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Reading in a Second Language

Moving from Theory to Practice

Second Edition

William Grabe and Junko Yamashita

Reading in a Second Language

Understanding reading abilities and their development is fundamental for language comprehension and human cognition. Now in its second edition, this book draws on research from multiple disciplines to explain reading abilities in both L1 and L2, and shows how this research can be applied in practice in order to support reading development. Research into reading has progressed a great deal since the first edition was published, so this edition has been completely updated and revised in order to reflect these advances. All chapters present updated research studies, and completely new chapters are included on the neurocognition of reading, reading–writing relationships, and digital reading. If you want to know how reading works, no matter the language(s) involved, as well as how it can be taught effectively, this book provides a persuasive research foundation and many practical insights. It is essential reading for academic researchers and students in Applied Linguistics and TESOL.

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Moving from Theory to Practice

Second Edition

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For Dot, Linda, Marshall, Mikiko, Tak, David, and Diane
Bill Grabe

Dedicated to Toshiyuki and Yoshie
Junko Yamashita

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Preface

This second edition of *Reading in a Second Language* is different from the first edition but also a direct continuation. We are happy to report that the general findings of research informing reading comprehension and reading development are essentially the same as the interpretations of research in the first edition. At the same time, there are new chapters in the second edition that reflect changing perspectives and priorities over the past fourteen years. Certain chapters have been slimmed down to provide room for these additions. Perhaps more importantly, new research has altered our own views on the roles of background knowledge, implicit learning, orthographic and syntactic processing, automaticity and the speed of word-to-text processing, amount of reading (or extensive reading), and the larger relationship between linguistic theory and language acquisition. Despite these changes from the first to the second edition, the goals remain the same as for the first edition, using research findings to describe reading comprehension skills and inform reading instruction.

The subtitle of this book captures its focus: *moving from theory to practice*. Writing a book about the impact and implications of reading research on second-language (L2) reading instruction means that a number of alternative perspectives are not developed in the book. So, at the outset, we will say that this book is not primarily a survey of existing L2 reading research and what it has uncovered about L2 reading abilities. Excellent publications already exist on that topic: Chen et al. (2016), Geva and Ramirez (2015), Koda (2005), and Koda and Zehler (2008) outline in detail L2 reading research. When envisioning this book, we wanted to focus as well on what researchers, teachers, and curriculum developers could do with information about reading comprehension and reading development to improve L2 reading instruction. At the moment, we are not convinced that synthesizing L2 reading research, by itself, would lead more clearly toward that goal. One consequence of this orientation is that this second edition remains heavily oriented to English (but not only English) first-language (L1) reading research.

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The book has a second goal that follows from the first. This second goal focuses on explanations for how fluent reading works and how research on reading can be used to promote reading development in both L1 and L2 reading contexts. Teachers and teacher trainers need to have a good sense of how fluent reading works if they are to understand key implications from research as well as the range of instructional assertions made about what will improve reading comprehension. Again, a consequence of this second goal is that the book is heavily influenced by L1 reading research.

At the same time, the book does not take the final step in moving from theory to practice. Such a step would involve highlighting L2 instructional applications that describe day-to-day instruction or the scope and sequence of a reading curriculum. A good example of this is seen in the work of Neil Anderson, in which a teacher-training framework (Anderson, 1999, 2009) is translated explicitly into an L2 reading textbook series (Anderson, 2014–2015).

In pursuing the above goals, we have explored how reading, not just L2 reading, works. We have also sought out research on reading instruction that is most likely to provide evidence for L2 instructional effectiveness. In a number of cases, that goal has meant a focus on L1 research that, so far, has no comparable L2 counterpart. Our intention all along has been to address L2 reading instruction, but the research and instructional training studies of most interest and potential are often L1 based. In many instances, the book does focus on L2 research, often involving experimental studies with instructional treatment groups. So the book discusses L2 reading research and its potential for L2 instruction, but this is not the main focus of the book, nor is it a consistent theme across chapters.

While research on L2 reading is often developed from research that is L1 based, this is not always the case, as research on L1–L2 transfer effects, the bilingual lexicon, and learning with a two-language system have shown (see especially Chapter 8). Moreover, L2 reading research on both extensive reading and vocabulary learning has made important independent contributions to understanding L2 reading development (Chapters 11 and 18). Perhaps most clearly, applied linguists have made major contributions to understanding the nature of written text structure and its potential impact on reading abilities (Chapter 14). Having noted all these L2 contributions, it nonetheless remains that much L2 reading research represents extensions from issues and developments initially explored in L1

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reading research. There is nothing wrong with this research evolution for L2 reading.

One obvious contrast that arises from these types of research comparisons is the greater role that L2 language proficiency plays in sorting individual differences in L2 reading comprehension (whereas in L1 reading comprehension, conceptual background knowledge is likely to play a somewhat greater role). Such research comparisons also highlight the unique demands on L2 reading development – learning to read with two language systems operating in the learner's mind.

In exploring the primary goal of moving from theory to practice in reading, we have made a consistent effort to base instructional implications and teaching suggestions on instructional treatment studies that reveal significant differences between experimental and control groups. We have not always been able to maintain this goal, and the chapters on social contexts, motivation, reading–writing relationships, and extensive reading (Chapters 9, 10, 15, and 18) include a considerable amount of correlational, regression, and meta-analysis evidence to support implications for instruction. Moreover, the chapter on curriculum development and instruction (Chapter 19) summarizes ideas from other chapters and reflects our own interests and experiences with reading instruction.

At the same time, the large majority of the chapters draw implications for instruction from experimental and instructional research studies (assuming experimental and control groups, some type of training period, and pre- and post-treatment assessment). We have tried to limit reliance on case studies, qualitative studies, and recommendations from practitioner knowledge, although some amount of intersection across methods and orientations is not necessarily a bad outcome. Case studies and qualitative research are fine as far as they go, but this book has focused on quantitative research to the extent that this has been possible.

The book is organized into five parts, as shown in the table of contents. The first part outlines the cognitive foundations for understanding how reading works. Chapters 1 to 3 provide the basic explanation, while Chapters 4 to 6 expand cognitive and neurocognitive concepts underlying reading abilities, and explore various models of reading. The second part examines variations in reading abilities. Some of these variations are due to L1–L2 relationships (Chapters 7 and 8), while other sources of variation are due to social-context factors and student motivation for reading (Chapters 9 and 10). The third part of the book highlights the development of reading

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comprehension abilities, addressing the major requirements for becoming a fluent reader (vocabulary knowledge, grammar knowledge, main idea comprehension, strategic reading, and awareness of discourse structure; Chapters 11 to 14). The fourth part focuses on skills and instruction that examine (a) more advanced reading in relation to writing development, (b) digital contexts for reading development, (c) reading fluency, and (d) extensive reading (also referred to as amount of reading, or exposure to print, in L1 contexts; Chapters 15 to 18). Part five brings together the research from the first four parts in addressing curricular and instructional contexts, and reading assessment practices.

This book has been written for at least two audiences. We hope that researchers, teacher trainers, curriculum developers, and anyone interested in L2 reading will want to read all the chapters. We also want the book to be relatively accessible to graduate students and intrepid teachers wanting to know more about reading and how to improve reading instruction. For teachers and graduate students looking for more streamlined explanations, a theoretical foundation can be built from Chapters 1 to 3. Core ideas for developing reading comprehension abilities can be found in Chapters 10 to 14. Expanding reading abilities beyond general comprehension to develop fluent L2 readers is addressed further in Chapters 15–19. We hope that this recognition of two potential audiences will help readers determine how to use the book most productively.

Unlike the first edition of this book, this edition does not include a closing discussion of further issues to consider. In large part, we have addressed three of these further issues explicitly with three new chapters in this second edition: the role of neurocognitive processing (Chapter 5), the importance of reading–writing relationships (Chapter 15), and the challenges of new digital literacy environments (Chapter 16). We have also moved discussions of teacher training into multiple chapters. We recognize that no book can treat all aspects of reading well, and so we have refrained from chapters on early literacy development of phonological awareness and word recognition, basic adult-literacy practices, reading disabilities, and primary-grade biliteracy instruction.

In writing this book, we have been encouraged by a number of people who did not let us slip behind on the project. We need to thank first Fredricka Stoller, who has read and commented on every page of this second edition. We also need to thank Jan Hulstijn, Norbert Schmitt, and Dongbo Zhang for reading and commenting on multiple chapters. The book has been made much better by their comments. We have also learned much from colleagues and

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researchers from several academic fields, some of whom have greatly shaped our thinking over the years.

We hope that this book turns out to be as stimulating for readers as it has been for us to write. The book has changed our thinking on reading in a number of ways, and we hope that the book conveys some of the excitement that we have felt in rethinking concepts and in exploring new and innovative ideas about reading and reading instruction. But throughout this process, one thing has remained constant. We only learn to read by reading, and by reading a lot.

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PART I
FOUNDATIONS OF READING

Part I comprises six chapters that, together, explain how comprehension works, how it can develop over time, and how various cognitive abilities contribute to reading comprehension. This section draws heavily on research in cognitive psychology and educational psychology; the explanation of reading comprehension presented relies on research primarily carried out in first-language (L1) contexts. The major research findings that explain reading comprehension rest primarily on research with learners reading in English as their L1, although there is also considerable and growing research on L1 reading comprehension in several Indo-European languages (e.g., Dutch, German, Greek) as well as in Hebrew, Korean, Japanese, and Chinese.

One consequence of the emphasis on L1 reading comprehension research is that this section is primarily oriented to reading ability more generally rather than to a specific explanation of second-language (L2) reading comprehension. There are, in fact, many differences between L1 and L2 reading, and they are addressed in various ways in Part II of this book. However, the basic comprehension process is one that generalizes across L1 and L2 contexts, even if local processing details might vary across different L1s and across L1 and L2 contexts. Complex comprehension abilities are shared across the human species, and these abilities apply to more than reading (e.g., listening comprehension, visual comprehension); so it should not be surprising that basic cognitive processes operate in consistent ways across modalities, across languages, and across multiple languages. This recognition of both the universal cognitive architecture for comprehension and specific variations in its operationalization in different language and multilanguage contexts has already been argued persuasively (Geva & Wang, 2001; Koda, 2007).

It is important, to note, however, that this generalization of the basic cognitive comprehension architecture is not equivalent to saying that reading abilities are the same in every language or multilanguage context (see Chapters 7 and 8). The cognitive processes underlying reading comprehension interact with specific orthographic systems,

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specific social contexts, and, in many cases, multiple orthographic and social contexts. The result is that the basic cognitive processing system adapts to make maximal use of the available information from the orthographic system(s), the linguistic system(s), and the social contexts. (How cognitive processing for comprehension adapts to different language and social contexts is the purpose of Part II.)

Chapter 1 introduces reading comprehension abilities and defines reading in terms of component skills that underlie and support comprehension. These component skills, in effect, define reading comprehension. Reading abilities are also described in terms of goals for reading. There are many ways in which people engage in reading, and different reading tasks call for distinct combinations of component skills. It is important to identify these variations in reading and explain how reading comprehension represents the core ability across these different goals for reading. Chapter 1 also connects reading skills development with learning theory more generally because learning and comprehension are intimately related, and both have major implications for how reading is learned and should be taught.

Chapters 2 and 3 explain how reading comprehension emerges from the specific cognitive skills applied to a written text. Chapter 2 focuses on lower-level processing skills that convert the orthographic, morphological, lexical, and syntactic patterns on the page to mental resources that build comprehension. Chapter 3 focuses on higher-level processes of comprehension and describes how cognitive resources are used to build text comprehension. By the end of Chapter 3, the reader should have a strong sense of how text comprehension emerges from the various component skill processes.

Chapters 4 and 5 explore in greater detail the underlying cognitive and neurocognitive abilities that have been identified in Chapters 2 and 3. They also address a number of issues that have arisen around reading comprehension; these issues include not only the contributions of implicit and explicit learning, but also the nature of automaticity, attention, inferencing, memory systems and neurological processing. A major goal of Chapters 4 and 5 is to integrate interpretations of these issues with the view of reading comprehension developed in Chapters 2 and 3.

Chapter 6 describes a number of efforts to present overall theories of reading abilities in terms of "models of reading." Such models provide ways to synthesize research findings, present coherent interpretations of reading abilities, and offer agendas for future research. For a model of reading to contribute significantly to our understanding of reading, it must offer descriptions that can be tested and validated by further investigations.

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Each chapter concludes with implications for instruction. Because the first section is very much foundation-oriented, implications reflect larger connections between research findings and instructional practices. Nonetheless, the connections are important for readers interested in instructional implications.

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1 *The Nature of Reading: Defining Reading*

It is only because these (reading) processes have become automatic and unconscious, thanks to years of practice, that we are under the illusion that reading is simple and effortless. (Dehaene, 2009, p. 8)

Reading is something many of us take for granted. We read with what appears to be little effort and little planning (Dehaene, 2009). And it is remarkable that so much of the world's population can read. A little more than 86 percent can read to some extent (UNESCO, 2016, ages 15–64; World Bank, 2016). They can read basic forms, read advertisements, read newspapers, and use basic reading skills in their work and daily lives when needed. Some percentage of these people can read at a much higher level of comprehension, learning new conceptual information from texts, synthesizing new information from multiple texts, critiquing information in texts, and using their comprehension skills to reinterpret texts (e.g., NAEP, 2020: 35 percent of 4th grade and 8th grade in the United States read at proficient or advanced levels). Universal literacy is an ideal goal that is an ongoing priority among UNESCO, nation states, and many nongovernmental organizations, and efforts need to be made to reduce illiteracy levels.

It is also important to recognize that many people around the world read in more than one language. Large populations of people have learned to read in second or third languages for a variety of reasons, including interactions within and across heterogeneous multilingual countries, large-scale immigration movements, global transportation, advanced education opportunities, and the spread of languages of wider communication. As the nature of reading is explored more fully in this chapter, and the true complexity of reading emerges, the large number of readers who can function well in more than one language will seem remarkable. (And it is remarkable.) In almost all cases, these readers have learned to read in their first language (L1), but they have also learned to be second-language (L2, subsuming both second and foreign language) readers, often under very different (and sometimes difficult) circumstances. In Chapters 1 to 6, we focus on

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research describing those who *can* read and who can read well. What is it that we do to comprehend a text? What specific skills and abilities do we use, and in what ways? How do we read differently for different purposes? As teachers and researchers, how do we define reading? What makes a person a fluent reader?

1.1 Ways We Read and Why We Read

As fluent readers, we read many different types of texts, some that we consciously intend to read, and some that we just seem to pick up or encounter. We read throughout the day in modern societies because print is all around us, and we use it in many more ways than we are aware of. We read magazines during the day, whether relaxing or waiting in some office. We read newspapers, flyers, and ads. We also read at night before going to sleep. But we read much more than this. We read when we look at products while shopping. We read posters, billboards, and displays when we travel on public transportation. We read forms in order to fill them out. We read when we receive and send emails, text messages, tweets, and when we search the Web for information. We read when we are on social media. We read when we browse movie titles for video streaming. We read when we look at the TV guide (in print or on the TV screen). We read (and reread, and reread) whenever we write anything.

In more formal settings, we expect to read in academic contexts or in workplace environments as part of learning or engaging in our jobs. Many of us also engage in reading that may be quite demanding in educational, professional, and occupational settings. In these latter settings, a great deal of learning occurs; part of that learning requires that we read and interpret informational texts in line with the tasks that we engage in and the goals that we set (or are set for us). These settings often require us to synthesize, interpret, evaluate, and selectively use information from texts. Moreover, we often encounter competing or contradictory information. It is a fact of modern life that almost any issue or topic can be discussed, addressed, or argued from multiple viewpoints, and it is our task routinely to decide among these alternative sources of information. How we learn to negotiate this world of print and achieve our goals is a large part of many professional and academic lives.

Citizens of modern societies must be good readers to be successful. Reading skills do not guarantee success for anyone, but success is much harder to come by without being a skilled reader. The advent of the computer, the smartphone, and the Internet does nothing to change this fact about reading. If anything, electronic

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communication only increases the need for effective reading skills and strategies as we try to cope with the large quantities of information made available to us.

A very large percentage of people around the world also learn to read an L2, usually as students in formal academic settings. Students may learn to read an L2 as a school subject with little further use outside the classroom. However, many students use their L2 reading skills to engage in advanced studies, get a good job, travel, gain access to information, become more cross-culturally aware, communicate with others, or be entertained. Moreover, events over the past 100 years have placed greater demands on people to become literate in an L2. The twentieth and early twenty-first centuries have been a time of massive migrations around the world as well as growth in the use of world languages (e.g., English, Chinese, Spanish, Arabic, French: see Gunderson & D'Silva, 2017). Many people have moved to new countries for various reasons. They and their children have had to, and continue to, learn to function in societies and school systems where their significant reading experiences are often primarily in an L2 (Gunderson & D'Silva, 2017). Modern societies are becoming more complex all the time. The level of expectation for a person to function well in a modern print environment is higher than ever before. This pressure will only continue to grow for people wanting to be active and successful participants in these societies. Electronic communication growth, rather than compensating for weak literacy skills, only amplifies the need for skilled reading abilities as well as the need for additional reading abilities in learning contexts (Ackerman & Goldsmith, 2011; Cobb, 2017; Salmerón et al., 2019; Stoller et al., 2018; Wylie et al., 2019).

Aside from massive waves of migration and relocation, the rise of English as a global language has had a major impact on educational systems around the world and the demands for reading in an L2. In countries around the world, school systems require students to learn English for access to information and for the eventual ability to compete economically and professionally. For good or for bad, this situation reflects a reality of the early twenty-first century (Crystal, 2019; Gunderson & D'Silva, 2017). Millions of students are expected to learn English as an additional language to some extent. Reading in English provides one of the few avenues for these students to develop their English L2 abilities to the point at which advanced academic curricular goals can be achieved.

It is evident that citizens of modern societies will benefit from being skilled L1 readers now and in the future. But it is also fair to say that, for millions of people, L2 reading skills represent a significant

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concern as these people negotiate careers and seek advancement in modern economies. A person's future opportunities for success and prosperity will be even more entwined with skilled reading abilities. It is therefore an important societal responsibility to offer every person the opportunity to become a skilled reader, and in many cases this means becoming a skilled L2 reader.

There are many contexts in which people develop reading abilities. Students in K-12 (or equivalent) education systems are taught to read their L1 as a primary goal. Adults who, for whatever reason, did not learn to read as children, often learn to read their L1s through adult education and adult literacy classes, many funded by regional and national institutions, but others sponsored by local school systems or volunteer organizations. L2 students can also be divided into those who learn to read in a K-12 educational system and those who take adult education classes (for either vocational or academic purposes). Moreover, there is a real difference for adults who want to gain access to significant academic training versus those who need basic, or survival, L2 reading skills. There are also major distinctions among K-12 students who *are required* to learn to read in an L2 (as in many foreign language settings), those who *want* to learn to read in an L2 (in many second and foreign language settings) and those who *need* to read in an L2 (in mostly L2 settings).

No book can address all these major contexts equally well, and this book focuses much more on academic reading contexts, although this emphasis also includes reading for entertainment and general comprehension as they are central issues for the development of academic reading. While survival reading skills for adult literacy and citizenship goals are not explicitly addressed, many facets of the discussions in this book will be informative for these areas as well. Lest one think that this book is narrowly conceptualized, it is safe to say that the demands of reading development in academic contexts, as indicated by the earlier discussion, are varied and extensive. Even reading in contexts outside the academic classroom, such as daily encounters with newspapers and emails, or reading novels for entertainment, represent important aspects of the development of academic reading skills.

1.2 Reading for Different Purposes: Types of Reading

Comprehension processes are influenced significantly by the general reading goals that are assigned to the reader, as well as by the specific task or relevance instruction…. Common reading goals include reading to study, reading for entertainment, reading to search for information (skimming and scanning), reading to learn, reading to integrate information from multiple sources,

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reading to evaluate, critique, and use information, and reading for general comprehension. (van den Broek & Kendeou, 2017, p. 287)

The combination of our daily encounters with texts and our needs to read in different ways in educational and professional settings requires that we read differently depending on the context and our goals (and motivations). When we read for different purposes, we engage in many types of reading, particularly in academics settings. Six major purposes are listed in Table 1.1.

Table 1.1 Academic purposes of reading

1. Reading to search for information (scanning and skimming)
2. Reading for quick understanding (skimming)
3. Reading to learn
4. Reading to synthesize information
5. Reading to evaluate, critique, and use information
6. Reading for general comprehension (in many cases, reading for interest or reading to entertain)

There are certainly other ways to classify purposes for reading aside from the six listed here, and we acknowledge that this list does not identify every possible purpose (cf. Alderson, 2000; Britt et al., 2018; McCrudden et al., 2010; Urquhart & Weir, 1998). Our list does, however, make the point that, as fluent readers, we read for different purposes. Different purposes for reading also tend to impose differing levels of demand on the reader in order to maintain an appropriate *standard of coherence*. The concept of standard of coherence is very important for discussions of academic reading. It refers to our ability to establish a level of understanding that is acceptable for a specific reading purpose, and for the more specific goals of individual reading tasks (van den Broek & Kendeou, 2017). With respect to more specific tasks, reading will also vary, and sometimes considerably. For example, reading to learn may involve learning new content in subject matter courses, studying for a test, answering specific questions, writing a brief response paper, or identifying arguments that support a position. Each of these specific tasks, as well as the settings that makes these tasks relevant, will likely lead to somewhat different reading processes being foregrounded (Britt et al., 2018; Eason et al., 2012; McCrudden et al., 2010; Pearson, Palincsar, Biancarosa, & Berman, 2020; Yeari et al., 2015). We need to account for these differing purposes and tasks when we consider any definition of reading.

When we want to locate some specific information, we engage in *search processes* that usually include *scanning* and *skimming*

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(cf. Guthrie, 1988; Guthrie & Kirsch, 1987). If we have read a chapter in a book and want to check when James Watt invented his version of the steam engine, we might first try to recall the context in which that discussion had occurred, then skim through the chapter to find the most likely pages, and then scan those pages for suitable information. Both skimming and scanning are processes carried out at very high speed (with high rates of words per minute [wpm], cf. Carver, 1992; Rayner et al., 2012, 2016). The combination of scanning (identifying a specific graphic form) and skimming (building a simple quick understanding of the text) allows a reader to search for information.

Skimming is also used for a variety of other reasons (and so may be seen as a superordinate purpose). We skim when we want to determine what a text is about and whether or not we want to spend more time reading it. We skim when we are expected to read a more difficult text so that we have a sense of where the text will lead us and what we may need to know to understand it. We skim when we need to work through many texts and want to make decisions about which texts to focus more attention on. We also skim when we are under intense time pressure and need to reach some decision about the usefulness of information in a text.

Reading to learn is often carried out in academic and professional settings. We read to learn when the information in a text is identified as important (often by a teacher or textbook) and when that information will be used for some task or may be needed in the future. Reading to learn places more processing demands on the reader because the reader is expected to remember the main ideas and many supporting ideas and be able to recall this information as needed for additional academic purposes (Chall, 1983 [stage 3]; Geva & Ramirez, 2015; Goldman et al., 2016; Millis et al., 2019; Pearson, Palincsar, Biancarosa, & Berman, 2020; Shanahan, 2014; Shanahan & Shanahan, 2014). We usually read to learn at a relatively slower speed (about 200 wpm; Carver, 1992), and usually for relatively shorter text segments at any one time. Reading to learn often involves close reading and rereading of text material. The effective reader organizes the content within a frame that is coherent and accurate with respect to the information presented in the text (Britt et al., 2018; Goldman & George, 2019). The reader also has to connect the text content with information established in the reader's long-term memory (i.e., prior knowledge). Reading to learn occurs whenever a reader has some motivation to recall and use the information at a later time (Grabe & Stoller, 2019). It is true that readers also learn when they read for general comprehension, but the expectations for using supporting information, for creating an organizing frame of

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reference (e.g., organizing information by cause–effect, comparison–contrast), and for building a close integration with prior knowledge are not usually assumed.

Reading to learn (or in most recent manifestations, reading for understanding, or deep comprehension), has become a recent focus in the United States as the primary reading goal for middle- and secondary-school students (both L1 and L2) (see Chapters 13 and 15). This shift is a response to a general lack of improvements over the past twenty years in national assessment reports by the National Assessment of Education Progress (NAEP), where about two-thirds of US 4th, 8th, and 12th grade students perform below "proficient," and the bottom third perform below "basic" in reading comprehension (see Chapter 13). More positively, it is also most clearly seen in efforts to promote disciplinary-specific literacy skills, close reading for challenging texts, and reading combined with additional academic skills of writing and project-based learning.

In reading to learn (and reading to integrate, evaluate, and apply information), there is a much greater emphasis on becoming a strategic reader, and engaging in learning content knowledge as a facet of reading for understanding or deep comprehension (Millis et al., 2019; Pearson, Palincsar, Afflerbach et al., 2020; Shanahan & Shanahan, 2008). It is not clear that this should, in fact, be the primary goal of all secondary-level students, especially with ESL/EFL students, emphasizing the learning of content knowledge and how to improve learning from texts. Instead, many students still need support and practice with general reading comprehension skills, academic motivation for reading, main idea comprehension, vocabulary knowledge, reading fluency, and sufficient overall reading experience.

Reading to synthesize information requires that the reader integrate (and learn) information from multiple texts or bring together different parts of a long text, such as a long and complex chapter in a textbook. This purpose represents a more complex and yet more difficult task for readers in academic and professional setting than reading to learn (Beker et al., 2017; Britt et al., 2018; Chall, 1983 [stage 4]). The effort to build a strong organizing frame in reading to learn is increased significantly when there are multiple texts that refer to related information but that may present conflicting or incompatible facts and explanations (Afflerbach et al., 2014). In the case of multiple texts, the reader must decide how to create his or her own organizing frame for the information because none is provided by the combined set of texts. In the case of a long complex text, the information may have been presented through multiple organizing frames (comparison–contrast, descriptive listing, problem–solution).

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For example, a set of texts may include a description of a situation, a comparison of competing views, a narrative of discovery, and extensions of a theory.

Readers often have to decide which aspects to select, prioritize, and highlight, and then create a coherent organizational frame around the full set of information to be synthesized. The key differences from reading to learn are that the reader typically must evaluate the information and create his or her own organizational structure rather than follow an organization structure provided by one of the texts. In a number of respects, the recent efforts to emphasize learning of content knowledge from text reading, and the emphasis on deep comprehension are more appropriate for reading-to-synthesize goals as well as specific purposes for evaluating, critiquing, and using texts (Millis et al., 2019; Pearson, Palincsar, Biancarosa, & Berman, 2020).

Reading to evaluate, critique, and use information often also represents an increased level of demand, greater use of reading strategies for academic goals, and a more complex interaction of reading processes. In academic and professional settings, readers are at times asked to evaluate and critique information from multiple texts or from one long text, requiring that they make decisions about which aspects of the text are most important, most persuasive, least persuasive, or most controversial. Moreover, readers need to decide how to relate the text information to other information intertextually and to their own prior knowledge and beliefs. Perhaps the greatest demand of this type of reading, aside from the ability to construct a careful understanding of the text(s), involves the application, and especially rhetorical control, of a reader's attitudes, emotional responses, interests, and preferences for the interpretation of the text (when evaluation or critique is done well). At this level of reading, extensive inferencing and background knowledge come into play, and the reader engages very actively in reinterpreting the text for the reader's own purposes (Chall, 1983 [stage 5]). In many cases, this intensive level of critical reading usually accompanies some further goal that involves the use of the output from the critique or evaluation for some other task, most commonly a writing or multimedia task (Grabe & Stoller, 2019; Grabe & Zhang, 2016).

Reading for general comprehension is the most common purpose for reading among fluent readers, and it is the default assumption for the term reading comprehension (Carver, 1992). This is the reading that takes place when we read a good novel, read an interesting newspaper story or feature article (online or in print), or web articles and the following "comments," or blogs, or a magazine when we are relaxing. It is saved for last in this discussion because

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it is both fundamental to reading and most often misunderstood as easy reading – but it is not easy (or "shallow"). Reading for general comprehension actually involves a complex set of processes when carried out by fluent readers. It is true that general comprehension processes provide a foundation for other reading purposes, such as reading to learn and reading to evaluate. But reading for general comprehension is also a type of reading that is carried out automatically for extended periods of time and with apparently few processing difficulties. Reading for general comprehension evolves over time for L1 readers to become seemingly effortless because of the extraordinary number of hours devoted to word recognition, automatic processing, lexical access and syntactic parsing, meaning formation, and text-building comprehension processes, all of which take place under very intense time constraints. It is this fluency under intense time constraints that makes reading for general comprehension difficult especially for L2 readers, who generally have far less exposure to L2 print.

1.3 Reading for Different Purposes: The Validity of the Concept

> Successful reading includes the ability to adjust processing in such a way that learning goals, as a function of reading purpose, are met. (Linderholm & van den Broek, 2002, p. 778)

Research on "purposes for reading" has become a more robust subfield over the two past decades, especially in US secondary school contexts. One foundation for increased attention to advanced academic reading has been the recognition that many L1 secondary-school students have not demonstrated the skills needed for advanced reading goals such as reading to learn, reading to integrate information, or reading to evaluate/critique texts (as noted earlier). Until recently, many US school systems also did not seem to recognize that texts in different disciplines are written in different ways that reflect different disciplinary knowledge, and many secondary-school curricula were not developed to help secondary-school teachers improve students' academic reading skills. A second, and related, foundation for the new emphasis on different purposes for reading in US secondary schools has been a response to students not learning content knowledge adequately, and has involved training studies to assess the effectiveness of instructional programs for teaching more advanced academic reading skills (Britt et al., 2018; Goldman et al., 2016; Guthrie et al., 2013; Vaughn et al., 2013, 2017).

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A third and more long-standing foundation has emerged from efforts by comprehension researchers to account for variations in reading abilities driven by different purposes for reading. This research focused on how a person reading for one purpose will comprehend a text or carry out a task in a certain way, but the same person pursuing a different reading purpose, and a different task, will perform differently on the latter task (Eason et al., 2012; Hagen et al., 2014). A range of studies in comprehension research have demonstrated significant differences in comprehension processing as a result of different purposes for reading (Britt et al., 2018; Linderholm & van den Broek, 2002; Lorch & van den Broek, 1997; Rayner et al., 2012).

For example, we know that readers who have expertise in a certain domain will read in ways different from readers who are learning much new information in the reading process. Multiple studies have shown that students with low domain or background knowledge, read with the purpose of gaining comprehension from the close reading of a text. Students with high domain knowledge read to build a more elaborative knowledge base and draw more selectively from the text. These distinct types of reading lead to differing performances on various post-reading tasks.

A further line of comprehension research studies has shown that reading different genres also has an impact on reading purpose. Research by McDaniel and his colleagues (1986, 1995) has argued that different text types promote distinct material appropriate processing. Readers adjust reading purpose to account for different genres of texts and perform differently on various post-reading measures (Einstein et al., 1990; McDaniel & Einstein, 1989; McDaniel et al., 1986, 1995). More generally, research has shown that reading expository and narrative texts impose different types of demands on readers (Gardner, 2013; Grabe, 2002; Lorch, 2015, 2017). In another line of research, Pressley (2002a, 2002b; Pressley & Afflerbach, 1995) has shown that reading for different purposes has a strong empirical research base in verbal protocol studies. These studies demonstrate that readers read for different purposes and that they adopt different processing goals to carry out their reading purposes.

In a seminal research study on reading purposes, Linderholm and Van den Broek (2002) examined higher and lower ability college readers to see if they read differently when reading for entertainment or reading for study purposes. They used verbal think-alouds with students as they read one of two texts, and they were asked to read the text imagining they were interested in a general article they had picked up or they were reading to prepare for an essay exam in class. All students reading the entertaining text used more general associations and evaluative

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comments. Better readers recalled more information than weaker readers, but both stronger and weaker readers recalled more information when reading for study purposes. Overall, all students adjusted their processing to fit reading purposes, though weaker readers chose somewhat different strategies while adjusting their processing.

In a study involving both L1 and L2 students, Horiba (2000) showed that L1 readers of Japanese adjusted their reading processes and strategies to differing types of texts and purposes for reading. L2 readers of Japanese were also strategic when reading both types of texts and used somewhat differing strategies overall, but were not as able to shift strategies to differing purposes for reading. Her findings were similar to Linderholm and van den Broek except that L2 readers had difficulties shifting their processing to new purposes for reading when the task was demanding.

Overall, the results of a range of research demonstrate that there is significant evidence for the reader purpose concept (or a task factor) and its impact on comprehension (and learning). All the various purposes for reading noted in this chapter are purposes that fluent readers can control and alter as the situation and task require (Britt et al., 2018). As can be inferred from this discussion, each purpose for reading engages cognitive processes in different combinations. For example, reading to learn may require (1) the ability to skim to build appropriate anticipation for task demands, (2) the ability to comprehend the text (main ideas and supporting information), and (3) the ability to connect sets of supporting information within an organizing frame in which all the parts fit together. It would normally be carried out at a slower reading rate than basic comprehension processes, and it can be slowed down further to become an intense study process (removing most time pressure demands). All the various purposes for reading raise a fundamental question: Can we define reading as a single concept? More formally, can we define reading as a unified construct?

Based on this discussion, it would seem that the many purposes for reading could be treated as different skills. One could even argue that there really is no single notion of reading, but rather four or five distinct skills that we tend to call reading. However, as we will see in Section 1.4, there are many commonalities among these various purposes for reading and the cognitive processes that are engaged (see also Chapters 2–4). In many cases, the differences are matters of emphasis and elaboration rather than different skills being used. For example, when we are reading to learn, we use the same cognitive processes that are also used for reading for general comprehension, and we use scanning and skimming (in effect, speeding up for some

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quick information) to fill in information or set up expectations. When viewed in terms of the set of processes involved, reading becomes a unified process that is adjusted flexibly in response to reader purpose, reader proficiency level, type of text, and possible contextual constraints. This notion of reading as a unified concept, or construct, points out the need for a careful definition of reading, one that is likely to reflect the true complexity of what we do when we read.

1.4 A Definition of Reading

[An] important dimension of reading education includes understanding what skilled readers do when they read. (Ashby & Rayner, 2006, p. 52)

Reading is often defined in a simple statement much like the following: "Comprehension occurs when the reader extracts and integrates various information from the text and combines it with what is already known" (Koda, 2005, p. 4). Or, "Successful comprehenders construct a coherent and integrated representation of the meaning of that text" (Cain & Barnes, 2017, p. 257). However, when we think of the different purposes for reading and the varying processes that are called into play, it is evident that no single statement is going to capture the complexity of reading (Grabe & Stoller, 2020; Stafura & Perfetti, 2017). A more comprehensive definition will need to address the characteristics of fluent readers and answer questions such as these: What do fluent readers do when they read? What resources are used by fluent readers? How do these processes work together to build a general notion of reading (Ashby & Rayner, 2006; Stafura & Perfetti, 2017)? As a starting point, we can say that reading is understood as a complex combination of processes. These processes are described in Table 1.2.

Fluent reading is certainly a *rapid and efficient process*. It is rapid in the sense that we read most materials at about 250–300 wpm. Even material that is related to learning or professional work is likely to be read at this rate unless we are new to the information and actively trying to learn it (cf. Carver, 1990; Pressley, 2006; Rayner et al., 2012; Seidenberg, 2017). Reading is efficient not only in terms of overall reading rate but also in terms of the ways that various processing skills work together smoothly. When we read, we coordinate rapid and automatic word recognition, syntactic parsing, meaning formation, text-comprehension building, inferencing, critical evaluation, and linkages to prior knowledge resources. We do this seemingly without effort and with all processes synchronizing in time (Breznitz, 2006; Christiansen & Chater, 2016a; Schwanenflugel & Knapp, 2016).

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Table 1.2 Processes that define reading

1. A rapid process
2. An efficient process
3. A comprehending process
4. An interactive process
5. A strategic process
6. A flexible process
7. A purposeful process
8. An evaluating process
9. A learning process
10. A linguistic process

Reading is centrally a *comprehending process*. We read to understand what the writer intended to convey in writing, though we also do more. One reason to point out that reading assumes comprehension is to be clear that all cognitive processing involved in reading is related to this fundamental goal. A second reason to highlight comprehension is to point out that reading is not the only comprehending process. Listening is also a comprehending process and there may be visual comprehension as well (Gernsbacher, 1990). Reading and comprehension should not be equated; comprehension is a more all-encompassing concept than reading. Nonetheless, as fluent readers, we assume that comprehension is a central goal. After all, we seldom pick up a book or magazine and expect not to understand.

Reading is an *interactive process* in two ways. As noted, reading combines many cognitive processes working together more or less at the same time. This pattern of parallel interaction is essential to fluent reading (Breznitz, 2006). Reading is also an interaction between the reader and the writer. The text provides information that the author wants the reader to understand in certain ways. The reader also brings a wide range of background knowledge to reading, and the reader actively constructs the meaning of the text by comprehending what the writer intends and by interpreting it in terms of the background knowledge activated (by the reader).

Reading is a *strategic process* in that a number of the skills and processes used in reading call for effort on the part of the reader to anticipate text information, select key information, organize and mentally summarize information, monitor comprehension, repair comprehension breakdowns, and match comprehension output to reader goals. At the same time, being strategic does not always imply active applications of strategies (see Chapters 4, 12, and 13).

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Fluent readers often learn to automatize strategies as well-practiced routines, even in combinations. These multiple efforts also require that reading be a *flexible process*. As reader purpose shifts, as comprehension is impeded, or as interest varies, the reader adjusts reading processes and goals. The flexibility demonstrated by fluent readers keeps the processes and purposes aligned with each other. Of course, this alignment between processes and purposes points out the fact, as already discussed, that reading is also (and always) a *purposeful process*.

Reading is also a continuously *evaluative process*. At one level, evaluation is tied to being strategic and purposeful in that we evaluate how well we are reading (or monitoring our reading). Evaluation also occurs when we decide how we should respond to a text. Do we like what the author says? Do we have an interest in the information? Do we agree with the author? How does the text compare with other texts on the topic? Do we like the attitude and perspective of the author? Do we want to learn more? Do we want to continue reading? This pattern of evaluation of the text calls up our own attitudes and emotional responses to the text and the topic, and it requires a strong set of general inferencing processes and use of background knowledge. Ongoing evaluations also make reading a *learning process*. In those situations in which learning is expected, this process is obvious. However, in combination with evaluation, all reading activity is a learning process in one sense or another. Learning, as rehearsal skill consolidation, occurs even when we decide to review and check a grocery list or see what information is required to fill out a form. With almost any text we read, the evaluation process makes reading a basic learning process as we make decisions about how to respond to the text (cf. Beker et al., 2017).

Finally, reading is a *linguistic process*. It is not possible to read without making graphemic-phonemic connections, without recognizing the words to be read and the structural phrases organizing the words, and without having a reasonable store of linguistic knowledge (morphological, syntactic, and semantic) in the language of the text. At one level, this is obvious, but it is so easily overlooked or ignored that it must be stated explicitly. If we are asked to read a newspaper in Arabic and we do not know the script or any words in Arabic, no amount of background knowledge on a topic will assist us in reading that text. There are clear and obvious limits to background knowledge and reasoning as foundations for reading. The processing of linguistic information is central to reading comprehension (Alderson et al., 2016; Jeon & Yamashita, 2014; Perfetti et al., 2005; Yamashita & Shiotsu, 2017).

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The many processes described here provide a reasonable functional overview of what fluent readers do when encountering a text. At the level of *what* we do, these processes, together, provide a good, if complex, definition of reading. There is evidence for all these processes as parts of what we do as fluent readers. In a sense, we can refer to these processes as functional components of reading. Yet in order to understand reading better, we also need to know *how* we read. What are the cognitive processes involved in reading? How do they work together? How does comprehension emerge? How can we interpret a text in multiple ways? How does inferencing and background knowledge influence comprehension? In Chapters 2 and 3, we outline a set of cognitive processes using linguistic knowledge resources that provide a plausible account of how we comprehend and interpret texts as fluent readers.

1.5 Learning to Read

> One dimension of learning is the conversion of the deliberate into the automatic. The process of acquiring fluency in the use of knowledge is called skill acquisition. (Anderson, 2000, p. 305)

In many chapters in this book, discussions and explanations will address students learning how to read. Discussing how students learn to read entails a more general theory of how students learn any academic skill, and identifying a theoretical approach that supports learning is essential for critical exploration of the chapters that follow. It is not the goal of this section to outline a full theory of learning in detail or explore competing theories of learning more generally. However, because skilled reading is such a complex and incremental ability, a clear and consistent view on learning helps to frame many ideas and issues that emerge (Beker et al., 2017).

This book generally assumes a cognitive learning theory in line with Adaptive Control of Thought theory (ACT), developed by John Anderson (2000, 2015; see also DeKeyser, 2007; Ellis, 2005, 2006a; Veenman, 2016). In simple terms, this theory proposes that all learning follows a general path from *cognitive* (or declarative) learning (learning the what, or attending at some level), to *associative* (or procedural) learning (practicing, building strong associations, and gaining fluency), to *autonomous* learning (developing automaticity in calling up and using knowledge resources and information) (Anderson, 2015). Identifying such a cognitive learning theory as grounding for a description of reading and reading development highlights the incremental nature of skill learning, the need for extended practice,

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the importance of time on task, the integration of subskills and subroutines as proceduralization, the introduction of new information as just the beginning phase of learning, and the central role of automaticity for fluent and skilled reading abilities. A cognitive theory of learning also needs to allow for the influence of social context factors on learning outcomes (as will be discussed in Chapter 9).

Having a well-articulated and evidence-based learning theory also helps to explain many observations about student learning, and nonlearning, in reading contexts. As a simple example, words are almost never learned on a reader's first encounter with the word, no matter how intensive. In fact, the path from understanding a word's meaning to learning a major meaning of a word, and then learning many aspects of a word's meaning and use, is a long learning process that takes time (Andrews, 2015; Castles et al., 2018; DeKeyser, 2007; Graves, 2016; Perfetti, 2007; Webb & Nation, 2017). In a similar way, learning facts, concepts, and strategies in ways that allow them to be used without effort is a long, incremental process. Understanding something for the first time is not very far along the path to effortless use of that knowledge or skill. Reading comprehension ability is not alone as an application of a learning theory such as ACT, but it is an outstanding example of the challenges facing teachers and students who need to dedicate time, effort, motivation, and growing skills to the development of fluent academic reading abilities.

1.6 Implications for Instruction

One of the primary goals in this book is to draw out the possible relationships between research on reading and its implications for L2 reading instruction. In this final section, we consider the topics and issues addressed in the chapter and present a set of implications for reading instruction and, in some cases, for curricular design.

At the same time, it is important to recognize that implications are the potential, not the actual. Implications need to be tested and instructional research needs to be carried out to determine which implications work well for instruction, which implications can be generalized, which implications apply well in certain contexts, and which implications do not seem to support students' reading comprehension abilities. We will also review instructional research in several of the following chapters, but in a number of cases there is currently insufficient L2 instructional research to determine that the implications for instruction have turned out to be generally successful. This situation, of course, means that the research and teaching linkages for L2 reading need to be encouraged continually.

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Implications from research also do not translate directly into classroom instruction or curriculum design. Instead, implications need to be translated into applications that (1) serve very practical teaching and learning goals, (2) can be maintained throughout a curriculum, (3) are consistent with learning theory, and (4) achieve learning goals and demonstrate successful outcomes in the classroom. For example, N. Anderson (2009) outlined basic findings from L2 reading research and identified major implications. N. Anderson (2014–2015) translated these major implications into a reading textbook series that serves high beginners to low advanced English for Academic Purposes (EAP) students. There are at least five steps involved in connecting reading research to successful student learning: (1) presenting important results from reading research, (2) identifying implications for instruction, (3) carrying out training/instructional research to determine effectiveness of implications, (4) translating implications and instructional research into the curriculum and the classroom, and (5) assessing learning outcomes (curricularizing instructional research). These steps frame the interpretation of implications that can be drawn from reading research.

Looking at the major themes raised in this chapter, it is clear that L2 students, who are learning to read in different settings, at different institutions, and with varying levels of instructional training and resource support, will have different learning goals generally and varying comprehension goals with each task they carry out. Certainly any reading curriculum will vary according to general learning goals and student proficiency levels. One general implication, in considering the wide range of contexts for L2 reading, is that there is no single "one size fits all" set of recommendations for reading instruction or curriculum development. L2 reading instruction should be sensitive to the students' needs and goals and to the larger institutional context.

When L2 students read specific texts in classroom contexts, particularly in academically oriented settings, they will engage in varying types of reading that reflect differing tasks, texts, and instructional objectives. Sometimes students do not fully understand the goals for a given reading text or reading task and perform poorly. The problem may not be an inability to comprehend but a lack of awareness of the real goal for that reading task (Johns, 1997, 2005; Perfetti et al., 1996). Students need to become aware of the goals that they might adopt while reading, and teachers need to be more sensitive to clarifying goals explicitly. Students can discuss these goals for reading and how they might read texts differently depending on each type of goal. Students might also consider how they adjust goals when they encounter varying kinds of difficulty while reading – when the concepts are

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new, when the task requires careful understanding, when the text is long, or when the grammar is particularly complex. Thus, on both a general curricular level and on a day-to-day instructional level, goals and purposes for reading play a major role in reading development.

At the broader level, curriculum developers and teachers need to decide what aspects of reading abilities should be emphasized and practiced consistently. Determining the most important purposes of reading in the curriculum then indicates the range of supporting reading skills that should be taught explicitly, practiced regularly, and recycled consistently. For example, if one of the long-term curricular goals is to build "reading to learn" skills (Beker et al., 2017; Britt et al., 2018; Duke & Martin, 2019; Millis et al., 2019), then texts and tasks need to center around this purpose. Student will need to practice reading skills that emphasize comprehension of main ideas, supporting ideas, and many details. The reader will need to recognize the organization of the text and interpret the text information within a coherent framework that reflects the main ideas. The reader will need to carry out tasks that ensure linking the text information to personal knowledge as well as to information from other texts. In addition, the reader will need to demonstrate that text information has been learned and can be used for relevant language and content tasks. Additional goals for skills development related to "reading to learn" would include a large vocabulary, an ability to pull apart more complex sentences and noun phrases, an awareness of larger organizational units in the text, a set of key reading strategies, and an ability to read accurately (Duke & Martin, 2019; Grabe & Stoller, 2019; van den Broek et al., 2016).

A further aspect of identifying key purposes for reading and needed reading instruction to support skills development practices involves better diagnostic practices for reading improvement. In both L1 and L2 contexts, especially at more advanced levels, sensitive diagnostic assessment practices are needed to ensure more effective instructional outcomes. Diagnostic assessments are distinct from other types of assessment usually carried out in classroom settings or in standardized testing context, and they need to be developed carefully to be useful (Alderson et al., 2015, 2016).

A further major implication from this chapter follows from the more complex definition of reading provided. The various components of a complex definition for skilled reading suggest that long-range curricular goals for L2 reading need to address relevant language-knowledge resources; an appropriate level of language knowledge will help develop students' abilities to be flexible, strategic, and purposeful in interpreting reading goals and reading tasks (Grabe & Stoller, 2020).

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Curricular goals need to promote abilities to read rapidly and efficiently, and they need to provide a range of practice opportunities to develop these skills and language resources through direct instruction and extended reading activities. Certainly, an institutional setting that does not aspire to have students read a range of texts fluently would need to consider how far along a reading proficiency continuum students should move and what would represent appropriate end goals as curricular objectives. In such contexts, fluency with more challenging texts may not be a realistic goal. The set of skills to be developed would then become more limited, and instruction would be more restricted in its practice with certain reading skills.

The definition of reading presented in this chapter also suggests that a broad range of subskills and knowledge resources need to be explored more carefully to consider appropriate implications for instruction. In Chapters 2–6, the major subskills and knowledge resources involved in reading comprehension are outlined. These major components of reading will expand our understanding of the reading comprehension process. They will also broaden our interpretation of skills needed for fluent reading and offer additional implications for L2 reading instructional.

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2 *How Reading Works: The Building Blocks of Fluency and Comprehension*

> Many reading researchers now consider reading as a complex information-processing task in which rapid and efficient lower-level (reading) processes are critical to the operation of higher level comprehension processes. (Nassaji, 2014, p. 13)

When we recognize the complexity of reading, its multiple purposes, and its many properties, it becomes clear that the cognitive processes operating while we read must also be complex. It is precisely this processing complexity that has led researchers to examine reading in terms of its component skills and knowledge bases. Over the past thirty years, significant progress has been made in understanding how component skills work together to build reading comprehension. These component skills provide a reasonably clear explanation of fluent reading processes and abilities, and are also essential for understanding appropriate instructional implications (Cain et al., 2017; Castles et al., 2018; Jeon & Yamashita, 2014; Nassaji, 2014; Rayner et al., 2012; Schwanenflugel & Knapp, 2016; Stafura & Perfetti, 2017).

In this chapter, we outline lower-level processes, including word recognition, syntactic parsing, and meaning encoding as propositions (more formally, semantic proposition encoding). We introduce recent contributions from cognitive science on the time course of lower-level (and higher-level) processing that need to be incorporated into current reading comprehension research. The processing mechanisms explain how the component processes come together for skilled reading comprehension. These processing mechanisms include **automaticity**, **working memory (WM)**, and **now-or-never processing** (e.g., Chater & Christiansen, 2018; McCauley & Christiansen, 2019). At the outset of this chapter, it is important to note that describing certain skills as "lower-level" does not mean that they are simple or undemanding. Instead, they form a group of skills that become strongly automatized, and this automatizing of lower-level skills is a requirement for fluent reading (Anderson, 2020; Ehri, 2014; Nassaji, 2014; Oakhill & Cain, 2017).

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In Chapter 3, we outline higher-level processing. Together, lower-level and higher-level component processing provide a persuasive explanation for how we read. Both levels of processes operate simultaneously and interact with each other at certain points, though it is *not* the case that all processes interact with each other all the time, should we be tempted by that oversimplification.

It is also important to keep in mind that all the component processes described in this chapter (and in the next) are complex processes in their own right. In fact, each subcomponent easily deserves a book on its own. These component processes, in combination, provide the best window that we have on the reading process. It is sometimes easy to say that reading is not just a combination of its component parts. However, no one has yet to make a persuasive argument based on evidence that the component processes do not work together to generate reading comprehension. Moreover, unfounded criticisms of component processes – labeling them as small meaningless units – ignore the complexity of reading, reveal a disinterest in seeking explanations for how reading works, and demonstrate a misunderstanding of the complexities within each subcomponent process.

2.1 Word Recognition

> In reading, the singular recurring cognitive activity is the identification of words. From this follows two other, related observations about reading: Comprehension depends on successful word reading. Skill differences in comprehension can arise from skill differences in word reading. (Perfetti, 2007, p. 357)

Word recognition (and the components of word recognition ability) is now widely accepted by researchers as one of the most important processes contributing to reading comprehension. Many studies over the past twenty years have demonstrated that word recognition is a major predictor of later reading abilities (Castles et al., 2018; Nassaji, 2014; Schwanenflugel & Knapp, 2016; Seidenberg, 2017; Stafura & Perfetti, 2017; Verhoeven & Perfetti, 2017a; Willingham, 2017). Fluent reading comprehension is not possible without rapid and automatic word recognition of a large vocabulary. Word recognition represents the part of comprehension that is unique to reading. In other words, many nonreaders, especially first-language (L1) readers, have listening comprehension abilities associated with language more generally; what they are missing is the ability to activate comprehension specifically from graphic symbols and their combinations.

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The importance of word recognition for reading is hard to overestimate. When we read, we actually focus visually on almost all (about 80 percent) of the content words that we read and about 50 percent of the small function words (Pressley, 2006; Shotter & Rayner, 2015). We are able to do this because we are such extraordinary word recognizers. We can often encode (begin the word recognition process) in well less than 100 milliseconds (Breznitz, 2006; Shotter & Rayner, 2015), and we tend to maintain our focal vision on words for an average time of 200–250 milliseconds while engaging in multiple processes (Perfetti, 1999; Rayner et al., 2012; Seidenberg, 2017). Keeping these numbers in mind, it is not hard to see how a skilled reader can read a text comfortably at 240–300 words per minute (wpm) (Brysbaert, 2019). It should also be evident that inefficient word recognition processes are a major obstacle for second-language (L2) learners (e.g., Yoshizawa et al., 2018, report freshman Japanese university student reading times in their L2 English being at only between 40 and 80 wpm; this limitation is likely true of many L2 contexts around the world).

For fluent word recognition to occur, a reader must recognize the word forms on the page very rapidly, activate links between the graphic form and phonological information, activate appropriate semantic and syntactic resources, and recognize morphological affixation in more complex word forms. These subskills represent a standard way to describe word recognition skills (see also Andrews, 2015; Castles et al., 2018; Seidenberg, 2017; Willingham, 2017; Yap & Balota, 2015). Fast and automatic word recognition occurs when visual input from the word on the page activates lexical entries in the reader's lexicon that have well-represented information of all four types: orthographic, phonological, semantic, and morphosyntactic. This word-level information is stored **in long-term memory** (LTM; permanent memory) and becomes activated, along with a well-developed set of associations that activate related words, concepts, and contextual information.

2.1.1 Orthographic Processing

One of the key subskill processes in reading is the visual recognition of word forms from the text (Ehri, 2014, 2015; Nassaji, 2014). These forms include letters, letter groups, visual word shapes, and key shapes that are letter parts (such as the long vertical line in "*l*" or "*b*," or the right-hand curve in "*b*" or "*o*" or "*p*"). In current theories of word recognition, all of this information is processed simultaneously in shorter word groups rather than in letter-by-letter

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fashion (Rayner et al., 2012; Willingham, 2017). However, there is a direct correspondence between time of visual processing and the length of word for longer words. So letter recognition is an important subcomponent, and the more letters involved, the longer the word recognition time (Pressley, 2006; Rayner et al., 2012). In addition, orthographic processing involves larger letter groups (spellings of rime parts of syllables) that are highly consistent (e.g., in English, *-ake*, *-ight*, *-ogy*, *-eat, -end, -ope, -in, -ain, -ick, -ell*). Whole word recognition (i.e., sight words triggered directly by the orthography without completing phonological processing) demonstrate that readers make strong use of orthographic information at multiple levels (Castles et al., 2018; Ehri, 2015; Snowling, 2019).

Sight word reading is a common early word recognition strategy for beginning readers and it also becomes a major pathway for **automaticity** (automatic processing) in word reading among skilled readers. In fact, sight word reading skills, developed over extended exposure to reading practice, is likely to be a major factor in building greater **lexical quality** (the integrated phonological, orthographic, and semantic knowledge of a word). Again, Ehri (2014) emphasizes the centrality of sight word reading for the development of word reading automaticity and the growth of a large recognition vocabulary: "People used to regard sight words as limited to high-frequency or irregularly spelled words, but it turns out that all words when practiced become read from memory by sight" (p. 5).

Orthographic processing is also very important for the recognition of more complex words with one or more morphological affixes (e.g., ***un-event-ful***). Beyond the first few thousand words of English, many words in English are expansions of more basic words through additional morphemes (Anglin, 1993; Rayner et al., 2012). Words with more complex morphology may be recognized either by whole word access (with more familiar words) or by morphological decomposition. The longer the complex word form is, the more likely that it will be processed compositionally (e.g., word stem, then suffix, then suffix) (Hyönä, 2015; Rayner et al., 2012).

Research also suggests that more than 60 percent of English school words have a orthographically transparent morphology; that is, each morpheme gives useful information for word meaning development (Nagy et al., 2014), and this morphological transparency supports word recognition and word learning. Knowing how words are put together to form derived words (**morphological awareness**) contributes directly to vocabulary growth and reading comprehension abilities. Thus, the recognition of not only graphic forms but also of

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morphological forms, and how they may change meanings, is crucial (e.g., Berninger et al., 2010; Castles et al., 2018; Deacon et al., 2014; Goodwin et al., 2017).

2.1.2 Phonological Processing

Phonological processing involves the recognition that words consist of various types of subword phonological units (e.g., syllables, rimes, phonemes). The early development of word reading involves decoding (graphemic-phonemic correspondences) by which the graphic forms (spelling) of the word can be reconstructed into the sound (pronunciation), activating meaning (using phonology to help locate word meaning) and phonological memory (using phonology of a word to maintain it in WM). Most early word recognition processes by learners build phonological activation prior to lexical access as part of the word recognition process that combines interactions among orthography, phonology, and meaning. Thus, for the development of word reading skills, phonological activation of the word form plays a major role (Ehri, 2015; Melby-Lervåg, Lyster, & Hulme, 2012; Nassaji, 2014; Willingham, 2017). This appears to be a universal aspect of reading no matter the orthography. Even readers of Chinese characters make use of the phonological clues in the characters and use phonological information from the initial point of character (morpheme) recognition (Chen & Pasquarella, 2017; Chow et al., 2005; Perfetti, Cao et al., 2013).

Phonological processing skills are also essential early predictors of later reading development (especially for English), and it is central to current discussions of reading disabilities. As Berent (2013) notes, "reading skill hinges on the capacity to extract linguistic phonological structure from print, and to do so accurately and efficiently" (p. 2) (see also Perfetti, 2007; Snowling, 2019; Verhoeven & Perfetti, 2017a). As readers become fluent over years of extended reading, all normal readers develop strong phonological recoding abilities (as well as strong sight word reading skills), and these abilities no longer remain as a large source of individual differences among skilled readers (as opposed to younger learners and certain groups of L2 learners).

The extensive research literature on alternative ways in which phonological processing contributes to word recognition goes well beyond the scope of this discussion (Castles et al., 2018; Ehri, 2015; Seidenberg, 2017; Yap & Balota, 2015). The two main competing models for English word recognition are the **Dual Route Model** of Coltheart and colleagues (Coltheart et al., 2001) and various emergent single-process **connectionist models** (Harm & Seidenberg, 2004;

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see also McClelland et al., 2010; Seidenberg, 2012; Yap & Balota, 2015). The Dual Route Model essentially proposes a processing "race" between phonological recoding as a separate process (lexical access mediated by *a phonological recoding route*) and orthographic information interacting with and supported by semantic and phonological information (*direct form-meaning route*). The "emergent" single-process models argue that all sublexical information (phonological, orthographic, semantic) that is activated by visual input contributes interactively to access the right word (see Chapter 4).

Over the past decade, the actual differences between these views have lessened. Both alternatives account for a large range of observable data and evidence, though many researchers now find emergent single-process models more persuasive because they reflect brain functioning in a more plausible way. Whatever the outcome of these theoretical debates, the most important point to keep in mind is that phonological processing is a key aspect of word recognition in both alternative models, as it is for all languages and among all learners (cf. Andrews, 2015; Seidenberg, 2012; Verhoeven & Perfetti, 2017b; Yap & Balota, 2015).

2.1.3 Semantic Processing and the Self-Teaching Hypothesis

> With enough repetitions, the spelling of the word and its identity come to be associated. This is called the self-teaching hypothesis. Most kids are taught to sound words out, but they teach themselves (without knowing they are doing so) what words look like, based on practice distributed over several years. (Willingham, 2015. p. 136)

For children and L2 learners in naturalistic environments, word meanings are learned initially from their store of oral vocabulary knowledge and secondly from additional exposure to words through print. The key issue in early learning of word meanings from exposure to oral language, and then printed words, is the development of letter–sound (grapheme–phoneme) correspondences that are both accurate and efficiently processed. Initial occurrences of the orthographic form being processed and the efforts to build phonological representations are needed to then connect pronunciations of a given word to its word meaning. This connection creates a triangle of orthographic recognition, phonological decoding of the word form, and a link to the semantics of the word (word meanings) in LTM (Andrews & Reynolds, 2013; Castles et al., 2018; Ehri, 2015; Seidenberg, 2017; Willingham, 2017).

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In L1 reading, there exists a large store of meanings for spoken word forms. The ability to build letter–sound correspondences (or morpheme–sound correspondences in Chinese) becomes a pathway to accessing the meanings of these words fairly quickly. Through this process, the known meanings of oral forms of words, over a number of repetitions, promote rapid gains in vocabulary knowledge for reading. This process also extends to efforts to learn those words not already known orally. This word learning process, often operating implicitly, has been termed the "**self-teaching hypothesis**" by Jorm and Share (1983; see also Ehri, 2014, 2015; Landi, 2013; Nation & Castles, 2017; Share, 2004; Willingham, 2015, 2017). The hypothesis provides a realistic explanation for how phonological knowledge of word forms, connected to the orthographic forms, can lead to new word learning (semantic knowledge) without requiring repeated explicit instruction for many thousands of words in the L1.

The self-teaching process works as follows. Phonological recoding enables a reader to recall the orthographic form more easily and supports learners' written word knowledge (establishing an initial word meaning in LTM). As orthographic form recognition become stronger and more accurate, a direct pathway from orthographic processing to stored spelling forms and a word's meaning emerges after multiple exposures during independent reading without needing to focus explicitly on the new word meaning many times. This second word recognition process becomes an automatic sight-word reading process (reading rapidly simply by sight) that triggers word recognition. In this way, new word learning is reinforced through implicit and **statistical learning** processes (discussed later in this chapter; see also Chapter 4) (Castles et al., 2018; Ehri, 2014, 2015; Frost, 2012; Seidenberg, 2017; Share, 2004; Verhoeven & Perfetti, 2017a). There are many consequences, and implications, to be taken from both the self-teaching hypothesis and a renewed emphasis on sight word reading.

One major consequence of the self-teaching hypothesis is that phonological awareness, letter–sound correspondences, and the **alphabetic principle** (systematic knowledge of the graphic symbols matched to phonemic sounds in the language) all need to be introduced explicitly to beginning readers if they are to develop efficient written word recognition skills connecting oral word knowledge (word meanings) to written word forms (and spellings) (Willingham, 2015). A second major consequence of this word learning process is that skilled readers continually grow their sight reading vocabulary word-by-word as they continue reading over a lifetime (Andrews, 2015). The early concept of a fairly small number of high frequency words being the

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basis of a reader's sight vocabulary does not account for the speed and automaticity of thousands of words being recognized and meanings accessed in less than 200 milliseconds by skilled readers. So a key goal of learning to read in an L1 to advanced levels is to build a sight-word vocabulary of thousands of words (Ehri, 2014) and also build the lexical quality of all words incrementally through repeated exposure in varying contexts (Andrews, 2015; Castles et al., 2018).

A third major consequence is that **implicit learning** (learning without conscious directed attention, see also Chapter 4) and a large amount of reading exposure over time is required to build this very large store of sight words. Most of the words we learn, and then build automatic recognition for, are learned implicitly because of very large numbers of exposures from reading. A fourth consequence of repeated exposure during this word learning process, is that the individual phonological sounds of letters and letter combinations become additionally supported in English by the greater phonological regularity of word-rime units, syllables, and morphological affixes. (English has a large number of individual nontransparent grapheme-to-phoneme correspondences.) A fifth consequence is that increasing accuracy in orthographic processing provides an important assist in building sight word reading abilities, especially when many similar-looking words become a part of sight-word reading (Ehri, 2015).

A different set of consequences of the self-teaching concept, to varying degrees, involves learning to read in the L2. Aside from young child bilinguals, L2 learners – whether in ELL (English language learners) K–12 contexts, intensive language programs, various English as a foreign language (EFL) contexts, or post-secondary L2 academic settings – are often less orally proficient in the L2. They will have a smaller L2 vocabulary, a weaker grasp of syntax, and much less experience with reading the L2, compared with L1 readers. These L2 contexts typically lead to weaker word recognition skills, weaker phonological decoding, and weaker encoding to meaning if the meaning of a word form even exists for the learner. Moreover, orthographic processing will be less efficient, and the growth of sight-word reading will be much more limited, both by the limits of existing orthographic knowledge, existing vocabulary knowledge (meanings), and much more limited reading experiences in general. The answer to these L2 problems, of course, is more reading practice (Castles et al., 2018; Seidenberg, 2017) and, less commonly discussed, spelling practice that serves to connect orthographic forms to phonological sounds (Ehri, 2014; Graham & Santangelo, 2014; Harris & Perfetti, 2017; Humaidan & Martin, 2019; Martin et al., 2020; Metsala & David, 2016; Shahar-Yames & Share, 2008).

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While the phonological, orthographic, and semantic (word meaning) processes have been viewed as long-standing lower level processes for word recognition, two other language-based processes have become equally important for word recognition. Research over the past twenty years has demonstrated that morphological processing and spelling skills are significant independent predictors of word recognition abilities.

2.1.4 Morphological Processing

The importance of morphological processing for word recognition, vocabulary knowledge, and reading comprehension, independent of phonology, orthography, and word meaning, has been argued for in a range of research studies (Berninger et al., 2010; Castles et al., 2018; Deacon et al., 2014, 2017, 2018; Goodwin et al., 2017; Jeon, 2011; Kieffer & Lesaux, 2012; Nagy et al., 2014; Stoffelsma et al., 2020). The suffixes and prefixes of a language are processed as part of word recognition and those readers who have greater knowledge (both implicit and explicit) of affixes perform better both in word recognition measures and in reading comprehension.

Facility with more complex and less regular morphological affixation (especially multiple derivational affixes in longer words) grows through school years (particularly after 3rd-grade) for L1 students and is associated with word recognition and comprehension during this time (4th to 12th grade). Morphologically derived words are an important part of more academic vocabulary learning. L1 researchers state that derived words represent 40 percent of learners' word knowledge by 5th grade (Anglin, 1993) and 60 percent of unfamiliar words encountered in texts in 3rd to 9th grades (Nagy & Anderson, 1984; see also Schwanenflugel & Knapp, 2016). Morphology also plays an important role in new word learning. First, morphology represents a part of the written word's orthographic information. Second, morphologically derived words already signal syntactic parts of speech. Third, morphology contains clues to word meaning based on a word stem that stands a good chance of being known by the reader (Castles et al., 2018).

A current issue is whether or not morphological processing plays a role in lexical access itself or if it primarily provides key information for integrating words into syntactic structures and meaning groups after these words have been accessed. Evidence discussed in Rayner et al. (2012) indicates that some aspects of morphological information must be part of word recognition processes (cf. Castles et al., 2018; Yap & Balota, 2015).

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2.1.5 Spelling Knowledge, Orthographic Mapping, and Word Recognition

Spelling knowledge is both a component skill for reading comprehension and an educational goal in its own right, a skill that is also critical for the development of writing ability. In the context of lower-level component skills for reading development, it has long been a background factor with respect to the development of reading abilities. However, spelling is important both for the self-teaching hypothesis (Shahar-Yames & Share, 2008) and the concept of orthographic mapping (Ehri, 2014, 2015) because it stabilizes the orthographic form in LTM. Spelling "fulfills a self-teaching function in the acquisition of orthographic knowledge because, like decoding, it requires close attention to letter order and identity as well as to word-specific spelling-sound mapping" (Shahar-Yames & Share, 2008, p. 22). In this way, spelling is a powerful tool in a child's self-teaching of new words. More recently, spelling has been the subject of a much wider range of research studies showing that in many contexts it is an important predictor of reading ability (Andrews, 2015; Ehri, 2015; Graham & Santangelo, 2014; Jeon & Yamashita, 2014; Reed et al., 2016; Rossi et al., 2019).

Ehri (2014, 2015), in particular, draws on a wide range of research studies to argue that spelling development and sight word recognition are both the result of a process of orthographic mapping between sounds and spellings (precise orthographic representations). The completeness and accuracy requirements of correct spellings for words create strong memory connections for the orthography-to-meaning process of sight word reading. "Orthographic mapping is a key concept that explains how the spellings of words are retained in memory and enable sight word reading" (Ehri, 2015, p. 307). As words are read in various contexts, the spellings of words trigger both semantic and syntactic information. Spelling knowledge of words is a key way by which word learning contributes to reading fluency and reading comprehension.

For example, Rossi et al. (2019) demonstrated that increased spelling training for teenagers led to increases in the reading fluency of words used in the study, and better spellers showed greater reading fluency gains (see also Ouellette et al., 2017). Graham and Santangelo (2014) carried out a meta-analysis of spelling instruction that involved fifty-three well-controlled English L1 research studies. They found that spelling instruction led to significant improvements in phonological awareness, reading skills, and reading comprehension, with moderate effect sizes (g = 0.51, 0.44, and 0.66, respectively) (see also a longitudinal study by Treiman et al., 2019).

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In L2 settings, findings are similar. Jeon and Yamashita (2014), in a meta-analysis of correlates of L2 reading comprehension, reported five spelling studies with a combined correlation with L2 reading at $r = 0.51$. Alderson et al. (2016) also showed that spelling was an effective predictor separating stronger from weaker EFL readers, especially at more advanced levels (see also Chapter 11).

2.2 Lexical Access

Lexical access refers to all the information that becomes activated when a word is recognized. Lexical access includes the phonological, orthographic, morphological, spelling, and semantic knowledge stored in a mental lexical entry. Lexical access also includes all of the variant orthographic forms, related meanings, metaphoric uses, pragmatic uses, and associated words. Lexical access (and word recognition) typically occurs in the following way.

As word forms are being processed visually, potential matches in the reader's mental lexicon are activated. For example, as a reader begins to process the form *lake*, orthographic and phonological processing begin to process letters shapes, the syllable rhyme unit (*ake*), the two long vertical lines, the rounded shapes of the two vowels, etc. This information activates all the words in the lexicon that have many of these visual and sound features (e.g., *rake, take, late, like, leak, fake, fate*, and *lake*). As these words become increasingly activated, and matching continues as visual and sound features are matched, candidate forms begin to generate their meanings. As a result, word candidates in LTM contribute orthographic, phonological, and semantic information to the process until the form that is the best match to the orthography is then accessed. Soon, so much activation energy builds in the right lexical item that it passes a threshold of activation and is accessed; the full information in that lexical entry then becomes available in WM. (And this process is very fast; all of this usually happens within 100 milliseconds (ms) with automatic word recognition processes.)

In many discussions of word recognition and lexical access, the two terms are equated, and in many contexts, they amount to much the same phenomenon. However, it is possible to refer to word recognition when referring to subword component skills used in the process of recognizing words. If word recognition emphasizes the process of recognizing words, lexical access refers to the point at which a specific and accurate word meaning is accessed from LTM along with all of the associated knowledge linked to the lexical item. In some cases, it is possible to initiate word recognition but lead to no or very little lexical access.

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For example, children can sometimes read words aloud but not understand what they are reading (a "word calling" phenomenon that is actually much less common than is sometimes claimed with L1 readers; see Schwanenflugel & Ruston, 2008). In these cases, children may not be accessing the meaning component of these words, but they are accessing the phonology and building an entry. In L2 reading contexts, beginning readers may encounter many unknown words for which there is simply no (or very little) lexical information in the student's mental lexicon. The student believes that the word is a real word in the L2 and may be able to pronounce it, but there is no meaning to access initially (see Elgort et al., 2018; Malone, 2018; Mohamed, 2018).

In cases where there is some minimal recognition, or awareness of having seen a word before, it is possible to assume that a lexical entry is emerging at some minimal level (recognition of the word form). This early stage may reflect an implicitly generated lexical entry with little more than a sense of having seen the word form before, or the entry may reflect some sense of a part of speech based on distributional (statistical) information of where the word occurs in the phrase or clause (see also Chapter 4).

Recent research indicates that word form recognition is a first stage to word-meaning recognition. The word-meaning recognition solidifies through a number of repetitions of that word form in both related and distinct contexts. This early learning process is a common path to word learning and primarily involves implicit learning across much reading experience, applicable in both L1 and L2 contexts. Given this close link between word form recognition and word meaning development, there are good reasons to view word recognition and lexical access as essentially the same process for the overwhelming majority of situations in which this issue could be raised, recognizing that lexical access could also be reserved for activating the meaning and all related information linked to the entry.

2.3 Automaticity and Lexical Access

> Reading a word is such an automatic process that it is difficult to inhibit, and it will interfere with processing other information about the word. (Anderson, 2020, p. 100)

All of the component processes required for efficient word recognition rely on the concept of automaticity. Word recognition skills must become very rapid and automatized for fluent reading to occur. The distinction between speed and automatization is important. Many

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processes are fast but not automatic. The key characteristics associated with automaticity, aside from speed, are that we cannot stop ourselves from carrying out the process and we cannot introspect on the process. For example, when we see the noun "bug" while reading, we will automatically activate the meanings for insect and for a listening device, and only after about 100–200 milliseconds (ms) will we begin to suppress the irrelevant word meaning. Moreover, we cannot, if asked, explain exactly how we accessed the two word meanings or how we began to suppress one of them, regardless of how long we might think about it (Nicholson & Tan, 1999; Segalowitz, 2010; Stanovich, 2000). Aside from automaticity, skilled word recognition requires accurate recognition processes and well-developed lexical entries in LTM with a wide range of associated knowledge of a given word (Perfetti, 2007). Skilled readers have very large lexicons, so they encounter relatively few unknown word forms when reading in non-specialized contexts (Carver, 1994).

Automaticity is important for fluent reading abilities and for most contemporary models of reading. In current theories of reading comprehension, automaticity is seen as a critical way for readers to engage in multiple processes more or less simultaneously (or in parallel). Automaticity is at the heart of the notion of parallel-like processing and, by extension, fluent reading ability. There are now a number of good reviews of automaticity (Anderson, 2020; Schwanenflugel & Knapp, 2016; Segalowitz, 2010); we only highlight a few key points here.

Automaticity arises through continual practice of a routine procedure (such as driving a car, typing, or reading) to the point where the individual no longer needs to attend to the task itself. In most cases, automaticity is the outcome of a process of attending, then proceduralizing, then automatizing (Anderson, 2000, 2020; DeKeyser, 2015). Automatic processes in reading are the outcome of thousands of hours of meaningful input. Automatic processes do not place great demands on processing resources in WM and thus can be carried out while focusing on other tasks.

Under normal reading conditions involving efficient (and automatic) word recognition processing with skilled readers, any intentional effort to activate context information from the text being read provides relatively little support for early word recognition processes. The most straightforward reason for this is that context information from the text takes some time to register and become available (Perfetti, 1999; Rayner et al., 2012; Schwanenflugel & Knapp, 2016; Stanovich, 2000). A skilled reader recognizes most words much more quickly and is already moving on to the next word. There is simply

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no need for a skilled reader to wait to make intentional use of contextual information. Implicit contextual support for word recognition in the form of semantic priming, associational linkages among words, or anticipation processing may support word recognition, but these operate automatically (Christiansen & Chater, 2016a, 2016b; Schwanenflugel & Knapp, 2016) (see also Chapter 4).

When a reader slows down because of processing difficulties, or a confusing word, or a word not well known or well learned, intentional context information is a useful support for word recognition. In learning situations, context information may be helpful in the disambiguation of words and word meanings, although information provided by the context alone is often not very helpful and further confirmation is often needed (Nassaji, 2014; Pressley, 2006). However, strong textual context use is not a preferred way to recognize words; rather, it is typically an indicator of a weak reader, not a strong reader. Strong context use disrupts the fluent reading process and should not be a continual practice. The ultimate goal of word recognition processing is rapid, accurate, and automatic recognition so that cognitive attention can be directed to building textual meaning rather than to recognizing words (see Chapters 3 and 4).

2.4 Lexical Quality Hypothesis

Reading Comprehension is driven by word knowledge (Lexical Quality). (Verhoeven & Perfetti, 2017a, p. 9)

2.4.1 Lexical Access and the Lexical Quality Hypothesis

Over the past forty years, Perfetti and colleagues (Adlof & Perfetti, 2014; Andrews, 2015; Andrews & Reynolds, 2013; Landi, 2013; Perfetti, 1985, 1992, 1999, 2007) have been making a persuasive argument that vocabulary knowledge, and the ability to access word meanings efficiently and automatically, is a major causal factor in reading comprehension abilities. This role for lexical knowledge is best explained in terms of Perfetti's Lexical Quality Hypothesis (LQH). The LQH is a core concept for understanding the role of component processes in generating text comprehension. Perfetti (2007) defines lexical quality as the "extent to which a mental representation of a word specifies its form and meaning components in a way that is both precise and flexible" (p. 359). Lexical quality grows word by word over time and with extensive reading practice; it is

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always graded knowledge, rather than present or absent, and it is consistently growing for each word. The goal is to develop as many high-quality lexical representations as possible incrementally over a lifetime.

The more words known very well, including many types of associations to other words and semantic concepts in memory, the more skilled a reader is, other things being relatively equal. High-quality lexical access activates information about orthographic forms and their variants, pronunciation, multiple meaning senses and metaphorical uses, automatic priming effects, topical associations, semantically related words, possible collocational phrases, formulaic phrases, and semantic relations of synonymy, antonymy, homonymy, class-exemplar relations, part–whole relations (meronomy), and more (see also Chapter 11). These features are also referred to as aspects of lexical depth of a word. Lexical depth and lexical breadth are not in opposition under the LQH. In fact, the largest number of words known with the most possible depth for each word is the long-term goal of vocabulary development for improving reading, as specified by the LQH.

The development of the LQH involves a tight binding of key components of word knowledge. As Andrews (2015) states, "high-quality representations are said to be orthographically fully specified, phonologically redundant, and semantically more generalized and less context-bound. The orthographic, phonological, and semantic constituents of a word are also assumed to be more tightly bound" (p. 130). These strongly connected features of word knowledge activate more reliable memory resources that contribute to accurate and automatic word recognition, new word learning, and reading comprehension. Interestingly, lexical quality even generates important individual differences among groups of skilled readers (Adlof & Perfetti, 2014; Andrews, 2015).

Lexical quality also provides directions for generating well-formed clause structures. Verbs and adjectives, acting as predicates, constrain what options are available as complement structures, whether as prepositional phrases, direct objects, or types of subordinate structures (e.g., *John believes that…*, *It is possible that…*). Articles indicate that a noun phrase is beginning. Pronouns direct a search for an antecedent in prior text. Nouns will require verbs that meet semantic constraints of the subject nouns (e.g., animate, human, physical object, breakable object, abstract concept). Prepositions signal an upcoming noun phrase. Transition words signal a shift of attention to a new perspective, new topic, or new knowledge to be provided. In this way, high-quality lexical entries initiate aspects of syntactic parsing that

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generate word-to-text integration processes (see Diessel, 2019, 2020 for detailed exploration of syntactic emergence out of initial associational lexical networks).

The component processes for word recognition described here, the increasing knowledge of word meanings themselves, and the extent of word reading experience from reading practice combine to generate more and more high-quality vocabulary entries in the reader's lexicon. LQH can be stated fairly simply: The more words a reader knows, and knows well as high-quality representations, the better a reader's comprehension.

2.4.2 *Lexical Access, Syntactic Processing, and Semantic Processing*

An important issue debated for the past twenty years has been the role of semantic and syntactic information in lexical access. One issue is whether or not prior text information (prior context) contributes to lexical access. Researchers agree that semantic and syntactic information become available after word recognition and are used for word integration and comprehension processes. Prior to lexical access, semantic and syntactic information do appear to make some contributions, primarily through automatic **spreading activation** mechanisms, sequential transitional probabilities (statistical knowledge of word sequences), and topically related co-occurrences (Kintsch, 2013; Kintsch & Mangalath, 2011; Perfetti & Stafura, 2015; Seidenberg, 2017). According to this notion of spreading activation, words that are recognized (activated) spread some activation (or energy) to their semantic neighbors (collocates, similar meanings) and associated structures in the lexical network when they are accessed. If a related word is then also accessed, it will be activated more rapidly by the association with a previously activated word. This **priming effect** is well recognized in the research literature (e.g., Anderson, 2020; Eysenck & Keane, 2020; Yap & Balota, 2015).

The support of semantic and syntactic processing for lexical access in other respects is less apparent because context activation processes are slower than phonological and orthographic processes, though they are observable with strongly constraining prior contexts, with nonfluent readers, and with words that are unusual or difficult to process. However, the argument that context information strongly and systematically directs and influences word recognition for skilled readers (Goodman, 1996; cf. Stanovich, 2000) is simply not true and has been widely discredited by reading researchers.

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2.5 Syntactic Parsing: From Word to Clause Integration

> Learning to read is the process of acquiring the several types of statistical knowledge that support rapid and efficient comprehension, starting with phonological structure, orthographic structure,…vocabulary, and grammar…. These types of knowledge differ—spelling is not the same as vocabulary or grammar—but they are all statistical, involving the frequencies and co-occurrences out of which they are composed. (Seidenberg, 2017, p. 88)

Much as word recognition has been a relatively hidden (subconscious) process, so is **syntactic parsing** as it contributes to reading comprehension. Syntactic parsing extracts information from a phrase, clause, or sentence structure being formed from a sequence of activated words (lexical access). Perfetti's Reading Systems Framework (Perfetti & Stafura, 2014; Perfetti, Stafura et al., 2013) proposes that syntactic parsing is generated directly out of the lexical processing component, that then feeds directly into text meaning construction (**word-to-text integration**). Perfetti and colleagues argue that the knowledge of structure is primarily encoded into lexical items themselves and their multiword sequences (along with incrementally developed statistical knowledge of multiword chunks – words combined into larger processing units). It is certainly a fact that reading proceeds predominantly in a word by word manner, building up phrase and clause-level semantic units (through chunking) that can then link into prior text comprehension (Chater & Christiansen, 2018; Juffs & Harrington, 2011; Rayner et al., 2012). As Ellis (2015) states, "research on implicit learning and chunking … has identified how language users are sensitive to the frequency of language forms and their sequential probabilities at all levels of granularity from phoneme to phrase" (p. 3).

Syntactic knowledge, as some set of LTM, is likely developed from sequential probabilities and chunked patterns through implicitly learned statistical knowledge (Christiansen & Chater, 2016a, 2016b; Ellis, 2015; Seidenberg, 2017). This syntactic knowledge, as more abstract "meaning" units in LTM (or units linked by statistical frequency to specific verbs) could be seen as types of lexical units, as "constructions," acquired through many repeated occurrences in the reading input. That is to say, clause structures themselves, when consistently repeated often enough, are activated automatically, triggered by specific words that are commonly used in these clause structures. In a loose sense, common abstract phrase and clause structures are themselves lexical entries. It is possible that syntactic sequences, as abstract units, are registered as retrievable knowledge resources;

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that is, as structural chunks of meaning. At the same time, syntactic knowledge provides a range of functional information that increases the precision of the message being conveyed and is traditionally associated with syntactic parsing as an independent language process (see Chapters 4 and 12).

There is considerable component-skills research to support the role of syntactic parsing in reading comprehension. Syntactic knowledge and processing skills correlate with reading comprehension among both normal readers and readers with disabilities. In addition, the increasing identification of syntactic knowledge as a predictor of reading comprehension in multiple recent studies suggests that structure-building processes are initiated and developed by some type of phrase- and clause-level analysis (Alderson, 1993; Brimo et al., 2017; Deacon & Kieffer, 2018; Farnia & Geva, 2013; Foorman et al., 2015; Geva & Farnia, 2012; Jeon & Yamashita, 2014; Poulson & Gravgaard, 2016; Shiotsu, 2010; Staub, 2015; Van Gelderen et al., 2004; Yamashita & Shiotsu, 2017).

The development of syntactic parsing skills is one area in which L1 and L2 development differs. For L2 learners, the need for explicit syntactic awareness as a component skill is much stronger than for L1 learners and the need for explicit instruction is much greater. Many L2 learners usually follow a more metalinguistic pathway to syntactic processing while reading; they do not begin learning to read with a large set of implicitly learned syntactic knowledge resources in their L2. In a number of L2 research studies, syntactic knowledge is an even stronger predictor of reading abilities than vocabulary knowledge. These arguments suggest that, for L2 learners, syntactic knowledge may not be generated entirely from lexical entries (Alderson, 1993; Jeon & Yamashita, 2014; Van Gelderen et al., 2004; Shiotsu, 2010).

One way to reconcile these L1–L2 differences is to suggest that L2 metalinguistic awareness-raising explicitly through grammar instruction can translate to more fluent implicit parsing of chunked word sequences after extensive exposure to reading practice (much as L1 phonological awareness translates into automatic word recognition through extensive reading practice). Until more automatic syntactic processing develops, there likely needs to be some level of explicit independent processing of learned syntactic structures. However, as argued in Chapter 12, it is also possible that lexical and syntactic knowledge represent two closely related types of a larger language knowledge factor (Deacon & Kieffer, 2018; Foorman et al., 2015), and they are not separate linguistic components for reading comprehension.

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On a functional level, rather than a cognitive/statistical level, it should be obvious to anyone who reflects on sentences in a text that syntactic processing, whether implicit or explicit, is essential to comprehension and may be hard to reduce solely to the lexicon and implicit statistical learning for L2 learners. For example, it is clear that we process pronoun information in different ways depending on the syntax of a sentence:

1. When **he** goes to the fast food outlet, Bill typically buys a vegetarian burger.
2. **He** stole the veggieburger from Bill.
3. Bill helped the old man and **he** thanked **him**.

Moreover, while sentence 4 is easy to process, L1 readers have to use tacit knowledge of grammar to sort out the meaning of sentence 5 (a garden-path sentence).

4. The man lent the money to a needy friend.
5. The man lent the money to gamble lost it all in one hour.

The key point here, and one that is often overlooked, is that grammatical information in some form is continuously involved in comprehension, and the process of syntactic parsing – whereby we access meaning information from words and sentence structure – is essential to reading (Deacon & Kieffer, 2018; Grabe, 2005; Poulson & Gravgaard, 2016; cf. Chater & Christiansen, 2018).

In contrast to formal linguistic theorizing with a separate set of abstract phrase structure rules, the discussion above argues that syntactic patterns are not empty frames waiting to be filled with lexical entries and then parsed clause by clause. An important outgrowth of statistical learning of language is that a given syntactic pattern, as the most likely option in a constrained statistical environment conforming with activated lexical items (specifically verbs), provides a "good enough" parsing of the developing syntactic frame, based at least in part on the syntactic information generated from the lexical items being accessed (Christiansen & Chater, 2016a, 2016b; Ellis, 2015, 2019; Ellis & Wulff, 2015; Seidenberg, 2017; Wells et al., 2009). The lexical argument for generating all syntactic knowledge may turn out to be too strong a statement, but the argument for overlap between lexical access and syntactic processing is becoming more widely accepted (Diessel, 2020).

Syntactic parsing is also the jumping off point for creating the "word-to-text integration" process. At the same time that words are being accessed, they are also generating possible syntactic

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structures, chunked into phrases and larger groupings that help indicate how a current syntactic unit could be given a semantic interpretation and integrated into an emerging text understanding (Christiansen & Chater, 2016a; Staub, 2015). Syntactic information drawn from sequentially accessed words helps specify more precisely how the words and phrases could form meaning associations, with the larger text representation being developed to that point (see Chapters 3 and 12).

There are also important arguments that the basic meaning structures used in comprehension (semantic propositional units) cannot be formed without syntactic parsing of clauses and sentences (Staub, 2015). Semantic propositions depend on isolating the main verb (predicate), subject position, object position, any adjunct noun phrase positions, subordination markers, and relational transition words and phrases. This information can only be determined from syntactic parsing of longer chunks of language. Similarly, the "meaning proposition" requires the processing of any transitional markers and discourse organization markers to establish the relative importance of specific information within and between propositions.

2.6 Meaning Proposition Encoding: Word-to-Text Integration

> Progress in language comprehension research required a well-defined system of semantic analysis. What emerged from this consensus was the proposal that one or more elementary ideas, or propositions, underlie each clause or sentence. (Singer & Leon, 2007, p. 10)

At the same time that the first words are being activated during reading and the first structural grouping of the words is parsed for its syntactic information, information being extracted from the words and structures is used to build semantic meaning units that are approximately equivalent to phrase and clause units (Kintsch, 1998; Pickering & Traxler, 2000). These meaning units, or propositions, are "the smallest unit that can be stored as a separate assertion," or units "that one can meaningfully judge as true or false" (Anderson, 2020, p. 145). Semantic propositions, formed simultaneously with word recognition and syntactic parsing, are the building blocks of text comprehension (Perfetti & Britt, 1995).

One can think of a semantic proposition as small packets of information chunked together in a meaning unit. The packets of meaning and the network linkages into text representation are built, or activated, as the input from the words and structures being read are

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combined (chunked). In a sense, we can imagine this network of information nodes and their linkages as "lighting up" temporarily: being activated above a certain threshold, which is also how we can understand the idea of information being active in WM more generally. This image of "lighting up," or glowing with activation energy, also provides a conceptualization of how reading comprehension works. As immediate networks are lit up and then added to the bigger network of activated information, the propositions are connected and the textual meaning of what we read is created. As smaller chunks are incorporated into larger chunks, and then into a text representation, the smaller units are suppressed to make way for the next chunks to be processed. This is an important way to conceptualize the building of a text representation that reflects what the author intends, but also removing from WM the actual words, phrases, and clauses as they are integrated (see Christiansen & Chater, 2016a, for one such conceptualization).

Semantic propositions are described for text analysis and research purposes in ways similar to the functional meanings of clause structures. For example, the following sentence (6) has the propositional information (7) immediately below:

6. The man ate the apple.
7. ATE (man, apple)

In this example, the predicate (ATE) represents the activated node of information that makes us think of eating. The predicate is linked to "*man*" and "*apple*," the two arguments of the predicate (in formal terms). The syntactic information adds the idea that "man" is singular and identifiable, as is "*apple*." As a person reads the sentence in (6), the semantic proposition, the activated network, is formed simultaneously with the structural parsing of the sentence. We should note here that propositions are heavily oriented toward the information provided by verbs (and other possible predicates), reflecting a traditional logical semantics of predicates and arguments.

We know that semantic propositions, as small networks of information, are important to reading comprehension because of consistent research findings (e.g., Kintsch, 1998; Singer & Leon, 2007): (a) The number of proposition units occurring in sets of sentences predicts how long it takes to process different sentences even when the number of words and clauses are kept equivalent; (b) Propositions that are more centrally linked to other information are consistently recalled more frequently in recall experiments (van den Broek & Kendeou, 2017; van den Broek et al., 2013); (c) Semantic propositions also form boundaries for automatic semantic priming of words.

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So there is good evidence for the psychological reality of propositions as part of text processing (Kintsch, 1998; Rapp et al., 2007).

There are many ways to describe proposition units, but we are more interested in explaining the notions of networks of meaning and information activation, so we will not attempt to justify the descriptive form in (7). It is important to note, however, that there is a consistent literature in cognitive psychology and discourse comprehension research that validates the concept of semantic propositions as meaning units paralleling the word and structural units of language (Fletcher, 1994; Perfetti & Britt, 1995; Singer, 1990).

2.7 Working Memory

> The ability to mentally maintain information in an active and readily accessible state, while concurrently and selectively processing new information, is one of the greatest accomplishments of the human mind; it makes possible planning, reasoning, problem solving, reading, and abstraction…. Working memory (WM) is the term cognitive psychologists use to describe the ability to simultaneously maintain and process goal-relevant information. (Conway et al., 2009b, p. 3)

The larger concept of memory is fundamental to all aspects of cognition. Memory is usually divided into LTM and WM as the two major components. LTM is the sum of the permanent records of our experiences and our efforts to understand our environment. Many cognitive psychologists have explored the ways in which we encode and store our permanent record, and the several concepts associated with LTM: declarative memory, episodic memory, semantic memory, conditional memory, procedural memory, priming, conditioning, and habituation (Anderson, 2000, 2020; Slotnick, 2017; See Chapter 4). While LTM *knowledge* is a major resource of reading, the key memory concept for comprehension *processing* is WM.

WM includes information that is active for processing operations. WM thus has both active storage and processing functions (Baddeley, 2015; Conway et al., 2009b; Cowan, 2015; Eysenck & Keane, 2020; Miyake & Friedman, 2012). WM is generally described as a limited capacity system. It has limited storage and limited abilities to carry out multiple processes simultaneously, or nearly simultaneously. WM usually maintains information actively for only two seconds without any rehearsal and comprises approximately four items or chunks in focal attention. However, information can remain active for longer periods of time through attentional salience, mental rehearsal, reactivation, and recall (Christiansen & Chater, 2016b; Cowan, 2010, 2015; Eysenck & Keane, 2020; Kintsch, Patel, & Ericsson, 1999).

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While WM is technically a domain-general capacity (with domain-specific applications) for all cognitive processing, in language-related research it is often viewed specifically as a language-based process. We introduce it first with lower-level processing skills because it is essential to an understanding of how lower-level (and higher-level) processes operate and are integrated.

With respect to reading, WM comprises the set of information that has been activated to some level of conscious attention. This set of activated information and processes includes the following:

1. Information from the immediate clause being processed, potentially open to mental examination through conscious attention and reflection.
2. Some type of immediately active prior network that new information can connect to.
3. More automatic processes that require very little attention or that actually are not attended to consciously (e.g., automatic word recognition, fluent syntactic processing, statistically-driven linkages to content in LTM, now-or-never processing constraints).
4. Various processing routines that can be applied to all information in WM (e.g., recognizing morphemes attached to base word forms, attending to word order information, linking overlapping information).
5. Semantic-based associational linkages to LTM for well-developed content knowledge activated by information in focal attention.

Most discussions of reading and WM refer to some mental place where information is kept active temporarily and can be rehearsed until it is used for some mental process. This "place" is usually referred to as short-term memory or WM, with WM being the more encompassing concept (and the more commonly used concept in general descriptions of reading). However, WM is not a "box" located somewhere in the brain; instead, it is best understood as those parts of LTM networks and pathways that are active at any given moment (Cowan, 2015). Information is not actually "sent" from LTM to WM. Rather, any information (and associated task processes) that is active because of recent input forms part of a network that becomes WM (Anderson, 2015; Cowan, 2015; Engle et al., 1999). (Note that the notion of an ever-shifting network of active information and cognitive processing fits well with connectionist explanations for cognition and neurolinguistic research showing integrated networks of activation across brain regions for comprehension and conscious processing. It also suggests a much closer relationship between WM and LTM in comprehension processing.)

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WM and LTM also form a major link for the learning (i.e., integrating and storing) process: Information used in WM fades when the immediate activity ends, but some network of integrated information will remain and be "stored" in LTM; we can say that this information is "learned." In this way, WM and LTM "communicate" via activation levels and integration processes. Each time some item or chunk is activated (e.g., by lexical access while reading), the activation registers another effort to call up a definition and associated knowledge as another pathway from LTM, and each registration reinforces knowledge of that item or chunk, strengthening learning. Each registration adds to the statistical strengthening among related items in LTM as well. Over time, many repetitions of this process for an item or chunk will generate a strong and more readily accessible linkage to a representation in LTM.

There are a number of competing views on WM for language processing. The two most important are Baddeley's (2007, 2015) multicomponent model of WM, and Cowan's (2010, 2015) embedded process model focusing on executive and attentional control. Baddeley's model is addressed in some detail here because it is the most well-known approach to WM. Cowan's model is also noted because it is a compelling alternative that (a) readily incorporates neurolinguistic processing and (b) considers executive control processes directed by attentional processes (and implicit processing) as part of activating relevant LTM resources. Furthermore, it can easily incorporate statistical and implicit knowledge resources as part of WM processing.

For Baddeley, WM is composed of a limited capacity attentional control system, the **central executive.** It is supported by two subsidiary perceptual systems: the **phonological (or articulatory) loop** and the **visuospatial sketchpad**. The phonological loop holds and rehearses sounds and speech-based information; the visuospatial sketchpad does the same with visual images and spatial relations. Research over the past three decades has supported the general theory for specific populations and specific applications, although there are problems with Baddeley's model (see below), and alternative proposals suggest other approaches (Anderson, 2020; Baddeley, 2015; Conway et al., 2009a; Cowan, 2015).

The phonological loop is the most well-researched subsystem of Baddeley's model and has two purposes. First, the loop is a store for holding phonological information for a few seconds or for refreshing the stored sounds with subvocalization (inner speech). It also is the component that decodes and stores visual information (written words) in phonological form for storage and rehearsal. The phonological loop performs critical functions for word learning and word

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recognition skills. Storage, rehearsal, and reinforced memory of new words in phonological form are the foundation of all vocabulary learning and much of language learning more generally (Baddeley, 2007). The visuospatial sketchpad carries out the same functions of storage, rehearsal, and active processing for visual information and spatial relations, two potentially distinct abilities.

In research exploring WM subsystems, Baddeley (2015) proposed a third WM subsystem under the central executive – **the episodic buffer** – that stores integrated processing outcomes from WM and links WM to LTM (learned information). The episodic buffer chunks smaller sets of information from WM into larger units to assist the integration process. Finally, the buffer stores activated information from LTM that is related to the information being processed in WM.

Baddeley (2015) has more recently proposed that the connection between the central executive and the episodic buffer is not close. Chunks may link up with the episodic buffer without the direct involvement of the central executive, suggesting that the building of chunks for comprehension may be primarily an implicit process under fluent reading circumstances. The episodic buffer is somewhat vague as a component of WM, but it is needed to account for how readers call back semi-active information and how they store and process the emerging text representation with prior text processing, (e.g., the gist of the prior text that has been processed to link in the newly activated information).

As described by Eysenck and Keane (2020):

> The episodic buffer … holds integrated information (or chunks) about episodes or events…. It acts as a buffer between the other components of the working memory system and also links working memory to perception and long-term memory. (p. 252)

The episodic buffer is also likely to be the WM component that engages in now-or-never processing (see Section 2.8).

The central executive component is the most general component (and the most vague in its various roles), overseeing operations in WM and connecting a number of general cognitive skills with the more specific roles of the WM subsystem components. Because of the connections among the central executive component and a variety of other underlying cognitive skills not subsumed under WM, there are questions as to whether there is a unified central executive regulating the WM system. For Baddeley and others, the central executive is most closely connected to concepts of attention, shifting, updating, and inhibitory processing. As Baddeley (2012, p. 22) states, the central executive "is an attentional system."

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Cowan's alternative approach to WM connects more strongly with LTM, representing those items or chunks that have been activated above a threshold of conscious attention, even if only for a few seconds. However, as items in WM fade below an active threshold, they can still be more easily recalled or reactivated through implicit knowledge linkages because their resting activation levels are much higher than other information in LTM. This concept fits well with a number of models of reading comprehension that require semi-active storage of information that can be easily recalled (e.g., C–I model, Landscape model, and the Reading Systems Framework approach; see Chapter 6).

For all theories of WM, one of the most challenging issues has been explaining the relationship between WM and **cognitive executive functions.** Executive functions (as opposed to the "central executive" of Baddeley) have been identified more generally as the locus of a wide range of cognitive processes that extend well beyond WM as general cognitive abilities. Executive functions, as described by various authors and in various studies, could include attention, inhibitory control, attention shifting, updating, WM, problem-solving, self-regulation, goal setting, monitoring, cognitive flexibility, inferencing, consolidation, chunking, and motivation (Baggetta & Alexander, 2016; Best et al., 2011; Cantin et al., 2016; Cartwright, 2015; Diamond, 2013; Kendeou et al., 2014; Miyake & Friedman, 2012; Petschur et al., 2017; see also Chapters 3 and 4). A second major challenge has been the difficulties in creating valid and reliable measures of WM, both for language-related research questions and for cognitive functioning more generally. Mixed results have been reported regarding the role for WM in predicting reading comprehension.

2.8 Now-or-Never Processing and Lower-Level Processes

> Reading proceeds quite normally if the reader gets to see the text for 50–60 msecs before it disappears…. Readers are able to encode all of the visual information they need from the text in this time frame. (Rayner et al., 2012, p. 132)

A more recent perspective on language processing, including reading processes, presents an alternative conceptualization of lower-level language processing during reading. This **now-or-never processing** perspective draws on extensive experimental processing research, language acquisition research as language-use processing, and computational modeling. The key issue for this section is how such a perspective relates to lower-level reading processes as presented to this point in the current chapter. It also has a bearing on how WM

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may need to be reconceptualized somewhat differently to incorporate now-or-never processing with new language input.

Research by Christiansen, Chater, and colleagues (e.g., Chater & Christiansen, 2016, 2018; Christiansen & Arnon, 2017; Christiansen & Chater, 2016a; McCauley & Christiansen, 2019; McCauley et al., 2017) provides a compelling alternative approach for language learning (both L1 and L2) and language processing in relation to reading comprehension. Our brain must process and react rapidly to a continuous flow of information. We are faced with an onrushing stream of sensory information where new information rapidly obliterates the old, and we often must generate a continuous stream of motor commands, such that each command must be implemented before it is overwritten by the next. How is the brain able to overcome the now-or-never bottleneck (Chater & Christiansen, 2018)?

Language input is highly transient: little auditory or visual trace of the exact input remains after 100 ms (Christiansen & Chater, 2016a; Rayner et al., 2012). The ability to maintain visual information is very limited (unless we are rehearsing the immediate input for some reason). Sensory memory for language input is quickly overwritten by new incoming sensory information. The cognitive system uses multiple processes to accommodate the now-or-never time pressure. Most importantly, lower-level information is retained in WM when it is chunked into next higher-level units.

The major processing mechanism to retain relevant information from the rapidly fading sensory input is **chunk-and-pass processing**. Human skill learning requires language processing to recode and compress complex time-varying input into successively larger and more abstract representations. The cognitive system engages in chunk-and-pass processing so that ever larger units are formed to retain information for longer periods of time. For example, letter and letter groups are immediately chunked into word units, and local groups of words are chunked into larger units, possibly phrases or other forms of multiword units. In order to maintain information under extremely rapid processing, the cognitive system needs to engage in a **principle of least commitment**, where chunks of information must be assembled while allowing some amount of multiword ambiguity (**good-enough processing**). The processing system will build the most abstract and complete representation that is justified, given the linguistic input.

Only by compressing the input into chunks and passing them to increasingly abstract levels of linguistic representation can the language system deal with the rapid input of new information. Simple statistical information gleaned from sentences over an extended period of time provides powerful predictive constraints on language

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comprehension and allows for reasonably accurate good-enough processing. The real underlying challenge of language acquisition is to learn a dazzling sequence of rapid processing operations rather than conjecturing a correct linguistic theory. Implications of the above cognitive processing strategy are that learning to process language is incremental over a long period of time, it is item-based (learned item by item), and it takes place online (as words and multiword chunks are processed).

This very fast processing and rapid loss of lower-level language information needs to be accounted for in any theory of lower-level processing. All language processing is local, and initial visual processing of new information involves little more than one word to three word groups. Chunk-and-pass processing leads to simple linguistic units with only a small number of components, so it produces a powerful tendency toward local dependencies (such as a preposition and its dependent object of preposition NP): Dependencies between linguistic elements will primarily be adjacent or separated by only a few other elements.

Syntactic structure emerges from the gradual overlearning and automatic processing of longer and longer internalized chunks of language. This approach connects directly with current theories of language learning through language usage (Bannard et al., 2009; Ellis, 2015, 2017; McCauley & Christiansen, 2019; Theakston et al., 2015; Tomasello, 2003). Simple phrase structure chunks are processed regularly as units of meaningful language; they are statistically registered over time as units, and as they themselves are chunked in repeated larger abstract units, syntactic structure builds as abstract units, much like lexical items. The early growth of syntactic structures will be mostly simple sequential relations and not heavily embedded hierarchical relations. Highly overlearned longer chunks might, for example, gradually come to be treated as a single chunk (a longer syntactic structure). Over time, learning how to process language *is* how we learn the grammar.

From our perspective as human learners of grammar through explicit instruction, we may have the sense that grammar exists independently. But the regularities of syntactic units that we are made aware of are more likely a product of our schooling. Our sense of grammar is raised to a level of awareness through social institutions (i.e., schools) and standardized as culturally shared knowledge.

The more recent emergence of now-or-never processing, and chunk-and-pass processing, linked with usage-based approaches to language learning, also alters how we consider WM processes, LTM knowledge, and executive control processes. It greatly strengthens

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Cowan's embedded process model focusing on executive and attentional control and potentially limits alternative approaches to WM. While language comprehension, and cognitive processes more generally, require some sort of WM capacity, it also requires some explanation for the amazing speed with which language input is processed and relevant information is somehow extracted and retained. Future research will need to address the challenges of linking together the speed of now-or-never processing with the information integration processing of WM.

2.9 Implications for Instruction

A central goal of reading instruction is to help children learn how to read effortlessly so they can ignore the reading process and focus on the content. (Ashby & Rayner, 2006, p. 52)

Reading comprehension requires the development of a number of language processing skills. Learners need to become efficient recognizers of a large number of words. Not only does this objective imply a large recognition vocabulary, it also implies that learners will need continual practice at word recognition. Such practice comes through extended reading as well as activities that highlight attention to (a) letter to sounds correspondences, (b) words and word-parts, (c) rapid identification of words, and (d) a range of fluency activities such as paired reading, reading with an audiotape, reader's theater, and opportunities to reread texts multiple times for different purposes (Kuhn & Levy, 2015; Rasinski, 2010; Rasinski & Padak, 2013; Rasinski et al., 2017).

Establishing letter to sound correspondences is not a major concern of many L2 reading courses with an academic orientation. But in the case of beginning L2 readers who are struggling, immigrant students in beginning reading settings, and L2 students who have not had prior exposure to an alphabetic orthography, some attention to letter–sound correspondences is necessary. The evidence is clear that beginning readers of an alphabetic script need to develop reasonable phonological awareness and recognition of the letters of the script (the alphabetic principle) (Castles et al., 2018; Ehri, 2014, 2015). L2 teachers should know enough about their students' backgrounds to determine if they need to build knowledge of letter–sound correspondences.

Beyond letter–sound correspondences, students need efficient word recognition skills. Because skilled readers do look at and recognize almost all words on a page, we do not want students to build habits

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of word processing based on partial recognition of a few letters along with regular guessing of what words they think they are seeing (see Pressley, 2006). Rather, we want learners to attend to new words in ways that require them to notice the full orthography and then learn to recognize the full form both rapidly and accurately (Adlof & Perfetti, 2014; Castles et al., 2018; Ehri, 2015). Only in this way will word recognition automaticity develop. It is certainly true that beginning readers and readers with comprehension difficulties read in a slow and intense word-by-word manner. But efforts to bypass this stage of reading by asking students to guess words from minimal cues will not lead to accuracy and automaticity in word recognition. The word-by-word stage in learning to read is a stage that all learners must pass through as they encounter new words and words they have only seen a few times.

Moving beyond this stage – a major goal for reading development – requires a considerable amount of awareness raising, fluency practice, and extensive reading. Students need a lot of reading practice with extended texts that are not frustrating and that provide some control over the number of new words being introduced. Recent research also argues for (a) the importance of spelling skills as a reflection of precise orthographic knowledge and (b) the importance of morphological knowledge as a predictor of more advanced vocabulary learning (Andrews, 2015; Carlisle & Goodwin, 2014; Ehri, 2015).

When teachers work with older L2 students who already have L1 literacy skills, this concern for accuracy and completeness of word recognition is generally less of an issue. These students usually expect to see words visually and will often immediately write down words as part of L2 learning. Spelling and morphological knowledge are supported through this practice. In these settings, the key skills-development goals are to (a) build word recognition automaticity with an increasingly large number of words (building a large sight recognition vocabulary) and (b) develop greater lexical quality for a large recognition vocabulary through extended reading practice.

In addition to word recognition for student learning, beginning L2 readers need a moderate foundational knowledge of L2 grammar because much basic textual information is conveyed through grammatical information. For purposes of reading comprehension, grammar should not be viewed as a set of arbitrary rules and structures to be learned; rather, grammar is a major discourse signaling system providing the reader with a constant stream of information for how the text is to be understood more precisely (Grabe, 2005; see also Chapters 12 and 14). Some amount of early explicit grammar instruction is essential for L2 reading development, particularly for

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EFL learners who already have a command of reading in their first language. In a sense, what beginning L2 readers need is the glue that holds sentences and texts together and specifies how the content is to be understood. At the same time, a very detailed and comprehensive grammar curriculum is not the goal for beginning L2 readers, or perhaps any L2 readers. Students will gain exposure to this more advanced grammar through various language activities and input from text reading. These patterns can be taught as needed when such structures appear a few times in texts or when the structures impact comprehension (Grabe, 2005).

When grammar knowledge and structures deserve some attention, this knowledge should first be drawn from the text being read itself. If it is not salient in the text, that grammar information probably should not be taught. If it is salient in the text, students should learn to identify the key occurrences in the text, have their awareness of the structure and its role in the text raised, and only then engage in instructional practice as appropriate. Aside from the occasional specific need to focus on grammar knowledge because of its importance to comprehension, extended reading practice, even at beginning stages with graded readers, reinforces basic grammar knowledge and gradually exposes readers to more complex variations.

Having emphasized implications that explain the need for word recognition and grammar knowledge, one might get the impression that reading instruction should be focused on word recognition, vocabulary, and grammar. But no one would say that these component skills are the direct means to reading comprehension. Reading comprehension instruction also requires attention to a range of comprehension issues and the overall reading comprehension system. An explanation of this system and its implications are taken up in Chapter 3.

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3 *How Reading Works: Comprehension Processes*

> Reading comprehension is not a single activity nor outcome; rather, it is multifaceted. Individuals can be good comprehenders in different ways. (van den Broek, 2012, p. 40)

Unlike the converging perspectives on the role of lower-level processing to support reading comprehension, the various activities and processes that define higher-level processes are not as uniformly specified in the comprehension literature. Nevertheless, research over the past twenty years has been building a fairly coherent synthesis of how higher-level processes contribute to comprehension. Because there is far more research being carried out on higher-level processes now, accumulating evidence gives us some confidence in the overview that follows (Afflerbach, 2016; Britt et al., 2018; Cain & Barnes, 2017; Castles et al., 2018; Israel, 2017; Kintsch, 2012, 2013; Millis et al., 2019; O'Brien et al., 2015; Pearson, Palincsar, Biancarosa, & Berman, 2020b; Pollatsek & Treiman, 2015; van den Broek & Kendeou, 2017; Verhoeven & Perfetti, 2017a).

At the same time, current research in language learning and the role of language processing in real-time has raised important issues that much research in higher-level comprehension processing has yet to deal with (Bannard et al., 2009; Chater & Christiansen, 2016, 2018; Ellis, 2019; Ellis & Ogden, 2017; McCauley & Christiansen, 2019; MacWhinney, 2018; Theakston et al., 2015; Tomasello, 2003). These issues include new perspectives on working memory (WM) and executive functions in reading and the importance of background knowledge for comprehension (Hirsch, Jr., 2018).

3.1 Key Features of Higher-Level Processing

Higher-level processing typically assumes that the reader can integrate the processing of the currently read word, phrase, clause, or sentence (semantic propositions) with an emerging comprehension of the text already read up to that point. This integration of new information

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with developing text meaning involves not only information from the prior text and from the current words and semantic propositions but also from automatic activation of semantically associated background knowledge, and, when needed (though less commonly), from strategic use of background knowledge. As such, higher-level processing is the end goal of word-to-text processing (Cook & O'Brien, 2015; Duke & Martin, 2019; Stafura & Perfetti, 2017; van den Broek & Kendeou, 2017). The combination of automatic and strategic processing remains a key feature of higher-level processing.

For most text comprehension contexts, automatic processing provides the necessary background knowledge to construct a sufficient **text representation**, especially for most narrative texts. Many aspects of these higher-level component abilities can be, and often are, carried out in automatic mode except when difficulties arise or when specific goals highlight attentional resource needs (Cook & O'Brien, 2015; Oakhill & Cain, 2017; Perfetti & Stafura, 2015; Stafura & Perfetti, 2017; van den Broek & Kendeou, 2017). Stafura and Perfetti (2017) note that the "word-to-text integration" process is mostly *not* an active (inferencing or strategic) process:

> Word-to-text integration is at least partly (if not mainly) a memory-driven process, in which words from a recently read text and the propositions they encode [into a text representation] are highly accessible in memory. A word, as it is read, 'resonates' with these memories [background knowledge], and connections are made without an active construction process. (p. 24)

Only when readers encounter comprehension difficulties or emotionally salient texts do they engage in strategic coherence-based processes, typically involving active inferencing. For example, reading to learn information for a test will likely lead a reader to attend consciously to linkages among main ideas in a text (Britt et al., 2018; van den Broek et al., 2016). This overall explanation is a clear shift from prior discussions of higher-level comprehension processing. This shift toward automatic, passive, implicit processes for comprehension draws on a number of more recent research findings (Table 3.1).

The main components of higher-order comprehension processing include the following:

1. A "text representation" that reflects ongoing text processing (the outcome of word-to-text integration processes that draw on high levels of automatic activation of relevant background knowledge).
2. A "situation model" of reader interpretation (a mental representation of what the reader constructs as his/her coherent interpretation

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of the text), especially for tasks that are challenging or emotionally charged in some way.
3. A set of processing skills and resources that is often associated with WM (including some type of central executive mechanism and the automatic activation or related semantic networks).
4. Executive function resources beyond WM (e.g., attention, inferencing, metacognitive awareness, goal formation, self-regulation, motivation).

This chapter addresses each of these components and resources. The goal is to provide sufficient detail so that readers gain a sense of how comprehension emerges from these comprehension processes.

Table 3.1 Summary of recent research on comprehension processing

1. A much greater role for word-knowledge linkages in long-term memory (LTM) as well as syntactic and clausal knowledge that these lexical items call up from LTM.
2. A much more pervasive role for implicitly activated background knowledge from LTM that is automatically connected to each new cycle of word-to-text processing.
3. A much larger role for rapid, automatic chunking of incoming information to support fast processing of this new information.
4. A much greater role for semantic networks of knowledge that are easily activated through co-occurrence patterns to support comprehension.
5. A stronger role for minimal bridging inferences that make automatic connections while building the main ideas for comprehension.
6. A smaller role for active, explicit inferencing while reading, except when challenging tasks and texts make greater comprehension demands (requiring a higher standard of coherence).

3.2 Building a Text Representation of Comprehension

> Some authors…have incorrectly argued that readers often jump directly to the situation model without bothering about a propositional textbase. Especially for school learning, however, basing a situational model on a representative textbase is very important. Students must learn that not everything goes, that they really need to find out just what the text says. (Kintsch, 2012, p. 25)

We begin to comprehend a text from the first words that are processed, although building up a general understanding of a longer text requires more processing information than immediate word

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recognition, sentence parsing, and propositional encoding. Text comprehension also involves the combination of information from the currently formed proposition with the active meaning from prior text input. The integration of information from the currently processed clause, the prior text main ideas, and the supportive role of background knowledge can be referred to as text-representation processing (maintained in some version of WM). The most strongly activated information reflects the central ideas at any point in the reading (and the ideas that are least likely to fade below an activation threshold). Text-representation processing requires **passive resonance** processes to call up automatically activated ideas from LTM as well as the use of "bridging" inferences (automatic inference links) to connect new propositions to the network of already active propositional ideas (Cook & O'Brien, 2015; Perfetti & Stafura, 2015; van den Broek et al., 2015), thus maintaining a coherent network of ideas and relationships.

Cook and O'Brien (2015) provide a strong explanation of the role of implicit passive resonance in text comprehension:

> Incoming information—as well as information already residing in active memory—serves as a signal to all of long-term memory, including both the inactive portion of the discourse representation as well as general world knowledge. These inactive concepts *resonate* in response to this signal to the extent that they share features in common with the information from which the signal emanates. These concepts that resonate the most are incorporated into working memory and have the potential to become part of the overall representation of a text. (pp. 19–20)

As a sentence is read, newly formed propositional elements may directly overlap with already active information, providing a direct connection into the network and strengthening the activity of that specific element in the network (e.g., possibly through noun phrase repetition or pronoun resolution). The new elements may represent extensions of existing information and become linked as part of a supporting network. The new information may also be linked by a discourse proposition indicating contrast, example, cause, concession, and so on (e.g., "because" as a link of a causal relation).

This process of text-representation development occurs very fast during fluent reading. A chunking process combining word parts into words, and then into larger units of multiword phrases and usually into automatically recognized meaning units is outlined by Christiansen and Chater (2016a, 2016b) as "the now-or-never bottleneck" (see Chapter 2). As Christiansen and Chater (2016a) describe it, fast processing must take information from the visual word forms, combine it

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with the immediately preceding information to pass it along to larger chunks (multiword groups, phrases), and then to clause-level chunks tied to semantic propositions. These larger chunked units are linked into the existing text representation where appropriate.

There are many consequences of this more recent understanding of written text processing. For purposes of building a reasonably coherent text representation, implications include the pressure for more shallow clausal text representations ("good enough" processing), a greater emphasis on local processing (the immediate information) rather than top-down processing (as predictive inferences about the text), a greater role for implicit knowledge and background knowledge activation, and an argument for incremental item-based learning of linguistic knowledge (a language-usage approach to language acquisition; e.g., Chater & Christiansen, 2018; Ellis, 2019).

Much of the explanation characterizing the formation of a text representation of comprehension reflects an adaptation of Kintsch's Construction-Integration model of reading (Kintsch, 1998, discussed in greater detail in Chapter 6). In brief, Kintsch proposes that comprehension processing from lexical access, syntactic parsing, and semantic proposition formation generate a textbase, reflecting only the information from the text itself (but no background knowledge resources) (e.g., Kintsch, 1998; Verhoeven & Perfetti, 2017a). As such, comprehension processing is incomplete, and ill-formed in parts, because it is constructed without access to background knowledge. Kintsch assumes a fairly active role for inferencing processes to generate a separate, accurate version of comprehension (the situation model).

However, this assumption is directly contradicted by Perfetti's Lexical Quality Hypothesis and by the current emphasis on automatic, passive resonance processing, both of which activate much background knowledge during each chunking cycle (Kintsch, 2013). In his earlier book, Kintsch (1998) argues that the reader would integrate the information from the textbase with appropriate background knowledge to generate the situation model. It is now more realistic to see the textbase (here referred to as text representation) as a reasonably well-formed, and mostly automatically generated, version of text comprehension. The difference between the text representation and the situation model is, for us, a distinction between comprehension of what the author of the text intended (text representation) versus what the reader decides to interpret as the meaning of the text (situation model) (see also Kintsch, 2013). Alternatively, the distinction could simply reflect reading for different purposes and tasks that require different levels of a "standard of coherence."

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Skilled readers are quite good at distinguishing what authors intend to convey in their writing from what they (as readers) want to "take away" as their own interpretations of the text. Given the increasing recognition of automatic implicit background knowledge needed to build coherent text representations, especially with less challenging text, there are good reasons to propose two versions of reasonably accurate text comprehension (Christiansen & Chater, 2016a; Ellis, 2015; Kintsch, 2013; Seidenberg & MacDonald, 2018).

We will assume that the emerging text representation provides a coherent and reasonably specified model of what authors intend the text to mean as long as the text is not difficult to understand (Cook & O'Brien, 2015; Kintsch, 2013; Perfetti & Stafura, 2015; cf. Kintsch, 1998). As stated by van den Broek et al. (2015), "during reading, the automatic processes occur continually and automatically but strategic processes only occur if, in the perception of the reader, the automatic processes do not yield adequate coherence" (p. 98). We argue that there are good reasons to propose the development of two coherent, understandable versions of text comprehension, one nested within the other, particularly when learners need to comprehend more challenging texts or when they encounter difficulties in comprehending a text, for multiple reasons (Lorch, Jr., 2015, 2017).

An extended example of an emerging text representation illustrates how the process of text comprehension can work for nonchallenging texts, including the word meanings themselves and automatic memory-activation processes that tap background knowledge. The following 4-sentence (6-clause) narrative episode is used as the beginning of a text to be read:

1. The man could not find the map to the treasure.
2. He saw an edge of paper under the professor's chair
3. and looked the professor in the eye.
4. Give me the map, said the man.
5. The professor raised a gun,
6. and the man dove out the window.

Let us assume that a reader is processing the first sentence of the text (1): The words are recognized and the clausal groupings are used to produce a set of propositions. Without worrying about details, the sentence can be represented by the propositions in (1').

1'. NOT FIND (man, map); TREASURE (map)

This set of propositions is established well within two seconds (ten words, at 4–5 words per second) (now-or-never processing, chunk-and-pass processing).

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As sentence (2) is read, the next proposition is formed (2')

2'. SAW (he, edge of paper); LOCATION-under (chair); HAS (professor, chair)

At this point, the reader connects "he" to "the man," (in 1) and "the man" receives more activation (i.e., receives more chemical-electric energy through neuronal activity). "Paper," "chair," and "professor" are all introduced and linked to "the man" by the appearance in the same clause. "Edge of paper" may also be linked to "map" by passive resonance and bridging inferences (all implicitly and automatically generated). The processing of sentence (2) and its text integration processing all occur in two seconds (sentence (2) has ten words).

As sentence (3) is read, the empty subject forces a link back to "the man," activating "the man" even further (an automatic default process). "Professor" now is introduced as a person rather than as the owner of "the chair," and is given more activation. By this time, the reader also knows (implicitly) that the text is a story narrative, most likely of the action-adventure sort with the first episode already begun; both characters are given more activation as potential main protagonists. (The reader most likely established this genre knowledge at the outset of reading.) The propositions in (3) could be represented as follows:

3'. LOOKED ([he], professor); DIRECTION (he, eye); MANNER (directly)

At this point, the two main characters are taking center stage and are full of activity; "the chair" is probably beginning to fade in activity; and the "the eye" has some activity. (Frequently used genre frames are called up automatically from background knowledge.) The online processing of sentence (3), and its integration into the emerging text, takes less than 2 seconds.

As sentence (4) is read, the following proposition may be assembled and the main protagonists become even more active:

4'. GIVE ([you], map, me); SAID (man)

The two people are now strongly activated. "The map" is given strong activation, including the implicit inferential link to "the edge of paper." At this point, the reader should sense the ongoing chain reaction generated by lexical-item overlap, automatic implicit knowledge generation, and chunk-and-pass processing. We let the reader work out the linkages of the last two sentences in the episode. It should be evident, from this example, that the key to forming the text representation is assembling a network from the ongoing processing of words, sentences, and propositions. Most of the emerging

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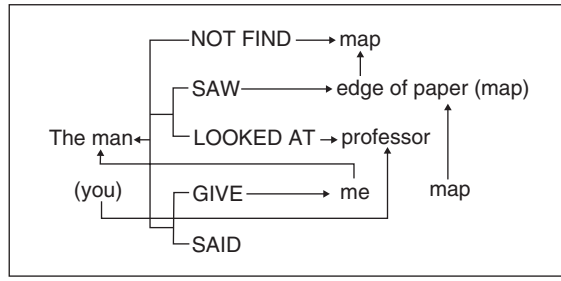


Figure 3.1 Propositional network of argument structures for example sentences

text representation is generated automatically from implicit knowledge, typically generated through lexical access of known and easily activated words and multiword chunks. The results of reading the first four clauses might form a simple network such as that specified in Figure 3.1.

Aside from the overlapping objects and people across propositions, and the passive resonance processing needed to link information (and possibly some simple bridging inferences), the reader must carry out a number of other operations to build a rapid, coherent text representation (see Christiansen & Chater, 2016b; Ellis, 2015; Kintsch, 2012, 2013; Kintsch et al., 1999). The reader must disambiguate any information (e.g., the edge of paper under the chair is "the map"), likely to be done automatically in this narrative context. The reader uses general background knowledge to automatically activate some image of "the man" (aged 25–45, fit, dangerous, handsome, the good guy), and leaves much information empty until it is filled in later (if "the man" is a major figure), drawing on "good enough" processing (Christiansen & Chater, 2016b). The reader passively suppresses peripheral information that does not become reactivated (e.g., "the chair"). And the reader implicitly activates the genre knowledge associated with an action story if this is not already activated.

As more information is added through predicates (e.g., FIND, LOOK, GIVE, DOVE), and as the story moves to another episode, the predicates may be restructured, and chunked, to "summarize" the episode (e.g., the professor has a STOLEN map). A generalizing, memory-triggered implicit connection might also be made that the professor is a "bad guy" and dangerous, and to this text presentation as a typical action-adventure sequence (based on past reading experience).

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This extended example is intended to illustrate how the notions, listed here, represent straightforward operations in building a text representation of comprehension:

1. Linkages added into a network.
2. Overlapping of elements.
3. Passive resonance, paraphrasing, spreading activation, bridging inferences.
4. Passive automatic suppression of less important information.
5. Memory-driven connections based on repeated prior reading experiences.
6. Simple implicit statistical frequency knowledge.
7. Summary restructuring (chunking).

There are several ways to link information into a network, and the overlapping of elements is a major process. As the network grows and restructuring becomes more efficient, the less-active information loses activation, aiding summary restructuring. The primary function of the ongoing text representation is to reflect as well as possible the information intended by the text and the writer.

While a textual network of information represents a reader's comprehension of a text as the author intended, it is not all that a reader does when engaging with a text (in addition to continual lower-level processing). The reader also brings a level of interpretation to the information being processed and, as a result, builds a situation model of reader interpretation.

3.3 Building a Situation Model of Reader Interpretation

> The situation model can go well beyond the text itself. It can carry with it the reader's goals for reading the text, his or her feelings about it, and its connections to prior knowledge. (Schwanenflugel & Knapp, 2016, p. 182)

When we read, we normally bring our own information to the processing of a text. This information includes our understanding of the ways in which discourse is structured, past instances of reading similar types of texts, the specific knowledge we have from these past reading experiences, and our attitudes toward the text, the author, the emerging situation, and the genre. In many cases, we add inferences that reflect our attitudes about and expectations of what the text is conveying, particularly if we are "reading to learn" or "reading to evaluate." These sorts of information, some implicit and some explicit, build the situation model of interpretation, the second level

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of comprehension processing superimposed over the growing text representation. This second model represents the reader's mental interpretation in response to the text, but not necessarily all of the specifics of the text representation itself. In this way, we can, and commonly do, discuss a text both in terms of what the writer wants us to understand and how we feel about the text and the writer (Rapp et al., 2007; Vaughn & Hall, 2017). In considering situation model construction, we take into account a number of factors that reflect the context, the reader's attitudes, the reader's goals for reading, and a greater role for prior knowledge, as outlined in Table 3.2.

Table 3.2 Factors influencing construction of situation model

1. Reader purpose (goals for reading)
2. Task expectation
3. Text level of challenge
4. Genre activation
5. Similar story instances
6. General background knowledge resources and topic knowledge
7. Evaluation of the importance of information, its enjoyment value, its interest value
8. Attitudes (and inferences) toward writer, story, genre, episode
9. Inferences needed for interpretation (of genre, episode, hierarchical organization, purpose)

The notion of a situation model is closely tied to research in cognitive psychology that views comprehension as the creation of an appropriate *mental model* of the situation presented by the text. Such a mental model not only incorporates the information from the text but also constructs spatial and visual interpretations and makes more extensive use of reader knowledge (Kintsch, 1998, 2012; Zwann & Rapp, 2006). It is also the mental model that determines what is learned and retained in LTM. If the text is not difficult, the task not challenging, nor the ideas in conflict with reader beliefs, the mental model will be constructed primarily from implicit knowledge, and it will closely reflect the text representation. Finally, if the text is hard to understand, especially in second-language (L2) contexts, such as in cases of reading-to-learn or reading-to-synthesize, the text representation is likely to be ambiguous, underspecified, and somewhat incoherent, thus calling for a situation model that leads to a more coherent interpretation, whether accurate or not.

To illustrate the situation model of interpretation, let's return to the episode in clauses 1–6 cited earlier. As we begin reading the episode,

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and even perhaps before beginning to read, we activate a range of knowledge, usually implicitly. We activate previous instances of similar stories from LTM. We activate our purposes for reading and our more immediate goals (using the central executive processing mechanism in WM, or some other form of executive control, with more challenging tasks). We begin to activate attitudes and emotions related to our expectations about the story to be read. We activate knowledge about the genre and what we can expect with respect to discourse structuring, in this case, an action-adventure story. We also leave many of the informational expectations vaguely specified because we know that events, characters, and places will all be filled into some extent in a fictional world. We also activate many associations triggered by lexical access to support the emerging text representation and situation model. Thus, at the moment that we start to recognize the first words and begin the parsing of the first clause, we already have information that is activated to some extent and ready for further activation. In effect, we are prepared to build the situation in which the information unfolds.

On reading sentence (1), we know that an episode is beginning and the problem has been announced. We might think that this is an uninspired opening or we might be anticipating the opportunity to "escape" into a story. We might think that the story is not well written, but we will give it a try. We might imagine what "the man" looks like (Indiana Jones) and how old the map might be (300 years old), although we might just let the text itself fill in these details. We certainly will set up slots in our interpretation for "the man" and a "map" based on our prior knowledge of this type of information. Sentence (2) introduces an unusual place for a piece of paper, a chair, and possibly a professor. Sentence (3) introduces two protagonists face to face and a standard conflict of characters has now been activated.

By the time we have read through clause (6), we have begun to fill in details about the situation, protagonists' personalities, the encounter taking place in a room, the causes for the protagonist's actions, and so on. We may also have (a) made further supporting inferences as necessary, (b) evaluated the episode for its exciting potential, (c) decided whether to continue reading or not, (d) considered how these protagonists match up with characters from other stories by this or other authors, (e) considered how much we like this story, and (f) decided if our goals for reading are being met. As readers, we build our own interpretive framework around the actual narrative episode being processed.

Reading for different purposes and reading different types of texts will most heavily influence the construction of the situation model.

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For example, if we are planning to read for evaluative purposes, that is, to read critically, we activate much more information that likely alters how the actual text information is interpreted. We invoke a higher "standard of coherence" in processing the text (i.e., the level of effort we make to understand the text and/or complete a task) (van den Broek et al., 2011, 2016; van den Broek & Kendeou, 2017). We can still use the text representation to decide what we think the author intends, but we may add information for a more elaborate situation model that might consider the triteness of the plot, the writing style, or the uninteresting descriptions of the protagonists. Responding critically, the reader may also call up other texts that carry out the genre better or less well. All of these ideas, deriving from the reader purpose, will influence other aspects of the emerging situation model.

Reading an informational text, as opposed to a story narrative, will also strongly influence the situation model of interpretation (Beker et al., 2017; Lorch, Jr., 2015, 2017). Imagine a reader who is reading a text on whales in anticipation of having to write about the relation between whales and sharks. The purpose for reading is different – it may be either reading to learn or reading to synthesize information – and the expectation that the information will be used for writing strongly influences how the reader builds the situation model. In this case, a different set of concerns may be highlighted throughout. Does the reader understand the information? Does the information integrate well with prior text information, information from another text, or the reader's background knowledge? How is the information organized? Can the information be used for the upcoming task? Is the information interesting or boring? Are there new words that need some attention? Is the author an authority? Again, the text representation will be built from the propositions extracted from the text and basic connecting inferences, though a reader may experience some difficulty in keeping all the relevant information active. Readers should be able to say what the text is about with some level of consistency. However, every reader will respond with differing interpretations of the text and differing attitudes about the text and the information.

What should now be evident is that both the text representation and the situation model play important roles in comprehension. A description of reading comprehension as involving two levels of text processing (text and situation) is generally accepted by most discourse comprehension researchers even if the nature of these two levels is open to interpretation (Kintsch, 2012; Stafura & Perfetti, 2017). It is, however, not required that two levels of text comprehension be proposed. For example, van den Broek, in multiple publications, focuses on building a single coherent mental representation of the text that

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is shaped by (a) reader goals and standards of coherence for a given task, (b) a need to develop structural centrality for a text, and (c) the use of inferencing, whether generated implicitly or explicitly. Nonetheless, there are good reasons to propose a two-level approach to text comprehension as it provides useful ways to examine variations in text processing.

Rather than pursuing more formal arguments for the dual notion of text representation and situation model, we highlight three major benefits of such a dual framework: First, a two-level explanation of reading comprehension helps clarify how we read different texts in different ways and the same text in multiple possible ways. Second, it allows us to account for the genre and register differences in reading comprehension. Third, it helps explain a number of difficulties that weaker readers encounter.

3.4 A Two-Level Account of Comprehension

The requirements for generating an appropriate situation model are quite distinct from the requirements for text representation. Text representation calls for understanding what the text itself is trying to signal and any implicit knowledge associations and inferences. The situation model calls for the reader to combine background knowledge with text information more explicitly in order to reflect an interpretation of the text in line with readers' goals. Thus, a situation model of reader interpretation accounts for how readers construct independent interpretations of a text while also agreeing generally on what a text is about. Different purposes for reading and different types of texts (or text genres) being read will also lead to more emphasis either on an implicitly driven text representation of comprehension or a situation model of interpretation (Kintsch, 1998).

For example, a manual for shutting down a nuclear reactor in the event of overheating is not intended to be interpreted in ten distinct ways by ten different readers. It is the nature of that genre to emphasize a single interpretation, and the interpretation should match the information intended by the author of the manual. Thus, for this particular genre, the goal is to emphasize the emerging text representation. In contrast, a literary poem often purposefully allows for interpretive gaps, vague language, and ambiguous symbolism that invite personal interpretation. In fact, most poems intentionally underspecify a fully coherent text representation – that is, a reader is simply not able to generate a fully specified text representation based on the text itself. The poem, therefore, privileges the situation model. Many types of texts tend to privilege one model or the other. Thus,

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literary texts, biographies, historical narratives, and news editorials require, to varying degrees, a greater emphasis on situation model building if the texts are to be read appropriately. (The reader engages by filling in personal interpretations.) In contrast, manuals, technical documents, most textbooks, and many science texts emphasize a more fully developed text representation if a reader is to learn the relevant information from the text.

A text representation is also privileged when the reader has relatively little background knowledge to draw on for interpretation or when the reader does not have a strong set of attitudinal responses to a text. In this way, many texts that are typically intended for learning purposes should build and reinforce text representation processing as an initial goal. On the other hand, a situation model is more likely to be emphasized when the reader has extensive background knowledge on the topic and author, and a more evaluative stance toward the text is expected.

An immediate question that might be asked is whether or not there is evidence for proposing two models of text understanding, one a close comprehension of the author's intentions, the second a personal reader interpretation of the text. Another key question to ask is what additional benefits are derived from proposing two levels of comprehension.

There is well-established research evidence that readers respond to texts variably in line with the two-process model of comprehension described in this chapter. First, readers with minimal background knowledge of a topic tend to produce recalls that reflect the information presented in the text, whereas students with extensive background knowledge produce recalls with higher levels of background knowledge and evaluative commentary (Kintsch, 1998; Long et al., 2006). Second, readers who have minimal background knowledge can still carry out tasks that rely heavily on text representation processing (Adams et al., 1995; Voss & Silfes, 1996); such tasks include summaries, simple recall tasks, and multiple-choice recognition questions. Thus, task demands interact with the construction of a text representation or a situation model.

Third, research has shown that certain types of texts lead students to emphasize either a text representation or a situation model. Research by McDaniel and his colleagues (Einstein et al., 1990; McDaniel & Einstein, 1989; McDaniel et al., 1995) has shown that students tend to demonstrate text representation processing with descriptive texts and situation model construction with narrative tasks. The early research of McDaniel and colleagues also showed that fairy tales are processed in distinct ways, as are strongly literary texts. In the case

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of literary texts, good readers demonstrate a greater awareness of the unusual use of surface-level language structures to convey insights.

With regard to the benefits of two-level processing, a number of advantages arise. The two processes, together, provide a strong explanation for the complementary roles of text organization and discourse signaling mechanisms on the one hand, and greater reader background resources on the other. The two levels can account for the competing assertions that a reader draws meaning from the text versus the reader constructs text meaning. With a two-level processing account, the reader does both, but emphasizes one or the other goal (recognizing author intention or providing reader interpretation) depending on a number of contextual factors.

The two-level account of comprehension also provides an explanation for the problem of weak comprehension monitoring as well as the dilemmas of reading both inconsiderate (difficult) and incompatible (contrary to reader's background knowledge) texts (Grabe, 2000; Kendeou & O'Brien, 2016; Lorch, Jr., 2017). Students often give up trying to build an appropriate text model when working through a difficult text, a poorly written text, or a text that counters their preconceptions; instead, they rely on an account that is preassembled from their existing background knowledge (Rapp et al., 2007). As a result, students respond to tasks without demonstrating that they have learned very much from the text that has just been read. In some cases, an initial situation model strongly reflects what a student wants to believe, and the situation model overpowers the emerging text representation. On the other hand, a lack of interpretation, when called for, would indicate that the student either has very little background knowledge to call on or that the student is too focused on the details of the text itself to make use of background knowledge resources.

In the case of L2 students, a common problem occurs when students are asked to read a text that is much too difficult simply because of limited L2 proficiency. In particular, limited vocabulary knowledge may lead to a minimally developed and minimally coherent text representation. In these cases, students over-rely on a "preassembled" situation model. Because students have few other resources, the situation model provides an opportunity to impose some degree of coherence on an interpretation that they may be required to provide. Thus, they are able to respond to a given task in a coherent way, but not necessarily in a way that indicates comprehension of the text.

As part of the creation of a text representation and situation model, readers engage in a number of higher-order cognitive processes, or **executive functions**, that deserve further comment. Several of these executive functions are amenable to some degree of training for

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purposes of reading comprehension (e.g., goal setting, inferencing), unlike underlying cognitive skills that develop as implicit knowledge from the outset (e.g., automaticity, processing speed, statistical knowledge, associative priming, chunking, consolidation). However, there are few neat distinctions across cognitive skills that are either purely implicit in development or always open to conscious cognitive control. We address in the remainder of this chapter a set of executive function skills that are typically seen as critical for comprehension. These executive functions include WM (particularly the central executive) as well as a wider range of executive functions such as attentional processes (if not assumed to be covered by WM), inferencing, metacognitive and metalinguistic awareness, strategy use, goal setting, and comprehension monitoring.

3.5 Working Memory as Executive Function

> [Working memory is] the ability to mentally maintain information in an active and readily accessible state, while concurrently and selectively processing new information. (Conway et al., 2009b, p. 3)

Just about all cognitive processing skills and knowledge resources intersect with WM as they support reading comprehension. The overall importance of WM was introduced in Chapter 2. The concept of WM is also a crucial support for higher-level processing; it is essential for the development of both the text representation and the situation model. It is logically reasonable to suggest that WM incorporates an updating function for the growing text representation with each newly processed chunk. Also logically, WM should inhibit, or suppress, increasingly less relevant information. Similarly, WM would seem to require an attentional process, and attention shifting would play some role. Alternatively, WM intersects and correlates with cognitive functions such as updating, inhibition, and attention shifting, but these appear to be independent of WM, and may be components of goal setting (Banich & Compton, 2018; cf. Friedman & Miyake, 2017). As one might guess, the overall picture is less than clear with respect to these (and other) executive functions and their intersections.

Conway et al. (2009b) point out many of the complications and challenges built into WM as a major cognitive skill. First, there are multiple different conceptualizations of WM in the research literature, Second, there is no consensus on how to measure WM for different populations or for its application to different cognitive skills such as reading, writing, visual processing (location, direction, image), music performance, and so on. Third, many assessment instruments

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are "plagued by poorly operationalized constructs" (Conway et al., 2009b, p. 4). Fourth, in cases where WM measures do seem to indicate some predictive relationship to reading and language ability, such as with reading span tasks, it is not clear why and how this is so (e.g., Farmer et al., 2012; cf. Friedman et al., 2016; Peng et al., 2018).

At present, WM is commonly seen as one subsystem within a much larger concept of executive functions (Baggetta & Alexander, 2016; Cain & Barnes, 2017; Cartwright, 2015; Diamond, 2013). It is most closely viewed as an executive function associated with attentional focus and attention shifting, inhibitory control, and updating (Butterfuss & Kendeou, 2018; Follmer, 2018; Friedman et al., 2016; Miyake & Friedman, 2012).

Perhaps most important for WM as a predictor of reading comprehension is its role in many studies that have measured WM as well as a range of other measures to determine their impacts on reading comprehension. In these cases, the goal is to determine the unique contributions of each measure or examine the relative extent of each measure's contribution to reading comprehension. To be sure, a large number of studies have identified WM as a significant predictor of reading comprehension (Alderson et al., 2016; Arrington et al., 2014; Booth et al., 2014; Daneman & Merilke, 1996; Follmer, 2018; Linck et al., 2014; Nouwens et al., 2016; Shin, 2020; Swanson et al., 2011). At the same time, a large number of studies have found no or only minimal effect of WM on reading comprehension, and a large number of these studies involve L2 students (Babayigit & Stainthorp, 2011; Currie & Cain, 2015; Foy & Mann, 2013; Georgiou & Das, 2018; Jeon &Yamashita, 2014; Language and Reading Research Consortium & Logan, 2017; Peng et al., 2018; Shiotsu, 2010; Stipek & Valentino, 2015; Tighe & Schatschneider, 2014; see also the review of L2 studies by Juffs & Harrington, 2011).

Without going into details about research methodologies, there are enough cautionary flags to say that WM measurement is still a work in progress. This caution is particularly relevant for determining the appropriateness of different assessment instruments and the development of assessments for different subject populations, especially in L2 contexts. WM measures that involve both storage and distracting processes (like reading span measures) also raise interesting questions about WM that appear to tap into a secondary type of WM rather than an immediate processing load measure. Assuming that WM attention span without rehearsal is about 2 seconds (e.g., Christiansen & Chater, 2016b; Martin & Ellis, 2012), one might ask if span tasks are really measures of active attention, or are they measures of the episodic buffer (Baddeley, 2015), or long-term WM

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(Ericsson & Kintsch, 1995). In such cases where a span task requires much more than 2 seconds to complete, are we measuring something other than a simple concept of WM, and instead measuring access to a secondary WM or partially activated LTM (as with reading span measures)? If reading comprehension requires chunk-and-pass processing within 100 milliseconds, and the exact surface form is inhibited, then why ask subjects to recall the final word of sentences (the surface form)?

There is no doubt that some concept of WM is needed to explain higher-level reading comprehension processes, but a final converging description has yet to be identified, and WM is also likely to be just one of a number of key executive functions critical for reading comprehension (Chung et al., 2020; Follmer, 2018). It is also an area of research that still is in need of many more carefully controlled studies. We know that WM for reading comprehension is critically important. At issue is how we conceptualize WM and how we measure it during reading.

3.6 Other Executive Functions

> Executive function is comprised of different behavioral and cognitive elements, and is considered to play a significant role in learning and academic achievement…. However, because of its complexity functionally, the research on executive function can at times be both confusing and contradictory. (Baggetta & Alexander, 2016, p. 10)

The executive function concept of cognitive skills is generally not well specified, despite a number of broadly identified higher-level executive functions: Attentional focus and attention shifting, WM, inhibitory control, cognitive flexibility, planning, motivation, goal-setting, monitoring, self-regulation, problem-solving, metacognitive awareness, inferencing, and others (Baggetta & Alexander, 2016; Banich & Compton, 2018; Cartwright, 2015; Diamond, 2013; Duke & Cartwright, 2021; Miyake & Friedman, 2012). The definitional problem arises partly because many terms have been proposed, many measures created to operationalize the terms, and many individual terms defined in different ways (e.g., WM, cognitive flexibility, goal-planning and execution, inferencing). It is also difficult to devise experiments that show how specific concepts would operate and still control for potentially confounding executive function factors. Despite these challenges conceptually and behaviorally, the overarching term (whether executive control or executive function) is extremely popular in current discussions of learning processes and in the research literature.

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In the past decade, the overall concept of executive function has had over 15,900 hits using Google news search headlines. PsycInfo identifies over 1,400 articles between 2000 and 2013 with the term "executive function" in the title (Baggetta & Alexander, 2016). Despite this extremely popular coverage, it is important to recognize a distinction between executive control processes that are able to arise to a conscious level (and open to some form of self-regulation and explicit learning) and those that are more implicitly driven processes. Several executive functions have both active conscious uses and automatic implicit uses. One organizational solution is to treat executive functions as applying with some level of explicit awareness (or combination of explicit and implicit processing) versus cognitive functions carried out almost entirely implicitly as underlying cognitive processes (e.g., consolidation, chunking, speed of processing, automaticity, associative knowledge activation).

Discourse comprehension researchers recognize that reading comprehension must incorporate attentional processes, monitoring, coherence-building types of inferencing, and metacognitive awareness as potentially active conscious processes, particularly when reading difficult materials and when learning or evaluation goals are crucial. These more conscious mechanisms (a) respond to reading difficulties, (b) respond to specific reading goals and purposes, (c) apply strategies appropriately, (d) draw on background knowledge as appropriate, and (e) are amenable to improvement through instruction. But how such more conscious processing is carried out by readers as part of reading comprehension (as executive functions) is less clearly understood in terms of component-skills cognitive models. Nevertheless, most researchers agree that such processing does occur on a continual basis, especially for problem-solving approaches to comprehension with difficult texts.

3.7 Attentional Processing

> Our brains can function effectively only if there is a means to select specific information for further processing.... This selective process is known as attention. (Banich & Compton, 2018, p. 297)

According to Banich and Compton (2018), attention comprises a set of processes (e.g., alertness, arousal, vigilance, selection, facilitation) that, in some combination, allow us to notice input and focus consciously on that input (see also Schmidt, 2001). In this way, attention supports explicit learning. All explicit learning requires noticing at some cognitive level. Attentional processes are subject to conscious

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control, limited in capacity, and relatively slow in activation. They are selective and determine what will be consciously available. They also control information processing when fluent skills and routines are inadequate to the task (e.g., when having difficulty in learning to use reading strategies). Under conditions of great difficulty, attentional resources are usually understood as conscious problem-solving processes (see also Eysenck & Keane, 2020; Styles, 2006). It is not clear if attentional processes are part of, equivalent to, or separate from the central executive in Baddeley's model of WM. Generally, it is assumed that attentional processes must be closely entwined with WM, but several researchers address attentional processes as a concept independent of WM.

Attentional processes are particularly important for explicitly learning new information and registering this new information in the episodic buffer (and perhaps, in a fragile way, in LTM). Attentional processing of new information typically requires the conscious awareness of this information (Ellis, 2005). This heightened awareness is what helps integrate new information into a situation model of comprehension. These initial efforts to register and integrate new information can then be reactivated when the same information is processed again in WM. Later repetitions of this information can also trigger priming of prior information and contribute to the implicit learning system by the tallying and abstracting of additional exemplars (Anderson, 2020; Ender, 2016; Suzuki & DeKeyser, 2017; cf. Ellis, 2005, 2015, 2019).

Attentional processes also provide the link between research on metalinguistic awareness and reading strategy use. Reading strategies often require conscious attention when they are applied to text comprehension difficulties or problems with learning from texts. However, reading strategies (aside from inferencing and comprehension monitoring) have been almost completely ignored in many cognitive theories of reading comprehension (cf. Beker et al., 2017; Britt et al., 2018), yet educational research has demonstrated the importance of reading strategies when reading in academic settings (as in reading-to-learn) (Cho & Afflerbach, 2017; Duke & Martin, 2019; Elleman, 2017; Goldman et al., 2016; Miyamoto et al., 2019; Schiefele et al., 2012). Attentional processing (whether part of WM or not) provides a mechanism to link metacognitive and metalinguistic processes to the use of reading strategies for comprehension.

Attentional processes are also used for many types of cognitive processing beyond reading comprehension. For example, goal setting, metacognitive and metalinguistic awareness, monitoring, and strategic processing are all potentially attentional processes that are

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also important for a range of other cognitive processes as well (e.g., setting goals for many nonreading activities). Aside from attentional processes, or as part of attentional processes, inferencing (basic to a wide range of attentional cognitive processing) is a further cognitive process and potentially explicit resource that is important for reading.

3.8 Inferencing

Inferencing is not limited to a skill that we use when reading. Rather, it is one of the fundamental cognitive mechanisms that connect what we are currently attempting to understand with the memory resources that activate our background knowledge (at all ages and in all contexts). Almost automatically, we infer other people's intentions from their actions (and our perceptions of their actions); we determine our likes and needs from multiple sources of information without being directed explicitly to like or need something; and we infer causes and consequences from events and people's actions or statements.

Humans engage in inferencing from very early childhood, and inferencing skills are part of the basic cognitive processes that all humans carry out in interpreting their environment. All types of comprehension – written, oral, and visual – rely on inferencing continually, and our inferencing abilities begin well before we engage in reading comprehension. A 1-year-old's emerging ability to form a "theory of mind" – involving the ability to establish joint attentional frames with others and understand the actions, intentions, and goals of others – is a generalized inference in itself and leads to countless additional inferences (Mason & Just, 2006; Tomasello, 2003). Human abilities to make inferences are part of human evolutionary survival skills, and all humans infer actions, attitudes, and intentions of others continually.

Our fundamental drive to generate coherent interpretations of the world and people's actions demands a considerable set of inferencing skills. The most basic distinction for inferencing skills centers on those that are carried out implicitly via passive resonance activation and those inferences carried out explicitly under difficult or challenging situations. Cross-secting the implicit–explicit contrast are types of inferences that serve distinct functions based on context. Several discourse comprehension researchers have developed taxonomies of inference types and their roles in comprehension (Cho & Afflerbach, 2017; O'Brien et al., 2015). The most basic distinction for discourse comprehension is between bridging inferences (the need to maintain coherent text representations during comprehension) and elaborative inferences (adding information that elaborates on the situation model; e.g., causal, goal, predictive, psychological state, and instrumental

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types of inferences) (see Cook & O'Brien, 2015; Graesser et al., 2015; McKoon & Ratcliff, 2015). Moreover, human abilities to draw analogies are types of inferences that assume similarities between two distinct objects, concepts, or outcomes.

The major contribution of inferencing more specifically for reading comprehension is to activate information that is not explicitly stated in the text. Predominantly this "outside the text" information emerges from the prior text already processed and from the reader's LTM (background knowledge). Inferences for comprehension include abilities to (a) integrate new information with prior knowledge, (b) interpret and situate information that is contextualized, (c) activate information from multiple cues and sources, (d) evaluate information in terms of a reader's goal and attitudes, and (e) understand information that may be conceptually different from prior expectations.

The vast majority of these inferences made during reading are automatic activations from associations to conceptually related information in LTM. These inferences are automatic, passive, and implicit. They are linkages made without any conscious effort to form a linkage (Cook & O'Brien, 2015; McKoon & Ratliff, 2015; Stafura & Perfetti, 2017; van den Broek et al., 2015). This perspective on inferencing is quite different from the view of inferencing strategies often described in educational settings involving reading instruction and reading assessment practices.

Because inferencing is such a fundamental part of our cognitive processing and our interpretations of the world around us, it should not be reduced only to the level of a reading strategy or a learning strategy in the educational sense. However, there are a number of circumstances in which it makes perfect sense to refer to inferencing as a reading strategy. Certain types of inferences are not normally carried out in our everyday interactions, but do apply to academic tasks, to more complex and challenging textual input, or as problem-solving solutions when poor readers struggle with difficult texts to improve their comprehension (Elleman, 2017; Goldman et al., 2016; van den Broek et al., 2015). As van den Broek et al. (2015), state,

> In addition to the automatic activation processes, information may be activated and inferences may be generated through strategic processes by which the reader attempts to create coherence in his or her representation of the text. These strategic coherence-based processes are particularly likely to occur if the automatic processes do not establish adequate coherence for the reader. (p. 97)

Making inferences of both types (automatic and strategic) are critical for reading comprehension (Elleman, 2017; Perfetti & Stafura, 2015). Making inferences to create a coherent interpretation of challenging

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academic texts or to understand new, unexpected explanations can be a very demanding skill, one that begins by explicitly learning academic inferencing as a strategy. Such academic inferencing requires the evaluation of many different linguistic cues, the recognition of sometimes very subtle textual cues, the prioritization of potentially conflicting cues, or the synthesis of evidence from multiple texts to build critical reading comprehension abilities. Academic inferencing tasks often require specific background knowledge, correlate well with advanced academic reading comprehension abilities, and can (and should) be practiced (Cho & Afflerbach, 2017; Perfetti et al., 2005).

3.9 Metacognitive and Metalinguistic Awareness

Metacognitive awareness is dependent on attentional processes directed in some way by the executive control mechanism (Baker, 2017; Nagy, 2007: Veenman, 2016, 2017; Westby, 2014; Wilkinson & Son, 2011). Generally speaking, metacognition can be defined as "the descriptive knowledge of, and the regulatory control over one's cognitive system" (Veenman, 2016, p. 26). The central defining notion of metacognitive awareness for reading comprehension is that the reader is aware of ways to support comprehension and can devote attentional resources to comprehension through the deliberate use of reading strategies. Metacognitive awareness and control provide the means by which readers can engage in active problem-solving to improve comprehension (Schiefele et al., 2012). When metacognitive awareness activates strategy use, goal setting, and comprehension monitoring, the reader is better able to enhance comprehension or repair any breakdowns in comprehension (Gascoine et al., 2017; Miyamoto et al., 2019; Schiefele et al., 2012; Veenman, 2016; see Chapter 13).

Metacognitive control, as one important aspect of metacognition, involves controlling one's reading process through the use of strategies. It has been a long-standing tenet of first-language (L1) reading research that expert readers use a variety of reading strategies to aid comprehension (Baker, 2017; Duke & Martin, 2019), and that strategic reading is a prime characteristic of expert readers (Paris et al., 1991). In fact, aspects of metacognition are often labeled as strategies, and awareness of these facets of comprehension certainly count as strategic processing. Choosing which strategies to use, how to use certain combinations of strategies, and when to use them or try other strategies are all parts of a good reader's metacognitive awareness and control (Westby, 2014).

An additional resource that can be directed to support comprehension under attentional processing includes **metalinguistic awareness:**

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Linguistic knowledge of various types is analyzed intentionally to support reading tasks, particularly when the reader is encountering significant comprehension difficulties (Koda, 2007, 2008; Nagy, 2007; see also Chapters 8 and 13). Nagy (2007) developed this perspective as the Metalinguistic Hypothesis for reading comprehension. Metalinguistic awareness supports the development of academic reading abilities at three levels:

1. Awareness of word learning skills (e.g., connecting sounds, letters, and meaning; using context; using word part information; and building new definitions).
2. Awareness of syntactic structuring (e.g., recognizing syntactic categories for new words, using syntactic information as context information, and disambiguating lexical meanings and discourse organization).
3. Awareness of discourse organization (e.g., recognizing genre clues, determining main ideas, recognizing discourse patterns in the text).

All of these forms of metalinguistic awareness represent one aspect of metacognition more generally – the ability to reflect on one's conscious knowledge of language and be able to act on that knowledge.

Indirectly, considerable evidence indicates that metalinguistic awareness is a critical factor in the development of reading abilities. In essence, almost all well-controlled training studies that involve explicit learning of some linguistic knowledge, skill, or strategy demonstrate the importance of metalinguistic awareness. That is to say, the learning of some explicit linguistic knowledge, along with awareness about that knowledge, involves metalinguistic awareness, which then can be related to improvement in reading comprehension: morphological awareness (Berninger et al., 2010; Deacon et al., 2014, 2018; Lyster et al., 2016), phonological awareness (Berninger et al., 2010; Castles et al. 2018; Stanovich, 2000), orthographic awareness – spelling (Castles et al., 2018; Ehri, 2015; Graham & Santangelo, 2014; Reed et al., 2016), lexical awareness (Nagy, 2007; Nation, 2013; Schmitt & Schmitt, 2020), and syntactic awareness (Deacon & Kieffer, 2018; Foorman et al., 2015; Geva & Farnia, 2012; Shiotsu, 2010).

Strategy use during reading is a major research topic for educational psychologists and reading instruction specialists, but it is less commonly addressed by cognitive psychologists and discourse comprehension researchers (cf. Allen & McNamara, 2017; Beker et al., 2017; Brown, 2017; Cho & Afflerbach, 2017; Veenman, 2016). Strategy use while reading is a metalinguistic process when the effort

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to engage in strategy use is intentional. Strategy use while reading is a process that is directed by executive control mechanisms generally and by attentional processes more specifically. In most cases, more-conscious strategic responses to texts represent awareness of a need to alter processing, to respond to the goals that have been set, to restore comprehension, to understand the possible meanings of new words, and/or to complete a comprehension task more effectively. All of these actions are, in effect, problem-solving. Strategy use generally requires some recognition that the text is difficult or that the goals of the reader are not being met. Although the role of strategic processing within cognitive models is not precisely defined, researchers concerned with reading instruction and reading development know that strategy use and the development of the strategic reader are central issues for comprehension (see Chapters 12 and 13 for additional reading strategy discussions).

Much like any consciously directed process, some strategies and combinations of strategies can shift over time to become fairly routine responses to reading problems and reading goals. This is particularly true when a given strategy set works well repeatedly. In these cases, strategic responses can become default processing skills that address the reader's needs without requiring full conscious awareness of what needs to be done. For example, a skilled reader often skips an unknown word if it is not commonly encountered and the word does not seem to be critical (e.g., an adjective, adverb, or name for an object that is not critical to overall understanding). Or a reader may turn the page to see a place to break or to see how much further to read, thus providing a check on goals or altering goals without conscious attention to this purpose. As these routines occur, hundreds if not thousands of times successfully, useful strategic routines can become well entrenched. But when they do not provide some sense of resolution, conscious awareness of the problem emerges more strongly. Because strategic responses to texts in academic settings are explicitly learned at some point, they are reading processes that can improve reading comprehension through instruction and practice.

Goal setting is an executive function that is central to all human activity and can be driven by attentional processing. Explicitly formed goals, or changes in goals, provide reasons for action and provide causal explanations for what other people are doing or what they want to see done. In academic settings, readers read with a variety of goals (and purposes) and make plans for how to achieve these goals (see Chapter 1). Goals can focus on basic comprehension of text information, such as finding simple information, checking facts, or entertaining oneself (i.e., simple functional literacy tasks). Alternatively,

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advanced academic goals may lead to strategies that involve critically interpreting texts in light of an array of other information and using the critical interpretation for other academic tasks (e.g., summarizing a text, synthesizing multiple sources of information, evaluating information, forming an argument, preparing for a test, studying to learn).

Goals are closely associated with motivations and attitudes toward reading and to the social contexts in which reading takes place. For good students in academic settings, goal setting is typically raised to a level of conscious awareness. Conscious awareness and attention to goals, in turn, generally have a positive influence on comprehension. Based on their goals, readers decide what information to focus their attention on. They decide the level of intensity of their efforts and set an appropriate expectation for their comprehension that will help them achieve their goals (see "standard of coherence" later in this section). Research on goal setting, and comprehension outcomes based on different goals, has shown that goals can impact comprehension outcomes in both L1 and L2 contexts (Britt et al., 2018; Kendeou et al., 2011; Linderholm et al., 2011).

Comprehension monitoring is also a basic human cognitive process (dependent on attentional processing and metacognitive awareness). Much like goal setting, all humans monitor their language comprehension and communication from an early age. It is part of our human survival mechanism to have a coherent theory of the world around us. If we could not understand events, actions, and intentions going on around us, we would not function well. Monitoring written texts in particular, however, imposes new challenges on our comprehension processing skills. In contrast to most oral interactions, written texts (a) are generally more informationally dense, (b) generally involve less common vocabulary, (c) can present new information or information that contradicts prior understanding, and (d) often require synthesis and evaluation abilities.

In these situations, comprehension may fail or become severely constrained. At certain points in reading, a reader develops the feeling that the text does not make sense as it should, and gradually this sense rises to a conscious level of awareness (though not all the time and not for all readers). Nonunderstanding may be driven, for example, by (a) an inability to form a coherent text representation, (b) the recognition that a few keywords are not understood, or (c) information that runs counter to social and cultural expectations (see also Currie et al., 2021; Hessell et al., 2021).

Skilled readers can recognize the sense of noncomprehension more readily and take a variety of strategic actions to address the problem. These strategic responses, which often vary depending on the goals

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and expectations of the reader and demands of the reading task, are among the range of strategies that can be taught and practiced by students. At the same time, comprehension monitoring is not a single strategy, but an awareness that can be addressed through multiple possible strategies; that is, we can teach students various strategies that help them monitor comprehension. Monitoring while reading, however, is something carried out by the executive control as part of goal setting and text model construction; conscious awareness of monitoring typically occurs when comprehension is becoming difficult to maintain.

Comprehension monitoring, as well as goal setting and strategic processing, is closely associated with a reader's effort to set an appropriate **standard of coherence** (van den Broek & Kendeou, 2017; van den Broek et al., 2011) (see Chapter 1). The standard of coherence concept represents one way of identifying the level of attention required to ensure that appropriate text representation and situation model processing are carried out. In other words, our standard of coherence represents our level of effort to understand a text, taking into account the reading task and reader purpose. Monitoring comprehension will depend on matching reader goals to an appropriate standard of coherence and having the strategic processing capabilities that ensure success in reading.

3.10 Comprehension Processes and Executive Control

The many higher-level processes outlined in this chapter point out the centrality of a text representation and a situation model of reading comprehension. Moreover, comprehension is guided by various executive control mechanisms. It should be evident that efficient reading ability combines aspects of higher-level and lower-level processing, though with certain constraints. For example, automatic lower-level processes do not interact strongly with higher-level processes. In order to run more or less in parallel, automatic lower-level processes cannot be interrupted by conscious intrusions or they will slow down and become inefficient.

It is important also to note that, contrary to the commentary of many educators, there are not primarily word-driven or schema-driven readers, that is, "bottom-up" or "top-down" readers. Nor is it the case that readers are "bottom-up" readers at certain points and "top-down" readers at other points, depending on their purposes for reading. Such descriptions of readers in these ways indicate a misunderstanding of reading comprehension processes and reading abilities. Readers most definitely are not either top-down or bottom-up

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readers. Instead, readers are, of necessity, potentially always both bottom-up and top-down readers. Fluent readers are, at all times, exercising very skilled and automatic word recognition and parsing abilities. When such abilities do not generate noticeable problems or are not readily observable processes, this does not mean that these skills are absent. Reading would stop if this were the case.

Similarly, readers could not assemble a text representation or a situation model if they were not continuously using inferencing skills, comprehension monitoring, and background knowledge representations (implicitly and sometimes explicitly) as part of comprehension processes. For readers who are experiencing difficulties with reading comprehension, it is possible to say that they are having difficulties with word recognition or with situation-model interpretation or both. But such observable difficulties only point out problems with certain processing skills and knowledge resource limitations while one is reading a given text. They say nothing about the full range of processes that are being carried out by the reader.

The role of executive control mechanisms, combined with automatic processing abilities, support the reader's efforts to create a text representation and a situation model. The complexity and efficiency of fluent reading comprehension processes are highlighted by the complementary roles of text representation and the situation model on the one hand, and lower-level processes of word recognition, syntactic parsing, and proposition formation, on the other. The processes centrally involved in reading comprehension are so remarkably fine-tuned, and integrate so efficiently, that fluent reading abilities border on the miraculous.

3.11 Implications for Instruction

In Chapter 2, implications for instruction pointed out the need for building fluency and automatic processing. In this chapter, the implications are somewhat different. Some reflection on the nature of comprehension indicates that higher-order processing, in some form, is already available to all readers from the outset of literacy learning. For example, a young child of eighteen months is already capable of listening to, and understanding, a simple narrative story. However, all readers in academic settings are expected to engage in a number of higher level processes to support reading comprehension goals. These processes are all open to metalinguistic awareness and instructional practice.

As implications for reading instruction, students need to learn how to engage in comprehension processes when (a) texts do not fit directly and easily with background knowledge, (b) texts require new

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levels of attentional processing because the context does not provide enough additional information, (c) the conceptual complexity of the text forces greater attentional resources (or demands a higher standard of coherence), and (d) the goals for reading require new abilities for reporting, synthesizing, and evaluating text information. In these contexts, the skills already honed in listening comprehension (most typically the case of L1 readers) will not match up well with the goals for reading. The result is a new set of comprehension skills that need to be part of reading instruction.

Among the skills that become critical for reading comprehension, above and beyond lower-level processing skills and linguistic resources, are skills in (a) applying comprehension strategies at an appropriate standard of coherence, (b) synthesizing and evaluating information through strategic processing, and (c) monitoring comprehension as well as setting and changing goals for reading, thereby developing metacognitive awareness to maintain or repair comprehension. In short, *learners need to become strategic readers* to develop more advanced, critical reading comprehension skills (see also Chapter 13). In particular, students need explicit practice in comprehension monitoring when they sense that they are not comprehending the text information at a level required for achieving reading goals. Students also need practice in forming inferences to comprehend more challenging texts and more difficult tasks.

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4 *Cognitive Issues in Reading*

Our cognitive system is, first of all, a correlation-seeking device. Hence…, models of reading should be structured to pick up covariations and conditioned probabilities that exist between *all* of the language components. (Frost, 2012, p. 278)

Chapters 2 and 3 outline how reading comprehension arises out of the efficient combination of lower-level and higher-level language processes. This chapter explores a number of more general cognitive skills that intersect with reading comprehension and help explain the effectiveness of various cognitive and experiential components of reading abilities as they work in combination. Almost all of the underlying cognitive skills (henceforth "cognitive skills") in this chapter have been introduced in the first three chapters because they support the various component reading abilities that build reading comprehension.

In this chapter, cognitive skills are covered more comprehensively to highlight their importance for reading abilities. It is also important to relate these cognitive skills to the discussion of executive functions in Chapter 3. At one level, executive functions and cognitive skills overlap in that they are both "cognitive." At another level, they overlap because a number of executive functions operate both explicitly and implicitly (e.g., inferencing, comprehension monitoring, goal setting). For example, when inferencing operates implicitly based on passive resonance, it operates as an automatic implicit process. When inferencing operates explicitly as a problem-solving strategy, it operates as an executive function under attentional control. So the two types of cognitive systems do not control totally distinct skills, but they represent specific skills differently. Cognitive skills, once learned, are the foundation for implicit processing during reading.

The cognitive skills covered in this chapter are not solely involved in reading comprehension processing; rather, they are key to all aspects of learning more generally (including all aspects of language learning). Each cognitive process listed in Table 4.1 is critical for

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understanding the central role of underlying cognitive systems in reading comprehension. (Note that starred skills and systems are covered well in other chapters and will not be discussed further in this chapter.)

Table 4.1 Cognitive skills and systems underlying reading comprehension

1. Implicit and explicit learning
2. Frequency of experience with language (and reading) (see also Chapters 1, 6, 9, 11, and 18)
3. Automaticity* (Chapter 2)
4. Statistical knowledge and statistical learning
5. Associative learning, co-occurrence, and emergence (by analogy)
6. Real-time language processing skills (now or never processing, chunk and pass processing, inhibition control, eager processing, predictive processing) (see also Chapters 2 and 3)
7. Speed of processing
8. Working memory system* (Chapters 2 and 3)
9. Long-term memory (LTM) system: the role of background knowledge in L2 reading (declarative knowledge, procedural knowledge, long-term working memory (LTWM), passive resonance, spreading activation, semantic priming, paraphrasing linkages) (see also Chapter 2)
10. Conceptualization and categorization
11. Motivation and engagement* (see Chapters 10 and 13)
12. Contextual processing (in L2 reading)

Cognitive skills and systems constitute the foundations of learning theory for all of cognitive and educational psychology (Anderson, 2000). They are also relevant for learning to read because reading, like all language learning, is skill-based learning that draws upon the accumulation of past experiences through instances of language comprehension and use (Chater & Christiansen, 2018; Christiansen & Chater, 2016a; Ellis, 2015). Research over the past twenty years, connecting cognitive skills with language development has significantly reshaped how cognitive psychologists have come to understand language processing over seconds, language acquisition over years, and language changes over decades and centuries (Christiansen & Chater, 2016a, 2016b; Ellis, 2015, 2019). Current directions in linguistics and psycholinguistics have moved strongly away from the Chomskean generative linguistics enterprise and moved toward general cognitive learning skills as the pathway to language acquisition (see also Chapters 3, 9, and 12).

Principles of language learning need to incorporate the following empirically supported skills and processing systems: just-in-time processing, automaticity, statistical learning skills, analogical and

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associative learning skills, incremental learning, item-by-item learning, local dependency constraints, good-enough processing, exemplar learning, and so on. The importance of these cognitive skills and systems for reading comprehension cannot be overestimated. They provide the basis not only for how reading comprehension works but also for how it develops. Multiple language usage theories align with research on cognitive skills including construction grammar, cognitive grammar, simple phrase-structure grammars, and lexical grammars (e.g., MacWhinney & O'Grady, 2018). The increasing role of general cognitive skills and long-term knowledge resources for language processing and language acquisition, backed by a wide array of experimental research studies, has highlighted the importance of several human processing and learning abilities that we connect to the development of reading comprehension, as indicated in Table 4.1 (Ellis, 2019; Theakston et al., 2015; Tomasello, 2003).

Before addressing specific cognitive skills and systems, a basic distinction running across all learning and memory processes needs to be addressed first to understand better how specific cognitive skills operate in different ways depending on the context, text, task, and overall exposure to language. This distinction involves the interplay of implicit and explicit learning processes as well as applications of each for reading comprehension.

4.1 Implicit and Explicit Learning

> Research on **implicit learning** and chunking … has identified how language users are sensitive to the frequency of language forms and their sequential probabilities at all levels of granularity from phoneme to phrase…. Research on **explicit knowledge** has shown how conscious processing promotes the acquisition of novel explicit form-meaning associations…. These representations are also then available as units of implicit learning and subsequent processing. (Ellis, 2015, p. 3)

Learning to read involves two fundamental learning processes: implicit learning and explicit learning, as well as the associated knowledge bases that emerge (implicit procedural knowledge and explicit declarative knowledge). These two learning and memory systems, in general, explain how lower-level processing can often be automatic and be carried out simultaneously alongside active main idea comprehension and text meaning interpretation (Ellis, 2015; Ullman, 2015).

Implicit learning involves the incremental growth of domain knowledge, and statistical and associative knowledge – the tacit learning of multiple types of co-occurrence patterns in the input

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we perceive (Anderson, 2020; Ellis & Wulff, 2015; Seidenberg & MacDonald, 2018). It also involves learning processing skills, language knowledge, and domain subject knowledge without the learner being aware of attending to the specific information that is learned. Implicit knowledge relies on extensive amounts of input. Hulstijn (2015a) identifies generally agreed upon components of implicit learning: "chunks, similarity, familiarity, and statistics form the substance of implicit acquisition" (p. 32). Input that supports implicit learning includes frequency of repetition, sequences that are repeated and gradually imprinted as larger units (chunking), and the gradual generalization of similar exemplar forms and features to produce concepts, categories, and prototypes (Barsalou, 2012; Ellis, 2006a; Kintsch, 1998; MacDonald & Seidenberg, 2006). Enough exposures to the same input and to repeated procedures lead to habitual processing of the input and to processing automaticity. "New explicit memories are formed in the hippocampus and prefrontal cortex; but with experience, this information is transferred elsewhere in the cortex … [where it] can be implicitly primed" (Anderson, 2020, p. 240).

Implicit learning and knowledge play fundamental roles in reading. The incremental acquisition of routines, associations, and habits supports fluent reading, large-scale receptive vocabulary development, automatic word recognition, syntactic parsing, and proposition formation. Implicit learning underlies the routinization of common default strategies by skilled readers (e.g., skipping a word, rereading a previous sentence, refreshing the main idea, forming inferences) without these readers realizing that they are using routinized strategies. Many reading processes develop and operate smoothly without us directing any attention to them.

For example, as skilled readers, we do not think about the phonological processing that we are engaging in while we read, but we use this knowledge to support word recognition processes. We also cannot introspect on just what we do when we automatically recognize words, parse phrases and clauses, or draw meaning from words, phrases, and clauses. In a sense, they just happen. We cannot think about how we disambiguate from among many possible word meanings in real-time, nor can we control how we suppress irrelevant word meanings. When we read (or learn to read), we develop implicit learning through the extensive repetitive input from reading – the continual exposure to letters, letter–sound correspondences, word parts, word forms, word meanings, syntactic phrases and clause structures, and even repeated elements of discourse structure and genres.

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Many aspects of reading depend on implicitly acquired knowledge and its applications while reading. Fluent reading would not be possible without automatic word recognition of most words. Categories and generalizations for organizing our world knowledge would not be readily available (Barsalou, 2012). Incremental learning of many thousands of words would not be possible (nor the lifelong consolidation of vocabulary knowledge). Lower-level processes in reading are heavily dependent on the implicit acquisition of knowledge and routines as well as the automatic recognition processes that support reading skills performance.

Explicit learning, unlike implicit learning, involves conscious attention to and awareness of the specific skills or language knowledge that a reader is focusing on. It requires rehearsal (in working memory [WM]) to establish a first memory of the information that can then be registered in LTM and reactivated for subsequent explicit (or implicit) processing. For example, learning word meanings by practicing with flashcards involves explicit learning. Explicit learning would also involve learning about word parts and word roots in order to remember word meanings or intentionally infer word meanings from sets of words. Explicit learning would also involve learning to use conscious strategies while trying to understand a difficult text.

Raising input to the level of conscious attention creates strong new patterns and exemplars that can be bound together in networks and stored in declarative (or episodic) memory (Ellis, 2015). In this way, the reader can call on explicit knowledge to construct new information resources and use them for new task demands (whether at the level of learning new word meanings, understanding a new idea, sorting out a complex construction, identifying the main idea, integrating information from a text, or addressing comprehension difficulties). Explicitly learned information is initially fragile and temporary unless it is recalled and used multiple times. As explicit information is recalled and reconstructed, it will strengthen LTM for this information (thus the importance of distributed learning). Newly learned information that is not re-established in WM for new tasks will disappear fairly quickly. In second-language (L2) contexts, and in reading development, in particular, the learner needs salient repeated examples to overcome many highly successful and highly practiced automatic first-language (L1) processes and routines that draw on strongly entrenched L1 knowledge, a process known as "blocking" (Ellis, 2019; Ellis & Wulff, 2015).

Explicit learning is particularly important for reading at the level of becoming a more strategic reader. Strategic reading depends heavily on the initial explicit learning of strategies to establish themselves, which gradually become skilled routines. Similarly, learners' metalinguistic

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and metacognitive awareness need to be developed explicitly in the L2. Learners need to have metalinguistic knowledge of letter–sound correspondences, word and word-part awareness, syntactic awareness, discourse structure awareness, and awareness of how to accomplish goals, monitor comprehension, and evaluate information (Nagy, 2007). Understanding the requirements for successful explicit learning should influence how reading is taught and learned.

Considerable discussion focuses on the intersection between implicit language learning and explicit language learning. Are language forms and structures learned explicitly available during implicit language processing? Do forms learned implicitly facilitate explicit language learning? These issues were explored in a highly cited article by Hulstijn (2005, see also 2015a). The best evidence to date is that there is a strong intersection: Implicitly learned language knowledge supports explicit language learning and explicitly learned language knowledge supports implicitly learned language knowledge (e.g., vocabulary knowledge) (Anderson, 2015; Ellis, 2015; Landauer & Dumais, 1997; Norris & Ortega, 2000; Suzuki & DeKeyser, 2017). Moreover, there is strong evidence that both implicit and explicit language learning is occurring during language use for learning purposes (e.g., reading for academic purposes) (Ellis, 2015; Ender, 2016).

Implicit learning, and the implicit knowledge (implicit memory resources) that results, arise out of a cognitive/neurological network that is, at least initially, distinct from explicit learning processes requiring direct attention and conscious processing (Anderson, 2020; Eysenck & Keane, 2020). At the same time, the exact relationships between implicit learning and explicit learning, and the extent to which knowledge can transfer from one system to the other, remain a point of discussion. Increasingly, there is a growing consensus that knowledge acquired through one system becomes available to the other system (over time and repeated use in the case of implicit knowledge, and through metacognitive and metalinguistic awareness in the case of explicit knowledge) (Ellis, 2015; Suzuki & DeKeyser, 2017). Implicitly acquired knowledge, often the outcome of implicit learning, generally requires considerable time to emerge as stable, automatized knowledge.

Explicit learning (like implicit learning) applies to all levels of L2 reading skills and language resources, but it is most important for developing the metacognitive and metalinguistic knowledge necessary for higher-level processes, especially for more academic reading tasks. Explicit learning is the means whereby more complex, attentional comprehension processes can be taught and learned, whether it is through awareness and use of more strategic processing or reading to learn with more difficult texts. At the same time, there is abundant

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evidence that implicit learning by itself can be limiting. That is, the role of explicit instruction leads to learning above and beyond simple exposure to language. Language learning is accelerated and expanded by explicit knowledge of language forms and usage (Ellis, 2015; Lightbown et al., 2002; Long, 1991, 2006; Norris & Ortega, 2000; Schmidt, 1990; Spada, 2011).

Ender (2016) demonstrated the interaction of implicit and explicit learning in the same task. Both explicit and implicit learning occurred while Austrian students were asked to attend to new vocabulary while reading. In think-alouds while reading, students specifically ignored about 40 percent of unknown words (255 words in all across subjects), but they learned the meanings of 11 percent of these words nonetheless as demonstrated by a postreading vocabulary test. (Students also learned a higher percentage of words that they explicitly attended to in some way.) There are many examples of complementary, but mutually supportive interactions between implicit and explicit learning.

Both types of learning go on continually while learning to read in academic settings. Implicit and explicit learning each support both lower-level and higher-level processes, though in different ways. Table 4.2 shows various types of reading processes and language resources that involve implicit or explicit learning.

In brief, the pattern of differences between implicit and explicit learning in reading arises consistently. Implicit learning and knowledge require extensive amounts of exposure to print and frequent encounters with repeated units in consistent contexts (and later in varying contexts). Because of its role in habit formation and automatic processing, implicit learning most strongly supports and develops lower-level processes in reading (e.g., automaticity, fluency, statistical knowledge). At the same time, implicit learning can support enhanced discourse structure knowledge, and main idea recognition by the gradual routinizing of common strategy applications, and recognition of genre organization over time.

Explicit learning, in contrast, most strongly supports higher-level attentional processes that establish goals, make new inferences, monitor comprehension, apply strategies for improved learning, resolve comprehension difficulties, and evaluate information. Explicit learning and knowledge involve directed attention to specific information to be learned as well as practiced at a level of conscious awareness. Explicit learning is also an important contributor to vocabulary learning and syntactic knowledge development, two processes that are considered lower-level processes in fluent reading. The development of reading abilities clearly requires both implicit and explicit learning.

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Table 4.2 Reading abilities that involve implicit or explicit learning

Implicit learning (as a by-product of reading)	Explicit learning
Improving word recognition with known words through fluent text reading and rereading	Learning new words through explicit definitions
Stabilizing and expanding word meanings by being exposed to words repeatedly in similar and new contexts	Learning new word meanings by noticing new uses of words and figuring out their meanings
Expanding word meanings through multiple incidental contacts with a word in consistent supporting contexts	Learning new word meanings by intentionally making inferences from context information
Processing letter–sound correspondences by reading easy texts	Attending to letter–sound correspondences with direct instruction
Increasing word reading fluency through large amounts of extensive reading	Attending to words that are not well established by noting words that reappear or intentionally using the word
Increasing text reading fluency by rereading texts and by extensive reading with easy texts	Improving reading accuracy by intentionally practicing passage reading to remember words and structures
Processing syntactic parsing information through fluency practice and extensive reading	Attending to syntactic structure to maintain comprehension with difficult texts
Building semantic propositions through fluency practice and extensive reading	Attending to meanings of words and sentences to maintain comprehension
Linking propositions into a network of main ideas	Attending to comprehension difficulties to establish connections across main ideas
Routinizing common reading strategies through extensive reading	Learning to use new reading strategies through direct strategy instruction
Tacitly recognizing discourse structure through extensive reading	Attending to discourse structure to support comprehension with discourse structure awareness exercises
Building passive resonance processes to support text coherence through extensive reading	Attending to reading comprehension difficulties to maintain a coherent interpretation of a text

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4.2 Frequency

> Frequency-sensitivity pervades all aspects of language processing [and] has profound implications for theories of language acquisition. (Ellis, 2015, p. 6)

In a series of articles, Ellis (2002a, 2002b, 2005, 2015, 2019) has argued persuasively that much of learning and cognitive processing, including language comprehension processes, is centered on the frequency of input as a central component of usage-based language learning. Ellis presents a wide array of empirical evidence to argue that individual differences can be related to the frequency with which a person is exposed to specific sets of input, the frequency with which processing routines are practiced, and the frequency with which individual words, phrases, and syntactic structures appear in the input (see also Frost et al., 2013). Of course, the frequency of individual elements or processes is not the whole story (as the other cognitive concepts in this chapter indicate). However, exposure frequency (how many times an item occurs), when combined with (a) the frequency of co-occurring units in the input, (b) our ability to recognize common features from repeated and similar exemplars, and (c) our cognitive capacity for chunking repeated sequences of information as larger units, leads to the emergence of new structural systems and new cognitive capacities. (The role and impact of frequency is covered in multiple other chapters.)

4.3 Statistical Learning and Statistical Knowledge

> We respond to patterns in the environment. We register repetitions…. Every time we use language, we update our statistical representations of it. Our learning mechanisms are similar to some computational algorithms used in analysing Big Data, which developed out of research on human learning. (Seidenberg, 2017, p. 87)

Turning to the knowledge of language and language learning, associations – whether sequential or in terms of form-meaning connections – emerge through the frequency of (co-) occurrences and the statistical registering of each instance of occurrence. Initially, a new form may be noticed in the input (explicit learning, even if minimal). From that point, a "detector unit" is added to the learner's perceptual system. Every detector unit has a resting level of activation. As a form recurs, the resting level crosses a threshold that causes the detector to fire (connects into a neural network). And as a form recurs, the detector unit adjusts to a higher resting level and activation becomes easier, leading toward the development of automaticity. (See Ellis & Wulff, 2015, p. 77, for extended commentary.) As Seidenberg describes,

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> Statistical learning takes place without conscious awareness or intention. It is a kind of implicit, subconscious learning, a complement to the explicit learning with conscious awareness that occurs with overt instruction.... The two types of learning are different but linked because both result in changes to the neural systems for long-term memory. Well-timed and targeted instruction is effective because it accelerates the acquisition of [an] enormous data structure. Explicit instruction and conscious effort are the visible tip of the iceberg; statistical learning is the mass below the surface. (Seidenberg, 2017, p. 87)

For example, after millions of encounters we "learn" that if "t" is the first letter of a word, there is a high probability, based on statistical frequency input, that "h" will be the next letter, but we are never taught this probabilistic association. In fact, we are statistically sensitive to all two-letter pairings in our language. Moreover, we are statistically sensitive to the frequency of occurrence of different words in different contexts, the frequencies of each one of the multiple meanings of common words, and the combinations of words that often are used together sequentially (multiword units). We subconsciously, and very incrementally, tally up these statistical frequencies as we are exposed to more and more input (Ellis, 2006a, 2017; Seidenberg, 2017; Seidenberg & MacDonald, 2018; Seidenberg et al., 2020; Treiman & Kessler, 2020).

We are able to perceive, without conscious attention, recurrent features in the input that pattern in consistent ways. As part of this pattern recognition, we all have the ability to recognize distributional tendencies in the input (collocations and consistent patterns) and use this ability to chunk repeated information together into larger recognizable units. The ability to recombine multiple smaller co-occurrence patterns helps us become more efficient pattern recognizers but also allows us to see larger and larger units as consistent patterns. A simple example of distributional tendencies may help explain this idea.

The following sentence has clear co-occurrence patterns that a learner will implicitly recognize after being exposed to the pattern thousands or even millions of times (as in L1 child language acquisition).

The doddering professor gave the worn book to the disinterested student.

There are three repetitions of a simple determiner–adjective–noun pattern. After several thousand repetitions of this pattern, a learner will be tuned to the idea of a pattern that begins with "*a/the/some/Ø*," then has a descriptive designation (an adjective word form), and then has a thing, an idea, a place, as the "possessor" of the descriptive form. By the time that this pattern has recurred millions of times (and

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it has for all native English speakers), the pattern is not only well entrenched because it is so consistent but also the specific parts of the pattern take on category status as what we would call "parts of speech," and these units are also patterned chunks of language structure (noun phrases).

This repeated statistical patterning is how the idea of "parts of speech" and simple phrasal dependency relations can emerge from extensive consistent distributional input (which is what language provides) without anyone teaching this concept to learners. Statistical learning also suggests that humans may not need an independent unique abstract syntactic processing system beyond ways to combine and recombine relatively simple phrase structure units, linked to frequent lexical items in these simple constructions, that may be well embedded in our LTM and called up, just as we call up lexical items and multiword units of various kinds (automatically).

The point of this distributional example is that larger and larger patterns can emerge as they become repeated consistently in the input; the input gets chunked together in units that we then begin to recognize as consistent words, phrase patterns, and clause patterns (Diessel, 2019, 2020; Ellis, 2015, 2017; Ellis & Ogden, 2017; Seidenberg & MacDonald, 2018). As native speakers, we were not taught the rules of grammar; rather, the building blocks of language structure exist in the consistent distributional patterns in the input. We have remarkable abilities to recognize, and then use, high-frequency co-occurrences in the input, chunk them into larger functional units, entrench these patterns in memory as habitual memory, and use the information automatically (even if we can't explain the rules of grammar, as is the case for many L1 speakers).

This process provides an explanation for the gradual emergence of complex clause constructions in L1 child language acquisition from initial "verb-island" constructions (very high frequency repeated utterances with a small number of verbs that children consistently hear and say) to larger, more abstract patterns (Bannard et al., 2009; Diessel, 2004, 2020; Theakston et al., 2015; Tomasello, 2003). Our more complex cognitive abilities, including our abilities to learn language and to read, have emerged in this way. In the case of language abilities, strong arguments for general cognitive learning principles have changed research in L1 acquisition over the past twenty years (Bybee & Hopper, 2001; Ellis, 2015, 2019; Tomasello, 2003; see also Chater & Christiansen, 2018). In the areas of L2 learning, the approach developed by Ellis (2007, 2019), named CREED (Construction-based, Rational, Exemplar-driven, Emergent, Dialectic) provides a parallel set of arguments for the emergence of L2 language

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knowledge and literacy skills, as can be recognized by the component concepts assumed in his theory.

The major role of statistical learning cannot be overstated. As asserted by Ellis (2015):

> Language users are sophisticated in their knowledge of the sequential probabilities of the units of language, and it is their usage experience that has cultivated this knowledge…. Learners are sensitive to the frequencies of occurrence of constructions and their transitional probabilities. (pp. 10, 11)

Constructions can be letter groups, morphemes, words, word combinations, phrasal structure, clausal structure, sentence structure, or discourse structure.

4.4 Associative Learning, Co-occurrence, and Emergence

Associative learning is the binding of two or more co-occurring items spatially, temporally, or causally through the frequency of exposure. It provides a major argument for how the frequency of occurrence leads to new knowledge and supports implicit learning. At the same time, one of the recent discussions among cognitive researchers is the relationship between implicit learning and statistical learning, asking if statistical learning and implicit learning are one and the same. **Implicit statistical learning** (combining associative learning, chunking skills, and sequential probability statistics – the probability of what is going to come next) is the term that has been proposed. At issue is whether or not statistical learning subsumes associative learning or if associative learning subsumes statistical learning.

Statistical learning – learning to anticipate the upcoming sequential unit – is a large part of associative learning, but they are most likely not synonymous (Siegelman & Frost, 2015). Our implicit abilities to make associations ("this" regularly appears with "that") also incorporate issues of saliency (strength of input processing) and contingency (competition among detector units). Associative learning also involves chunking processes at all levels of language knowledge; chunking processes are most likely not limited to sequential transition probabilities. Rather, the process of chunking will also need to look backwards and determine what is capable of being a "unit" at a higher level. Associative learning also contributes to **analogical reasoning** ("this" is like "that") and to concept formation and categorization ("this" goes with "that," or not), two processes that are likely to require more than the simple frequency of input and sequential transitions (cf. Christianson & Chater, 2016a; Ellis, 2019; Ellis & Wulff, 2015).

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Associative learning comprises a complex of cognitive processes that incorporates frequency and statistical learning but also incorporates chunking, saliency, contingency, similarity, and semantic network relationships. Associative learning not only leads to automatized processing but it also supports our abilities to build new concepts, form categories, make generalizations, and suppress (or inhibit) perceived irrelevant information. Our ability to automatize knowledge and employ underlying cognitive processes depends on these associative skills perhaps developed initially from statistical input. Both associative learning and statistical learning should be seen as parts of a larger concept of implicit learning. Whether associative learning or statistical learning fully subsumes the other is still an open question (see also Christiansen, 2019).

Associative learning, much like statistical learning, also "consolidates" processing patterns and habitual responses that are hard to break (leading to "blocking"), making new learning difficult when these patterns need to be altered and habitual responses broken, such as when we are learning an L2 and need to overcome L1 processing interference (initial L1 consolidation, leading to blocking of the L2 pattern, then L2 learning that overcomes blocking and leads to L2 reconsolidation). As part of the resources needed to overcome deeply entrenched patterns and habits in our memory (e.g., L1 versus L2 learning), associative learning skills can be influenced by explicit input via selective attention, attention to salient cues, attention to surprise, and suppression of habitual and nonsalient cues in the input (in other words, intentional learning). These latter skills (explicit attention) represent resources that allow us to learn new information and fit it into our ongoing learning and memory resources. The use of the latter, more explicit skills to influence learning and reconceptualization, most likely occurs when readers are engaged with more challenging texts and more demanding (academic or professional) tasks.

Turning specifically to reading, the central point is that associative processing, frequency of input, and chunked co-occurrence patterns play major roles in constructing and improving the reading comprehension system throughout an individual's life. As exemplars repeat, the knowledge is registered in long-term networks of information associated with habits and motor responses that become increasingly easier to call up and use without requiring conscious attention. This process provides a straightforward way to understand the incremental development of word knowledge, background knowledge, automatic word recognition, and reading fluency that is so important for reading abilities.

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4.5 Language Processing Constraints: Reading and Now-or-Never Processing

> The existence of a **Now-or-Never bottleneck** is relatively uncontroversial.… However … the consequences of this constraint for language are remarkably far-reaching, touching on issues that include the multi-level organization of language, the prevalence of local linguistic dependencies, the incrementality of language processing, the use of prediction in language comprehension, the nature of what is learned during language acquisition, and even the structure of language itself. (Christansen & Chater, 2016a, p. 94)

In Chapter 2, we introduced a persuasive way to understand the processing constraints that readers must learn to work with in order to process language fluently. The now-or-never processing constraint on language comprehension creates major processing and learning challenges for young children (and L2 learners), and strongly shapes the cognitive mechanisms underlying language learning (Chater & Christiansen, 2016, 2018; Christiansen & Chater, 2016a, 2016b; McCauley & Christiansen, 2019). Because perceptual language input remains in sensory memory for less than 100 milliseconds, fluent language users (for both production and comprehension) need to register the input immediately before new input reaches sensory memory and overrides the current memory (the "Now-or-Never Bottleneck").

As noted in Chapter 2, the primary processing mechanism that accommodates this constraint is a process of "Chunk-and-Pass." As Chater and Christiansen (2018) state, "human skill learning requires learning to recode and compress complex time-varying input into successively larger and more abstract representations.… We call this aspect of skill perception **Chunk-and-Pass processing**" (p. 206). Registration of the sensory memory passes into WM where three to five units can be held, activating additional language knowledge. The input is chunked into larger units that can be retained in WM for a longer period of time. Chunking occurs at multiple levels; each chunk-and-pass process builds larger units that can be stored for longer periods of time, eventually being part of the gist of longer discourse units of sentences, paragraphs, and discourse structures as episodic buffer operations (or perhaps as LTWM in some fragile form; Ericsson & Kintsch, 1995). This now-or-never constraint and the accommodating process of chunk-and-pass are well supported by decades of experimental research on real-time information processing (see Chater & Christiansen, 2016; Christainsen & Chater, 2016a).

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4.6 Connectionism

> [Computational Modeling] is not merely a nice thing to understand [about] the brain bases of reading; rather characteristics of reading… arise from ways in which reading is accomplished by the brain, and thus cannot be fully understood without reference to it. (Seidenberg, 2012, p. 192)

The concept of connectionism was first developed in the late 1970s with the idea that human learning theory should, at some level, align itself with the basic architecture of the human brain and how the brain most likely functions under learning conditions (Seidenberg, 2012, 2017). At a level of research application, connectionism is represented by computational models that predict the learning of language abilities generally and learning word recognition processes (and word learning difficulties) more specifically. The key goal has been to develop computer programs capable of simulating cycles of how humans learn words, how word learning strengthens and becomes more automatic over time, and why humans do not learn in cases when word learning is impaired. The more extended idea is to consider connectionism as a neural representation of what the brain might actually do while learning language.

Behavioral skills, such as language learning and reading, as stated by Seidenberg (2017), are the result of

> the activity of massive numbers of neurons, interconnected to form huge networks in which each neuron is affected by the thousands of neurons within which it links. Things that we know and do correspond to patterns of activity in such networks…. These concepts have been explored using computational models that perform simplified versions of tasks such as learning to pronounce words. (p. 138)

The key to using computational models is that predictions about learning can be observed over time through repeated trials along with mechanisms for algorithm learning to improve from each trial. In this way, it is possible to see if predictions about language use match the output of the algorithms and if the output looks similar to the path of learning development demonstrated through the observation of human longitudinal data collection. Connectionist modeling has provided powerful alternative theories of word recognition in reading (Harm & Seidenberg, 2004; McClelland & Elman, 1986; Plaut, 2005), sentence comprehension (MacDonald & Seidenberg, 2006), and L1 acquisition more generally (Elman et al., 1996).

The dual constraints of psychological plausibility and neural architecture require connectionist research to draw on a number of ideas

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that might appear unusual or counterintuitive. In particular, connectionist modeling does not use rule-based input to produce the expected outcomes, so, for example, there are no grammar rules in connectionist modeling. It also does not assume abstract components of mental processing such as the lexicon or stable conceptual schemata. For example, we like to think that there are grammatical rules for making plural forms in English, but a connectionist explanation would not propose a plural rule for the uses of plural forms in English (though the plural "s" certainly looks like a rule through "after the fact" analyses). If a network of neurons in the brain generates a plural marker, the regeneration of this network thousands of times will result in a network that easily and consistently generates the plural as needed in the right circumstances based on weighted statistical occurrences. This building of an automatic, patterned response certainly looks like we have learned a rule.

The applications of connectionist modeling align well with the more general approaches to language learning and comprehension processing that is embodied in the various language-usage theories of language acquisition (see Ellis, 2019). It predicts that the several general cognitive skills addressed in this chapter are the likely mechanisms underlying the development of reading comprehension abilities. It prioritizes implicit learning abilities: (a) the frequency of relevant and accessible input, statistical learning, and associative learning; (b) the gradual and incremental learning of skills and knowledge; (c) the local nature of learning; and (d) the prominence of item-by-item learning (Seidenberg, 2017). It is also the only approach to human learning that attempts to model itself closely on neural processing mechanisms. In this way, connectionism is both an experimental paradigm and also a plausible explanation of how brain architecture and research on reading ability can be merged. At the same time, as a possible caveat, we note that one fundamental skill for early reading development seems to require some level of explicit learning: that is the development of letter-sound correspondences for word recognition. (See Seidenberg, 2012, for a useful technical summary of connectionist concepts and outcomes.)

4.7 Speed of Processing and Rapid Automatic Naming

The importance of speed cannot be overestimated (Wolf, 2016, p. 77)

An underlying cognitive skill that regularly reappears in reading research throughout the past thirty years is the role of simple speed of

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processing. This skill is most often captured by the Rapid Automatic Naming (RAN) assessment procedure. RAN measurements (whether letters, digits, objects, or colors) have long been used to identify certain specific cases of reading disabilities (Wolff, 2015), and it has been challenged as well from time to time. In the past decade, research across multiple orthographic systems, and especially across alphabetic scripts, has shown that RAN is a significant, early, unique predictor of reading abilities (for both fluency and comprehension). As research methods have increased in sophistication, researchers have been able to establish more clearly the independent contributions of RAN to reading development across cross-sectional and longitudinal studies and across alphabetic languages, alpha-syllabic languages, and Chinese logography (Araújo et al., 2015; Caravolas & Samara, 2015; Clayton et al., 2020; Landerl et al., 2019; Powell et al., 2014; Rodríguez et al., 2015; Shanahan, 2020).

4.8 Long-Term Memory and Background Knowledge

> In view of the remarkable variety of information stored in long-term memory, it is improbable that there is a single memory store. (Eysenck & Keane, 2015, p. 261)

4.8.1 Long-Term Memory

In reading research, it is common to talk about background knowledge, but this is a large (over)generalization of what seems to be many types of LTM. Research in cognitive psychology does not use the term "background knowledge" as a loose cover term for LTM (Anderson, 2020; Eysenck & Keane, 2020). Instead, LTM is described in terms of declarative memory and nondeclarative memory. Within declarative memory, a major distinction is made between semantic memory (facts, ideas) and episodic memory (events, recollections). Under nondeclarative memory, major distinctions are made between procedural memory (skills and habits) and priming (Eysenck & Keane, 2020). These distinctions among types of LTM have been developed primarily based on the study of congenital disabilities, various types of trauma, and diseases. This tradition has been supported by neurocognitive studies that seem to highlight strong activation in the hippocampus and related areas for declarative knowledge versus strong activation in the basal ganglia for procedural memory. This distinction parallels, more or less, the contrast between explicit versus implicit learning activations. (See Slotnick, 2017, for an alternative version of LTM categories.)

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Among the multiple types of LTM, the most common distinction is between declarative memory and procedural memory. According to Ullman (2015), "these two memory systems play key roles in language that are analogous to the functioning of these systems in other domains [aside from language]" (p. 135). Ullman's declarative/procedural approach to language learning highlights neurocognitive processing primarily in the hippocampus for declarative (explicit and conscious registration) learning and memory, and the basal ganglia system for procedural (implicit, involving subconscious registration of input) learning and memory (see also Anderson, 2020).

Recent discussions around LTM have called into question the strong boundaries originally proposed for declarative and procedural memory, particularly the distinct pairing of declarative and procedural memory systems with specific brain locations. First, semantic memory appears to be located in the anterior temporal lobe, but individual semantic memories also appear to be stored in various locations throughout the temporal, parietal, and occipital lobes. The anterior temporal lobe appears to be a processing hub drawing on multiple pathways from primary locations. Second, the hippocampus appears to register implicit input as well as explicit declarative input. Whether declarative memory registers in brain systems beyond the hippocampus is still an open issue. Third, procedural knowledge of multiple types registers in multiple locations in the brain (suggesting multiple important pathways), even though the basal ganglia system seems to be the critical relay center. The key change in recent thinking is that the roles of the hippocampus and the basal ganglia appear to interact with each other and engage in overlapping roles. They seem to learn and process the same knowledge, although in different ways (Eysenck & Keane, 2020; Ullman, 2015).

One key connection of LTM to reading comprehension is the major roles for passive resonance processing for word and phrase recognition, and semantic priming (spreading activation) more generally (Anderson, 2020; Cook & O'Brien, 2015; Ellis, 2015; Stafura & Perfetti, 2017). These activation processes are facets of word-to-text integration during fluent reading and would be aspects of implicit procedural knowledge. For example, Perfetti and Stafura (2014) describe the role of passive resonance (or the "paraphrase effect") as follows:

> [Word-to-text processing] is at least partly (if not mainly) a memory-driven process, in which words from the recently read text and the propositions they encode…are highly accessible in memory. A word, as it is read, "resonates" with these memories, and connections are made without an active construction process…. The value of a more passive memory process is that text

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integration can occur at low cost to processing resources, and this may be the default integration processing mode within and across sentences. (p. 33)

4.8.2 Background Knowledge

Reading comprehension depends heavily on how much you happen to know about the topic of the text, because that determines your ability to make up for the information the writer feels free to omit. (Willingham, 2015, p. 18)

In contrast to discussions of LTM, educational research on the impact of background knowledge on reading comprehension seems to live in a parallel universe alongside, but not necessarily connected to, LTM. In educational research on reading, there is very little discussion of LTM, or how it might function in educational research on background knowledge. Instead, background knowledge research usually employs a quantitative measure of some subset of content knowledge related to a reading comprehension passage, or general knowledge is used as a proxy for LTM (the real neurocognitive concept). Sometimes, experimental researchers rely on standardized assessment measures or, in other cases, researcher-developed assessment instruments (which may or may not be valid proxy measures of LTM in either case). Examples of these background knowledge proxy measures can be found in articles by Ahmed et al. (2016), Alderson (2000), Cromley et al. (2010), Joh and Plakans (2017), Rapp et al. (2007), Shin et al. (2019), Stanovich (2000), and Talwar et al. (2018).

Background knowledge is widely recognized as a major behavioral research factor in reading comprehension experiments (see also Sparks et al., 2014; Stanovich, 2000; Willingham, 2015). Background knowledge measurements, as predictors of reading comprehension, have been used many times; readers who know much more about a topic read a given text on that topic both faster and with better comprehension (assuming that the text is real and not a trick text of some type). For example, Klauda & Guthrie (2008) report that background knowledge accounted for 50 percent of variance shared with a measure of reading comprehension for 5th-grade students (see also Talwar et al., 2018; Vaughn et al., 2017). However, the ways in which background knowledge interacts with other concepts and skills indicate that background knowledge cannot be viewed as a singular, easily treated factor in comprehension. Nor can it be viewed as a simple, uniformly positive factor. Weaker readers often call up the wrong background knowledge and draw wrong inferences (Kendeou & O'Brien, 2016; Rapp et al., 2007).

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To acknowledge the complexities of background knowledge, it is first important to divide knowledge conceptually into distinct subcategories: general knowledge of the world, cultural knowledge, topical knowledge, and specialist expertise knowledge. Second, background knowledge in educational settings is often viewed as some set of knowledge provided by a teacher to help students comprehend a text better. Third, knowledge interacts with many other factors, including motivations, attitudes, goals, and language proficiency, and there is no straightforward way to predict the impact of background knowledge on comprehension performance in many cases (Perfetti et al., 1996). Fourth, as mentioned earlier, there are many ways to try to measure background knowledge to determine its role in comprehension, but there is little agreement on the best ways to do this.

At the same time, it is not possible to comprehend texts well without adequate background knowledge, so the issue is whether or not it is a reliable factor in predicting individual differences among readers. More recent research involving the background knowledge of L2 readers suggests that background knowledge plays a strong independent role in predicting reading comprehension abilities. For example, Shin (2020; Shin et al., 2019) has shown that background knowledge is a significant independent predictor of reading comprehension with both Korean and Japanese university students studying English as a foreign language.

Conceptually, background knowledge, in its various forms, is an essential component of reading comprehension and central to the construction of an appropriate situation model (Hirsch, Jr., 2018; O'Reilly, Wang, & Sabatini, 2019). But it is probably safe to say that it is not a concept that is well-specified to this point in reading research. There are also too many different ways to assess background knowledge to generate consistent research results. Nevertheless, reading comprehension is not possible without adequate background knowledge, and advanced reading comprehension requires strong levels of background knowledge As Wiliam (2018a, p. 145) notes, "Many, if not most, of the difficulties that children have in making progress in reading stem not from a lack of reading skill but from a lack of background knowledge about what is being described in the text."

4.9 Concepts, Categorization, and Reading Comprehension

The human conceptual system contains people's knowledge about the world. (Barsalou, 2012, p. 239)

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Categorization and conceptualization, central notions for comprehension purposes, are closely linked to background knowledge (LTM) as it accumulates from individual experiences and instruction. People encounter information that is repeated, they extract common features from repeated exemplars (or instances), and they engage in categorization and conceptualization as major cognitive processes (Barsalou, 2012; Ellis, 2005, 2015; Ellis & Wulff, 2015; Logan, 1997, 2002). In general, we collect exemplars with each repeated memory registration, and we draw central tendencies among the exemplars (through associative skills). From these multiple exemplars, we generate new concepts, and from concepts, we generate categories for finer discriminations (Barsalou, 2012; Ellis & Wulff, 2015). In this way, with individual experiences over time, we form concepts that eventually lead to generalizations. Categories and established concepts then support readers when they make inferences, form situation models of reading interpretation, and learn information from texts (Ellis, 2005; Kintsch, 1998; Zwaan & Radvansky, 1998).

There are several ways to analyze and examine categorization and conceptualization abilities, most commonly discussed in terms of exemplar theory, instance theory, prototypes, or schemas (Barsalou, 2012; Hampton, 1997; Logan, 2002; Rosch et al., 1976; Shanks, 1995, 1997). For the purposes of this volume, it is not necessary to describe these alternative perspectives except to point out that they reflect possible ways to understand the role of knowledge as part of comprehension and learning from texts. In fact, most contemporary discussions of reading abilities and reading research make no strong connections to how concepts, categorization, or generalized knowledge structures would explain reading comprehension (cf. Kendeou & O'Brien, 2016). Contemporary overview handbooks on reading research and volumes synthesizing reading research make very few references to concepts, categorization, exemplar theory, schema theory, or prototype knowledge (see Afflerbach, 2016; Pollatsek & Treiman, 2015; Pressley, 2006; Seidenberg, 2017; Snowling & Hulme, 2005 Stanovich, 2000).

4.10 Role of Context in Reading

> The hallmark of a skilled reader is context free word recognition.... Skilled readers' use of context is limited by their basic fluent abilities in identifying words. It is less skilled readers who use contexts to identify words simply because their context-free word identification skills are not up to the task of reading. (Perfetti, 1994, p. 863)

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Contextual information (typically the immediately preceding words, phrases, and clause) plays major roles in the various processes and subprocesses of reading (Table 4.3). While the concept of context is complex, its many roles and contributions must be considered carefully if it is to be incorporated appropriately into explanations of reading comprehension (both for skilled readers and for less skilled readers – L1 and L2). Context information plays important roles in developing the overall comprehension of a text and supporting syntactic parsing. In contrast, most of the conflicting interpretations of context support center on word-level recognition and word learning, and these issues are emphasized here. Context-effect assertions in reading can be outlined in the twelve ways that are listed in Table 4.3.

Table 4.3 *Contexts effects in reading*

1. Context plays a critical role in the development of word-to-text integration and the situation model of interpretation (implicitly).
2. Context supports syntactic parsing by constraining upcoming options within immediate clause structure and phrasal structures (implicitly).
3. Context provides information to help a reader comprehend a difficult text (explicitly and implicitly).
4. Context supports word recognition by means of passive resonance and semantic priming (automatic spreading activation, implicitly).
5. Context helps disambiguate multiple meanings of words so that readers can activate the most appropriate meaning after the word is recognized (implicitly).
6. Context helps readers notice new words or new word meanings and begin to build meaning frames (explicitly).
7. Context plays an important role in vocabulary development through the accumulation of multiple incidental contacts with words over time (implicitly).
8. Context information is not the primary means for recognizing known words during fluent reading (explicitly).
9. The use of context to recognize words usually takes longer than basic visual recognition processes for known words (so the role of context for word recognition is useful only when words are not well learned and cannot be recognized easily) (explicitly).
10. Poor readers make greater use of context clues than do skilled readers to guess meanings of upcoming words while reading (explicitly).
11. Intentionally learning words through guessing from context represents a relatively poor instructional way to learn new vocabulary (explicitly).
12. The effective use of context for word recognition purposes requires knowing most of the other words in the environment.

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Context plays important roles in the development of both the text representation and the situation model of reading interpretation. As readers integrate a newly active meaning proposition into the growing text representation, these propositional attachments are often supported by contextual information that triggers passive resonance (or paraphrasing effect) between prior text and the current proposition. Perhaps more importantly, contextual information strongly influences interpretation, drawing on prior knowledge from LTM. It also influences reader attitudes, shifts in goal setting, the monitoring of comprehension, and evaluations of the author's intentions (primarily through the application of strategies to assist in understanding challenging texts). At the level of syntactic parsing, the prior text and the immediately processed chunk of text will constrain expected upcoming word and phrase combinations (Givón, 1995; Seidenberg & MacDonald, 2018).

Using contextual information to support comprehension at a more conscious level can build coherence and is a good strategy. Wider discourse contexts (e.g., prior text information, background knowledge) provide a way to maintain comprehension when confronted with a difficult text or when encountering many unknown words. However, this use of context is demanding on conscious processing and slows reading to a type of problem-solving processing.

Semantic priming, the automatic activation that associated lexical items pass along to each other, represents a second major way in which context influences reading comprehension. As ideas and meanings are encountered and accessed through word recognition, they spread activation energy automatically to related words and concepts in background knowledge (Anderson, 2020; Stanovich, 2000). These partly activated words provide contextual information in that these words can be fully activated with a minimum of additional input if encountered relatively soon after the priming (spreading activation), generally within the same clause (Anderson, 2020; Rayner et al., 2012; Schwanenflugel & Knapp, 2016). Empirical evidence demonstrates that primed information is usually limited to strong close associations; chains of inferential associations do not easily activate loosely related information from WM. For example, *cat* may activate *dog* because they are often associated with our experiences, but *cat* will not prime *dog food* or *bone* (O'Brien et al., 1998).

Implicit context effects assist in the activation of the most appropriate meaning of a word that has multiple meanings as the word becomes active in WM. Research by Gernsbacher (1997) has shown that after initial activation of all word meanings, contextual support helps readers to select the most appropriate meaning and suppress other competing meanings, usually within 300–500 milliseconds of visual perception

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(see also Long et al., 2006; MacDonald & Seidenberg, 2006; Perfetti, 1994). Most discussions of context effects on word recognition and meaning access focus on word frequency effects, semantic priming within clause or sentence contexts, and sentence parsing information. There is relatively little discussion of the possible effects of the broader discourse context on word recognition (Balota et al., 2006; O'Brien & Cook, 2015; Seidenberg & MacDonald, 2018; cf. Rayner et al., 2012).

Similarly, using context to guess enough about a word meaning to maintain a reasonable understanding of text meaning is also a good strategy, and training in using clues to guess word meaning is likely to have some positive (but not large) effect on students when they have comprehension difficulties (Pressley, 2006). When a reader is confronted with the need to understand a challenging text, but has no external resources (e.g., a dictionary, a gloss) to help with difficult vocabulary, the conscious use of context information represents an active problem-solving strategy to carry out the task. The use of context to infer word meanings, over an extended period of time, helps learners begin to build meaning frames for words, consolidate information, and eventually learn many words incidentally (Nagy & Scott, 2000).

The idea that the larger discourse context is the primary mechanism that helps skilled readers recognize words while reading fluently is a common assumption among educators, but it is not true (Morris, 2006). Skilled readers do not use discourse contexts to recognize words they already know. Skilled readers can engage in visual processing and automatic recognition of known words much more rapidly than if they wait for contextual information to generate word recognition. Rayner et al. (2012) point out that automatic visual perception of a word occurs well within 100 milliseconds and most known words are recognized within 250 milliseconds. Contextual facilitation for word recognition typically does not take over until approximately 300–500 milliseconds (Morris, 2006; Perfetti, 1994). There is no reason for a good reader, who knows almost all the words on a page, to wait for contextual information to be helpful. That reader has already accessed the word and the next one to follow by the time that context could help. In fact, weaker readers make greater use of context to recognize upcoming words while reading; in contrast, skilled readers typically do not need to wait for context information to contribute to word recognition (Perfetti, 1994; Stanovich, 2000).

On the instructional side, intentionally guessing the meanings of words from context is not an efficient way to learn new words explicitly when it is used as a textbook or class exercise. As noted by Ellis (2005, 2007), intentional learning of new information needs to be accurate and consistent; the outcomes of guessing to learn new words

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is far from accurate and consistent, particularly for readers with weak vocabulary knowledge who cannot use the lexical context to make a reasonable guess (see Beck et al., 2013; Fukkink & de Glopper, 1998; Gardner, 2013; Gough & Wren, 1999; Nassaji, 2003a; Stahl & Nagy, 2006). For example, Gough and Wren (1999) have shown that L1 students guessing words from context are accurate only 14–45 percent of the time, depending on the context. Nassaji (2003a) similarly found that L2 students were only successful at guessing unknown word meanings 26 percent of the time. Moreover, context information that supports effective inferring of word meaning usually requires that the reader already knows most of the other words in the context, which is not likely for weaker readers (Koda, 2005).

Overall, the role of context is often simplified in the literature in a way that misrepresents its real value for reading comprehension. The simplified view focuses on guessing upcoming word meanings from context as central to word recognition processes and word learning. However, the important roles for contextual support do not include the direct guessing of word meanings from context as the central component of fluent reading comprehension. Rather, the point of context effects is that contextual information influences reading comprehension in multiple ways apart from guessing upcoming word meanings.

4.11 Implications for Instruction

The implications to be drawn from this chapter are more foundational than in most other chapters. The skills that humans bring to both L1 and L2 language learning and literacy development build on a set of general cognitive resources directed to language and literacy. The research supporting the roles of these cognitive foundations for reading suggests some basic implications for how students develop their reading abilities. First and foremost, reading is an incremental learning process that requires automatic recognition skills, extensive linkages among lexical entries, and fluent implicit processing. The keys to fluent skill development are practice and frequency of repetitions to develop automaticity. Knowing that implicit learning and knowledge underlie many reading skills should influence how aspects of reading instruction are carried out, especially recognizing the need for extensive reading input of many types, the importance of coherent motivating content knowledge for reading instruction, and the continual practice of skills.

Cognitive processing skills such as inferencing, goal setting, monitoring skills, strategic processing, and selective attention emerge very early in childhood. What is crucial to recognize is that academic

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language and literacy learning build on these foundations, but they typically involve more complex and difficult tasks with decontextualized language processing through reading. These difficulties for learners require a need to transfer basic and general cognitive abilities to specific reading contexts that are more demanding, particularly with expository texts that present readers with new knowledge. In these contexts, some level of explicit instruction, for example, making inferences to connect information from two parts of a challenging text, is crucial for reading comprehension development.

More general instructional guidelines to take from this chapter include the need to engage students in consistent long-term practice. Rather than learning rules, reading development is about the incremental associative learning gains arising through massive exposure to print, continual building of vocabulary knowledge and automatic word recognition skills, and consistent practice with meaningful reading tasks that build coherent knowledge resources. It is the combination of multiple academic text and task processing challenges, drawing on thematic content and students' background knowledge, that makes instruction in goal setting, inferencing, monitoring, and strategic processing so relevant for reading development.

It is probably best to sum up implications for instruction as using (and providing) appropriate background knowledge and exploring possible inferences to understand challenging texts better. This connection is carried out most effectively through a number of prereading and during-reading activities, including the following suggestions for teachers:

1. Using reading guides and specific text previews with more difficult texts to highlight key points and reveal linkages to background knowledge.
2. Introducing key vocabulary or introducing a key idea from the text before students are asked to read, and guide students in making relevant associations between the key idea and the main ideas of the text.
3. Using semantic mapping and helping students make explicit connections between background knowledge and specific details of the text.
4. Surveying student beliefs offering three to five brief statements and directing students to find out if the text supports these statements.

There are many more ways in which instruction can connect background knowledge and text information, and these deserve careful exploration by both teachers and researchers.

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5 *Neurocognitive Processing and Reading Ability*

In this chapter, we examine the relationship between neurological processing and reading comprehension. Over the past ten years, neurocognitive perspectives on comprehension have become increasingly more important as language processing ideas line up more closely with brain processes. This is true not only for connectionist conceptualizations of comprehension but also for real-time language processing, working memory (WM) and long-term memory (LTM) activation, implicit memory, passive resonance activation, and language emergence approaches (Christiansen & Chater, 2016a, 2016b; Cook & O'Brien, 2015; Cowan, 2015; Ellis, 2019; Seidenberg & MacDonald, 2018; Ullman, 2015). Modern views on reading research can no longer ignore the behavioral-cognitive and neurocognitive connections. In the first half of this chapter, we provide a number of figures detailing brain structure and organization. They will be essential to visualizing how brain functions and locations support reading. This tour of brain physiology is critical to minimize some oversimplifications that sometimes arise in discussions of brain functions and reading comprehension. (Key terminology identifying brain locations will appear in italics in this chapter.)

5.1 Neurolinguistic Research on Reading

> Research within cognitive neuroscience increasingly reveals the importance to cognitive processing of brain networks rather than specific regions. (Eysenck & Keane, 2020, p. 31)

Neurolinguistic research related to reading, language, and learning has exploded in the past twenty years as many journals, books, and research studies have explored imaging and time sequencing data using multiple methodologies. Fairly standard methods for brain imaging and process sequencing research on cortical and subcortical regions use techniques that measure oxygenated blood flow (fMRI), radioactive markers in regions of the brain (PET), magneto- and

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electro-encephalography activity patterns (MEG, ERP). More recent variations in brain imaging include Diffusion Tensor Imaging (DTI) and Transcranial Magnetic Stimulation (TMS). (See Banich & Compton, 2018 for discussion of these later methods.) For the more commonly used methods, functional Magnetic Resonance Imaging (fMRI) provides excellent data on the location of activation (but poor time-course data). In contrast, Event-Related Potentials (ERP) provides detailed data on the time-course of activation, though less precise location data (Anderson, 2020; Banich & Compton, 2018; Eysenck & Keane, 2020; Slotnick, 2017).

A major goal of brain imaging research with respect to reading is to identify those regions of the four major lobes of the neocortex and pathways within and across multiple cortexes that are involved in reading. Imaging allows researchers to examine how brain activation varies with reading tasks, and how different patterns of activation (a) associate with specific component skills; (b) vary across normal readers, weak readers, and reading-disabled readers; and (c) link brain region activation and processing sequence (ERP) results to psychological/behavioral findings that inform theories of reading and reading development.

Research results reveal clear, consistent, and interpretable variations and similarities across skilled readers and beginning readers, across normal readers and reading-disabled readers, between readers of Chinese and English, and across first-language (L1) and second-language (L2) readers (Berninger & Richard, 2002; Dronjic & Bitan, 2016; Perfetti & Dunlap, 2008; Rueckl et al., 2015; Schmalhofer & Perfetti, 2007; Steinhauer, 2014; Wolf, 2007; Yang et al., 2018). Specific research using brain imaging and sequence processing is introduced briefly. However, there are now hundreds if not thousands of such studies, and detailing these many studies would require a book on its own.

5.2 A Tour of Major Brain Structures

> The human brain contains approximately 100 billion neurons, each of which may have roughly the processing capability of a computer. A considerable fraction of these 100 billion neurons are active simultaneously and do much of their information processing through interactions with one another. (Anderson, 2020, p. 13)

The major divisions of brain anatomy include the left and right hemispheres, the *corpus callosum* (the major pathway that links the two hemispheres), the four major *neocortex lobes* in each cerebral hemisphere (*frontal*, *parietal*, *temporal*, *and occipital*), the

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subcortical structures, and the cerebellum. The left hemisphere is predominant in discussions of language processing, but it is important to note that much activation occurs in the right hemisphere during reading comprehension, especially in the frontal lobe. The four standardly identified cerebral cortexes are composed of grey matter (primarily *neuron cells*) at the highest layers of cortical structure and mostly white matter (*glial cells* around neuronal cells that descend through up to the five additional descending layers of the major cortical lobes; Banich & Compton, 2018). In each of the four cerebral lobes, the cells descending through the cortical layers form pathways within each lobe and long pathways to the subcortical structures and to other lobes.

Just below the innermost layer of the frontal and parietal lobes is a fifth important cortex, the *cingulate cortex*, curving above and then around and behind the subcortical structures and ending up as the *hippocampus* structure among other subcortical structures. Neurocognitive and neurolinguistic research commonly makes reference to more specific regions within a given lobe; for example, the *prefrontal cortex* (roughly the front half of the frontal lobe), the *dorsal prefrontal cortex* (the top part of the prefrontal cortex), and the *motor cortex* (the rearmost cortical area of the frontal lobe) (see Figure 5.1 for cortical region locations and Table 5.1 for terminology describing locations with cortexes). Straightforward introductions of this level of complexity can be found in several sources (e.g., Anderson, 2020, pp. 18–31; Banich & Compton, 2018; Carter et al., 2019; Eysenck & Keane, 2020, pp. 10–27; Passingham, 2016; Seidenberg, 2017, pp. 201–214).

The limbic system of the brain includes the structures that operate below the six layers of the cerebral neocortexes. These subcortical structures comprise most importantly the *cingulate gyrus (cingulate cortex)*, *hypothalamus*, *hippocampus*, and *amygdala*. These structures regulate information flow related to instinctive behaviors, emotions, learning, and LTM (see Figure 5.2). The various parts of the limbic system are closely linked to associational pathways that connect this system to all cerebral cortexes, especially the frontal cortex (Passingham, 2016). The system interacts with the frontal lobe roles of expectations, rewards, and decision-making. The *anterior cingulate cortex* regulates planning and emotional responses, and monitors and guides actions. The intersection of the anterior cingulate and the prefrontal cortex is a major source of conscious processing and executive functions (especially monitoring and awareness). The posterior parts of the cingulate gyrus are involved in memory storage and learning. The hippocampus, the locus for conscious declarative learning (semantic

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Table 5.1 Terms for identifying the cortex regions of the brain

Superior (or Dorsal): Top of the cortex region (superior temporal gyrus).
Middle: The mid-level between the superior and the inferior regions (middle temporal gyrus).
Inferior or Ventral: Bottom of the cortex region (inferior temporal gyrus).
Anterior: Front of the cortex region.
Posterior (or Rostral): Back of the cortex region.
Lateral: To the side of the cortex and to the side of the hemisphere.
Medial: At the middle of the hemisphere (at the inner part of the cortex), or at the subcortical level.
Sulcus: A major fold in the cortex surface (a valley) (central sulcus – between the frontal cortex and the parietal cortex).
Gyrus: A rounded bulge on the cortex surface (middle temporal gyrus, angular gyrus).
Fissure: A major sulcus dividing major parts of the brain (e.g., the Longitudinal fissure – front to back, separating the left and right hemispheres).

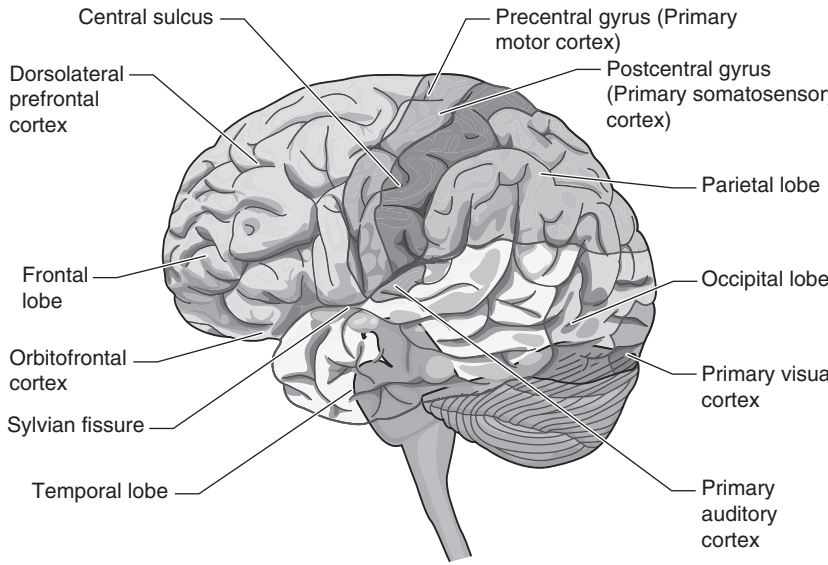


Figure 5.1 Specific cortex regions of the neocortex (left hemisphere shown) (Banich & Compton, 2018, p. 27)

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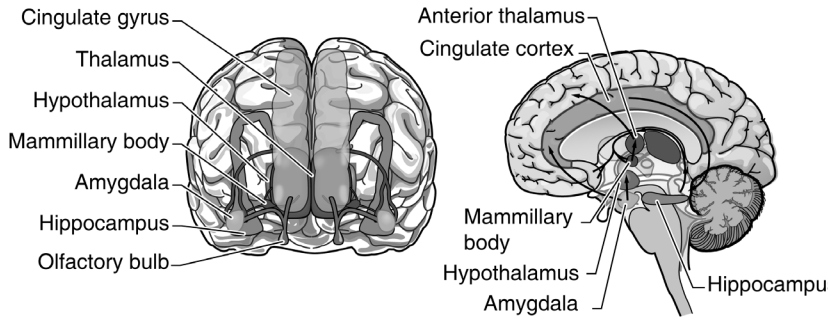


Figure 5.2 Limbic system: cingulate cortex and hippocampus (Banich & Compton, 2018, p. 14)

learning and episodic learning [personal experience learning]), is at the back and lower end of the cingulate cortex (Ullman, 2015). (The non-anterior cingulate cortex, various more specific cortexes behind the nuclei, and the hippocampus can all be referred to as the *Medial temporal cortex*.)

Intersecting with the components of the limbic system are the *brain nuclei*. The brain nuclei most importantly consist of *basal ganglia* structures and the *thalamus*. The basal ganglia structures are involved in fine motor control, coordinated movements, memory, and learning (implicit learning). They form circuits that take sensory input from the cortical lobes, register the relevant functions, and connect the information to other parts of the cortical lobes, most often to the frontal lobe. The thalamus is the main relay station for early sensory information from the cortical lobes (vision, hearing, motion) as well as from the body (touch, taste); it connects relevant information on to multiple cortical lobes for further processing; it is the arousal source for conscious processing. Pugh et al. (2013) comment on the connection between this subcortical network and reading: "A major role of subcortical networks in reading acquisition should not be terribly surprising, given the importance of *cortical basal ganglia-thalamus-cortical tracts* to brain-based accounts of skill learning in general" (p. 167).

Finally, the *cerebellum,* a unique structure, is behind the brainstem, situated under the temporal and occipital lobes. It involves fine motor control of unconscious body functions, especially body coordination through balance, muscle control, and posture. It may also play an important role in learning. It is one of the most densely packed brain structures in terms of nerve cell density (visible but not labeled in Figures 5.1 and 5.2).

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Standard overviews of brain structures and their functions for language processing and learning typically do not provide as much detail about the various subcortical structures and systems as the summary given here. However, recent research in cognitive neuroscience suggests that the various structures of the brain are closely integrated and coordinate many functions that involve language processing (and language learning) as well as a number of other nonlanguage processing functions (cf. Banich & Compton, 2018).

5.3 Language-Associated Brain Areas

> Cognitive neuroscientists attach less importance than they used to the assumption of functional specialization – the notion that each brain region is specialized for a different function. Instead they accept that there is substantial integration and coordination across the brain…. Most brain regions are involved in several different cognitive processes and so activation of any given brain area is not very informative. (Eysenck & Keane, 2015, pp. 20–21)

The brain areas that are traditionally recognized as essential for language processing include *Broca's area (left inferior premotor cortex)*, *Wernicke's area (left posterior superior temporal gyrus)*, and *Geschwind's area (left angular gyrus, left supramarginal gyrus)* linking with Wernicke's area. The parietal-temporal interface, where Geschwind's and Wernicke's areas intersect, is the associational hub that connects sound, form, and meaning with non-automatic word processing. (It is also the source of word production fluency.) The mid-superior left temporal lobe processes auditory information (*Heschl's gyrus*).

The left anterior temporal lobe is a collection relay hub of much semantic memory (both lateral and medial). The bottom of the *posterior inferior temporal gyrus* connects with the face recognition occipital region, the *fusiform gyrus* (the visual word form area). The latter is an early source of automatic word recognition (Figure 5.3). The hippocampus is the primary location for intentional (declarative) language learning, and the basal ganglia is the primary source of implicit learning, including statistical (probabilistic) learning and associative learning of language forms and structures.

The prefrontal cortex, along with the anterior cingulate cortex, is a major association area (a multifunctional collection hub) for WM as well as attentional processes and executive functions (conscious awareness, planning, goal setting, monitoring and control, inferring, problem-solving, decision-making, reflecting) (Banich &

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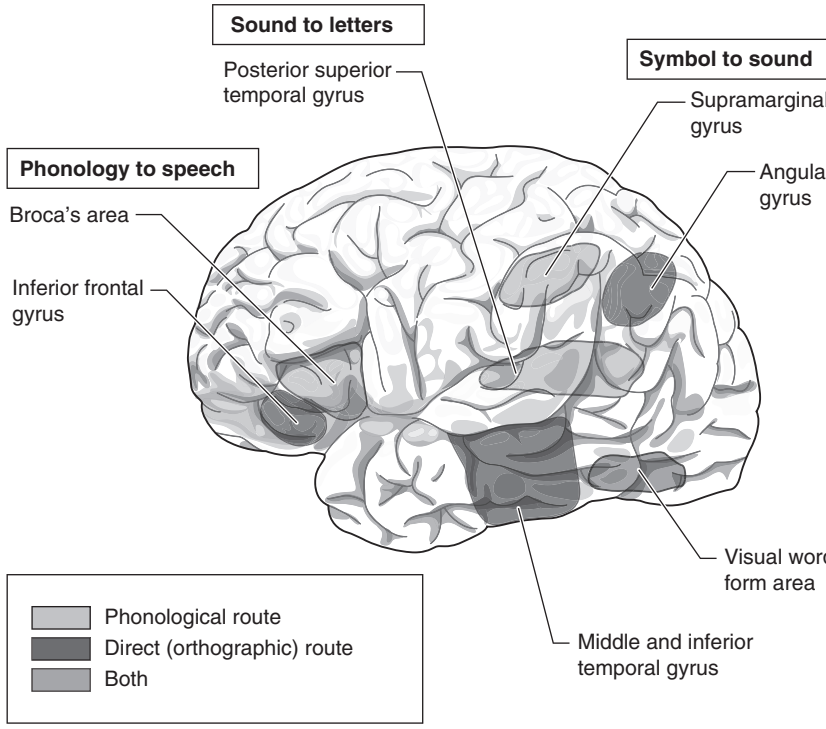


Figure 5.3 Language: direct and indirect routes to meaning (Banich & Compton 2018, p. 246) (left lateral hemisphere figure). Regions primarily involved in the indirect route indicate how phonology is linked to meaning: supramarginal gyrus, posterior superior temporal gyrus, and Broca's area. Regions primarily involved in the direct route: angular gyrus, middle and inferior temporal gyrus, and inferior frontal gyrus. The visual word form area (fusiform gyrus) is involved in both routes.

Compton, 2018; Passingham, 2016). It is important to note that these specific locations and structures are not limited to language processing but carry out multiple nonlinguistic functions as parts of highly integrated networks and pathways (Ullman, 2015). Broca's area is a collection hub that assembles activated information (parsing or language production sequencing). Broca's area, as part of the premotor cortex, also plays a role in embodiment phenomena (physical activation linked to relevant mental processing; e.g., articulatory activation even when reading silently). Furthermore, the higher-order executive processes are carried out in both the left and right prefrontal cortex (Banich & Compton, 2018; Eysenck & Keane, 2020; Passingham, 2016).

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5.4 Networks and Pathways

> Rather than the mapping of single regions to single processes, [research] results demonstrate a complex network of connections broadly distributed across brain regions in support of reading and language that emerge in response to task requirements and are subject to reorganization during learning. (Perfetti, Van Dyke, & Hart, 2001, p. 141)

Several major pathways are used to convey information within and across cerebral cortexes and between cerebral cortexes and subcortical structures. As Eysenck and Keane (2020) state, "in recent years, there has been considerable progress in identifying the *connectome*: this is the 'wiring diagram' providing a complete map of the brain's neutral connections" (p. 14) (see Figure 5.4 for an example of long-distance pathways across cortexes, but not the pathways from cortexes to subcortical regions, and back). The two major pathways that have been traditionally referred to for language processing are the *arcuate fasciculus* (the dorsal route) and the *ventral-semantic* pathway (*inferior longitudinal fasciculus* and the *ocipitofrontal fasciculus,* and likely also the *uncinate fasciculus*). Both the dorsal and ventral pathways begin at the back of the occipital cortex and then move forward either to the arcuate fasciculus pathway (dorsal) or the bottom part of the occipital lobe to the bottom edge of the inferior temporal lobe and then following one or more ventral pathways (Banich & Compton, 2018; cf. Friederici, 2016).

The *arcuate fasciculus* is the major pathway that begins from the *angular gyrus* and the *supramarginal gyrus* (Geschwind's area) in the parietal lobe (and is connected as well to the *posterior-superior temporal cortex* – Wernicke's area for phonological processing). The supramarginal gyrus and the angular gyrus integrate phonology, semantics, and orthography from multiple sources for word recognition and preparation for word production. Because the parietal lobe is commonly associated with location and motion, the pathway moving through the parietal lobe to Broca's area also activates and incorporates motion, logical relationships (equal, similar, different, etc.), location, and direction as potential aspects of language processing. The dorsal route is the more common pathway for recognizing new words or words just recently learned while reading. The Arcuate Fasciculus runs to the prefrontal lobe (WM and executive control functions) and to Broca's area to generate language production (or internal voicing) (Banich & Compton, 2018; Carter et al., 2019; Passingham, 2016).

The second major language pathway is more specific to reading and meaning generation, also beginning at the back inferior part of the occipital lobe. The *occipitofrontal fasciculus* (or ventral-lateral

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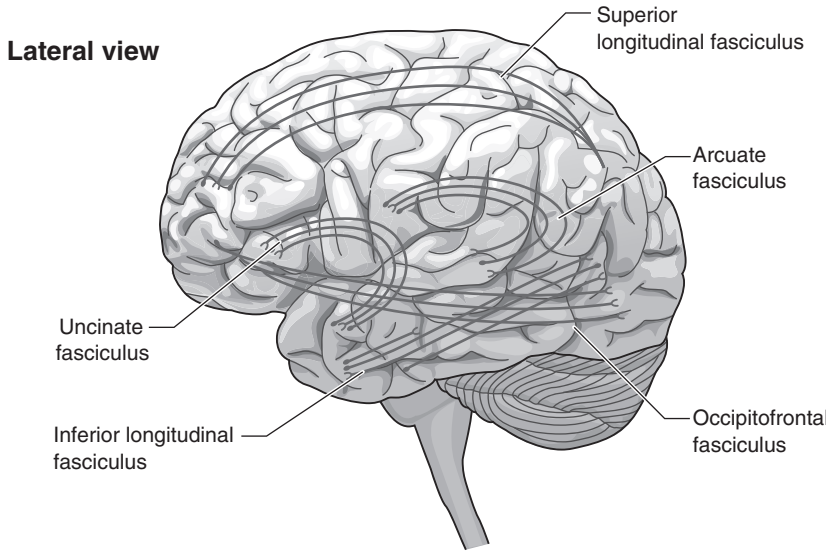


Figure 5.4 Major connecting pathways across cortexes (Banich & Compton, 2018, p. 38). (Not shown are cortical–subcortical–cortical pathways.)

pathway) connects the *fusiform gyrus* near the bottom of the occipital and temporal cortexes (for automatic word form identification and object identification more generally) and then moves forward through the inferior and middle temporal gyruses (as a location for concept/semantic information, and then to the *perirhinal cortex* at the front tip of the temporal cortex, and then to the *ventral prefrontal cortex* (immediately in front of Broca's area). This pathway is an automatic word recognition pathway with a focus on semantic knowledge.

Both pathways activate WM in the prefrontal cortex with connections to Broca's area and to other prefrontal regions that account for executive control processes (e.g., word-to-text integration). The key point is that both pathways lead to prefrontal cortex areas, activating WM and a full range of executive functions for language processing before connecting to Broca's area for production. The interconnections among more specific areas in the prefrontal cortex are involved in multiple additional networks (or pathways) that run through other cortexes and to subcortical structures and networks (Carter et al., 2019; Passingham, 2016).

Four major gaps in the fairly standard account of language production, comprehension, and learning are becoming increasingly important in the neurocognitive description of language processing. These gaps in many language/brain function discussions include the

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following: (a) the roles of the many other important long-distance pathways across cortexes and between cerebral cortexes and subcortical structures, (b) the critical roles of subcortical structures, (c) the roles of several nonlanguage-specific cognitive skills located across the prefrontal cortex and the anterior cingulate cortex, and (d) the idea that the transfer of information from one location does *not* mean that information actually *moves* to a new location, but becomes part of a connecting pathway in a more elaborate network of connections. For example, no information located in a parietal region moves anywhere; it just becomes part of a more elaborate network of connections that spread all the way to the prefrontal cortex (Banich & Compton, 2018; Carter et al., 2019; Edelman, 2004; Passingham, 2016; Ullman, 2015). As Wolf (2016) states, "Each process that is incorporated into the reading circuit—like phonology or semantics—inhabits entire neuronal networks, that, more often than not, involve multiple distant regions in one or both hemispheres across multiple layers of the brain" (p. 70).

Regarding gap 1, a major set of pathways run from all sensory locations in the cerebral lobes to the basal ganglia structures (*striatum: putamen* and *globus pallidus*) and the thalamus (as the major relay system). These descending and ascending pathways also connect through the explicit learning and memory network (the cingulate cortex to the hippocampus) and the implicit learning and memory network (basal ganglia and thalamus). Even the cerebellum appears to be involved in aspects of language learning (Passingham, 2016). These networks are general in nature and cover many types of memory and learning (Figure 5.5). The two types of language learning (i.e., memory building) structures (the hippocampus and the basal ganglia) and the thalamus also have linkages. But these linkages are not very well understood (Banich & Compton, 2018; Carter et al., 2019; Passingham, 2016).

The second gap involves the subcortical structures that are essential for language processing and learning (gap 2). The hippocampus binds stimulus elements together into larger units and it is a critical component of long-term episodic and declarative memory, learning, and the retrieval of memories. Long-term memory is also likely to be in networks linked to the hippocampus and the prefrontal cortex, but stored in various areas in more posterior cortex regions (the temporal, parietal, and occipital cortexes) (Banich & Compton, 2018; Seidenberg, 2017; Slotnick, 2017; Ullman, 2015). The basal ganglia, critical for the implicit learning system (including statistical learning processes), collects activation information from all areas of the neo-cortex, controls associative (procedural) memories, is involved in

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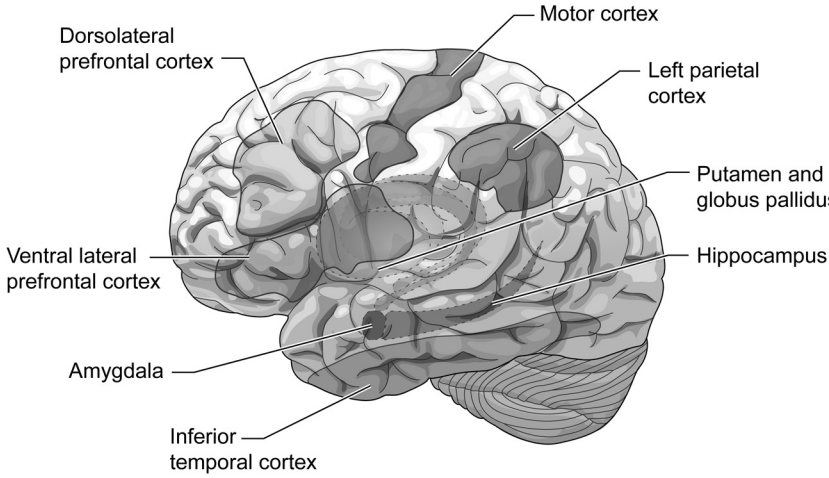


Figure 5.5 Network of structures for memory and learning (Banich & Compton, 2018, p. 292). Cortical structures are labeled. Subcortical structures include the hippocampus, the striatum (putamen and globus pallidus parts of the basal ganglia), and the amygdala (emotional memory). See Banich & Compton, 2018, for a detailed explanation of various interactions among locations and pathways.

complex cognition (involving the prefrontal cortex), links activation information with body senses and motor activity, and connects the key output to the thalamus to be recycled back to cortical areas that maintain or change activation patterns (Anderson, 2020; Banich & Compton, 2018; Edelman, 2004; Pugh et al., 2013).

The ascending pathways to the cerebral cortexes link up strongly with the dorsolateral prefrontal cortex and the anterior cingulate gyrus, the primary sites for executive control functions; the anterior cingulate cortex, in particular, is the mechanism for directing attention. Both automatic and strategic processing likely require all of the subcortical regions noted here. More generally, subcortical systems play greater roles than cortical processes in automatic processing (i.e., activating familiar stimuli), while cortical systems play a greater role in processing new stimuli. This brief sketch of brain functioning is clearly an oversimplification, but it does provide a sense of the complexity involved and the potential for new insights.

The third gap in standard accounts, the roles of several nonlanguage-specific cognitive skills, involves the multiple roles of the prefrontal cortex and anterior cingulate cortex (Passingham, 2016). Aside from the pathways to and from the subcortical structures, pathways critical for language processing and learning integrate language

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information with more general higher-order cognitive processes in the frontal lobe. These areas not only direct executive control abilities but also are critical for predictive processing, in which a preset for an upcoming task activates relevant areas in other cortexes, activating long-distance information from and to the parietal and temporal cortexes and to subcortical structures (Banich & Compton, 2018; Kuperberg, 2013).

Activating associated semantic information based on prior and current language processing (words and structures) will prime recognition of upcoming words and phrases, reflecting automatic (implicit) processing between WM and LTM. As Banich and Compton (2018) note, "The organization of the frontal lobe for executive function is quite complicated…. There is unlikely to be a strict subregion-to-function mapping; rather, overlapping regions are involved in most [executive control] functions" (p. 361; see also Passingham, 2016, for functional complexity within the frontal lobe).

The fourth, and in some ways the most obvious gap focuses on how information is connected in the brain. Brain pathways are best understood as many, many pathways that maintain a connection between two or more parts of the brain at the same time. Brain processing requires massively articulated networks that stay active as long as a process is keeping both ends of the pathway active. This gap requires stressing just what it means to say that the brain is organized as a *connectome* (see also Dick et al., 2014; Herbet et al., 2018).

Having provided a fairly detailed explanation of neurocognitive processing, it is also true that we do not have a full neurolinguistic grasp on any language skills that have important roles in reading. As Seidenberg (2017) notes for semantics:

> [Semantic] information is distributed across numerous brain regions and linked via an integrative hub…. The ventrolateral pathway links the spellings of words, integrated through the occipito-temporal hub, to semantics in parts of the temporal lobe. However, we know that the meaning of a word is more than a simple definition….
>
> The meaning of CANARY is encoded by many brain structures…. How is all this widely distributed information linked to the word CANARY? The best supported current theory holds that the anterior temporal lobe acts as a hub linking amodal representations of words to the satellite areas in which associated information is stored…. Semantics is not "in" the temporal lobe, just as orthography is not "in" the visual word form area, but each area is crucially involved in using these types of information. (p. 207)

Multiple other researchers make similar statements on the importance of brain networks that are brought together in informational hubs, and then activation continues along rather than identifying a

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"location" where a skill resides (Banich & Compton, 2018; Bilalić, 2017; Carter et al., 2019; Edelman, 2004; Eysenck & Keane, 2020; Passingham, 2016; Pulvermüller & Fadiga, 2016; Wolf, 2016).

5.5 Neurolinguistic Research Methods

Recent research on brain structure, function, and integration has raised questions about simple statements that seem to privilege specific cerebral brain locations for a language processing system. To be sure, key locations and major pathways have been identified, but we do not know the roles of other key locations and pathways. We do know that almost all major locations that are identified with language functions carry out other nonlanguage functions as well. We know that automatic processes often do not become as "active" as intentional, effortful processing (and also may not appear as active through brain imaging studies), and yet they may be important for language processing. We need to know more about integrated pathways and networks that support language processes. Various areas of the brain may be parts of key integrated networks and we do not yet have good ways to study this integration of networks. At the same time, we have learned much more in the past twenty years about how cognitive functions are networked in the brain (Banich & Compton, 2018; Carter et al., 2019; Passingham, 2016).

The most common neurolinguistic research methods specifically associated with reading involve fMRI and ERP. fMRI measures blood flow changes (and oxygenation) to parts of the brain. As noted earlier, it is good at identifying locations with higher than resting activation, but is slow in tracking the time course of activation. Simple tasks are carried out while subjects rest in an fMRI machine. Because of the need for the subject's head to remain motionless, tasks need to be fairly simple in nature for easy hand motions. Tasks also need to be repeated multiple times to create an average of the individual results. The averaging is what provides well-defined locations. Brain images with specific activation locations and patterns highlighted are commonly presented as key outcomes of fMRI experiments (Banich & Compton, 2018; Eysenck & Keane, 2020).

fMRI imaging has identified major locations for language processing. These major locations include, among others, Broca's area in the frontal lobe for word-to-text integration and language production; the fusiform gyrus (word recognition area) at the bottom boundary between the occipital and temporal lobes, the temporal lobe for the automatic visual recognition route (the ventral route), the supramarginal gyrus and the angular gyrus (in the parietal lobe),

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and Wernicke's area (posterior superior temporal gyrus) for connecting phonological, orthographic, and semantic information and new word analysis (the dorsal word recognition route) (Banich & Compton, 2018). Executive control abilities and WM have also been identified in various parts of the prefrontal region as well as the cingulate cortex. Memory and learning appear to activate a pathway from the prefrontal cortex to the anterior cingulate cortex and along to the posterior cingulate cortex and down and around the main subcortical structures through various smaller medial-cortical regions until the cingulate lobe becomes the hippocampus (essentially a remembering/explicit learning pathway; Passingham, 2016).

But the story is much more complex because language functions are carried out in other areas as well, such as the left dorsolateral prefrontal cortex (associated with WM and attention) and the motor cortex (associated with multiple aspects of language) (Passingham, 2016; Wolf, 2016). Moreover, the storage of lexical knowledge (see Chapter 11) appears to be quite diffuse across cerebral lobes: Semantic memory (for the full range of lexical items) activates Broca's area (left inferior lateral prefrontal cortex), the area in front of Broca's area, the anterior temporal cortex, Wernicke's area (the left posterior superior temporal cortex), the hippocampus (medial temporal cortex), and the perirhinal cortex and the parahippocampus (and likely many more locations) (Banich & Compton, 2018; Slotnick, 2017).

The second major neurocognitive approach for analyzing brain functions is ERP. ERP generates wave patterns as a visual output of *electroencephalography* (EEG) that measures chemo-electrical impulses. ERP wave patterns are generated as subjects do various tasks. The time-course of electrical activation recorded emerges as a wave pattern with Positive (P) and negative (N) polarities. The time-course is relatively well-defined in milliseconds (ms). Brain locations of the cerebral activation are less well-defined. Unlike fMRI approaches, subjects can sit up and have a cap fitted on their scalp with multiple sensors in the cap. Commonly, the wave patterns are produced from the frontal lobe sites, the temporal lobe sites, the parietal lobe sites, and the sites at the midline between the two hemispheres to help provide some sense of location, though these locations are not detailed nor fully reliable.

The strength of ERP is that it provides a real-time account of brain activity from 1 to 1000 milliseconds (ms). The tasks are repeated multiple times and the averaging of wave patterns produces a relatively well-defined composite wave pattern. Three commonly interpreted patterns that are related to language processing are the *P100 wave*, the *N400 wave*, and the *P600 wave*. The P100 wave is the recognition

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of sensory input (marking the activation for further processing of a word fixation). The N400 wave (the negative amplitude wave pattern cresting at about 400 ms) occurs when the brain is processing semantic information. For example, the amplitude increases when an anomalous word ("For breakfast, she ordered bacon and socks") is processed. The amplitude decreases when a word is processed automatically. The P600 wave (the positive amplitude wave pattern at about 600 ms) occurs when a syntactic violation ("The two men is lost") is processed (cf. a semantic P600 analysis; Kuperberg, 2013). There are other wave patterns associated with language processing, but they are less well-defined. In particular, the P300 wave may be an indicator of implicit paraphrase linkage that updates a connection between some element in prior text with the word being read (Perfetti et al., 2008). Studies noted later in this chapter are intended to provide examples of research using ERP methods.

Kutas and Federmeier (2010) provide a comprehensive overview of research involving ERP methods, and they comment on a number of important research studies conducted over a period of thirty years (1980–2010). They provide a good description of the uses of N400 as a strong indicator of meaning processing. When a task requires a focus on the last word in a clause, the N400 will have higher amplitude wave if the last word is unexpected, anomalous, new, or part of a semantically challenging clause. The N400 wave pattern is lower than a baseline when a word is familiar, contextually predictable, or primed by known associated words. In these tasks, the N400 is an automatic semantic recognition measure (with lower amplitudes than a neutral baseline measure).

In contrast, when the target word is the first word of the next sentence, the N400 appears to represent postlexical linkages across sentences as part of word-to-text integration. When the word is primed by associated words or supported context from the prior sentence, the N400 wave is lower, suggesting strong semantic priming across sentences and integration of semantic information across sentences (see also Helder et al., 2019). A higher N400 wave suggests that integrating the new word with the prior sentence is not easily or automatically primed (e.g., through passive resonance, paraphrasing relationships). There are multiple reasons why this might be the case: new words or not well-learned words, limited content knowledge of a topic, a shift to a new topic or situation, and so on.

An ERP study with the former task (semantic processing) is reported in Frishkoff et al. (2010). Students were asked to read new words in sentence contexts. Words seen in strongly supportive contexts were learned better right after training. The words in supportive sentence

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contexts had lower N400 wave amplitude than words trained in weak sentence contexts. Two days later, the words in stronger contexts again showed lower wave amplitudes than words (a) in sentences with weak contexts and (b) in sentences with new, contextually appropriate words that were not part of training. The ERP results were matched to a vocabulary assessment task to see which words were learned better with differing degrees of supporting context. Words appearing in contextually strong environments were learned better based on the assessment tasks, confirming the ERP data interpretation. It is also important to point out that there was no explicit contextual awareness training (e.g., active guessing from context training), so this effect was incremental and passive.

Stafura and Perfetti (2014) examined the role of the N400 to demonstrate word-to-text integration. This study examined the amplitude of the N400 when the target word appeared at the beginning of a second sentence (crossing a sentence boundary). The key finding showed that when target words were primed by associated words in the prior sentence, the amplitude of the N400 wave was much lower, signaling contextual (implicit) preactivation from the prior sentence. The key goal of this study was to show that associated word meanings from an already formed text representation (the prior sentence) contributed to more automatic processing. (See also Ng et al., 2017, specifically distinguishing more and less proficient students based on prior sentence context priming.)

Yang et al. (2018) used the same type of task to examine the roles of the N400 and *Late Positive Component* (LPC) profiles (a P600 profile that does not indicate an ungrammatical target word, but measures an effort to link the connection across sentences to a growing situation model). Again, this study targeted the first word at the beginning of the new sentence. In this case, target words were not anomalous, semantic oddities, or surprising words, but words that are more or less easy to integrate with the prior sentence. More proficient Chinese students of L2 English showed a strong profile of low N400 and high (LPC) P600 in their word-to-text integration processes. Less proficient L2 students demonstrated a reverse ERP profile: The target word was less familiar and less automatically recognized, and the LPC P600 profile was one that indicated difficulty in identifying the connection, suggesting less automaticity of the target word to connect with the prior sentence. These interpretations matched text reading comprehension measures of L2 students. The studies noted here suggest ways that ERP measures provide important insights into language processing and L1/L2 differences.

A number of L2 ERP studies focusing on a target word in a sentence are reported in Steinhauer (2014), who compared L1 and L2 language

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learners and different groups of L2 learners as they processed word category errors in sentences. One key study, by Bowden et al. (2013), reported that higher proficiency L2 learners of English showed N400 LAN (Late Anterior Negativities), and P600 patterns that matched L1 English participants, unlike lower proficiency L2 learners. The closer profile of higher proficiency L2 students to L1 English speakers in ERP results suggests that L2 learners gradually develop processing similarities with L1 learners, countering arguments for an L2 Critical Period Hypothesis (CHP). The study showed that more proficient L2 learners can be distinguished from lower proficiency L2 learners on the basis of ERP profiles. The study also showed that lower proficiency L2 learners from different L1s had different ERP profiles. However, as a more general finding, as L2 students from different L1s became more proficient, they had more similar ERP profiles and also had profiles more like English L1 speakers.

As with any new research technology, it is also important to exercise caution in interpreting fMRI and ERP data. Eysenck and Keane (2020, pp. 23–26) identify a number of limitations with both brain imaging (fMRI) and electroencephalography (ERP). The importance of recognizing limitations is that visual images in research studies tend to be persuasive without highlighting the limitations of the methods used. For example, imaging studies can lead a reader to overinterpret findings and believe that simple one-to-one relationships exist between behavioral language tasks and brain area activation. Some psychological processes will never be isolated to just one or two brain areas. In many cases, other areas will be active, or a network will be active, but the imaging will not reveal all of these patterns. There is also always "noise in the machine," an imaging version of error variance. In addition, where imaging is consistent and persuasive to a point, researchers are seeing an association without knowing for sure what is causing it. As Eysenck and Keane (2015, p. 23) caution, "We must avoid 'the neuroimaging illusion,' which involves overvaluing the contribution pictures of brain activity make to our understanding of human cognition."

In the case of ERP research, certain interpretations of wave patterns may not provide data associated with real cognitive/language processes. Moreover, many of the wave patterns may appear at different time points with participants at different ages and L2 proficiency levels. For example, the N400 wave may begin at 300 ms or may reach a highpoint at 500 ms. These varied patterns can sometimes be interpreted as other types of waves rather than the N400 wave. In addition, ERP data are not able to identify more detailed specific processing locations. Finally, ERP data commonly involve right hemisphere activations that are seldom discussed.

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Despite the caveats involving the uses of fMRI and ERP methods, neurological research approaches open up new avenues for understanding language processing and will likely play greater roles in cognitive interpretations of reading comprehension. Aside from examining L1 readers at different ages and proficiency levels, readers with disabilities have also been studied and provide distinct profiles. L2 learners from differing L1s, or at lower proficiency levels, reveal distinct neurolinguistic profiles with standard brain measures, including differing patterns of right hemisphere activations (Perfetti & Bolger, 2004; Pugh et al., 2013; Snowling, 2019; Wolf, 2007, 2018). A particularly positive outcome of brain measures is how the profiles change for disabled readers after effective training to pattern more like nondisabled readers. It appears that training can change patterns of brain functioning for the better, and these results appear to be robust (Wolf, 2016).

Many new neurocognitive measures in relation to language processes can be associated with components of reading ability. In addition, new research methods and technologies will be developed, leading to new interpretations of brain functions (especially networks and pathways). What can be identified at this point are numerous brain areas and neural networks related to comprehension processes for reading. It is also useful to consider how neurocognitive research on reading abilities match up with and support specific theoretical frameworks for reading comprehension. Given the unique nature of this chapter on neurocognition and reading, there are no implications for instruction. Instead, we suggest that interested readers follow-up by reading Banich and Compton (2018) for a strong introduction to neurocognitive research.

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Appendix: Integrating a Reading Comprehension Timeline: Proposed attentional and Automatic Processing while Reading

Fluent, automatic word processing and word-to-text integration (ventral pathway)

1–80 ms. Register orthographic word form in occipital cortex boundary with posterior temporal cortex
80–240 ms. Chunk-and-Pass processing (chunk subword units into words, etc.)
100–240 ms. Automatic word recognition: Visual word form area (fusiform gyrus) to anterior lateral temporal gyrus, to the perirhinal cortex, to ventral prefrontal cortex (pars triangularis); preactivation of associated knowledge for automatic word recognition and integration. Includes activation of subcortical areas (limbic system and nuclei).
160–600 ms. Activation of attentional and executive control processes
200–2,000 ms. Activation in WM, dorsal prefrontal cortex, integration with prior sentence/text. Chunk-and-pass multiword phrasal level processing
240 ms. Saccadic movement to next focal fixation for word recognition
300–600 ms. Passive check for semantic appropriateness and disambiguation, local phrasal parsing, integration with prior sentence/text. Chunk-and-pass processing of semantic units.
400–800 ms. Check for connections with LTM, structural form interpretation, further development of situation model of comprehension.

Attentional phonological-orthographic-semantic process route (dorsal pathway)

1–100 ms. Register orthographic word form in occipital cortex boundary with inferior posterior temporal cortex
80–240 ms. Chunk-and-pass processing
100–240 ms. Indirect word recognition: Visual word form area (fusiform gyrus) to superior posterior temporal gyrus, angular gurus, and supramarginal gyrus as the major association area for new words (or only partially known words), then activation along the arcuate fasciculus to the dorsal premotor cortex and to Broca's area. Activation of limbic system and thalamus.
200–2,000 ms. Activation of attentional and executive control processes. Chunk-and-pass processing
200–2,000 ms. Activation in WM and dorsal prefrontal cortex, integration with prior sentence/text (dorsal route is slower). Greater attentional effort required
240–500 ms. Saccadic movement to next focal fixation for word recognition. Longer word recognition time with new words
300–600 ms. Check for semantic appropriateness and disambiguation, integration with prior sentence/text. Chunk-and-pass processing
400–2,000 ms. Check for connections with LTM, structural form interpretation, development of situation model of comprehension

(Banich & Compton, 2018; Christiansen & Chater, 2016a, 2016b; Passingham, 2016; Wolf, 2007)

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6 *Explaining Reading Comprehension: Models of Reading*

Reading comprehension is too broad a target for precise models…. There is value in capturing this breadth in a general framework that provides a view of the component subsystems of reading comprehension. (Perfetti & Stafura, 2014, p. 23)

Chapters 2 to 5 have explored many of the basic cognitive concepts and processes that underlie how we understand reading as well as the many major component processes involved in comprehension. The present chapter highlights the most important current models of reading that seek to explain how component processes and underlying cognitive processes can be assembled into an understandable synthesis of comprehension abilities. Models, of whatever type, need to present concepts, interpret new data, synthesize a range of findings that adhere to acceptable methodological standards, make accurate predictions, provide strong linkages to comprehension performance among learners, and respond adaptively to critical examination if they are to be seen as persuasive.

6.1 Models of Reading

Models characterize theories of reading, thereby providing ways to represent a theory or part of a theory; they explain what reading involves and, in more detailed computational versions, how reading works on a cognitive processing level (Chater & Christiansen, 2016, 2018; Christiansen & Chater, 2016a, 2016b). Models generally make further predictions about reading beyond accounting for existing research results, and these predictions, in principle, can be supported or falsified. In this way, models organize a body of research findings, provide a coherent explanation of some larger ability, and build a foundation for additional research.

There are general models of reading comprehension abilities and also models of word recognition (Seidenberg, 2012), syntactic processing (Misyak & Christiansen, 2012; Ousterhout et al., 2012),

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working memory (Baddeley, 2015; Conway et al., 2009a), and background knowledge (long-term memory) activation (Slotnick, 2017). Some models are based on extensive empirical evidence, and some are metaphorical that make more abstract generalizations. In every case, the authors are looking to explain how reading, or certain essential subcomponents of reading, might work based on available evidence.

For anyone to assert that a model (any model) provides a complete and accurate synthesis, however, is problematic. It is fairly obvious that many competing research results are not easily reconciled. Moreover, models cannot account for all the available evidence that exists. Researchers who propose models must decide which evidence to include and to account for. They must weigh the various types of evidence available and prioritize certain evidence over others. These decisions are influenced by the authors' research backgrounds as well as their training and dispositions, and the social and cultural milieus in which they work. So the construction and presentation of models of any kind represent selection processes and decision-making, suggesting that there is an element of subjective shaping in all model construction. These limitations make the scrutiny of research results supporting model development all the more important and affirm the need for the more objective constraints that are usually provided by carefully controlled research methods.

At the same time, some researchers and educators still make reference to more metaphoric models of reading to offer simplified versions of reading processes and reading comprehension. For decades, reading researchers and educators have discussed models in terms of top-down, bottom-up, and interactive models. Top-down models are driven by reasoning processes and leave the language and memory processes unspecified. Pure bottom-up models assemble comprehension as word-by-word, phrase-by-phrase processes that do not take into account the integration of background knowledge and language resources to explain comprehension or reading's more challenging goals of reading to learn, synthesize, or evaluate information.

Even the "grand compromise" interactive models are not accurate in their details. We know that implicit processing and automaticity prevent top-down processing from interfering with more automatic processing, particularly in cases of fluent word recognition and implicit (passive resonance) inferencing. Instead of expanding on well-worn commentary about metaphorical conceptualizations, we turn to the most important current models of reading that influence much of the current research on reading comprehension.

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In the last twenty years, a small number of proposed models have taken on greater prominence and driven much of reading research at all levels of reading ability and across many languages. These specific models of reading are well supported, have strong rationales, and assume cognitive processing efficiencies. They all have foundations going back at least thirty years based on extensive empirical research. In this chapter, we introduce these models and note major resources that can inform the interested reader. All are, at a minimum, empirically driven, descriptive, and psychologically plausible models:

1. Simple View of Reading;
2. Construction-Integration Model;
3. Landscape View of Reading;
4. Verbal Efficiency Model (Lexical Quality Hypothesis, Word-to-Text Integration);
5. Reading Systems Framework Approach.

6.1.1 Simple View of Reading

> Research shows that the Simple View of Reading equally holds for L1 and L2 reading. In both cases, variation in reading comprehension can be seen to be largely the product of children's word decoding and listening comprehension—including their vocabulary, morphological awareness, and syntactic abilities. (Verhoeven, 2017, p. 225)

The Simple View of Reading (SVR), perhaps the most widely used reading comprehension model for research purposes, is based on a simple idea. Reading is a straightforward combination of word recognition abilities and comprehension abilities. This model does not describe subsets of component reading abilities and their interactions; instead, it offers a general account of reading comprehension by means of a statistical assessment argument. The model initially stated that reading comprehension (R) is the product of word recognition abilities (i.e., decoding) (D) and comprehension abilities (C), that is, R = D x C (Chen & Vellutino, 1997; Gough et al., 1996; Hoover & Gough, 1990).

The evidence for SVR rests primarily with analyses of assessment data – the interaction between word recognition scores and language knowledge scores (as in listening comprehension, oral vocabulary, syntax, or a common language factor) predict reading comprehension scores that use standardized comprehension measures. At present, the more persuasive outcome is that the SVR combines word recognition and language knowledge at elementary grades, but moves more strongly to a common language knowledge factor dominating as a

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predictor of reading comprehension from 5th grade onwards. The power of this model is that it is intuitively appealing, easily testable, and simple; it holds up well across different languages studied (e.g., English, Chinese, Dutch, Greek, Hebrew, Italian, Malay, Portuguese, Spanish, among others). It holds up well across both first-language (L1) and second-language (L2) groups; and it overlaps well with other theories of reading comprehension (e.g., Reading Systems Framework Approach).

Proponents of this view expect reading abilities to be shaped by other factors as well, but, for them, the central argument is that reading comprehension can be understood primarily as some combination of word recognition and language knowledge (Foorman et al., 2015, 2018; Kim, 2017, 2020; Lonigan et al., 2018). A number of research studies have explored variations in ways to operationalize SVR, either in terms of types of specific measurements used or in terms of how component skills outcomes are combined to generate a composite score. In addition, research studies have argued that additional component skills would improve the overall prediction of reading comprehension, including independent measures of vocabulary knowledge, syntactic knowledge, background knowledge, executive functions, and reading fluency, with varying success (Ahmed et al., 2016; Cadime et al., 2017; Catts, 2018; Cervetti et al., 2020; Cirino et al., 2019; Duke & Cartwright, 2021; Geva & Farnia, 2012; Quinn & Wagner, 2018; Silverman et al., 2013; Talwar et al., 2018).

Research outcomes for L2 readers are less stable because of the many more variations in learners' L2 proficiency outcomes. For example, patterns of decoding and comprehension relationships are more complex for L2 readers because some L2 groups do not achieve word recognition fluency levels evident among most L1 readers, nor do they achieve strong levels of vocabulary or syntactic knowledge, nor do they achieve reading fluency levels as do L1 readers, especially with more complex texts (Farnia & Geva, 2013; Geva & Farnia, 2012; Jeon & Yamashita, 2014; Yamashita, 2022).

There are a few obvious limitations to the SVR as a model of reading. It leaves aside several component skills known to have independent impacts on reading comprehension; it does not explain how reading comprehension is achieved; it generates many variable interpretations of how to operationalize language knowledge; and it produces results that vary considerably across learner groups. Nevertheless, the fundamental claims of SVR, that word recognitions skills and general language knowledge skills predict reading comprehension outcomes, have been verified across many studies. These results also

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generally hold up well across L1 and L2 learners (Verhoeven, 2017; Verhoeven, & van Leeuwe, 2012).

6.1.2 Construction-Integration Model

> After reading [a] whole text, the reader has a representation of the meaning of the text in long-term memory. This representation is patched together from the different processing cycles involved and linked in various ways to his or her prior knowledge and relevant personal experiences. (Kintsch, 2012, p. 22)

The Construction-Integration Model (C-I Model) was first described in the research literature in 1988 (Kintsch, 1988). At the time, it argued for cycles of word-by-word and phrase-by-phrase on-line linguistic processing in contrast to a looser top-down schema-based comprehension processing approach. The model was extended further through a series of studies reported in Kintsch's (1998) book, *Comprehension*. Kintsch elaborated on the C-I Model as a powerful way to understand the nature of comprehension. In any processing cycle (word group or phrase), the construction phase generated language knowledge based solely on the text. The integration phase inhibited irrelevant information and reinforced thematic information in line with reading goals and prior text processing (situation model). The situation model constructed a network from the text information as well as the reader's related background knowledge and domain knowledge (Kintsch, 1998, 2012) (see Chapter 3).

Over the past twenty years, Kintsch has also explored the concept of passively activated information to support comprehension. In earlier descriptions of the construction phase, it was assumed that much irrelevant information is generated while building the textbase (or text-representation), then many active inferences would be required to generate the situation model (integrating the most relevant information). However, explorations with (a) latent semantic analysis, (b) a probabilistic topic model, (c) an explicit relational trace model (the intersecting appearance of two topics [e.g., *hunter* and *kill*] to limit association generation), and (d) a simple sequential dependency grammar parsing of phrases have been used to predict reading comprehension outcomes automatically without requiring extensive inferencing (Kintsch & Mangalath, 2011). Results of combined automatic processes demonstrated an 89 percent overlap with reading comprehension performance on a 186-item cloze test (Kintsch, 2013; Kintsch & Mangalath, 2011).

The point of this automated processing research, as well as other more recent research on passive resonance and other automatic

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priming concepts (see Chapter 2), is that text-base processing by fluent readers can passively and automatically generate a model of comprehension that is quite coherent without requiring extensive "clean-up" from active inferencing and other strategic processes. This largely passive and automatic generation of a model of text comprehension also ties in well with the discussion of rapid language comprehension processing (chunk-and-pass) developed by Christiansen and Chater (2016a, 2016b; Chater & Christiansen, 2018; see Chapter 4). As Kintsch (2012, p. 24) notes, "if reading skills and domain knowledge are high, the result is automatic, expert comprehension."

A key strength of the C-I Model is that it focuses on the comprehension process and outcome itself rather than on processes of component abilities meant to tie together as text comprehension. The notion of a text-base and a situation model emerging in parallel provides ways to talk about comprehension that have real applications to various (non)comprehension outcomes (see Chapter 3). The C-I model has represented a breakthrough in addressing the actual process in generating text comprehension, and it has moved research on reading comprehension considerably forward.

6.1.3 The Landscape Model of Reading

The Landscape Model could be interpreted as an extension of both Kintsch's C-I Model and Gernsbacher's Structure Building Framework (1990, 1997; see Chapter 12). Van den Broek and colleagues' Landscape Model emphasizes discourse processing to explain reading comprehension outcomes and incorporates underlying cognitive skills as part of the process of building text comprehension (van den Broek et al., 2016). This model explains how readers build text comprehension to meet their own standard of coherence for a given reading task (Goldman et al., 2007; van den Broek et al., 1996, 1999). The model provides a means to estimate the level of activation of all concepts mentioned in a text, both at the point at which they appear in a text and in all subsequent sentences in the text. The activation levels of each concept are described in Table 6.1.

In early experiments, each concept is assigned (a) a score for its level of activation at each subsequent sentence in the text, (b) a total activation score, and (c) an activation score for every other word that it is co-active within a clause. van den Broek also proposed a simple mechanism for the decay of activation when a word is not used or associated with the current clause.

The Landscape Model also incorporates automatic passive comprehension processing depending on the demands of a given

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Table 6.1 Factors influencing level of activation

1. Concepts mentioned in the current clause.
2. Concepts available from the prior clause.
3. Concepts that contribute to main thematic development.
4. Inferred concepts that are required to connect anaphors to prior referents.
5. Inferred concepts that are required to make causal connections with concepts in the current clause.
6. Concepts that have semantic associations with concepts in the current clause.

comprehension task and the reader's reading skills (the reader's standard of coherence). As noted by van den Broek et al. (2013), "At any point during the reading of a text, if the automatic processes triggered by the text at that point yield sufficient coherence to satisfy the reader's standard of coherence, then strategic processes are not necessary for comprehension" (p. 133). Another key feature of the Landscape Model is the demonstration that readers build thematic main ideas that are more central to a reader's comprehension. In early studies, predicted outcomes of the model have been compared with clause-by-clause statements of L1 students as to what is most important as they read a text, as well as by delayed free-recall tests. In both cases, the relationships between the proposed activation measures of the Landscape Model and student performances were very strong. Students almost always assigned most importance to the concept with highest overall calculated activation in a text, followed by the next most important to the concepts that were most closely associated with the dominant concept.

Finally, the Landscape Model is important as a type of operationalization of Kintsch's C-I Model, showing how each concept can be assigned an activation value during real-time linguistic processing, and only the concepts that retain activation over many clauses remain integrated as central ideas in a text representation. The model provides a clear means for applying discourse analysis principles to an activation model of reading comprehension. The model is readily testable in comparisons across different groups of students, including L2 students.

At the same time, like the C-I Model, the Landscape Model has its limitations. First, research has focused primarily on fairly simple narrative texts, and this approach may not work as well with more complex expository texts (cf. Lorch, 2015, 2017). Second, it is not clear what the role of inferencing is as part of the process of online

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comprehension, apart from being needed to problem-solve some level of coherent interpretation with challenging texts (van den Broek et al., 2015, 2016). Third, there are relatively few demonstrations of readers navigating a "text's landscape" to arrive at a coherent situation model. Despite these limitations, the Landscape Model provides an important way to characterize the discourse processes above the level of words, syntax, and sentential meaning. Both Kintsch and van den Broek offer ways to consider how comprehension might be achieved.

6.1.4 *Verbal Efficiency Model, Lexical Quality Hypothesis, and Word-to-Text Integration*

In 1985, Perfetti published his early groundbreaking book *Reading Ability* that integrated many of his early research findings on reading comprehension processes. Along with his colleagues, he developed the Verbal Efficiency Model. Since that time, Perfetti has extended aspects of his model in various publications (1992, 1999, 2003, 2007; Perfetti & Hart, 2001). The early model assumed that lower-level processes (phonological, orthographic, morphological, and semantic processing) for skilled readers are relatively automatized and interact efficiently for word recognition (and lexical access). This efficiency for familiar words allowed cognitive resources to be used for other comprehension processes. Efficient word recognition skills were central to the model, and the model suggested that readers often have problems with higher-level comprehension skills because of inefficient word identification skills. Less skilled readers generally have low-quality lexical representations, and this problem is indicated by slow word recognition, spelling problems, and relatively weak phonological knowledge.

The Verbal Efficiency Model argued that individual differences in comprehension and weaker comprehension skills are primarily due to processing inefficiencies at the lexical level. At the same time, the Verbal Efficiency Model recognized other sources of bottlenecks that limit comprehension (Perfetti, 1985; Perfetti & Hart, 2001). Discussions of the importance of fully specified and redundant lexical representations and efficient word recognition processes have since been developed as the Lexical Quality Hypothesis (Adlof & Perfetti, 2014; Andrews, 2015; Perfetti, 2007; Stafura & Perfetti, 2017; see also Chapters 2 and 11).

This hypothesis, in its early version, argued that lexical access (word recognition) involves three constituent information sources working in combination: phonological information, orthographic information, and semantic information, each contributing to high

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lexical quality. Later, it has expanded to include morpho-syntax as well (Perfetti, 2007, 2017). These constituents are not separate components of word recognition, but rather, are tightly integrated constituents sharing information until a given word is recognized. The quality of lexical entries is suffused with long-term knowledge – the extent to which a given lexical entry activates associations with (a) related meanings across multiple words, (b) phrasal dependency frequencies, (c) clausal syntactic associations, (d) statistical co-occurrence relationships, and (e) discourse sensitive associations. This hypothesis suggests that there can be several sources of word recognition limitations, or alternatively that there are several levels of (implicit) lexical associations that contribute to automatic word activation and fluent text processing.

A second major expansion in theory building involves Perfetti's concept of Word-to-Text Integration processes. Word-to-Text Integration accounts for reading comprehension processing beginning from the point of lexical access, to the integration of new information with prior text processing, and to the development of a coherent situation model of comprehension (Perfetti & Stafura, 2014, 2015; Perfetti et al., 2013; Stafura & Perfetti, 2014, 2017; see also Chapter 3). This concept explores the movement from word-level to text-level processing and the development of discourse-level processes for reading comprehension. At the same time, other comprehension problems, such as problems with syntactic parsing, text-base development, situation model formation, comprehension monitoring, or inferencing can be additional causes of poor comprehension. More recently, Perfetti and colleagues have argued persuasively that the Lexical Quality Hypothesis intersects with a Word-to-Text Integration process.

6.1.5 Reading Systems Framework Approach

> Many efforts at instructional "theory" are really frameworks… because they do not lead directly to precise predictions. Nevertheless, a theoretical framework does entail a hypothesis-testing research agenda. (Koedinger et al., 2012, p. 760)

The most recent evolution of Perfetti's views are captured in his Reading Systems Framework Approach. The rationale for Perfetti's shift from a "model" to a "framework" stems from the idea that no model can capture all of the factors that might contribute to reading comprehension abilities or its development. Instead, the goal is to propose an evidence-based framework that accounts for many important components of reading, but also recognizes that other variables may contribute as new research is carried out. In this way, the Reading

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Systems Framework assembles an empirically driven, but partial account of reading comprehension abilities while also allowing for additional empirically supported future variables.

The Reading Systems Framework is developed around three key components: *knowledge* (linguistic, orthographic, and general background), *reading processes*, and *general cognitive resources*. Skilled readers need to have strong abilities in all three areas. As shown in Figure 6.1, three types of knowledge organize the various component abilities that influence reading comprehension. The linguistic processes that lead to comprehension are identified as word recognition and lexical quality, Word-to-Text Integration, and the production of the situation model.

Lexical quality knowledge not only represents individual words, but also multiword segments, phrasal units, and even parts of clausal structure called up much like individual words. The latter, "construction" units, follow from the growth of language knowledge specified by usage-based language learning, statistical language knowledge, and other associative relationships among lexical entries (Chapters 2 to 4). Word-to-Text Integration includes all of the background knowledge and associated knowledge activated by lexical quality processing; thus, the text representation level of discourse comprehension may not require much inferencing and it may not differ significantly from the situation model. In cases where a text or task is challenging or when students are poor readers, a considerable amount of more explicit knowledge production through inferencing and other problem-solving cognitive skills will be needed to build a more coherent (and hopefully accurate) situation model. The Reading Systems Framework is outlined in Figure 6.1

While the Reading Systems Framework Approach may not make precise predictions for all types of readers carrying out all types of tasks, in different languages, and in second or third languages, it nonetheless captures much relevant information and juxtaposes it with other research already known to date. This framework allows for new hypotheses or, alternatively, for general sets of insights that can account for variations in reading abilities and support more effective instructional applications.

As one example of new hypotheses to incorporate into the framework, research on reading practice has led Perfetti, Stafura and Adlof (2013, p. 24) to make the following suggestion as a possible expansion of the Framework:

> The default hypothesis for what causes the development of reading skill is relevant knowledge and practice in applying that knowledge in reading. If this sounds too simple, it probably is. But this is the formula for expertise in other domains….

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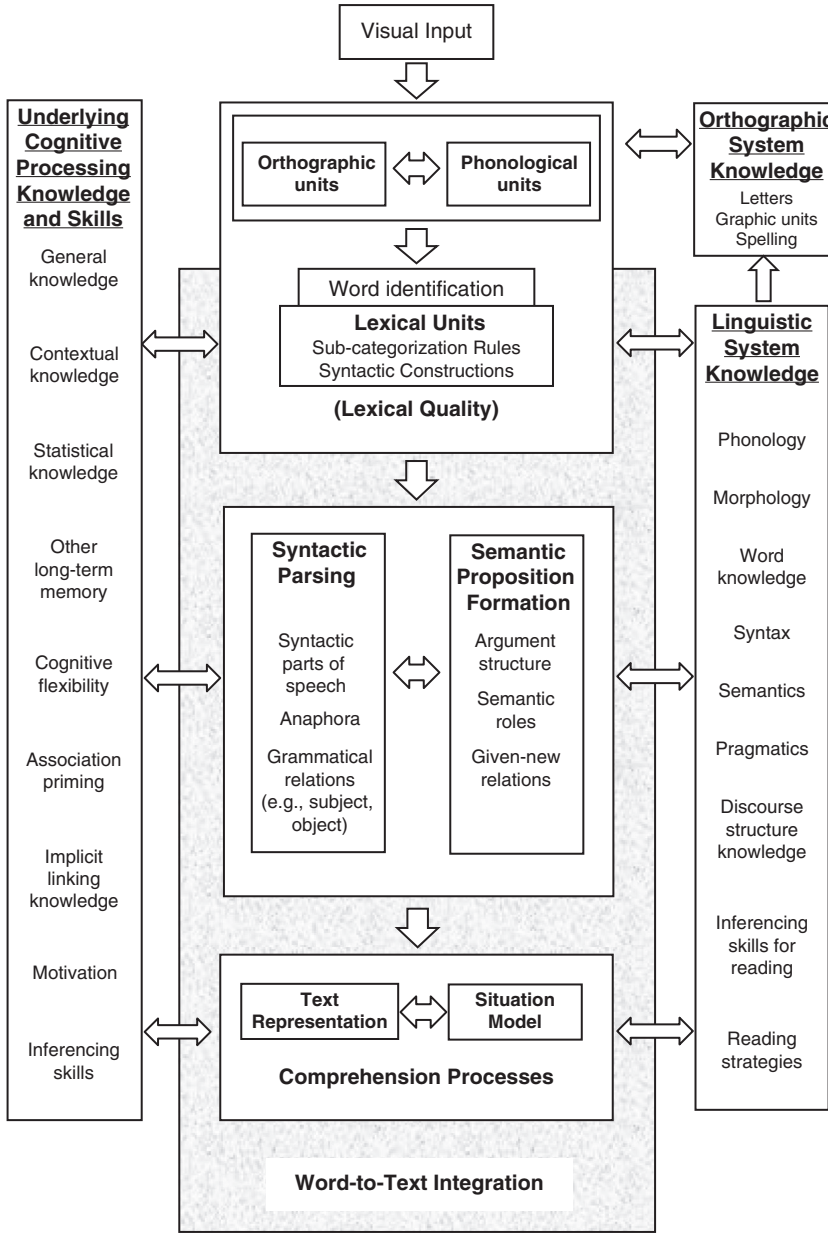


Figure 6.1 Reading Systems Framework approach (adapted from Perfetti & Stafura, 2014)

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> The reading field might consider this skill model more seriously. *Effective practice reading text* strengthens word knowledge, informational knowledge that supports subsequent reading, and basic and higher level skills in identifying words, retrieving context-relevant word meanings, and making coherence preserving inferences. The challenge is to make practice effective. (p. 24, italic emphasis by WG & JY)

This conclusion about reading exposure and reading practice has become more widespread among reading researchers in the past decade (Alderson et al., 2016; Andrews, 2015; Castles et al., 2018; Ellis, 2019; Geva & Ramirez, 2015; Mislevy & Sabatini, 2012; Mohamed, 2018; Mol & Bus, 2011; Oakhill & Cain, 2017; Seidenberg & MacDonald, 2018; Sparks et al., 2014; Stafura & Perfetti, 2017; Steacy et al., 2017; Suk, 2017; Verhoeven, 2013; Webb & Chang, 2015).

At present, the Reading Systems Framework Approach is the best overall way to translate new research on reading comprehension and development. This framework can incorporate the Simple View of Reading, the C-I Model, and the Landscape Model. It is compatible with the greater role for implicit learning and implicit memory processing described in earlier chapters. It supports the idea that reading develops from many experiences with texts and with an incremental accumulation of language usage knowledge. It directly incorporates a broad range of underlying cognitive skills that have not been widely addressed in combination. Finally, it provides an interpretable and plausible pathway from word recognition to text comprehension.

6.2 L2 Reading Comprehension and Models of Reading

In L2 reading research, only one general, descriptive model of reading has been proposed (Bernhardt, 1991, 2010), and it is somewhat vague in its specifications of multiple component abilities and in its implications for reading development. There are good reasons why frameworks specific to L2 reading comprehension and reading development are challenging. Aside from all of the component skills, processes, and knowledge resources for L1 reading, there are many more variations in L2 language proficiency, motivations for learning to read the L2, and variable opportunities for extensive reading (see Chapter 8).

From a more applied perspective, there is also a wider range of varying outcomes from L2 reading instruction (e.g., many L2 readers never become fluent) as well as many different consequences for L2 learners (e.g., not needing the L2 beyond school requirements, not planning to use the L2 for professional reasons after graduation). In

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addition, L2 students often leave language classes after a relatively short period of time in language instruction situations, and it is generally more difficult to track and assess progress in L2 reading over longer periods of time (outside of L2 K–12 instruction). Further, from a research perspective, relatively fewer research resources and grant funding possibilities are available for L2 reading research.

At the same time, it would be a mistake to ignore the many advances that have been made in L2 reading research. In the United States, L2 reading research has demonstrated that L2 reading developmental paths appear to be quite similar to L1 developmental paths. While L2 students may have lower scores on various component skills, the variables that are important for L2 performance are, with minor variations, the same ones that are important for L1 student performance, for example, phonological awareness, word recognition, vocabulary, syntax, background knowledge, executive functions, and motivation (Jeon & Yamashita, 2014; Nassaji, 2014; Verhoeven et al., 2019). Similar results are common in studies where Dutch, German, and Chinese are the L1 and other languages are the L2 (e.g., Chung et al., 2019; Verhoeven, 2017; Verhoeven & van Leeuwe, 2012; Verhoeven et al., 2019).

One specific study demonstrating similarities in terms of important components of reading (vocabulary knowledge and syntactic knowledge) was reported by Yamashita and Shiotsu (2017). In a sample of 325 Japanese university students studying L2 English, they found that comprehension components in the Simple View of Reading in L2 English were the only factors predicting L2 reading comprehension (with $r^2 = 0.94$) (see also Chapter 8). Similar evidence of well-recognized L2 components accounting for L2 reading comprehension were reported in studies by Mancilla-Martinez and Lesaux (2010, 2017) and Goodwin et al. (2015). Because of the similarity in component skills and developmental paths in L1 and L2 reading, models of reading, and the Reading Systems Framework, apply equally well to L1 learners and L2 learners (see also Alderson et al., 2015; Jeon & Yamashita, 2014; Verhoeven, 2017; Verhoeven et al., 2019). Some unique aspects of L2 reading will be discussed in Chapters 7 and 8.

6.3 Implications for Instruction

Implications for reading instruction that stem from the models introduced in this chapter support implications raised in prior chapters and anticipate discussions in many of the chapters to follow. For this reason, in this chapter, we keep our implications for instruction at a more general level of principles that can guide reading curricula design and instructional practices.

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A major theme running across most of the current models of reading (and Chapters 1 to 4 in this volume) is the importance of component reading skills that contribute to reading comprehension. The models discussed in this chapter suggest reading curricula that focus instructional efforts on a number of specific component abilities. These component skills include word recognition, vocabulary knowledge, syntactic knowledge, discourse awareness, inferencing, comprehension monitoring, fluency, and motivations for reading. Models of reading, based on component skills assumptions, argue that each component skill can be a source of reading problems, and each needs to be considered in planning for well-developed reading curricula.

A second implication, reinforcing the implications from Chapter 2, is the importance of lower-level processing and the limitations of somewhat more vague expectations that readers can simply comprehend texts without adequate explicit attention to major component skills. For example, weaker readers more often are not weak because they do not engage in higher-level processing. Rather, they are weaker because they are unable to carry out lower-level processing easily and fluently, and this problem prevents cognitive resources from being used for comprehension. One major implication for L2 instruction is that automatic word recognition ability is a critical component of fluent reading. To enhance automaticity skills, fluency practice of various types should be considered in any reading curriculum (Grabe & Stoller, 2020).

A third implication is that many words must be thoroughly established in students' internal lexicons (the Lexical Quality Hypothesis) (see also Chapter 11). Learners need to know a lot of words well to be good readers. Their lexical knowledge should also be thought of in terms of multiword units, phrasal units that commonly co-occur with specific words, and even parts of clausal constructions that commonly associate with specific words, although these latter forms are likely to be based on extensive exposure to texts. The need to know more frequent words at some depth of knowledge also suggests that extensive reading and word recycling in many contexts will not only provide reinforcement of word learning, but also opportunities to build deeper word knowledge.

The Lexical Quality Hypothesis also highlights the centrality of implicit knowledge development from extensive incremental exposure over time. Much of our lexical and syntactic knowledge used for comprehension is gained implicitly, and the only way this can happen is through extensive exposure to reading texts. Ellis and Wulff (2015) explain the critical role of exposure to reading in terms of language learning, as follows:

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> The majority of language learning is implicit. Implicit tallying is the raw basis of human pattern recognition, categorization, and rational cognition…. The tuning of the system to the probabilities of the input evidence is unconscious. So also is the emergence of structural regularities, prototypes, attractors, and other system regularities…. We know … far too many linguistic regularities for us to have explicitly learned them. Usage-based approaches [to learning] maintain that incidental associative learning provides the rational mechanisms and is sufficient for L1 acquisition. (pp. 86–87)

What is true of language learning, more generally, is also true for the development of L2 component skills for reading comprehension.

A fourth key implication is that fluency instruction, and the effort to have readers increase their reading rate at somewhat faster than normal rates, is an important ability that runs in parallel with increasing comprehension abilities. Reading fluency is not easy for L2 students to develop, and it usually goes hand in hand with extensive reading and vocabulary growth. However, fluency practice cannot be an afterthought in instructional planning; rather, it needs to become an equal partner with comprehension practice in reading instruction (Chapter 17).

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PART II
PATTERNS OF VARIATION IN READING

Part I identified the component skills that are considered as cognitive factors in reading. Part II explores aspects of variation in reading ability that are not specifically associated with individual cognitive differences among learners. Instead, chapters in Part II examine how reading abilities can vary across learners who read in different languages, who read in more than one language, who come from different social contexts, and who read with differing levels of motivation.

Chapter 7 outlines differences in reading abilities that are due to reading across first languages (L1s). The fundamental argument of this chapter is that there are variations in word and sentence processing based on the specific L1 orthographic systems. These orthographic differences across languages are captured in part by the Orthographic Depth Hypothesis, which is described in some detail. Other orthographic differences across languages that contribute to L1 reading variation include differences in (a) syllable complexities allowed by different languages (phonotactic constraints and consonant clusters), (b) degrees of morphological complexity allowed by varying L1s, and (c) informational density presented by the script. At the same time, the study of reading across L1s highlights universal aspects of reading, which are discussed in the latter part of the chapter.

Chapter 8 focuses specifically on L1 and second-language (L2) relations in L2 reading. The chapter begins with a careful examination of L1–L2 differences, most of which are associated closely with L2 linguistic, socioeducational, and cultural developmental factors. That is, differences between L1 and L2 reading are due to more limited skills in processing L2 texts, less exposure to L2 reading experiences, fewer experiences in using L2 texts, and limited L2 linguistic, social, and cultural knowledge. At the same time, the importance of L1 transfer effects remains crucial to a fuller understanding of L2 reading development. The chapter examines perspectives on L1–L2 relationships and concludes by focusing on reading development as an outcome of acquiring the L2 while also learning to read with an emerging dual-language system.

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Chapter 9 addresses social context factors in reading development by focusing on quantitative and experimental research, reporting primarily on the development of English L1 reading and English L2 reading. The goal is to understand better those social context factors that form the foundation of reading abilities regardless of L1 and that can have a major impact on L2 reading development, even if relatively little research exists on this aspect of L2 reading. Most discussions of social context influences on L2 reading focus almost exclusively on language and cultural differences that are created by crossing cultures and socialization practices. These cultural, language minority, and educational socialization issues typically emphasize differences between home and school practices. However, that body of research is limited in its research scope as compared with L1 research, and many possible avenues of exploration are not pursued in L2 discussions on social context factors. A goal of this chapter, then, is to identify a number of additional research options that can be examined much more carefully among L2 groups.

Chapter 10 describes another source of variation among readers, whether L1 or L2 – the impact of motivation on reading development. In the past two decades, much more attention has been paid to reading motivation in multiple L1 reading contexts. This research has identified motivation as a major contributing influence on L1 reading development. This research is reviewed as a way to highlight the importance of motivation, explore the multiple ways in which motivation is studied, and identify ways to enhance reading motivation. In L2 reading contexts, relatively few discussions of reading motivation exist, and little research on the impact of motivation on reading has been carried out. An important goal of this chapter is to encourage further exploration of L2 reading motivation. A second goal is to highlight ways to incorporate more motivating instruction into the classroom. A large number of research studies and teaching recommendations have emerged in the past decade in L1 contexts. L2 research lags behind in this important area of reading development, and many L2 research opportunities are available for connecting motivation to L2 reading abilities. Chapter 10 also addresses instructional possibilities in considerable detail, representing the first of several chapters that highlight instructional implications in greater depth.

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7 *Reading in Different Languages*

Recent studies suggest that the nature of a writing system will influence the early stages of learning to read, and may leave developmental footprints that are detectable in cross-language comparisons of skilled word recognition. (Rayner et al., 2012, p. 287)

This chapter outlines some of the differences in learning to read in differing first languages (L1s). Because different languages vary in their phonological, orthographic, morphological, syntactic, and semantic systems, a given L1 and second language (L2) could be quite different from each other linguistically. Generally speaking, the linguistic differences, or linguistic distance, between any given L1 and L2 will be a factor to consider in L2 reading development. When two languages are more distinct linguistically, there is a greater likelihood (though no guarantees) that there will be greater linguistic processing interference. An examination of reading in different L1s helps to interpret the notion of "linguistic distance" as a useful concept. Moreover, the exploration of reading development in different languages can help identify the extent to which there are universals of reading development and the extent to which the interaction between a given L1 and L2 will create unique issues for learning and instruction. This issue of different patterns of L1 reading development provides additional perspectives on some of the difficulties that L2 readers might face as they learn to read an L2.

In exploring reading development in different languages, this chapter does not make any claim for comprehensiveness. Crosslinguistic variability in reading is already a basis for multiple books and major reviews (Chen et al., 2016; Frost, 2005; Koda & Zehler, 2008; Pae, 2018b; Seymour, 2006; Verhoeven & Perfetti, 2017b; 2022). The differences that are outlined in this chapter point out the many complexities of learning to read in an L2 and many reading-instruction issues that need to be considered as well, including the transfer effects that are observable when students read in their L2s. Different phonology, orthography, morphology, syntax, lexical semantics, and discourse

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features create countless patterns of similarities and differences across any two languages. How these patterns interact with growing L2 reading proficiency is the subject of the latter part of this chapter.

7.1 Reading in Different Languages

> In learning to read, children, in all languages, must first recognize which language elements are directly encoded in the writing system…. Although the linking requirement is universally imposed, how it is accomplished varies across languages. (Koda, 2007, p. 12)

Several aspects of reading are very likely universal (Verhoeven & Perfetti, 2017a). Most of these aspects have to do with the nature of cognitive processing mechanisms more generally and universal concepts of language knowledge. All readers make use of visual word recognition processes while reading and engage in phonological processing in reading at the earliest possible moment that the orthography allows. All readers use syntactic information to determine text meaning and text comprehension. All readers set goals, engage in reading strategies, and apply some level of metacognitive awareness to text comprehension. On the purely cognitive side, all readers use a capacity-limited working memory (WM) system, draw on long-term memory (LTM; background knowledge) to interpret text meaning, engage in very rapid pattern recognition, and automatize well-practiced processing skills.

In terms of language knowledge, there is a long and interesting literature on language universals and language variation (Comrie, 2018; Crystal, 2010; Hawkins, 2014) despite occasional odd counterexamples. For example, all languages have nouns and verbs. All languages have vowels. All languages have stop phonemes. All languages have first- and second-person pronouns. All languages have relative clauses or relativization-like structures. Furthermore, all languages use recursion or related mechanisms (e.g., embed a noun phrase within a noun phrase, embed a clause within a clause) to build more complex syntactic clauses. In all of these respects, one can say that reading requires fluent readers to draw on universal human processing skills and language knowledge.

Of course, the above skills and knowledge resources do not comprise all that there is to reading comprehension. In many cases, these skills and resources are similar at the level of general cognitive architecture and language learning, but they are not similar in the specific details of how they work in differing languages. Thus, a major issue is determining what is general across languages and what is specific

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to reading development in each language (Frost, 2012; Hawkins, 2014; Helms-Park et al., 2016; Verhoeven & Perfetti, 2017b; 2022). This chapter will expand on these similarities and differences. The outcome of this exploration demonstrates that reading in different languages involves a number of specific differences that cannot be ignored. These differences influence the path of L1 reading development and patterns of L1–L2 transfer (see also Chapter 8).

Languages vary in a number of ways that influence how fluent readers process a text. Foremost among these differences are the diverse orthographies that visually recode the phonological and morphological systems of each language (see Comrie, 2018; Crystal, 2010; Helms-Park et al., 2016; Verhoeven & Perfetti, 2017b). The phonology and morphology of different L1s vary widely and can influence reading processes. First, languages vary considerably in their phonological systems, some being quite limited, others being very extensive. Crystal (2010) notes that the fewest phonemes in a language are eleven (Rotokas, an Indo-Pacific language; Mura, a Chibchan language). The largest number of phoneme sounds in a language is 141 (!Xu, a Khoisan language). English has around forty phonemes (Perfetti & Harris, 2017). According to Crystal (2010), vowel systems range from three vowels to twenty-four vowels (again !Xu). Most languages have five to seven vowels. Indo-European languages tend to have large vowel systems in comparison to most languages of the world (e.g., German and Norwegian both have fifteen vowel sounds).

Beyond the level of the phoneme itself, languages vary considerably in the allowable structure of syllables. A number of languages use only consonant-vowel (CV) or vowel (V) structures as its allowable syllables (e.g., Hawaiian, Japanese). Many others also include CVC as an option (e.g., Chinese, Hebrew, Turkish). Some languages can be quite extreme in what they allow. English, for example, allows CCCVCCC (*strengths*). This extreme syllable structure combination strikes speakers of many languages as very unusual.

It is also obvious that the vocabulary and grammar of each language can be quite distinct from one language to another and that there is a wide range of variability across languages. Even in the area of strategic processing, certain languages may privilege one set of strategies over others, depending not only on the orthography and morphology of each language but also the social and cultural uses of texts (e.g., Chinese readers place more emphasis on visual processing, Hebrew readers place more emphasis on processing consonants, Czech readers place more emphasis on initial consonant cluster recognition (see Verhoeven & Perfetti, 2017b).

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Many books describe linguistic differences across L1s as well as examining their impact on reading skills development. This chapter focuses primarily on word recognition processes and the impact of differing L1 orthographies, phonologies, and morphologies on word recognition processes. While languages vary considerably in their syntactic structures, relatively little research demonstrates how these differences would impact readers from different L1s (and L2s) (cf. Frost, 2012; Verhoeven & Perfetti, 2017a). Differences across L1s in higher-order reading processes, to the extent that they can be generalized, are less likely to be due to language differences in the orthography, phonology, morphology, and syntax of the languages involved.

7.2 Orthographic Systems

Orthography refers to the writing system and how the writing forms (or graphemes) of a language reflect the phonology (as discrete sounds and syllable units) and morphology (as minimal units of meaning) of a language. These are the two prominent language subsystems critical for word recognition in a language. Anyone who has learned both a non-alphabetic language and an alphabetic language (one as L1, the other as L2) is well aware of the large differences that the orthography of the language can impose on visual comprehension processing. These differences include the extent to which phonology is directly reflected in the orthographic graphemes and the extent to which morphology is directly coded in the orthography. They also include whether or not the language is primarily alphabetic, syllabic (e.g., Cherokee or Japanese Kana), alphasyllabic or abugida (e.g., Kannada or Thai), morphosyllabic (e.g., Chinese or Japanese Kanji), or consonantal alphabetic or abjad (e.g., Arabic or Hebrew) (Chang & Perfetti, 2018; Share, 2017).

In alphabetic languages, each graph (or digraph) maps onto a phoneme. In a syllabic system, distinct graphic symbols reflect syllables in the languages (e.g., there could be separate symbols for *ba*, *be*, *bi*, *bo*, *bu*, or they are related by a common consonantal component in an alphasyllabic language). Only Chinese and Japanese Kanji are classified as morphosyllabic writing systems. This notation reflects the fact that these characters indicate a meaning component (as a stand-alone morpheme or a semantic radical) and often a phonological, or syllabic, component. As much as 80–90 percent of Chinese characters have both a phonetic and a semantic radical component (Chen & Pasquarella, 2017). Moreover, most Chinese "words" are multicharacter, usually involving two characters (80 percent according to Hanley, 2005). So almost all "words" in Chinese have some phonetic indication.

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The alphabetic designation itself includes several types of distinctions. In alphabetic languages such as English or Spanish, both vowel and consonant are represented by a graph, whereas in abjad, graphs map onto consonants only (i.e., vowels are not written), although diacritics/pointers are added to show vowels to help beginning readers. Abugida scripts are alphasyllabaries where graphemes simultaneously represent sound at the level of the phoneme and the syllable (Nag et al., 2011).

It should be pointed out that reality is more complex than this categorization, and few languages are purely one of these types. Japanese stands out as an example. It is a mixed writing system using both syllabic and logographic systems. Hangul in Korean has been primarily regarded as alphabetic in reading research, but it shows abugida features as well with letters (phonemic symbols) written in syllable blocks, thus representing both phoneme and syllable units (Nag et al., 2011).

Alphabetic writing systems, more specifically, may be more or less reflective of phonological or morphological processes in the language (see Chapter 2). English prioritizes the phonological system, but also strongly preserves a morphological system in its orthography. For example, the plural suffix "s" in *cats* and *dogs* looks like the same morpheme, though it represents two different phonological sounds. We do not spell *dogs* as *dogz*, so the English orthographic system preserves the same morpheme rather than spell the words exactly as they sound. Another critical aspect of orthography that affects learning to read is the transparency of the mapping between a graph and what it designates. In the alphabetic writing systems, the correspondence between grapheme and phoneme is transparent in some languages (e.g., Finnish or Korean), whereas opaque in some others (e.g., English or Danish) (see Section 7.5, "The Orthographic Depth Hypothesis").

The graph appearance reflects a continuum of visual complexity. Alphabets and morphosyllabaries are at opposite ends of the continuum, with alphabets being simpler, morphosyllabaries (e.g., Chinese) being complex, and alphasyllabaries in between. The visual complexity and the number of graphs in the language are associated with the prioritization of the phonological or morphological system in a given language, with a more visually complex script using a larger number of graphs. Accordingly, alphabets use fewer graphs (24–36 for most); morphosyllabaries require largest numbers of graphs (over 2,500 in Chinese); and alphasyllabaries are in between these two writing systems (200–500) (Chang & Perfetti, 2018). The number of graphs affects the time to master the whole set of graphs. In alphabets, children usually master all graphs during the 1st grade; in

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alphasyllablaries, children need three to four years of instruction; in morphosyllabaries, children continue to learn new characters after six years of education (Chang & Perfetti, 2018).

7.3 Traditional Taxonomic Classification of Languages

Languages also vary considerably in their use of morphological forms – the affix, stem, or character form variations that indicate grammatical and semantic changes to the word (Crystal, 2010). These variations in morphological forms and their uses can also impact the potential processing complexity for reading a language. These uses of morphological forms across languages have generated a typological classification system that both overlaps and cross-sects somewhat with the writing system classification of alphabetic, syllabic, and morphemic writing systems. Languages such as Chinese have very few grammatical or semantic morphemes (and are therefore called **isolating** languages). Chinese words basically come in only one word form. English is also fairly simple in terms of its morphology (though Old English was very complex morphologically). There are many derivational prefixes and suffixes, but inflectional morphology is very simple, making English noun case and verb conjugation forms fairly easy to learn and use. While both languages may be isolating on use of morphemes, they have obviously different writing systems,

In **agglutinative** languages (e.g., Finnish, Japanese, Swahili, and Turkish), words can become quite long through affixation processes. For instance, words in Turkish, a language typically labeled as such, often have strings of multiple affixes (as prefixes, infixes, and suffixes), often with each affix adding some additional information. Finnish is an even more complex agglutinative (and fusional) language, adding many affixes to the stem with many types of grammatical and semantic information. Many agglutinative languages combine strings of morphemes to a word stem but nevertheless privilege phonology by maintaining mostly transparent and direct sound-letter correspondences for purposes of word recognition.

Fusional languages (e.g., Arabic, Greek, and Latin) are identified by complex inflectional morphology that combines multiple semantic and syntactic aspects of information into a single form. For example, Spanish verb endings combine information on person, tense, and number. Two other types of complex morphological systems lead to languages being labeled as **polysynthetic languages** (e.g., Eskimo, Mohawk, and multiple Australian languages) and complex **consonantal root languages** (e.g., Hebrew). For example, the Aboriginal language Tiwi can create full sentences by complex affixation

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processes on a single root word form. Hebrew builds many word variations on three-consonant root forms, such as the root KLT, creating "KaLat ('he grasped'), niKLaT ('was grasped/absorbed'), hiKLiT ('he recorded') and many more" (Share, 2017, p. 159). It also adds a range of external affixes and has an extensive inflectional morphology system for nouns, adjectives, and verbs.

The traditional taxonomic classification system of languages tends to vary across many of the key distinctions in the orthographic writing systems taxonomy, and groups many languages together with a fairly loose and variable classification system. For the purposes of reading research and reading development, the orthographic writing systems classifications are more useful and more appropriate.

7.4 The Orthographic Writing System and Learning to Read

One challenge for the orthographic writing systems approach is the role of phonological processing at different stages of reading development. It is generally accepted that phonological awareness is a universal feature of becoming a fluent reader (see Perfetti, 2003; Perfetti & Verhoeven, 2017; see also Chapter 8). There are many complexities to this universal, some of which are tied to extreme variations in the ways that grapheme units at multiple levels reflect consistency and regularity in supporting phonological processing of words.

These variations across languages are reflected by numerous options in the orthography of these languages. Chinese only reflects phonology indirectly and fairly loosely, incorporating inexact phonetic components in a large subset of Chinese characters (approximately 40 percent consistency between phonetic component pronunciation and character pronunciation; Koda, 2005). English has a particularly complex set of relationships between the sounds and the letter combinations for vowels. Japanese combines three script systems to reflect syllables (Hiragana, Katakana) and morphemes (Kanji). These examples and many others illustrate the impact of a language's phonology (and morphology) on its orthography and the possible difficulties that can arise in learning to read. Many of these distinctions, and their impact on reading, are captured by the Orthographic Depth Hypothesis.

7.5 The Orthographic Depth Hypothesis

> The orthographic depth hypothesis … posits a continuum of shallow to deep orthography and predicts that the depth of a script has an impact on the processes governing lexical access and, therefore, word recognition. (Helms-Park et al., 2016, p. 16)

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The Orthographic Depth Hypothesis states that orthographies (particularly alphabetic orthographies) have varying degrees of transparency between the phonological segments of the language and the orthographic symbols intended to represent the phonological segments. An orthography that closely represents the phonology of the language in clear one-to-one relationships is a shallow (or transparent) orthography (e.g., Finnish, Serbo-Croatian). An orthography that does not closely represent the phonology in a clear one-to-one relationship is a deep (or opaque) orthography (e.g., English). The orthographic depth of a language varies along a continuum rather than being an either/or determination. Most importantly for the present volume, the orthographic depth of a language has important implications for word recognition processes in reading (Caravolas & Samara, 2015).

The shallowness or depth of letter–sound correspondences can be examined in multiple ways. Two factors are considered basic for orthographic depth discussions: regularity and consistency. The two concepts are very similar and often overlap, but they are separable (see Balota et al., 2006 for discussion of these two factors). Regularity refers to the extent to which words in a language follow expected correspondences between words and word-level pronunciation (usually caused by specific types of letter–sound correspondences). For example, in English, the first sound in *chili* is pronounced /ch/, and this is the expected letter–sound correspondence. There are exceptions to this expectation in English: *chord*, *chef*, and *yacht*. There are many exceptions of this type in English, so English is a fairly irregular language. Consistency is specifically designated to refer to the rhyme segment of words (the word-final coda). For example, in English, the orthography of the word *trip* is completely regular. The /ɪ/, the /p/, and the syllable rhyme (coda) *ip* can only be pronounced in one way. The rhyme relationship is fully regular (*trip, slip, skip, ship, lip, rip, nip, tip*). If you have a certain spelling, it can only be sounded out in one way.

However, English has many inconsistent spelling patterns for the rhyming part of words. So, for English, there are two productive regular options for the spelling form "ea" (and a third that could be considered irregular). For example, in English, the letter sequence "ea" can be pronounced in either of two common ways: first as /i/: *heal*, *deal, peal, dream, beat*; or as /ɛ/: *head, bread, sweat, read, dealt, lead* (also, uncommon options, perhaps irregular, would involve */ə/learner*, /a/ *heart*, or /ay/ *steak*, *break*). It should be clear from this example that a learner seeing "*ea*" will not know how to pronounce it outside the specific word. The complexity of a language could include it being more or less regular and more or less consistent. English

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appears to be both less regular and less consistent (making English a deep-orthography language).

The depth of an orthography can also be associated with the completeness of the orthography in representing sounds. In Hebrew, for example, certain vowel sounds are not represented in the normal adult orthography. In this way, Hebrew has a deep orthography because it is potentially ambiguous in how to sound out words. It is not a matter of irregular or inconsistent mapping between letter and sounds. It is simply the case that some sounds in normal Hebrew have no orthographic representation. In fact, the orthography of Hebrew, for the sounds that it does represent, is very shallow, or transparent (i.e., highly regular and very consistent) across all letter–sound correspondences. In Hebrew, if you see a letter, you know how to pronounce it.

It is also possible to consider orthographic depth from a spelling perspective (from sound to letter rather than from letter to sound). If a word in an L1 is heard, is there a regular and consistent correspondence so that one would know how to spell the word just from hearing it pronounced? In fact, one orthographic form may have one pronunciation, but one pronunciation may be represented by more than one orthographic form (or form sequence). In English, for example, if you saw "ff," "f," or "ph," you know that the sound is /f/, but if you hear /f/, you cannot be sure how to spell it. More generally, in French the letter-to-sound mappings are fairly consistent and regular. However, the mapping from sound-to-letter forms is very irregular, thus making spelling very difficult when just hearing a word. In English, most commonly the correspondences between sounds and graphic forms can be opaque in both directions. The graphic form "*ough*" can be pronounced in a number of different ways: *though*, *through*, *thought*, *bough*, *enough* (decoding, letter to sound direction). The sound /i/ can be represented with different graphic forms in the following words: *seal*, *peel*, *ceiling*, *icy*, *recent* (spelling, sound to letter direction). In English, very often a person has to know the specific word to know how to spell it.

Language can also be classified for orthographic depth in terms of simple or complex correspondences. In some languages, the correspondences between individual letters and individual sounds are very regular. However, in specific contexts in relation to other letters and other sounds, the sound of a given graphic form changes. In English, the letter "c" varies in a patterned way in words such as *cell* and *call* (because a following "low" vowel changes /s/ to /k/). More generally, in English, the addition of derivational morphemes changes stress patterns and changes vowel (and some consonant) sounds. These morphological changes lead to letter-to-sound changes within

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words ("electric" to "electricity," "nation" to "national") but do not significantly disturb the spelling of English words. This preference in English to preserve morphology over phonology is a major reason why it is a deep orthography (but not the only reason).

An example helps explain why English is a deep orthography that preserves morphological information, but loses letter-to-sound regularity. Using the contrast between *nation* and *national*, the first vowel in *national* (/æ/) has become different from *nation* (/ay/), but we keep the same spelling in English ("a"). The same two vowel sounds, in other spoken English words, create very different words (e.g., *bait* versus *bat*). But in *national*, despite the different first vowel sound, we know that we are referring to the same base word. In this way, English preserves the morphological similarity (and follows complex stress patterns), and sacrifices the sound similarity. If the spelling of "a" in *national* were changed to reflect the change in pronunciation, we would save the letter–sound relationship, but we would lose the information that the two words come from the same source (losing morphological information). In other languages that are much more regular and consistent, in Serbo-Croatian for example, the addition of morphemes to base words almost never changes the letter-to-sound correspondences.

Considering these factors, the orthographic depth of any language is not a single nor a simple factor. Languages all vary in their extent of regularity, consistency, and completeness of representation. Languages can also vary in the extent to which the additions of morphemes impact the letter-to-sound correspondences. Moreover, all languages vary in direction (decoding or spelling) in terms of regularity, consistency, and completeness of representation: For purposes of reading, the discussion that follows focuses on letter-to-sound correspondences (reading and decoding) rather than sound-to-letter correspondences (spelling).

Orthographic depth is a continuous notion, rather than categorical (shallow versus deep), with one language more or less deep than others. Finnish, Hungarian, and Serbo-Croatian are often cited as very shallow languages. Only a bit less shallow are Greek, Icelandic, Italian, Norwegian, and Spanish. Most cases of irregularities with these languages are in the direction of sounds to letters (spelling). The letter-to-sound correspondences are very regular and consistent (i.e., if you see the letter, you know how to pronounce it). More moderate in depth are Portuguese, Dutch, and Swedish. Fairly deep languages include French and Danish. English is the deepest orthography in terms of regularity and consistency (Caravolas & Samara, 2015; Seymour, 2006). Hebrew (and also Arabic) is also a deep orthography,

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but this categorization is because of incomplete graphic representation of sounds. Languages that are logographic in nature may be regarded as yet deeper (more opaque) with respect to being able to pronounce words from the graphic forms (Chinese, Japanese Kanji). However, it may be worth mentioning that the notion of orthographic depth is most clearly applied to sound-based writing systems (alphabets and syllabaries), and scholars have different views regarding morphosyllabaries. Chang and Perfetti (2018) suggest that the notion should be restricted to alphabetic orthographies.

7.6 Consequences of the Orthographic Depth Hypothesis for Reading

One major consequence of the Orthographic Depth Hypothesis is that a given language reader will be more or less able to rely easily on letter–sound correspondences as the major developmental path to L1 word recognition and early L1 reading. For example, languages that have a shallow orthography (e.g., Finnish, German, Greek, Hungarian, Italian, Spanish, Turkish) allow schools to teach students letter to sound correspondences within months, as a relatively effortless process. These students benefit greatly from basic instruction in letter–sound correspondences and are able to read and recognize words quickly and easily (Aro, 2017; Caravolas, 2017; Caravolas & Samara, 2015; Landerl, 2017, Landerl et al., 2019; Verhoeven & Perfetti, 2017a).

A related consequence of the Orthographic Depth Hypothesis is that phonological awareness measures commonly used to assess beginning English readers turn out to be poor indicators of differences among learners in transparent languages (Caravolas & Samara, 2015; Share, 2008). In shallow languages, children in early stages of reading development almost all perform very well on decoding tasks because even weak readers gain quick command of letter–sound correspondences. As a result, these measures also do not predict later reading development with young readers of shallow languages (Caravolas & Samara, 2015; Landerl, 2017; Seymour, 2006). Instead, measures of word reading speed (Rapid Automatized Naming [RAN] measures) and vocabulary knowledge are better predictors of early reading development.

The situation is quite different for deeper orthographies, where phonological awareness is a major indicator of individual differences and a predictor of later reading abilities. Students learning to read in a deeper orthography (e.g., English) experience reading difficulties because of complex letter-to-sound relationships. They need to

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master letter-to-sound correspondences as quickly as they can, but it is a much more difficult task. In these situations, it is useful for students to build a store of simple sight words that they can recognize quickly and automatically because of the longer time it takes to develop recognition skills with letter-to-sound correspondences. Thus, L1 children reading in deeper orthographies (e.g., Danish, English, French,) need to build two skills at the same time: a fast lexical access process for quick recognition of very common words (sight word reading) and a more gradual process of mastering letter–sound correspondences that might take one to two years to control completely. In brief, greater lexical access processing (sight word reading) is required in languages with deeper orthographies (Ehri, 2015; Harris & Perfetti, 2017). This second system of sight word reading also makes greater use of larger letter–sound units, typically the rhyme units in syllables and affix forms to assist word recognition (Ehri, 2015). The need for recognition of full word forms at an early stage in reading development also holds for non-alphabetic languages (e.g., Chinese and Japanese), in which children learn two much more independent systems (i.e., phonological and logographic, or morphemic systems) (Seymour, 2006).

It is worth noting that English is the most opaque alphabetic orthography, so learning to read in English is very different from most other languages in the world. English reading instruction, as a consequence of its deep orthography, places a fairly unique emphasis on early sight word reading for very high frequency words. These early sight words give learners examples for learning more-complex letter–sound correspondences through analogies to the known sight words. L1 reading instruction in most languages, however, does not need to emphasize early sight word reading to the extent that it is done in English as a way to aid learning more complex letter–sound correspondences (Caravolas & Samara, 2015; Share, 2008).

Nonetheless, phonological awareness instruction is still very important for languages with shallow orthographies. All learners need to develop phonological awareness abilities for word recognition. But for shallow orthographies, it is easy to learn, and it does not constrain weaker students. However, phonological awareness does need to be taught to young learners to help them see the connections between orthographic units and sounds. In languages with shallow orthographies, this instruction may only take six months and not prove to be difficult for learners. Just as all children benefit from phonological awareness training (Bialystok, 2001; Caravolas & Samara, 2015), all learners are likely to benefit from some level of training in lexical access processes, or learning sight words (recognizing whole words

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and word parts that are very common). Even very shallow orthographies have some complications that can be accounted for usefully by learning common sight words (Frost, 2005; Seymour, 2006) or by training on larger orthographical units above the phonological segment (e.g., rhyme units) (Helm-Parks et al., 2016; Koda, 2016).

An additional consequence of the Orthographic Depth Hypothesis is that learners from deeper orthographies show a much stronger word frequency effect in experiments. In deeper orthographies, words that are less frequent take longer to recognize than words that are frequent. Languages that are highly regular and transparent allow learners to sound out longer, morphologically complex words quickly and quite easily. Even though these more complex words are less frequent and not familiar to learners, they can pronounce the words easily and WM rehearsal will be more efficient. Learners from deeper orthographies, because they do not have many encounters with less frequent words, will not know how to pronounce them as accurately, and their word recognition will be slower (Koda, 2005).

7.7 Other Factors in Word Recognition Development

Orthographies in several languages have additional impacts on word recognition that may be related to orthographic depth but also to other features of the orthography, such as densely organized orthographic print, the typical length of words in the language, and, with non-alphabetic languages, an emphasis on visual processing skills. One such consequence of orthographic differences is word reading time in different L1s. Learners from certain orthographies read consistently more slowly than readers in other orthographies. L1 readers of Chinese read words more slowly than readers of English. Readers pause longer at each word; their perceptual span is shorter (in Chinese, one character to the left and three to the right versus English, five letters to the left and twelve letters to the right), and their eye movements to the next orthographic unit are shorter (Rayner et al., 2012). A likely cause for these differences, and for slower word reading, is that these languages have greater lexical density; that is, they have more information per word (or orthographic unit) than does English. While fewer words are read in Chinese (and other languages, see the next paragraph) compared with English reading rates, it is an open question as to whether or not the actual rate of information processing is roughly equal across many languages with differing orthographies (Rayner et al., 2012).

Other languages with greater informational density per word also have slower reading rates per word than English. Hebrew readers, for

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example, are slower readers in words-per-minute than English readers (Share, 2017). Slower Hebrew reading is likely due to a combination of an extremely dense set of morphological information and a dense block-like print shape that requires more time (Rayner et al., 2005). German readers also read at a slower reading rate than English, even though it is an alphabetic language. Finnish and Turkish readers (and perhaps Norwegian readers) have more complex morphology and word formation processes that create longer words. Unpacking these words requires slower reading through phonological recoding, an important aspect of reading that leads to slower word recognition while reading texts (Durgunoğlu, 2006). These longer words also require readers "to attend to the word endings very carefully to understand the intended meaning" (Durgunoğlu, 2006, p. 220). Again, it is likely that a distinction needs to be made between word reading time across languages versus the rate of information processing across languages.

Word reading time is also tied to the Orthographic Depth Hypothesis because word reading time differences within shallower languages are strong predictors of early reading difficulties. In English, phonological awareness factors (and especially pseudoword reading-time measures) is a powerful indicator of learners with early reading difficulties. German L1 children who experience reading difficulties often do so because of slow word recognition speeds and less so because of phonological processing difficulties (Caravolas & Samara, 2015; Landerl et al., 2019). These findings do not mean that phonological processing is not a useful early indicator of reading difficulties across languages, but that it may not be the most important indicator of difficulties and may be limited to very early reading proficiency differences in some orthographies.

Other consequences of orthographic differences across languages include the roles of visual processing skills, morphological awareness, and syllable reading effects. Languages that are non-alphabetic or that have dense and complex orthographic forms will lead readers to develop greater emphasis on visual form processing as part of reading development. Most obviously, L1 readers in non-alphabetic languages (Chinese and Japanese) develop specific skills for processing visual units that are not strongly tied to phonological processing. Character recognition depends on both linguistic and non-linguistic visual memory. In Hebrew, with its dense orthographic form, visual-spatial processing is also an important predictor ability. This may be due both to the dense block-like print and the need to attend to morphemes carefully to unpack the multimorphemic strings into constituents (Share, 2017). Young Hebrew readers are also more sensitive to

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consonants than to vowels, reflecting the basic orthographic patterning of Hebrew.

Morphological awareness, a learner's understanding of how words are formed and changed by word-internal subparts, affixation and lexical compounding, is also impacted by different L1 orthographies. Morphological awareness appears to be a better predictor of reading abilities than phonological awareness among Chinese children (Chen & Pasquarella, 2017; Koda, 2005). Moreover, the processing of syllable structures may have some role to play in L1 reading in some languages. In Korean, syllable processing is noted along with naming speed and phonological processing as important predictors of word reading. Korean orthography in syllable block form may be a cause for the relative importance of morphological processing in Korean (Cho & McBride-Chang, 2005; Pae, 2018a). Whether syllable processing is an important skill for reading in most languages is still an open question. Rhyming abilities in English, German, Swedish, and Greek do not seem to be strong predictors of later reading ability (Seymour, 2006).

7.8 From the L1 to the L2: Transfer Effects of Different L1s on L2 Reading

The patterns of variation across languages with respect to phonology, morphology, and orthography suggest that a learner from a given L1 may encounter some difficulties when processing words in an L2. To review these complexities, a learner may come from a language with few vowels and relatively few consonants. That learner needs to recognize the many more sounds in the L2 that make a meaning difference (the phonemes), as well as their recoding as letters in the orthography of the L2. The learner needs to learn new processes of affixation and word stem changes that are productive in the L2 and that differ greatly from a learner's L1. The learner needs to recognize what the acceptable options are for syllable structures in the L2. The learner needs to learn any new complications in letter-to-sound patterning, particularly if the L2 is less transparent in its orthography. These patterns of L1–L2 variation created by differences across L1s are likely to have a significant impact on the speed and accuracy of word recognition processes in L2 reading development, particularly at lower proficiency levels.

The patterns of differences in L1 reading development reviewed in this chapter have their most obvious link to L2 reading development in terms of L1–L2 transfer effects at the word reading level (see Chapter 8 for research on transfer more generally). Based on

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the descriptions given here, it is evident that L2 reading development will be affected to some degree by the L1 background of the L2 readers. Before providing specific evidence and examples of these patterns of word-level L1 transfer (either as facilitation or interference), it is important to be clear first about the concept of transfer and the issue of universal aspects of reading across all languages.

Koda (2016) provides a good overview of L1 transfer effect for L2 word recognition abilities. As she states, "L1 word recognition skills are involved in L2 print information processing and …L2 skills emerge through the dynamic interplay between linguistically conditioned L1 skills and the linguistic demands imposed by properties specific to the second language" (p. 83). For Koda, transfer is not simply reliance on L1 knowledge when there is a language or processing limitation with the L2. Instead, this view of transfer implies three important criteria: (a) for L1 effects to be active in L2 reading, the L1 resources must be well learned and automatic (through extensive practice); otherwise these effects will not intrude without intentional effort on L2 reading; (b) transfer does not end at any specific point of improved L2 reading processes; rather, L1 resources will always be activated to some extent when these resources are closely associated with L2 reading processes; and (c) the L1 transferred abilities will continue to develop in relation to L2 reading development; useful L1 support resources will integrate with growing L2 reading abilities (Bialystok, 2001; Koda, 2005, 2016). These three implications suggest that L2 reading is inevitably an integration of dual language abilities and dual language processing – thus L1 transfer effects of several types will play some role throughout L2 reading development. What role the L1 plays depends both on universal aspects of reading abilities and language specific aspects influencing L1–L2 transfer effects.

7.9 Universals of Reading Development

At the beginning of this chapter, a number of very basic cognitive and linguistic universals were noted that should influence learning to read in any language (Kahn-Horwitz et al., 2005; Koda, 2007; Perfetti, 2007). These universals, outlined in Table 7.1, emphasize general cognitive skills and language resources for all readers (Verhoeven & Perfetti, 2017a; 2022; see also Chapter 6, Reading Systems Framework).

It is possible to create a large inventory of specific skills and resources that are likely to be universal aspects of reading abilities and are capable of fully transferring. However, understanding how universals are deployed differentially in a given language is what

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Table 7.1 Universal aspects of cognitive and linguistic processing

All skilled readers:

1. Carry out phonological and morphological processes while reading to activate word recognition.
2. Carry out very rapid pattern recognition and automatic processing skills. Shift word recognition from computational processing to memory processing (automatic access to LTM).
3. Engage multiple levels of language knowledge awareness in building reading skills. These levels of metalinguistic knowledge useful to reading include phonological awareness, orthographic awareness, morphological awareness, syntactic awareness, and discourse awareness (Koda, 2007; Nagy, 2007).
4. Use syntactic information to determine text meaning and text comprehension.
5. Translate executive control cognitive skills into reading strategies as appropriate to reading purposes.
6. Draw on LTM (background knowledge) to interpret text meaning.
7. Elaborate the text model of comprehension to a situation model that is strongly linked to reader background knowledge, attitudinal responses, and cultural socialization (Chapter 3).

leads to observable differences across languages and sources of variable language transfer. In fact, aspects of L1 language knowledge do not always transfer well. Word recognition abilities in the L1 do not always transfer to the L2, particularly when the writing system is different. L1 vocabulary knowledge generally does not transfer, and syntactic knowledge usually does not transfer positively (see Chapters 8 and 12).

For purposes of L1–L2 transfer, even with similarities of underlying cognitive skills, it is important to recognize variations within universal aspects of reading abilities. For example, one might say that all readers engage in reading strategies, but at a more specific level, a reader from a given L1 might engage in a specific combination of L1 reading strategies that are most suited to the L1. A Chinese strategy might focus on identifying the semantic radical and the phonological component in a character, and phonological processing might be secondary to visual processing. A strategy in Hebrew might be to identify the morphological information that is critical to word recognition, thus emphasizing the ways that word parts and morphological information are extracted from the printed word (Frost et al., 2005). Even at higher-order levels, strategies for main idea comprehension may vary considerably from language to language (and this is where strategy instruction enters the picture).

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Koda (2007) distinguishes language universals from language specific patterns by labeling universals as "general mapping principles" and the specific abilities as "the mapping details" (p. 12). The combined exploration of what is universal and what is specific to each language involved in L1–L2 reading combinations helps to determine just what can transfer, and in what ways (as facilitation or as interference). Thus, the principles may be universal but how languages operationalize the principles, and carry them out as specific language skills and abilities, are still likely to vary from language to language, though in ways constrained by the universal principles.

7.10 Reading Universals and L1–L2 Transfer: The Role of Phonological Decoding

There is extensive evidence that phonological decoding is an important part of reading in all languages, including non-alphabetic languages (Koda, 2005), that phonological processing in the L1 influences word reading in the L2 (Cho & McBride-Chang, 2005; He et al., 2005) and, after an alphabetic language has been learned, that the "alphabetic principle" does not need to be relearned when learning to read in additional languages (Koda, 2016). At the same time, for all alphabetic languages (including all shallow languages), L1 instruction that explicitly raises awareness of letter–sound correspondences is necessary (Caravolas & Samara, 2015). When there is no systematic instruction, phonological skills deficits arise and contribute to weak readers; this is true in all languages (Koda, 2005).

Chinese, as a non-alphabetic language, may seem not to require phonological decoding skills but rather the processing of characters directly from print to meaning. However, research on Chinese reading shows that Chinese children do make use of phonological awareness for Chinese L1 reading. Phonological awareness is a predictor of Chinese reading abilities in research studies, and phonological components in Chinese characters are processed, influencing children's reading abilities. Chinese children attend to the phonetic component in characters and make use of this information while reading, including recognizing unfamiliar characters (Chow et al., 2005; He et al., 2005). As Koda (2005) notes, "Phonological processing may be guided by [phonetic] radical activation to a far greater extent than has been suspected" (p. 81). From the perspective of reading difficulties among Chinese L1 learners, Chinese children with reading problems tend to have poor phonological awareness skills.

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One of the clearest consequences of the universal role of phonological awareness in reading is the transfer benefit of being an L1 reader from any alphabetic system. These readers (e.g., Spanish L1 readers of English) will be much better at internalizing the more opaque letter–sound correspondences of an L2 such as English than will L1 readers of a non-alphabetic orthography (Bialystok, 2001). The process of establishing consistent letter–sound correspondences (understanding the alphabetic principle) in the L1, and then experiencing large amounts of repetition in the L1 with the letter–sound correspondences, will make internalization of the more complex L2 system much less difficult and time-consuming (Koda, 2016).

In closing this chapter, a final consideration should be given to the long-term consequences of reading development in different L1s and the potential problems created when L1 readers learn to read in an L2 that has many differences and relatively few facilitative similarities. As Akamatsu (2006) states,

> Studies suggest that word-processing skills or strategies cultivated in a first language … has a major impact on the cognitive processes that are used in reading a second written language, L2. Nevertheless, this does not necessarily imply that L2 learners whose L1 is orthographically different from the target language encounter insurmountable difficulty in acquiring particular L2 reading skills or strategies. Research findings … simply suggest … some qualitative differences in [a student's] ability to recognize written English words. (p. 494)

7.11 Implications for Instruction

This chapter has provided an overview of reading in different languages, introduced a number of important concepts related to L1–L2 transfer, and outlined briefly some reading universals across languages (while also introducing a number of transfer facilitation effects for L2 reading). Implications for instruction follow generally from a number of issues raised throughout the chapter. First, teachers should have some idea about the linguistic and literacy backgrounds of their students, although it is not necessary for teachers to be language typologists, tracking down every possible difference between a student's L1 and L2 that impacts reading.

The issue of differences in learning to read in different L1s suggests that teachers should check beginning-level students' abilities to read a set of high-frequency sight words in English with reasonable ease and check to make sure that they can read a basic list of English pseudowords without being seriously impeded or

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unable to complete the task. A simple check can take no more than five minutes per student at the outset. Practice in learning to read frequent sight words also has uses beyond a check for reading difficulties. All students need to develop some level of fluency in English with basic sight words, and learning a set of high-frequency sight words, in turn, should address most L1 word-recognition transfer issues.

If some beginning-level students have difficulties with sight word reading and pseudoword reading tasks, students can learn to develop letter–sound relationships over larger units than the letter–sound relationship. Larger pronounceable units, such as the rhyme parts of word endings, provide English L2 learners with a more regular set of relationships from letter-groups to sounds and allow readers to make efficient analogies from spelling patterns of learned sight words to new words that students encounter. This instruction can be carried out with a list of 100 examples of consistent rime patterns in English. These larger sets of letter and word part patterns in English provide a more consistent set of relationships that can be reinforced through practice in reading frequent sight words.

The patterns of variability across different L1 orthographies, both with respect to the Orthographic Depth Hypothesis as well as other features of a language's orthography, show that an important goal for L2 word recognition rests with accurate and fluent recognition and the development of automatic letter–sound correspondences. The distinct orthographic, phonological, and morphological patterns for a given L2 needs to be practiced consistently and learned well. Students need well-practiced L2 word processing skills to carry out L2 word recognition efficiently. One of the best ways to build such automaticity is through consistent inclusion of extensive reading in the curriculum.

This chapter has noted the importance of metalinguistic awareness for L1 word recognition skills and reading development. The same goal should be developed for L2 reading instruction (see also Chapters 3 and 13). Raising student awareness of how sounds change during affixation, how word parts have consistent form–sound relations, how morphologically derived words include sound and stress changes, and how morphologically complex words build from more basic words are all important instructional and learning goals in a reading curriculum. Students who have some awareness of the roles of phonology, orthography, and morphology in word recognition will be more efficient at lower-level language processing as well as at vocabulary learning.

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Finally, it is important to recognize that not all word recognition difficulties are the result of L1 transfer effects. In most respects, word recognition development in L2 contexts needs to focus more on the complexities of L2 orthography, phonology, and morphology. L1 transfer effects will have an impact at the level of L2 word-recognition processing, and these effects will vary from L1 to L1, but they can be addressed by developing L2 processing efficiency. For teachers, the development of L2 processing efficiency is brought about through consistent practice, extended exposure to L2 reading, the development of sight word reading of high frequency words, and the growth of receptive L2 vocabulary knowledge.

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8 *L1 and L2 Reading Relationships*

> Unlike first language reading, second language reading involves two languages. The dual-language involvement implies continual interactions between the two languages as well as incessant adjustments in accommodating the disparate demands each language imposes. For this reason, L2 reading is crosslinguistic and, thus, inherently more complex than L1 reading. (Koda, 2007, p. 1)

Chapter 7 addressed the first-language (L1) influences on learning to read in different L1s in terms of differing facets of grapheme–sound relationships, specific orthographic features of the second-language (L2) script, morphological knowledge influences on language processing, and the impact of vocabulary and syntactic processing on reading comprehension. It also focused on how the paths toward L1 reading comprehension development will vary according to each L1. As a direct link to this chapter, Chapter 7 also addressed the identification of potential universals of reading development as well as examples of specific language difference across any two languages that raise issues of language transfer effects. This chapter explores the various factors influencing L2 reading development, describing various more general L1–L2 differences in reading development, the impact of L1 transfer on L2 reading relative to L2 developmental influences, the role of nonlanguage-specific underlying cognate abilities, and issues of L1–L2 distance and dual language processing.

In Chapters 1 to 6, we have covered many factors influencing the development of L1 reading abilities. In this chapter, we examine in detail the factors that influence the development of L2 reading abilities, and more specifically, factors that promote L1–L2 transfer in comparison with the contributions of L2 component skills as primary sources of L2 reading development. To begin, it is clear that L1 reading skills have a role to play in L2 reading development. At the same time, L2 reading comprehension can be associated more with the development of L2 language proficiency, L2 language exposure, L2 print exposure,

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and L2 processing skills development, and these differences are identified briefly in the first half of the chapter. As it turns out, L2 reading development emerges from a combination of L1 transfer and L2 language skills as a dual-language processing system (Koda, 2007, 2016).

Koda (2007) refers to crosslinguistic interactions to capture the concept of an L2 reading system in which "the transferred competencies will continue to mature through experience with L2 print input" (p. 18) (see also Bialystok, 2001; Chung et al., 2019; Hipfner-Boucher & Chen, 2016; Koda, 2008, 2016; Kroll & Ma, 2018). The view that a hybrid L2 reading system emerges with increasing L2 reading proficiency also fits well with connectionist theories of cognitive processing (Ellis, 2019; Seidenberg 2017), dynamic language learning systems (Ellis & Larsen-Freeman, 2007; Larsen-Freeman & Cameron, 2008), and the importance of input frequency and practice (Ellis, 2015; Lightbown, 2019; Suzuki et al., 2019; Seidenberg, 2017). As Koda (2008) states, "Variations in second-language processing procedures are attributable, in part, to different processing requirements imposed by both first- and second-language writing systems" (p. 81).

As a first step in exploring L1 and L2 relationships, we outline in some detail the many ways that L1 and L2 reading comprehension are likely to be different from each other. The chapter will then address the many complex relationships between L1 and L2 reading, bringing into focus pathways of L2 reading development that are most relevant for reading instruction and assessment practices.

8.1 L1 Versus L2 Reading

It is first important to understand the various ways in which L2 reading is not the same as L1 reading and the impact that these differences can have in L2 reading development. Students engage in L1 and L2 reading in many distinct ways. This section outlines three major sets of differences between L1 and L2 reading:

1. Linguistic and processing differences.
2. Cognitive and educational differences.
3. Sociocultural and institutional differences.

Many differences between L1 and L2 reading are more apparent with beginning readers and weak readers who struggle with word recognition, but there are key differences to consider even with advanced L2 readers in academic contexts. These different demands of learning to read in an L2 need to be considered carefully in research, assessment, and instructional practices.

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8.1.1 Key Linguistic and Processing Differences in L1–L2 Reading

It should not take more than a moment's reflection to recognize that students vary considerably in their L2 lexical, grammatical, morphological, and discourse knowledge, and that L2 readers may differ widely from L1 readers in terms of linguistic resources that support comprehension (e.g., Melby-Lervåg & Lervåg, 2014). This section reviews many of the distinct ways that the L2 reader will approach reading comprehension of L2 texts (as opposed to L1 readers) with respect to linguistic and processing differences.

First, L1 and L2 readers begin to learn to read from very different starting points. L1 students (at least in English) usually know several thousand words orally in their L1 before formally starting to read (in 1st grade). Several estimates state that L1 children at age six typically know 5,000 to 8,000 words orally at the onset of formal reading instruction (e.g., Cunningham, 2005; Graves, 2016). By this age, L1 children have a large store of implicit morphological knowledge about their language, and they have strong implicit knowledge of how sounds go together most regularly within words. These L1 children also implicitly know most of the basic syntactic structures of the language, and they have already had experiences with the way stories and some other genres are structured.

The abilities of L2 readers, when they are just beginning to read, do not match their L1 beginner counterparts. L2 learners with a vocabulary of 5,000 to 8,000 words would be considered as quite advanced learners (Schmitt & Schmitt, 2020). A similar argument can be made for weaker L2 knowledge of morphology and syntax. It takes years before an L2 reader can internalize and automatically process a fairly full range of morphological and syntactic variations in the L2 in ways similar to L1 readers of the same language. Many L2 learners do not have the luxury of waiting several years to build their language knowledge before they begin to read in the L2, so they must develop linguistic resources at the same time that they develop reading comprehension skills.

Second, in addition to the L1–L2 differences in language resources themselves, there is also the more basic fact that the L2 reader is working with the resources of two languages (Bialystok, 2001; Bialystok et al., 2012; Koda, 2007, 2008; Kroll & Ma, 2018). This fact raises issues of how words for the two languages are stored in a reader's mental lexicon. The L2 reader must have a lexicon that is organized somewhat differently from the monolingual reader (Bialystok, 2001; Bialystok et al., 2012; Kroll & Ma, 2018; Sánchez-Casas &

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García-Albea, 2005). Moreover, the way that L2 and L1 words are stored, connected, and used in reading will change over the course of L2 reading development. For example, Kroll and De Groot (1997) state that, early in the word learning process, L2 words are likely to be connected to L1 words first and then to meaning concepts. Over time, the L2 words will develop their own direct connections to concepts, with the ability to bypass the 'translation' link through L1 words (see also Kroll & Tokowicz, 2005).

In addition, the process of switching from the L1 to the L2 and back again – a fairly common strategy for L2 readers working with challenging texts – creates additional processing costs. As less proficient students mentally translate, the reading processes supporting comprehension are different for the L2 reader (see Bialystok et al., 2012; Meuter, 2005; Segalowitz & Hulstijn, 2005). Even though the true nature of the bilingual lexicon is still somewhat elusive and likely to vary across L2 readers, it is clear that monolingual readers simply do not engage in this type of processing.

Third, L2 readers are likely to engage in different types of metalinguistic processing while reading in the L2. Metalinguistic processing includes a heightened awareness of how language systems work and can be used to help carry out language tasks (Hulstijn, 2015b; Koda, 2008, 2016; Nagy, 2007; Veenman, 2016). Consensus has yet to be reached on the difference between metalinguistic knowledge and linguistic knowledge, but the former is often characterized by a greater explicit awareness of linguistic systems, a heightened sense of how the L2 linguistic systems work, and how they can work for particular tasks. These processes would include metalinguistic-analysis processes (knowledge about language systems and structures), metalinguistic-control processes (ability to use metalinguistic knowledge to carry out tasks), and metalinguistic awareness (explicitly recognizing the need to use metalinguistic knowledge and directing attention to act on that need) (Bialystok, 2001; Bialystok et al., 2012).

For L2 readers, both vocabulary knowledge and syntactic knowledge create challenges that L2 readers are forced to problem-solve through conscious attention, demanding a higher level of metalinguistic awareness as word and syntax difficulties directly confront the L2 reader on a regular basis (and very unlike most L1 reading experiences). The resulting processes of associating comprehension difficulties with vocabulary and syntax problems, analyzing the problems, and then attempting solutions produce slow and difficult reading experiences that raise the level of metalinguistic and metacognitive processing to a relatively high level. This can be very exhausting for L2 readers when they are asked to read difficult extended text

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materials (see also Chapters 13 to 15). One of the problems of less successful L2 readers is that they may not have the requisite metalinguistic knowledge or they are incapable of using this knowledge to support L2 comprehension.

Fourth, there are processing differences between L1 and L2 readers that are not associated directly with linguistic knowledge, but with fluency through practice in reading and the visual information in the orthography of the L2. L2 readers will be slower and less accurate in word recognition than their L1 counterparts (Brysbaert, 2019; Segalowitz, 2010; Yoshizawa et al., 2018). L2 readers will be slower in reading rate because of less processing practice in the L2, a new L2 orthography with both obvious and subtle differences from the reader's L1, and differing patterns of morphology represented in the L2 orthography. L2 readers will have less complete lexical representations for most words (Perfetti, 2007) that may slow word recognition, syntactic processing, and semantic linkages into the network of main ideas that emerge from reading a text.

Fifth, the L2 reader brings a wide range of experiences that are sociolinguistic in nature. Readers implicitly understand how language varies in different sociolinguistic contexts, what counts as socially appropriate language, what is the appropriate level of formality, what is the appropriate register of language use for specific types of written material, and so on. These sociolinguistic resources used by readers also vary from the L1 to the L2 (in addition to differences from individual to individual).

L1 sociolinguistic knowledge is simply part of L1 students' linguistic resources. As a result, there will be additional layers of facilitation or interference tied to how language resources typically are used in the L1 and the L2. While this level of sociolinguistic knowledge may have a greater impact on writing outcomes, it will also likely have some impact on comprehension abilities. This additional layering of linguistic transfer effects represents a further aspect of L2 comprehension processing unique to the L2 reader. The sociolinguistic layer also forms a bridge to a discussion of the many external and individual differences in reading, all of which are external to the combined linguistic resources that distinguish L1 from L2 reading.

8.1.2 Cognitive and Educational Differences in L1–L2 Reading

In addition to linguistic differences, there are a number of very important educational and developmental/cognitive distinctions that are more contextual in nature. These L1–L2 differences are not

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predictable by the linguistic nature of the two languages involved or the fact that two languages are involved.

First, L2 readers who are engaged in academic learning (to simplify, 6th grade through graduate school, or 20th grade), have a very large store of L1 reading experiences that go beyond basic language processing (Table 8.1). L1 readers vary in their higher-level reading abilities that reflect distinct purposes for reading.

Table 8.1 L2 readers drawing on L1 higher-level reading abilities

1. Identifying main ideas.
2. Drawing inferences as appropriate.
3. Connecting main ideas with supporting ideas.
4. Focusing selectively on key information.
5. Learning from new information presented in texts.
6. Integrating information across a text and across texts.
7. Evaluating information in relation to background knowledge and in relation to other texts.

This set of variations could extend through all types of reading purposes and strategies underlying cognitive skills and levels of metalinguistic awareness. L1 readers bring all of these experiences and skills to their L2 reading efforts, and these academic skills also develop through L2 reading practice. Determining exactly how and when these L1 and L2 skills impact L2 reading is a very good question that is still in need of much additional research (see Language Threshold discussion in Section 8.3.4). It is safe to say, however, that these combined academic skills and experiences with reading do impact a reader's L2 comprehension development and make it distinct from a learner's L1 reading experiences.

Second, L1 and L2 readers differ in the sheer amounts of exposure to print that a learner experiences. Most L2 readers have only very limited exposure to L2 print, much of which comes from L2 classroom contexts. L1 students may encounter millions of words of printed text in a year, every year from early on in their schooling experience. Reading an hour a day in the L1 (including both print and digital recreational reading) will expose an L1 learner to about 4 million words per year (assuming 200 wpm x 365 days). This much exposure is usually hard to achieve for most L2 readers.

The most obvious L1–L2 difference is going to be the massive fluency practice with more frequent aspects of the language. Automaticity will emerge in L1 reading as a matter of course for processing the orthography, morphology, words, and syntax of

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the language. In L1 reading, many higher frequency words will be automatically recognized sight words. In addition, the extensive exposure will also mean continual practice in all of the reading skills and strategies noted earlier as well as many opportunities to develop the types of metacognitive awareness that support critical comprehension abilities (e.g., metalinguistic awareness of discourse structure).

Third, readers often have different motivations for reading in the L2 in comparison with reading in their L1s. In fact, one can say that every person will have a unique combination of motivation for reading, whether in the L1 or the L2. However, there are clear situations in which reading in the L2 is going to vary from L1 reading in terms of goals (and motivation is driven by goals and persistence). In many L1 settings, people read because they have certain types of expertise or skills that they are willing to develop, or they read for enjoyment, often reading for hours or exploring Web pages for extended periods of time. In many cases, L1 readers carry out work-related or study-related tasks that involve extended periods of reading. The extent of their motivation in reading is strongly associated with their academic/professional goals more generally, their educational experiences, and their future aspirations.

L2 readers, in many foreign language contexts around the world, are reading texts that often are very difficult and at the upper edge of their linguistic resources. The reasons for reading, particularly in foreign language classrooms, are often limited to developing language skills rather than building academic expertise. The goals for reading are often to carry out language-learning assignments rather than to build new academic skills and knowledge bases (Koda, 2019; Yamashita, 2019). L2 reading goals for students are also often constrained by the limited expectations of others in terms of outcome goals and purposes for reading. The context itself, commonly the foreign language classroom, suggests that L2 reading is not very important for larger academic goals and future aspirations. Even for academically oriented English as a foreign language (EFL) and advanced English as a second language students (e.g., in Hong Kong, India, and Singapore), they know that they read well in their L1s and that their future may rest more with their L1 literacy skills than their L2 literacy skills. Motivation in L2 reading, as opposed to motivation for L2 language learning more generally, is a relatively unexplored territory (see Chapter 10), but it should be clear from this comparison that L2 readers often (though not always) engage in L2 reading with different motivations for reading and very different expectations in terms of long-term outcomes (Koda & Yamashita, 2019).

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Fourth, L2 readers often encounter differing kinds of texts in L2 settings than in their L1 settings, particularly in EFL contexts. In many classroom settings, students read short excerpts of texts, and sometimes texts that are simplified. Even instructional textbooks for high intermediate and advanced L2 readers have brief excerpts so that the texts can be read and the skills and comprehension activities can be completed in a manageable amount of time. Seldom is there an expectation that the L2 reading texts are a resource for learning new and challenging information or developing academic skills and expertise (except for immigrant and language minority students in mainstream L2 educational systems) (Koda & Yamashita, 2019). Only at very advanced levels of L2 reading, in cases in which learners need to learn new material and carry out advanced academic skills in the L2, do the L2 reading texts tend to parallel L1 reading text reading demands.

Fifth, L2 reading inevitably involves a range of supporting resources that are unique to the L2 learning situation (e.g., cognates, bilingual dictionaries, learner-based grammar textbooks, word glosses, text translations, and L2-specific digital resources). These resources for L2 learning are common in L2 settings but are relatively uncommon in L1 settings. One sometimes finds some of these resources in L1 contexts as well. However, overall the resources commonly used to support L2 reading are not commonly used in various L1 settings where the goal is reading a text for some type for comprehension.

The differences in L1 and L2 experiences are clear, but less clear is how these L2 reading resources impact L2 reading development. Perhaps the best expectation is that these resources will facilitate L2 reading development at a rate faster than L1 reading development occurs if they are good resources, used effectively in instructional settings, and incorporated by readers as strategic supports for reading development. The benefits of these L2-specific resources for readers assume that L2 readers can also make good use of L1 reading resources (e.g., dictionaries, grammars) when reading in their L1s. These L2 resources contribute to the difference in metalinguistic awareness between L1–L2 reading.

Sixth, L2 readers, particularly those who are academically oriented, are commonly considered to have acquired higher levels of metalinguistic awareness than that of monolingual L1 readers (Bialystok, 2001; Bialystok et al., 2012; Hulstijn, 2015b; Koda, 2007, 2008, Kuo & Anderson, 2008). This specific difference reflects the positive outcomes of extended struggling to work through difficult L2 language processing and text material. L2 learners make mental translations from the L2 back to their L1 with difficult texts; they recall L1 synonyms for L2 words; they try out L1 words for new L2 words to

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see if they fit the context; they notice similarities and differences in structures between the L2 and their L1s; and they generally are aware of these metalinguistic activities. They also use their growing L2 metalinguistic awareness to examine the contexts of unknown words to infer possible meanings; they look at word-internal parts of a word to recognize useful morphological information; they recognize text structure clues; and they learn how to puzzle through misunderstandings and noncomprehensions that arise in L2 reading.

In these cases, L2 readers are raising their metalinguistic awareness of the L2 and drawing connections at a more abstract level between their L1 and L2 knowledge and skills. Most people who have studied a foreign language in a classroom setting have had that moment of an L2 grammar explanation that also explained what language was doing in their L1s. These moments involve a heightened metalinguistic awareness, as well as an understanding of how the language works and how the parts are put together.

This kind of awareness may also be a part of L1 readers' experiences, but this awareness is not a resource consistently and explicitly taught and developed to carry out specific tasks across large groups of L1 readers. The benefit, in this case, goes to L2 readers. Bialystok (2001) argues that learning two languages can lead to a somewhat greater ability to reflect on ways in which language works when involved in specific tasks. This could suggest that L2 readers would have a greater awareness of how a text, and the language in the text, is organized to carry out a given task.

Overall, the factors related to education and cognitive development point out major differences that separate L1 and L2 reading. These differences are less commonly investigated, but the available results suggest that they play important roles in L2 reading development. In particular, they suggest that findings and implications from L1 reading research need to be examined in light of the distinct experiences of L2 readers rather than be assumed to apply directly as implications for L2 instruction. This caution is further reinforced by the third major source of L1–L2 differences – those that arise from sociocultural and institutional factors.

8.1.3 Key Sociocultural and Institutional Factors in L1–L2 Reading

L2 reading development is also influenced by societal and cultural contexts in which a learner is socialized. In addition, institutional and cultural expectations shape (a) the literacy events that are enacted in a given society, (b) the types of texts that are commonly and preferentially

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produced and read, (c) the reasons why people read texts, (d) the ways that texts tend to be interpreted, and (e) the literacy experiences that a learner accumulates. All of these experiences, because of their social and cultural origins, will be different in L1 and L2 contexts.

First, when we learn to read in our L1s, we are shaped in our expectations about reading by our sociocultural belief, attitudes, and family/community/cultural backgrounds. For example, in some cultures, texts are everywhere (e.g., on flyers, advertisements, or internet sites, or in homes and schools). In other cultures, texts may not pervasively saturate the environment. In some cultures, texts have a throwaway quality (even for books) because there is so much text material in the environment. In other cultures, texts are not so common and books are seen as highly valued even when becoming outdated. A reader in a given culture and society is conditioned to these patterns of variation and the ways that texts are used. (This description could also depict different groups within a country or society, or different socioeconomic status levels, but at the sociocultural level of languages and countries, these differences are magnified.)

Second, for L2 readers, particularly in L2 settings more so than foreign language settings, the role of texts in L2 social life can be very different from their L1 literacy experiences. L2 readers need to recognize these differences and find ways to accommodate them or be limited in the L2 setting. L2 readers need to recognize that the new L2 reading environment may not assume the privileged status of "the book" or the printed word. Instead, the L2 reader may be asked to critically review a text or compare one text with a second conflicting text. These L1–L2 differences in expectations about how texts are used can have a profound influence on an L2 student's performance, particularly if an academic task involves synthesizing multiple texts or critically evaluating a major text.

One extension of the use of texts differently in L1 and L2 contexts needs to include the type and extent of digital text resources that are read for differing purposes. Aside for the question of what digital access is available to L1 and L2 learners, the sociocultural issue is the extent to which L2 students in many different contexts use digital resources in the same ways and if they have the same experiences engaging with digital texts. A further issue is if L2 learners transfer their L1 digital reading experiences to L2 reading. There seems to be little research on these issues, and much needs to be done as more and more instructional resources and learning expectations revolve around the uses of digital texts (see Barzillai et al., 2018; Cobb, 2017: Park & Warschauer, 2016; Stoller & Nguyen, 2020; also Chapter 16).

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Third, the impact of texts at the cultural level in L1 and L2 settings is magnified by the ways that institutions (primarily educational but also other public institutions) use texts for educational and informational purposes. More specific to advanced educational settings, L2 learners may be asked to do far more (or far less) reading in the L2 than they had ever done in the L1 context. The educational institution may assume that most new information to be learned will be introduced by texts rather than by teachers' oral explanations. The educational institution may not assume that the teacher is the ultimate authority on a topic, and much additional information should be taken from texts, some of which will have greater authority than the teacher. In educational settings, there can be a surplus of text resources so that it is impossible to read all the texts that might have relevant information. These additional factors involving the use of texts in educational contexts may create major difference for L1 versus L2 reading. (See Chapter 15 discussion of deep comprehension; Millis et al., 2019; Pearson et al., 2020)

Fourth, a final area in which the social and cultural influences will create L1–L2 differences is in the ways that texts themselves are preferentially organized in different cultures. Texts reflect preferred institutional and educational ways to achieve literacy goals, to inform readers, and to entertain readers. As a result, different societies and cultural groups will develop distinct, preferred ways to carry out social roles through texts, to create informational texts, to persuade readers, and to do everyday business. In short, text genres and their uses will vary between L1 and L2 settings. It is well known that letters of all kinds will vary across cultures (letters of support, letters of recommendation, letters of complaint, letters requesting information or money, letters rejecting a request, etc.). Similarly, editorials can vary from culture to culture, as different cultures emphasize different preferences for what counts as argument, what counts as evidence, and what counts as persuasive emphasis. The area of intercultural rhetoric (formerly contrastive rhetoric) represents an entire field of research studies that investigate how and why texts may vary across different L1 settings (Connor, 2011; Kaplan, 2005).

The impact of text organization and genre variability on L2 reading can be considerable. Texts that L2 students read can be organized in ways that seem unusual, disorganized, ineffective, and even hard to understand. For readers, the L2 contexts may produce and use texts that vary in the ways that (a) main ideas are presented and developed, (b) persuasive arguments are made, (c) evidence is presented and counterevidence addressed, (d) repetition and paraphrases are used, (e) new information is introduced, and (f) inferring a critical

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interpretation is expected. Students will not readily be able to articulate some of the reading problems that they encounter when working with L2 texts, nor will teachers necessarily understand what some of the sources of confusion might be. L2 students may not even understand the purpose of certain texts, the arguments being made, or the evidence being presented.

The sociocultural issues outlined here reveal L1–L2 reading differences that are not easily recognized. Moreover, these sociocultural factors are also not as well understood by teachers and educational researchers in comparison with the factors identified as experiential and cognitive development differences. Sociocultural factors are typically researched at a more general level in terms of the influence of cultural and socialization practices on learning and literacy in the home and at school (including, identity, attitudes, and expectations for success among family members and community). However, these factors are seldom explored empirically in controlled studies for their impact on L2 reading development. Nevertheless, these factors can have a real impact on the successes and difficulties that L2 readers face, particularly in academic settings (Schwartz & Baladzhaeva, 2016).

Up to this point in the chapter, a large set of L1–L2 differences have been outlined. The combination of these factors makes it somewhat difficult to identify just one or two key issues that create the greatest difficulties for L2 readers. While it is clear that linguistic resources for L2 reading are an important factor in L1–L2 differences, addressing this problem may not be sufficient to ensure the successful development of L2 readers. At the same time, the complexity of such explorations is further complicated by varying patterns in the development of L1 reading skills in different languages (Chapter 7) and the role that the L1 can play in L2 reading development. Certain aspects of L1 reading abilities are likely to transfer to L2 reading contexts, such as L1 metalinguistic awareness and underlying cognitive skills. Thus, L1–L2 differences represent only part of the story.

8.2 Similarities between L1 and L2 Reading

Given the very large set of distinctions between L1 and L2 reading, it would be easy to conclude that L1 reading is very different from L2 reading. However, that would be an oversimplification of L1 and L2 reading relationships. From many studies of both L1 and L2 reading, a number of major similarities clearly emerge. The many types of language resources for reading comprehension are essentially the same in L1 and L2 settings; variables that predict L1 reading comprehension

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tend to be the same ones that predict L2 reading comprehension. The comprehension processes are pretty much the same across L1s and L2s (Hulstijn, 2015a; Kieffer, 2011; Kieffer & Lesaux, 2012; Melby-Lervåg & Lervåg, 2014; Nassaji, 2014; Verhoeven, 2017). The underlying cognitive resources beyond language itself are essentially the same ones for both L1 and L2 comprehension. The background knowledge resources are essentially the same for an individual using the L1 or the L2. Neurolinguistically, the many locations, collection hubs, and neural pathways are almost the same (Brice et al., 2019; Li & Clariana, 2019; Verhoeven et al., 2019; cf. Cao, 2018). The developmental processes over time, in line with current models of reading, appear to be quite similar, and automaticity and fluency growth in the L2 bring L1 and L2 comprehension continually closer together, as does the sheer amount of exposure and practice with L2 reading.

In fact, the many points of similarity is what makes the examination of L1 and L2 reading relations such an interesting research topic. Given all of the many factors involved in reading comprehension and reading development, there are almost endless combinations of strengths and limitations across L1s and L2s to analyze. But more than the inherent interest in understanding the many complex relationships, there are practical consequences of such research efforts. In an intensely interconnected world, a crucial goal is to understand better how L2 learners can read L2 texts with good comprehension, become better readers of academic and professional materials, and participate in multilingual environments to achieve personal goals. For these reasons, we turn to L1 and L2 reading relationships.

8.3 Relationships Between L1 Reading and L2 Reading Development

> L1 literacy experience not only imposes lasting impacts on L2 reading development but also systematically alters processing procedures for print information extraction in a L2. (Koda, 2007, p. 22)

In Chapter 7, we provided a brief commentary on L1 transfer issues as they might arise in relation to different L1s, especially for lower-level processes. We also noted transfer effects that arise from universals of reading. This section takes up L1 (or crosslinguistic) transfer issues more generally and discusses major theories and recent empirical findings around L1 transfer effects on L2 reading development. This section provides perspectives on four L1 transfer theories and their impact on L2 reading development: the Interdependence Hypothesis and Linguistic Threshold Hypothesis, the Common Underlying Cognitive

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Processing Framework, the Transfer Facilitation Model, and the Language Threshold Hypothesis. The various approaches outlined point out the many complexities of L2 reading and many of the issues that reading instruction needs to account for as well.

8.3.1 Interdependence Hypothesis and Linguistic Threshold Hypothesis

> [A]cademic proficiency transfers across languages such that students who have developed literacy in their L1 will tend to make stronger progress in acquiring literacy in their L2 (Cummins, 2000, p. 173).

The transfer of L1 literacy skills to L2 reading and some L1 linguistic threshold that may affect such a transfer are concepts that have been discussed for more than forty years in bilingual acquisition and L2 acquisition research. Cummins (1979, 1981) developed both hypotheses to account for the relationship between L1 and L2 reading development in North American bilingual education contexts. The Interdependence Hypothesis states that academic language proficiency involves common underlying language skills that are interdependent and can be shared between two languages in educational contexts. In this way, academic language proficiency in a child's L1 will transfer to another academic language learned later. The Linguistic Threshold Hypothesis states that a certain level of proficiency will be needed in each language (but with emphasis on the L1) for transfer to occur from the L1 to the L2.

These hypotheses were adopted by bilingual educators in both Canada and the United States as arguments for the benefits of bilingual education for children as a counter to perceived "deficit" models of language learning, then common with respect to linguistic minority children entering English-based school systems. This revolutionary set of hypotheses became a source for decades of bilingual education studies in North America. It has also generated a number of other theories and research studies that have examined in much detail the relationships among L1 and L2 language and reading development, as well as the question of language and reading skills transfer in educational contexts. Alternative theories on L1–L2 transfer since the 1970s include the Common Underlying Processes view (Geva & Ramirez, 2015; Gholamain & Geva, 1999), the Language Threshold Hypothesis (Alderson, 1984), and the Transfer Facilitation Model (Koda, 2007, 2008). Before reviewing these major perspectives on transfer, a short detour into English language history is required.

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In considering transfer phenomena between two languages, it is not enough to identify underlying linguistic relationships, especially with regard to lexical and morphological similarities (cognates). The historical relationships between the English and French languages and between the English and Spanish languages are both very strong, French more directly and Spanish somewhat more indirectly. England was invaded in 1066 by French-speaking Normans. French was the sole spoken language of England for royalty and the noble class for more than 300 years. The first "English" king to address parliament in English was Henry IV in 1399. Latin was the language of formal schooling well into the eighteenth century. French and Spanish have very close historical and linguistic structural ties (or occasionally, antagonisms). Latin was also very influential in England from 1400 to 1700 as part of the movement of the European renaissance from the European continent to England. All of these historical facts strongly influence linguistic relationships among English, French, and Spanish, as well as Italian and Portuguese (see Crystal, 2019, for details).

In the English lexicon, almost all of the first 100 words are Anglo-Saxon words, and the large majority of the 1,000 most frequent words are Anglo-Saxon words. After the 1,000 most frequent words, French borrowings (and later Latin variants) account for well more than 50 percent of all the more common words, and especially academic-oriented words in the 20,000 most common English words. Many scientific and technical terms were borrowed from Latin, the historical basis for both French and Spanish. In addition, the language structure of English was influenced historically by French. For example, English borrowed the "v" consonant, borrowed many morphological affixes, and shared many aspects of syntactic structures (Crystal, 2019). These language-history facts are important to keep in mind when discussing transfer across three such closely related languages. It should be important to separate Latin-based languages from other languages when examining transfer relationships between any L1 and English as the L2. (And meta-analyses that combine Latin-based L1s and other L1s in order to examine L1 transfer to English are likely to be suspect.)

In the past thirty years of bilingual acquisition research, many studies have shown correlations between language and reading features of L1 Spanish and French children and their L2 English reading abilities, suggesting the importance of L1–L2 transfer when a Spanish- or French-speaking child or more advanced student later acquires English as an L2, most commonly in school contexts (e.g., Commeau et al., 1999; Durgunoğlu et al., 1993; Hipfner-Boucher & Chen, 2016; Pasquarella et al., 2015). However, correlations between English and Spanish, or English and French can arise for multiple reasons, part of

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which may be the historical relationship already mentioned. As McKeown (2019) states, "English, even more than most other languages, is a mishmash…. In fact, English mingled with latinate vocabulary to such an extent that modern English seems as much a Romance language as a Germanic language, as far as its word stock" (p. 467).

Despite substantial correlations between Spanish/French L1 and English L2 performance, a number of studies have nevertheless provided evidence that L1–L2 transfer has not regularly been a significant predictor of English L2 reading comprehension, especially above early elementary grades. In contrast, English L2 language skills have strongly predicted English reading skills (Alderson et al., 2015; Goodrich & Lonigan, 2017; Goodwin et al., 2015; Jeon & Yamashita, 2014; Mancilla-Martinez & Lesaux, 2010, 2017; Melby-Lervåg & Lervåg, 2014; Yamashita & Shiotsu, 2017). The key point of this commentary is that the evidence for the Interdependence Hypothesis and the Linguistic Threshold Hypothesis have been unduly influenced by two languages closely related to English.

At the same time, multiple reviews of the Interdependence Hypothesis and the Linguistic Threshold Hypothesis have also argued that these hypotheses have been left vague in terms of the specific mechanisms to promote transfer that strengthens L2 reading (Hulstijn, 2015b). Moreover, when research studies are carried out on skills that do seem to support L1–L2 transfer outcomes, they tend to be skills that are specific components of word recognition abilities or are skills that are more cognitive in nature than linguistic (Chung et al., 2019; Fraser et al., 2016; Genesee et al., 2006; Hipfner-Boucher & Chen, 2016).

In response to certain limitations of the Interdependence Hypothesis and Linguistic Threshold Hypothesis, research on possible L1–L2 transfer effects has gone on to explore L1–L2 transfer for many different L1s (e.g., Chinese, Dutch, Farsi, Hebrew, Indonesian, Japanese, Korean) where English is the L2. This research has identified specific cognitive and language skills that appear to transfer as component of L2 reading abilities, and provides a more balanced examination of these hypotheses. Two key theories include the Common Underlying Cognitive Processes Framework (Geva & Ramirez, 2015; Chung et al., 2019) and the Transfer Facilitation Model (Koda, 2007, 2008).

8.3.2 Common Underlying Cognitive Processing Framework

The Common Underlying Cognitive Processes Framework provides a partial and more specific type of support for the Interdependence Hypothesis. Drawing on many more L1–L2 pairings, it maintains that

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common (or underlying) cognitive processes such as verbal working memory (WM), rapid serial naming, reading strategies, metacognitive awareness skills, executive control skills (WM, inferencing, comprehension monitoring, inhibitory processing, etc.; see Chapter 4), background knowledge, motivation, and phonological awareness are all viewed as potentially universal supports for reading abilities in any (alphabetical) language (and potentially also the concept of metalinguistic awareness). Thus, they will positively support L1–L2 transfer (or L2–L1 transfer if these common skills are stronger in the L2 through reading practice (Fraser et al., 2016; Geva & Ramirez, 2015; Geva & Wang, 2001; Taki, 2016). Genesee et al. (2006) see these skills as "procedural knowledge that underlies language use for academic or higher order cognitive purposes" (p. 156).

One of the challenges of this framework is the generality of these underlying cognitive processes across languages. In certain cases, these underlying cognitive similarities are obvious and self-explanatory, but little empirical work has been reported on the specific impact of individual cognitive processes. In other cases, it is clear that background knowledge, WM, motivation, reading strategy uses, and comprehension monitoring have been explored and have strong linkages across L1–L2 transfer.

On the level of linguistic knowledge, phonological awareness, as metalinguistic knowledge, is commonly viewed as a universal ability. Once acquired in one language, it will readily transfer to other languages, particularly for word-reading skills (Branum-Martin et al., 2015; Chung et al., 2019; Melby-Lervåg & Lervåg, 2011; see also Chapter 7). Melby-Lervåg & Lervåg (2011) carried out a meta-analysis that examined the role of phonological awareness and other skills on crosslanguage reading abilities. The research involved children under age eighteen with various L1–L2 combinations (but the majority of studies involved pairs of alphabetic languages with English as the L2). The aggregated correlations between two languages were 0.16 in oral language (oral vocabulary or listening comprehension), 0.54 in decoding, and 0.60 in phonological awareness. The correlation was higher when children were instructed in both L1 and L2 (0.65) than only in L2 (0.37) or when L1 was alphabetic (0.58) as opposed to ideographic (0.24).

In a second meta-analysis, Branum-Martin et al. (2012) examined L1–L2 combinations that specifically involved phonological awareness. They focused on English as the L2 and nine languages (alphabetic and logographic) as the L1. The correlations varied from 0.34 to 0.82 in nine L1s. Although the variation seemed substantial, the effect of writing system was not significant (see also Branum-Martin et al., 2015, for

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confirming evidence of phonological awareness as a unitary skill across languages). In another meta-analysis, Yang et al. (2017) focused on L1-Chinese learners of L2-English. The mean correlations were 0.10 in vocabulary, 0.44 in decoding, 0.42 in phonological awareness, and 0.37 in morphological awareness. Age was a significant moderator of decoding with a higher correlation with pre-kindergarten children (0.56) than primary-school children (0.36).

Although L2 readers may seem to be distinct from (and often behind) L1 readers in many linguistic and processing domains of reading, growing literature suggests that there are areas where L2 readers can perform on a par with L1 reading in the early years of learning to read. L2 children tend to acquire word recognition skills comparable with their L1 counterparts in early grade levels but continue to be weaker in higher-level skills in later years (Lesaux et al. 2006; Melby-Lervåg & Lervåg, 2011; Raudszus et al., 2018; Yang et al., 2017). Similarly, Melby-Lervåg and Lervåg's (2014) meta-analysis identified strong difference between L1 and L2 readers in reading comprehension, oral language comprehension (oral vocabulary and listening comprehension), and decoding, but not in phonological awareness. This pattern may be explained by the complexity of subskills; that is, phonological awareness or orthographic awareness skills are simpler with relatively small sets of rules and items to acquire compared with higher-level comprehension skills (Proctor et al., 2006; Melby-Lervåg & Lervåg, 2014).

In addition to phonological awareness, morphological awareness and orthographic awareness have been examined with variable levels of support across different L1–L2 combinations. The role of cognate awareness has been particularly strong in studies analyzing the impact French or Spanish L1s have had on English L2 development. The awareness of many cognates across two languages, and instructional support to make use of cognates, appears to facilitate L2 reading (Chung et al., 2019; Dressler et al., 2011; Hipfner-Boucher et al., 2014; Hipfner-Boucher & Chen, 2016; Ramírez et al., 2013). In fact, all aspects of L1–L2 relationships that are similar structurally are likely to help the L2 reader (Bialystok, 2001; Koda, 2008). For example, parallel grammatical word ordering in both languages, as well as similarities in the extent to which word order is used grammatically (fixed word order), should facilitate L1–L2 transfer. Similarities across determiner systems in both languages (i.e., articles [*a*, *the*, *some*], possessive determiners [*my*, *your*], demonstratives [*this*, *those*]), and conceptual similarities for time (tense-aspect system) and space reference (deixis [*here*, *there*]) should facilitate transfer (for transfer of different syntactic features see, e.g., Jared et al., 2011; Siu & Ho, 2015).

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Arguments for morphological awareness have often been found for alphabetic language pairings with cognate equivalences, but Chinese-English pairing also indicates a transfer of compounding knowledge (but not affixation). However, morphological transfer is less evident across languages that do not have cognate pairings, do not have word-building similarities (compounding), or are not both alphabetic (see Chung et al., 2019). Orthographic awareness appears to transfer for word recognition purposes when languages use the same script and once learners become aware of the concept of letter–sound correspondences (see Chung et al. 2019; Hipfner-Boucher & Chen, 2016; Koda, 2016; Pae, 2019; Siu & Ho, 2015). As a larger generalization, component skills involved in word recognition appear to play some role in L1–L2 transfer, depending on the two languages involved.

Overall, vocabulary, syntax, and oral language comprehension have not provided persuasive evidence as universal underlying skills promoting L1–L2 transfer (cf. Siu & Ho, 2015 for transfer of very early syntactic knowledge from Chinese to English). One of the key research methodology issues is whether or not L1–L2 transfer results remain when controlling for related linguistic variables or underlying cognitive abilities. Many studies favoring interdependence L1–L2 transfer have primarily used correlations without controlling for many other variables. More recently, studies tend to incorporate hierarchical regression, metaregression, or Structural Equation Modeling (SEM); they do not provide consistent positive outcomes supporting L1–L2 transfer for L2 reading development.

8.3.3 Transfer Facilitation Model

Koda (1998, 2000, 2005) has presented several studies and reviewed other studies that have produced a more nuanced picture of L1–L2 transfer (and interference). Through multiple studies, she has shown that L1–L2 distance factors – the degree of differences in writing systems (orthographic processing), morphological affixation, and specific underlying cognitive factors – produce differing degrees of transfer that promote or interfere with L1–L2 transfer. A major distinguishing feature of her research and her model is that she carried out empirical research studies to demonstrate aspects of the Transfer Facilitation Model rather than just examining correlations across batteries of language measures in each language. Her studies involved specific hypotheses, most based on components of L1–L2 distance across languages (see also Jeon & Yamashita, 2014, 2022).

For example, Muljani et al. (1998) compared English L2 students from Indonesia and China (with equivalent reading comprehension

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scores overall). They showed that the Bahasa alphabetic script of Indonesian students, along with phonological awareness strengths, promoted word recognition skills in L2 English, while Chinese students were less skilled in word recognition because of their morphosyllabic processing experiences with Chinese characters.

Koda (2005) argued that word recognition is faster and more accurate with readers from related L1 orthographic backgrounds. For example, Hamada & Koda (2008) compared L1-Korean (alphabetic) and L1-Chinese (logographic) college students in decoding and new word learning in English. Koreans were not only faster and more accurate in decoding, but also more accurate in new word learning (see also Pae & Lee, 2015).

Another key to facilitating transfer from the L1 to the L2 is through the development of metalinguistic awareness, a requirement for both L1 and L2 development. Metalinguistic awareness, especially at the word recognition level, broadly refers to the understanding that speech is segmented into individual sounds and those segmented sounds relate to graphic symbols in the written language. Based on insights into these general principles, readers acquire language-specific details; for instance, graphic symbols represent phonemes in alphabetic languages or syllables and morphemes in logographic languages. Since metalinguistic awareness at general and fundamental levels applies to reading in any language, once learned in the L1, it can be transferred to L2 reading and facilitate reading acquisition. At language-specific levels, what is sharable depends on linguistic features of the languages involved (Koda, 2007; Kuo & Anderson, 2008).

A further component concept of the Transfer Facilitation Model represents a variant interpretation of the importance of L1 reading abilities. For Koda, component processing skills in the L1 need to be automatized if L1 word recognition skills are to impact L2 transfer. Then L1 word recognition processing is carried out implicitly, without conscious attentional effort. In effect, the L1 processing skills cannot be completely turned off or controlled when reading in the L2. This effect provides a strong demonstration that L2 readers always read with "languages" because the strongly ingrained automatic processing skills of the reader's L1 will always be a part of that person's L2 reading abilities, sometimes as facilitation and sometimes as interference. As L2 readers become advanced in L2 reading, the cases of interference is minimized by greater degrees of L2 processing automaticity, but never completely disappears.

The Transfer Facilitation Model provides a way to account for common underlying processing skills, the transfer of phonological awareness, and some aspects of morphological and orthographic processing

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that lead to well-documented L1–L2 distance effects across different pairs of L1–L2 languages. These studies, and many others, all show that transfer effects do commonly occur in various L1–L2 relations, and that L1–L2 similarities enhance facilitative transfer. Thus, in multiple ways, universal aspects of language processing and reading development create multiple contexts for L1–L2 transfer. At the same time, as Section 8.3.4 on the Language Threshold Hypothesis persuasively argues, the critical threshold is L2 development (except perhaps for very young children).

8.3.4 Language Threshold Hypothesis

As a general distinguisher between education/bilingual research from Second Language Acquisition (SLA), we use the Language Threshold label (rather than the Linguistic Threshold label) to refer to the array of research studies in which L2 language development plays a much stronger role in L2 reading abilities than L1–L2 transfer. There are also a number of recent educational psychology studies that privilege L2 component skills over L1 transfer. Language Threshold research typically involves L2 learners who have established L1 literacy skills (most typically adult foreign language learners). It is somewhat simpler than Cummins' framework, which argues that L2 students who have stronger L1 reading skills should consistently outperform L2 students who are less-skilled in L1 reading. However, reading development, whether L1 or L2, is much too complex to be resolved so easily. This is readily apparent by considering the full range of component skills that support L2 reading development and a range of earlier research results that did not demonstrate very high correlations between L1 and L2 reading comprehension.

The Language Transfer approach to reading skills transfer was most strongly described by Alderson (1984), who asked whether the difficulty in L2 reading is a reading problem (L2 readers cannot read well because they cannot read well even in their L1), or a language problem (L2 readers cannot read well because their low L2 proficiency prevents transfer of their high L1 reading skills). The language problem is also known as the Short Circuit Hypothesis (Clarke, 1980), and we can predict larger degrees of transfer (stronger associations between L1 and L2 reading abilities) at higher levels of L2 proficiency. Empirical investigations in the 1990s and early 2000s, reached a general consensus supporting the language problem (Alderson, 2000). More recently, several studies with language minority children in the United States and the Netherlands, and with L2 students in different countries have highlighted the much greater importance of L2 component

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skills development over L1 transfer effects, especially with respect to vocabulary, morphology, syntax, and listening comprehension (oral language skills).

Nakamoto et al. (2007) followed 282 Spanish speaking English L2 children from 3rd to 6th grades. They took decoding and oral language measures of vocabulary, sentence reading, and listening comprehension. They also took a reading comprehension measure in both 3rd and 6th grades. In a SEM using 3rd grade measures to predict 6th grade performance, no Spanish language variables, nor Spanish reading comprehension, accounted for any unique variance in English 6th grade reading comprehension.

Goodwin et al. (2015) assessed 113 Spanish L1 4th grade students in both their L1 and in English L2. Assessment measures included phonological decoding, morphological awareness, oral vocabulary, listening comprehension, word reading, and reading comprehension in both languages. As might be expected for Spanish L1 children, phonological decoding and morphological awareness provided some degree of crosslinguistic correlations, but overall, English component skills predicted English reading comprehension and Spanish component skills predicted Spanish reading comprehension. As for transfer effects, there was no significant contributions of Spanish phonological decoding or morphological awareness to English word reading or reading comprehension. They concluded their results as follows: "there was no evidence of cross-language transfer in linguistic processing or in reading subskills" (p. 617). For additional studies with the same general conclusions, see Goodrich and Lonigan (2017) and Mancilla-Martinez and Lesaux (2010, 2017).

A number of recent studies of multiple L1–L2 relationships beyond only Spanish L1 and English L2 are reported. Jeon and Yamashita (2014) carried out a meta-analysis on correlations between L2 reading comprehension and various components of L2 reading (including L1 reading comprehension and several L2 language and cognitive component skills). Results showed that the strongest correlates of L2 reading comprehension were all L2 language skills (vocabulary, syntax, and listening comprehension, by a large margin, ranging from 0.48 to 0.85), showing the highest levels of shared variance with L2 reading comprehension. Interestingly, the cognitive variables (WM and metacognition) were the two lowest predictors (0.42 and 0.32), although each significant on their own. L1 reading was a moderate predictor and significant on its own (0.47).The result demonstrated the powerful role of L2 language predictors of L2 reading comprehension (see also Hulstijn, 2015b; Jeon &Yamashita, 2022).

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Alderson et al. (2016) carried out a study comparing weak and strong L2-English readers, and in the process assessed the impact of L1 reading ability as well as a range of L2 component-skills. They assessed three groups of L1-Finnish students in 4th grade, 8th grade, and upper secondary school (seventeen year olds) on L2 reading comprehension measures at each level as well as several L1 and L2 component measures (and additional cognitive measures). They used English reading comprehension (strong versus weak students) as the independent variable and carried out a Multiple Analysis of Variance (MANOVA) on several dependent variables to identify which skills separated strong from weak EFL readers. The best overall separator was L2 English vocabulary skills. Other major skills were EFL writing, EFL dictation, and EFL word segmentation skills. Students' self-efficacy motivation was also a major differentiator. They also found that L2 skills were increasingly more important with increasing age. As they state, "FL [foreign language] knowledge was the best separator of weak and strong FL readers. Much bigger effect sizes were discovered for FL skills … than for the L1 and cognitive skills.… Training L2 skills is the best treatment for most learners with L2 reading problems" (Alderson et al., 2016, p. 863).

In a final study, Yamashita and Shiotsu (2017) carried out a straightforward test of L1 transfer effects with EFL university students in Japan. They assessed 227 intermediate EFL students on L1 reading, L2 listening skills, L2 language skills, and L2 reading comprehension skills. They used a Rasch model to create equatable scores and combined multiple measures into latent trait scores for each variable. They carried out a SEM to analyze direct and indirect contributions to English reading comprehension from among the three predictor variables. The SEM provided an extremely strong fit with the data and accounted for 94 percent of the shared variance with English reading. Using the full sample, they found that only the English language variables explained how these students performed in English reading. In a follow-up, they analyzed only the upper 70 percent of students. With a higher proficiency in English overall, L1 reading achieved significance, although as the weakest of the variables. This second analysis provided evidence for a threshold level at which L1 knowledge contributes in some way to L2 reading (cf. Alderson et al., 2016).

Across all four perspectives on L1 transfer to L2 reading (from the Interdependence Hypothesis to the Common Underlying Cognitive Processes Framework, to the Transfer Facilitation Model, to the Language Threshold Hypothesis), there is evidence suggesting some levels of crosslinguistic influences, although a strong version

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of the Interdependence Hypothesis is the least supportable theory. Good evidence exists for the Common Underlying Cognitive Processing Framework, the Transfer Facilitation Model, and the Language Threshold Model. It is almost impossible to account for all possible controlling factors that might influence language transfer, especially for additional common underlying variables. More generally, different views continue to be expressed regarding what constitutes the common underlying proficiency or what is transferable across languages. Phonological awareness is a crosslinguistic universal. Orthographic and morphological knowledge is variably involved in transfer depending on metalinguistic awareness, L1–L2 distance, script similarities, and cognate similarities. Underlying cognitive processes are promising, but there is still much room for further research. One outcome is reasonably clear: L2 reading development is a dual-language process.

8.3.5 Dual-Language Involvement in L2 Reading

> Because, dual-language involvement is the defining characteristic of second-language reading, understanding how the two languages interact during second-language processing is critical. (Koda, 2007, p. 28)

There has been an increasing emphasis on the recognition that the L2 reader engages the L2 reading task with a dual-language system (Bialystok et al., 2012; Koda, 2007, 2008, 2016; Kroll & Ma, 2018). This processing system is likely to vary more for the L1 reader or the L2 reader with distinct L1 and L2 processing systems. The dual-language processing system that emerges will be dynamic, changing, and shifting in response to reader, task, topic, goal, training, context, amounts of L2 input, and so on. This shift to a dual-language view does not mean that the notion of transfer has lost its place in guiding L2 reading research, but it has started to take on a broader meaning. Generally, the process of L2 reading has expanded to include the ability to develop L2 reading skills by drawing on previously acquired L1 resources, many of them implicitly activated (Genesee et al., 2006; Koda, 2007). This broadened concept of transfer provides a strong theoretical avenue for empirical research on the relationship between L1 and L2 reading development.

In the dual language perspective in L2 reading development, whether and how L1 skills contribute to L2 reading achievement is an important question. Insights from this question are also relevant to pedagogy offering hints on how we can make the most of readers' L1 skills. Results of meta-analyses are informative. Melby-Lervåg and Lervåg (2011) and Ke et al. (2020) computed correlations between two L2 reading outcome measures (decoding and reading comprehension)

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and various L1 and L2 components. With L2 decoding, the correlations were 0.44 (L1 phonological awareness) in Melby-Lervåg and Lervåg (2011); 0.35 (L1 morphological awareness) and 0.46 (with L2 morphological awareness) in Ke et al. (2020). With L2 reading comprehension, the correlations were 0.24 (L1 decoding), 0.04 (L1 oral language, insignificant), 0.54 (L2 decoding), and 0.46 (L2 oral language) in Melby-Lervåg and Lervåg (2011). In Ke et al. (2020), the correlations were 0.39 (L1 morphological awareness) and 0.52 (L2 morphological awareness). Further, Melby-Lervåg and Lervåg (2011) found that the correlation between both L1 and L2 decoding and L2 reading comprehension decreases with age.

Several observations emerge from these syntheses. First, despite indications of the impacts of L1 components on L2 reading, they are generally weaker predictors than L2 components of L2 reading outcomes, as discussed earlier. Second, L1 oral language may have only a weak influence, if any, on L2 reading comprehension compared with L1 decoding and L1 morphological awareness. This implication resonates with an authoritative review on decoding by Geva and Genesee (2006): generally, L1 oral language proficiency does not correlate with L2-English word reading skills, whereas L1 phonological processing skills are closely related to L2-English word reading skills. Lastly, the age effect found by Melby-Lervåg and Lervåg (2011) shows that, at least among largely alphabetic L1–L2 parings, the effects of L1 and L2 decoding on L2 reading comprehension is larger in younger readers.

Dual-language involvement in L2 reading has been examined in various components of reading including morphological awareness, vocabulary, syntax, or metacognitive strategies (see Chung et al., 2019; Yamashita, 2022, for more studies). Here, we will introduce one further, rapidly expanding area of dual-language research: reading fluency. Significant L1–L2 associations have been reported in word reading fluency (Pasquarella et al., 2014) and text reading fluency (Domingez de Ramírez & Shapiro, 2007). For instance, Pasquarella et al. (2014) examined bi-directional transfer (L1-to-L2 and L2-to-L1) of word reading accuracy and word reading fluency in Spanish-English and Chinese-English bilingual children longitudinally from 1st to 2nd grade. Both groups of children were similar in their levels of accuracy and fluency in English word reading. However, different L1–L2 associations appeared. After controlling for grade 1 variables, bidirectional transfer was observed in both groups in reading fluency (i.e., L1 fluency explained English fluency and English fluency explained L1 fluency). However, in reading accuracy, no transfer was observed in the Chinese-English bilinguals; only L2-to-L1 transfer was

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observed in Spanish-English bilinguals. The authors maintained that the result of the Spanish-English group may be because of the stronger English ability (English was the instruction language) or more complex grapheme-phoneme correspondences in English. The results suggests that transfer of word reading accuracy may be constrained by script distance, but word reading fluency may be script-universal. This is an interesting insight that needs to be examined further.

This chapter also argues that more current views of transfer do not depict transfer as a temporary process, one that only lasts until the L2 becomes proficient enough. Rather, L1 processes will always be present at some level because L2 reading involves reading with a dual-language system (Bialsytok, 2001; Bialystok et al., 2012; Koda, 2007; Kroll & Ma, 2018). In effect, transfer, when it involves an automatized L1 process, is a permanent effect. As interference, a dual-language L1 transfer effect can be minimized to some extent, particularly at advanced L2 levels. A facilitation transfer effect supports L2 reading on an ongoing basis.

8.4 Implications for Instruction

The most general implication for instruction that can be drawn from this chapter is that explicit L2 reading instruction is necessary and important. The issues raised by the L1 versus L2 reading orientation and L1 transfer versus L2 development orientation strongly suggest that L2 reading development requires both consistent explicit instruction and cumulative print processing practice. Just reading a lot in the L2 and assuming transfer of L1 reading skills will not work as an instructional plan. First, many aspects of L2 reading skills can only be provided through instruction, and second, L1 skills that are automatic are likely to lead to interference with L2 reading. One of the key arguments of Ellis (2005, 2006b) is that automatic processing skills in the L1 can produce strong interference effects, and the L2 learner needs to work explicitly to reset associative processing to L2 input (and override automatic L1 associations). This resetting process requires explicit attention to L2 input through L2 reading instruction. The goal is not to intentionally discourage established L1 processing skills as much as it is to give students many opportunities to engage in L2 processing. Students may well build upon L1 processing skills as part of their resetting of associative processes.

A second implication involves the amount of L2 reading input. As the chapter has pointed out, L1 versus L2 differences are considerable. Even while differences do not suggest that L2 reading development is unlike L1 reading development, nor that L1 reading abilities

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are irrelevant, L2 reading is, nevertheless, likely to depend more on the development of L2 linguistic knowledge as well as extensive exposure to L2 texts and experiences and practice with L2 reading. There is little question that the amount of L2 reading has a large role to play in overcoming the many L1–L2 differences that exist for L2 reading development. This implication suggests that reading curricula need to consistently implement some form of extensive reading (see Chapter 18).

A third implication is that L2 reading instruction needs to explore ways that L1 reading skills can support L2 reading development. Certainly, the development of metacognitive and metalinguistic awareness should draw on both L1 and L2 resources to develop heightened attention to features of language, texts, and writer assumptions. Cognates and morphological similarities should also be exploited when relevant. It would also be important to point out when sociocultural expectations about text organization and uses are consistent across languages if teachers have this knowledge. This is likely to involve talking about text organization, author purpose, text goals, and ways to use text information. Teacher development programs to help teachers exploit text structure for students (see Chapter 12), as well as point to discourse-level linkages across L1 and L2 patterns of organization, would allow teachers to develop specific instructional practices for these purposes.

A fourth implication, and a complement to the third implication, is that L2 readers will often be unaware of social and cultural factors that influence how L2 texts are organized, used, and interpreted by skilled readers in the L2 culture. L2 readers may experience confusion about how texts are treated by the L2 culture, how evidence is assembled to create a persuasive text, or how texts can be subjected to a critical analysis by drawing on other text resources. These aspects of text as resource, the structure of persuasion, and the critical interpretation of text need to be taught explicitly. Teachers can introduce these concepts through (a) specific tasks that help students analyze aspects of text structure, (b) think-aloud teacher modeling of comprehension processes, and (c) classroom discussions that connect text comprehension with ways that L1 texts are typically organized. Chapter 14 addresses the importance of text structure knowledge and offers instructional suggestions.

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9 *Social Contexts of Reading*

> Within a few years after birth, a relatively small blip of time, a brain circuitry that is remarkably strong or dangerously weak or somewhere in between will be created, affecting a lifetime of attainment. What are the key factors determining this? Essentially genetics, early experience, and their lifelong effects on each other. That's it; for better or worse. (Suskind, 2015, p. 52)

Most efforts to describe the nature of reading abilities and their development, for either first-language (L1) or second-language (L2) readers, focus heavily on the cognitive aspects of reading – the mechanisms by which an individual carries out fluent reading. In fact, much progress has been made in understanding the cognitive aspects of reading, and reading development cannot be discussed without considering these aspects of reading. At the same time, there is considerable variation across different individuals' reading abilities, and not all of this variation is due solely to individual cognitive abilities and their development. We all learn to read in a variety of contexts, from the time we encounter our first books or are read to as a child, to the times when we are reading advanced research material as professional adults. We learn to read within a family unit (influenced by the educational levels, financial resources, goals, expectations, and support of family members), in various school settings (and their associated goals, resources, expectations, and opportunities), in various classrooms (with differing curricular and instructional approaches), and in interaction with specific teachers and student peers (with their goals, training, expectation, and abilities).

Students are also influenced by the wider social and cultural expectations of political, religious, ethnic, economic, and social institutions. Certainly, popular culture has profound influences on children and young adults learning to read, and neighborhood influences, both formal and informal, cannot be overlooked. These factors are multiplied for L2 readers who must sort through competing cultural and social influences emerging from both L1 and L2 contexts, as

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well as the many competing L1–L2 influences in the dual-language mind of each individual L2 reader. All of these contexts have varying impacts on the cognitive aspects of reading abilities for all learners (see Table 9.1). We will focus on a number of these key social context factors in this chapter.

Table 9.1 Social context factors influencing reading development

1. Family factors (maternal, paternal, siblings, relatives)
2. Exposure to print factors, amount of leisure reading
3. Language exposure, language development factors
4. Digital influences
5. Socioeconomic status factors (parental income, parental education, food availability, crime, neighborhood resources)
6. Ethnic factors
7. Cultural factors
8. Political factors
9. Preschool programs; preschool education
10. School factors
11. Educational resources
12. Peer factors

Unlike the research on cognitive aspects of L2 reading, there is relatively less empirical research on the social factors that influence L2 reading and reading development (although this domain of research has expanded in the past decade). Much of the social context research involving L2 readers is focused on young bilingual children and L2 elementary-school children from pre-kindergarten to 6th grade (ages four to twelve). However, there is a much larger set of L1 research studies in the United States and other countries that examine socioeconomic factors, home environment factors, ethnic and community factors, and factors associated with opportunities for reading (Fernald et al., 2013; Goldenberg et al., 2006a; Goldin-Meadow et al., 2014; Hart & Risley, 1995, 1999; Hirsh-Pasek et al., 2015; Hoff, 2013; Kieffer, 2012; Mol & Bus, 2011; Rowe & Goldin-Meadow, 2009; Schwanenflugel & Knapp, 2016; Seidenberg, 2017; Sénéchal, 2015; Shahaeian et al., 2018; Sirin, 2005; Snow et al., 2007; Sparks et al., 2014). Relatively speaking, there is less research on social factors influencing older immigrant students in the United States (who enter the US system later), on English as a second language (ESL) students learning to read English for advanced academic (university) studies, or on English as a foreign language (EFL) students learning English in thousands of different (foreign language, FL) contexts around the world.

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This chapter focuses primarily on social context factors in the US birth to 6th grade setting. There is much research on social contexts in other countries and other languages (e.g., the United Kingdom, Germany, Holland), but a large majority of well-controlled research has been in the United States (e.g., the list of studies in the Mol & Bus, 2011 meta-analysis). This setting is well documented in terms of carefully controlled research studies, and it offers insights for many L2 academic reading contexts. The social context obstacles impacting students' literacy development can be truly discouraging for those less well off, but this perspective needs to be presented, not only for what it says about US literacy instruction (both L1 and L2), but also for the implications that can be drawn for other countries and for L2 students in many different contexts worldwide.

This chapter can only provide a basic sketch of ideas and research studies in many different settings. It does not emphasize cross-cultural and cross-ethnic language uses that can lead to discontinuities with academic language uses in school systems, or educational contexts and policies that limit minority-student access to equal instruction (see Goldenberg et al., 2006b; Hoff, 2013). Instead, it focuses on factors affecting measurable reading achievement outcomes with the United States as the primary reference point. It emphasizes, wherever possible, empirical and controlled research studies over narrative evidence and case studies. The commentary that follows describes (a) US demographic information on reading, (b) influences of social context factors on very early development, primarily in the United States, (c) influences of social context factors on subsequent reading skills development, (d) the situation of US language-minority learners, and (e) social contexts factors influencing ESL and EFL students in academic settings.

9.1 Demographics on Students and Reading Development in the United States

In the United States in 2019, based on the National Center for Education Statistics, 59.4 million K-12 students attended public and private K-12 schools; 54.5 million of these students spoke English in the home and were, presumably, not English Language (EL) minority students (National Center for Education Statistics, 2020, programs). Approximately 30 million students (approximately 50 percent of all US school-age children) are considered economically poor or near poor by government criteria (poverty levels, federal free lunch programs; National Center for Education Statistics, Programs, Digest, 2016; US News and World Report, 2015).

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Multiple estimates are regularly provided of the numbers of students in the United States who have difficulty with reading or who would be classified as weak readers. The 2019 US National Assessment of Educational Progress (NAEP, 2020) has estimated that 35 percent of children have difficulty learning to read in school, scoring below the basic level. For 4th graders, the 2019 NAEP report estimated that 34 percent of students were unable to read at a basic level and 35 percent of 8th graders were unable to read at a basic level. The 2019 NAEP data also showed that 35 percent of 4th graders read at proficient or advanced levels, and only 20 percent of 8th grade students read at proficient or advanced levels (see also Chapter 13). Reading at below "basic" levels does not mean that the students are illiterate (96 percent of US students are able to perform discrete reading tasks; Snow et al., 2007), but rather that these students are incapable of reading at, or close to, grade levels in their schools. (NAEP data exclude reading disabled students and EL learners.)

EL students enrolled in public schools are estimated at 4.9 million in 2019. EL students in the US public school system typically do not close the language and reading gap with children in equivalent grades. According to NAEP data from 2003 to 2015, English-speaking L1 students have shown some progress (2003 to 2017, but have regressed to some extent between 2017 and 2019). EL population performance has been essentially the same throughout the years of NAEP testing. For some time, this lack of progress had been a source of some concern. However, Kieffer and Thompson (2018) have pointed out that the EL population is not a stable longitudinal group for comparison purposes. Every year, students originally classified as EL improve in their English proficiency and their reading skills, are reassessed, then removed from the EL cohort and moved to the English–L1 general population for subsequent testing. Every year new students come into the public education system and they are designated as EL students because they are entering the US schools with EL limitations. It would be unusual if this group demonstrated year over year improvement because they are designated EL precisely because they are often new students with EL limitations, by definition.

More importantly, students who come from bilingual or multilingual family backgrounds (as distinct from EL backgrounds) can be tracked for progress over multiple years. When this is done, multilingual students show incremental progress, and actually begin to close the gap between their own progress and the progress of English-L1 students over a number of years, suggesting that children from multilingual households are gaining in their reading skills compared with English-L1 students (Kieffer & Thompson, 2018). The fact that

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many do not fully close the performance gap on NAEP assessment requires a more nuanced analysis with subgroups within the multilingual cohort.

Such an analysis was carried out by Kieffer (2011). In this longitudinal study, he identified five distinct subgroups of multilingual students in US public schools and tracked their performances from kindergarten to 8th grade (n = 9,189). The most proficient of these subgroups were multilingual students who were never classified as EL from kindergarten onwards. A second level included students classified as EL in kindergarten, but reclassified as fluent English proficient by the end of kindergarten. A third group was classified as EL, but reclassified in the first half of 1st grade. A fourth group reclassified at the end of 1st grade. The fifth group remained EL through the end of 1st grade (four assessment periods during kindergarten and 1st grade).

All students, including English L1 students, were re-assessed for English reading abilities at 3rd grade and 8th grade. Even though the lowest cohort was never reclassified out of EL status for purposes of this study, they were also assessed at 3rd grade and 8th grade. By 8th grade, the never-EL multilingual children were slightly outperforming the English-L1 students. All five multilingual subgroups showed higher rates of growth in reading than the English-L1 group through 3rd grade. However, the students not reclassified by the fall of 1st grade (subgroups 4 and 5) never came close to the performance level of English L1 students by 8th grade and were two grade levels below at 8th grade. One likely source of the split among groups 1–3 and groups 4 and 5 was a lower SES rating for the latter two groups. When equivalent English-L1 students at a similarly low SES level were used as a comparison group, there was little difference in reading development between the low-SES English-L1 students and the multilingual students (Kieffer, 2011). The key takeaway for this discussion is that EL status (based solely on EL assessment), as a group performance marker, is both too broad and also not appropriate as a simple category for evaluating reading progress in elementary and middle grades.

When considering the full range of multilingual and multidialect students in US public schools, in 2019 there were approximately 26 million ethnic minority students, representing approximately 53 percent of the total 51 million K-12 public school students (not counting charter public schools or private schools). These ethnic groups included approximately 13 million Hispanic students, 8 million African American students, 3 million Asian students, and 1 million Native American students (using official Department of Education

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ethnic minority categories). Of these students, only a relatively small percentage of students spoke English with difficulty (as opposed to being reasonably fluent English/English dialect speakers).

Expanding the scope of discussion for language-minority students beyond the United States, the number of non-native students in the education systems in several other countries matches or exceeds the situation in the United States. So concerns for literacy development among language-minority school-aged students are not localized to just one or two countries (August, 2006). For example, immigration rates in Israel represent 36 percent of its 8.8 million population (as of 2021). Important languages are Hebrew, Arabic, Yiddish, Russian, English, and Amharic (1.2 million immigrants to Israel are Russian immigrants). In Canada, extensive immigration patterns lead to a complex picture. Demographic data for Canada breaks down as follows: Anglophone at 28 percent, Francophone at 23 percent, other European at 15 percent, mixed backgrounds at 26 percent, Asian/Arabic/African backgrounds at 6 percent, indigenous American Indians at 2 percent. In Europe, several countries have large immigrant populations and similar patterns of language-minority students in the educational systems. In the Netherlands, for example, the Dutch L1 population represents 83 percent of the total population, while the immigrant language minority population represents 17 percent (August 2006). These examples, and many more, suggest that L2 literacy learning for large numbers of students in K-12 systems worldwide will be impacted by sociocultural contexts, combining home, school, and social group factors.

9.2 Social Factors Influencing L1 and L2 Literacy

> Poverty takes no prisoners.... It is not surprising that hundreds of studies have now documented the dramatic, linear, negative relationships between poverty and children's cognitive-developmental outcomes. (Neuman, 2006, pp. 29–30)

Social influences on literacy development cover a wide spectrum of factors. These factors may reflect the types of students being considered, the likely influences of social, cultural, and institutional backgrounds, and the attitudes of people who impact children's literacy development. Major social factors include the socioeconomic status of the parents and family, the values and attitudes of the family and the wider social group, the educational levels of parents, the number of books in the home, the patterns of interactions between parents and children, the amount of talk and interaction between parents (and other family members) with children, the literacy resources available

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in the home, community, and schools, the uses of language in the home, the training of teachers, and the policies and practices of educational institutions of all types (Goldin-Meadows et al., 2014; McCutchen, 2013; Schwanenflugel & Knapp, 2016; Sénéchal, 2015; Mol & Bus, 2011). In the following subsections, these variables are examined most closely with respect to young children in L1 contexts. It is where the best controlled and most compelling evidence is found. If the social context research on the development of reading abilities among L1 children only points out the complexity of the issues and the types of data that need to be gathered and studied, it will open the way for more farsighted discussions of social context factors on L2 reading.

9.2.1 The Development of Emergent Literacy

> The knowledge and skills that children take with them into kindergarten strongly predict where they end up as readers in 10th grade. (Snow et al., 2007, p. 24)

Literacy skills of the child emerge as a result of the interaction between growing cognitive development and a supportive environment that encourages exploration and engagement. This supportive environment includes early oral and written language experiences, communicative gestures, parent–child interactions, and interactions with written materials. These contexts for learning support the key components of emergent literacy: development of phonological awareness, processing speed, print and letter knowledge, orthographic knowledge, oral language development (e.g., vocabulary, syntax, speaking fluency, listening comprehension), and an interest in print (Fitton et al., 2018; Hamilton et al., 2016; Leseman & De Jong, 1998; Pace et al., 2017; Rowe, 2012; Sénéchal, 2015; Shahaeian et al., 2018; Snow et al., 2007; Suskind, 2015).

Early oral language skills are good predictors of later reading abilities in upper elementary grades, and they impact reading indirectly at earlier stages through the development of phonological awareness and letter knowledge (Burchinal et al., 2011; Hamilton et al, 2016; Hart & Risley, 1995; Hoff, 2013; NICHD, 2005; Sénéchal & LeFevre, 2014; Snow et al., 2007). This focus on oral language skill development is also a core focus of the Simple View of Reading (see Chapter 5). In fact, vocabulary, phonological awareness, and orthographic knowledge are likely to generate a long-running mutually supportive set of relationships throughout early childhood (Ehri, 2015; Schwanenfluget & Knapp, 2016; Seidenberg, 2017; Willingham, 2017).

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Emergent literacy is also impacted by a number of nonlinguistic and noncognitive behavioral factors. These also have well-recognized roles in child literacy development: socioeconomic status (SES), general health issues, prenatal care, nutrition, environmental health hazards, food resources, and parental stress and depression (Fitton et al., 2018; Hoff, 2013; Pace et al., 2017; Snow et al., 2007).

9.2.2 Socioeconomic Status

> Differences in SES are strongly associated with variation in language outcomes. By the time they enter kindergarten, children from disadvantaged backgrounds differ substantially from their more advantaged peers in verbal and other cognitive abilities. (Fernald et al., 2013, p. 234)

A considerable amount of research has identified low SES of families as a major factor in less advanced reading abilities by children. The impact of SES on child language development begins from birth, much like genetic predispositions, although the impact of SES may not manifest itself in actual language variables until the age of one. SES remains a significant factor in language development throughout both preschool years and schooling years (Kieffer, 2012; Pace et al., 2017), usually as a direct predictor of subsequent language skills. The research issue around SES that is most commonly addressed is whether or not it totally supersedes other potential variables in early child language development (through the age of four). It is also important to recognize that SES impacts on child development are not equivalent to race, ethnicity, or other cultural variables. All ethnic and cultural groups include both high and low socioeconomic groups. While low-SES families may be associated more with specific ethnic-minority groups, and often are, research studies using SES have demonstrated that it is an educational/economic variable rather than a cultural variable.

In earlier research, SES has correlated at $r = 0.68$ with academic achievement (White, 1982) and is one of the strongest predictors of performance differences among 1st graders (Lonigan, 2004). Children from low SES backgrounds are at significant risk for reading difficulties and will likely have slower development in oral language, letter knowledge, and phonological awareness skills. Children living in poverty have much less home access to computers or the Internet; they have many fewer books in the home; they have fewer novel environments; and they spend more hours watching television. Children living in poverty also lack sufficient food nutrition and lack basic health and dental care (Hoff, 2006, 2013; Phillips & Lonigan, 2005; Schwanenflugel & Knapp, 2016). There is a strong relationship between SES

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factors and oral language abilities (Hoff, 2003, 2013). SES also interacts with home literacy variables, predicting home literacy variables in many studies. Two earlier major meta-analyses have been carried out on SES (Sirin, 2005; White, 1982). In both studies, SES has been found to be a moderate but robust predictor of later reading abilities, on average accounting for 10 percent of shared variance with reading measures (Sirin, 2005).

SES is not a simple variable but a complex combination of factors with considerable variation within SES-determined groups. However, four measures are consistent and highly correlated: parental education, parental occupations, family income, and child school lunch program selection. Many generalizations are still appropriate based on aggregate group data (Sirin, 2005). Lower SES homes lead to less language input, less language output by children, and less developed vocabulary (Goldin-Meadow et al., 2014; Hart & Risley, 1995; Hoff, 2003, 2013; Pace et al., 2017). Lower SES leads to lower scores on several measures of expressive language (Arriaga et al., 1998). Low income families have children with greater risk of reading difficulties (Fernald et al., 2013). Many studies document these differences in shared reading experiences and patterns of book ownership (Adams, 1990; Shahaeian et al., 2018). Adams (1990) estimates that middle-class parents spend 1,700 hours in one-on-one reading with a child; lower-income families spend less than 25 hours in one-on-one reading with a child. Oral language input is also very different. Higher SES parents speak more, speak with greater lexical complexity, engage in more contingent (conversational) interactions, and are more encouraging (Hart & Risley, 1995; Hoff-Ginzberg, 1991; Rindermann & Baumeister, 2015; Weizman & Snow, 2001).

In a recent study by Shahaeian et al. (2018), the authors analyzed a sample of 4,768 children from the Longitudinal Study of Australian Children from three time points: at ages two to three, ages four to five, and ages eight to nine. In the first wave (ages two to three), they analyzed data on shared reading, books at home, home leisure activities, SES, and non-verbal intelligence. At ages four to five, children were assessed on early academic skills (vocabulary, letters, words, numbers, writing). At ages eight to nine, the children were assessed with the National Assessment Program for Literacy and Numeracy (NAPLAN) (reading, writing, spelling, grammar, punctuation, math). Results showed that SES distinguished high and low performing children in stages two and three, but in addition, shared book reading, both directly and indirectly, predicted scores at stages two (on vocabulary and early academic skills) and three on all academic skills on the NAPLAN with eight to nine year olds. Shared book reading

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had a greater impact on low and middle SES students, suggesting the importance of shared book reading for later improved academic performance with students who need this most.

In another recent review of the impact of SES in literacy development, Pace et al. (2017) traced three pathways of child language development all the way to academic literacy skills, including cognitive processing skills development, family interactions around language, and broader social and cultural interactions involving language use. The review addressed the impacts of SES on early vocabulary development and knowledge of the world (background knowledge), and points to research subsequent to Hart and Risley (1995, 1999) that support their seminal findings. In addition, Pace et al. (2017), highlighted research on the impact of SES on early syntactic development, phonological development, narrative skills, and subsequent reading and writing development in school (see also Fernald et al., 2013; Peter et al., 2019).

A final study that explored the important role of SES on school age children is that by Kieffer (2012). In this study, three stages of student data from the Early Childhood Longitudinal Study-Kindergarten (ECLS-K) (N = 9,189) were used to examine the impact of SES on prereading and reading achievement for kindergarten children, children in 1st to 3rd grades, and children in 5th to 8th grades. He found that the SES gap between low and high SES children's reading growth narrowed from K to 3rd grade, but began to widen again from 5th to 8th grades. Based on these results, he argued that 3rd grade is the critical year for closing the SES gaps in student reading proficiency. After 3rd grade, closing the proficiency gap becomes much more difficult and will require much greater effort in the school systems.

9.2.3 Going Beyond SES

> Deciding to spend time on speaking and reading to children, to spend the given money and time in acquiring or lending and reading books, or to carefully select kindergarten and school according to their quality are notable examples of the way individual decisions can alter the environment of children toward a more positive development. (Rindermann & Baumeister, 2015, p. 137)

One of the most discussed research associations between SES and later reading development is in relation to very early language development, and in particular early language (vocabulary) input and subsequent growth (Hart & Risley, 1995; Suskind, 2015). In a landmark early child development study by Hart and Risley (1995, 1999), children in families grouped by SES showed major differences in early

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vocabulary growth from nine months to thirty-six months (forty-two children in a longitudinal study). According to Hart and Risley (1995), children from high SES homes were exposed to approximately 45 million words in the first four years of their lives (language directed to the child). The children from medium SES homes were exposed to approximately 26 million words, and lower SES children were exposed to approximately 13 million words (Hart & Risley, 1999, p, 293). Differences in vocabulary growth on the part of children were highly correlated with these differences in word exposure. Moreover, 40 percent of the shared variance of early vocabulary growth was accounted for by family SES.

Six years later, these differences in children's vocabulary growth led to large significant differences in language knowledge in 3rd-grade at ages nine to ten (vocabulary, listening, speaking, syntax), demonstrating that the amount of exposure to language from nine months to thirty-six months led to major consistent differences in language and literacy abilities six years later (shared variance of 43 percent for vocabulary and shared variance of 52 percent for listening, speaking, and syntax abilities; Hart & Risley, 2003). These results, based on home variables collected six to eight years earlier, are remarkable, and led many to assume that SES was the single major causal variable for early vocabulary development. This finding also subsequently led to the phrase "the 30 million word gap."

Hart and Risley (1999), however, also observed a family from a lower SES level engage extensively in oral exchanges with their child in ways similar to a number of higher SES families. That child developed vocabulary skills like a child from a higher SES. This led them to argue that SES is not the ultimate source of differential vocabulary and language skills; rather the stronger determining factor was the total amount of talk, especially parental talk, directed to the child over the course of the child's first thirty-six months (as well as the quality of interactional conversation patterns between parents and child). This reanalysis of their data showed that simple amount of total talk from parent to the child accounted for variation attributed to SES and also variation attributed to IQ. Even more remarkable is the finding that early word exposure differences led to differences in reading ability six years later (shared variance of 59 percent) (see also Burchinal et al., 2011; Halle et al., 2009; Hirsh-Pasek et al., 2015; Hoff, 2013; Snow et al., 2007).

Before the early work of Hart & Risley (1995, 1999), there was limited longitudinal data on language development from birth to three years old (for multiple reasons, see Fernald et al., 2013; Suskind, 2015), so it was hard to find an alternative account for individual

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differences owing to SES variation or IQ. But after Hart and Risley, a considerable amount of research has examined the first three to four years of infant language learning. Subsequent results over the past twenty-five years have generally supported the arguments of Hart and Risley that parental talk with the child and the rapid growth of vocabulary knowledge through exposure and social interactive speaking "practice" are among the earliest indicators of subsequent successful academic skills development, especially reading development (Cartmill et al., 2013; Fernald et al., 2013; Goldin-Meadow et al, 2014; Hirsh-Pasek et al., 2015; Hoff, 2003, 2006; Huttenlocher et al., 2010; Rindermann & Baumeister, 2015; Rowe, 2012; Rowe et al., 2012; Uccelli et al., 2019). While SES has remained as a major contributing factor, additional early developmental and environmental factors have become equally important.

Rindermann and Baumeister (2015) directly examined the claims of Hart and Risley by reanalyzing their data and adding data from Hoff (2003). Their results confirmed that the key factor contributing to major gaps among children from diverse backgrounds was less likely to be the result of SES, but rather, the result of patterns in parent–child interactions. The aggregated data on quantity of parent child interactions (number of words), quality of parent–child interactions, topic continuing replies to the child, and children's growing verbal abilities showed that verbal interactions between parent and child up to thirty-six months strongly predicted child abilities at thirty-six months. Further, this strong impact of parent–child interactions was a major contributor to reading abilities in 3rd grade.

Research specifically highlighting the role of parent–child interactions has been both extensive and persuasive. These patterns of high quality interactions were described in some detail in Hart and Risley (1995, 1999). The power of their arguments were subsequently confirmed in research by Cartmill et al. (2013), Hirsh-Pasek et al. (2015), Huttenlocher et al. (2010), Goldin-Meadow et al. (2014), and Golinkoff et al. (2019). In most cases, the patterns of interaction that support parental quality of interactions does not negate the contribution of total amount of language directed to the child. However, research specifically on the quality of parent–child interactions strongly supports its positive impact on early child vocabulary learning and syntactic pattern development (Fernald et al., 2013; Harris et al., 2011; Marchman & Fernald, 2008; Peter et al., 2019; Uccelli et al., 2019).

On a broader level of language acquisition research, the research subsequent to Hart and Risley has greatly expanded the abilities of developmental psychologists and "emergentist" linguists to propose,

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and explore empirically, the development of language abilities from birth. This research has contributed to a larger pathway explaining language acquisition in greater detail (see Christiansen & Chater, 2016b; Ellis, 2019). It is somewhat remarkable that a science of language could function for so long without seeking empirical support using scientific methods (cf. Popper, 1959, 1963) (see also Chapters 2 and 4 for the roles of language processing pressure, chunking, input frequency, statistical learning, implicit learning, and incremental item-by-item learning as cognitive factors impacting language acquisition; Ellis, 2015, 2019; Christiansen & Chater, 2016a; McCauley & Christiansen, 2019).

The expanded examination of language development from birth to three is important in explaining how key prereading skills at the age of five have such powerful impacts on later literacy development. The key predictor variables, such as vocabulary knowledge (and word recognition), syntax knowledge, and phonological awareness, begin to emerge from the early years of life in the interactions between the cognitive development of children and the family environment. The foundation is not rooted in nature versus nurture, but in nature and nurture combined (genetics and environment). This is the source of an individual's eventual reading abilities.

9.2.4 Family Beliefs and Values

Any description of the social context factors impacting a child's prereading development will be multifaceted, and another of these facets is family beliefs and values. Parents who value education strongly influence reading development (Reynolds & Gill, 1994). Moreover, attitudes toward shared reading and other home literacy activities support children's preliteracy skills (concepts of print, oral language skills) (Bennett et al., 2002). Parents who promote literacy activities as a form of entertainment/enjoyment rather than instruction engaged in more literacy activities at home and had children with more interest in print (Serpell et al., 2002). The concept of literacy as enjoyment is one that is much more commonly adopted by middle-class homes (Stipek et al., 1995).

Different ethnic groups also tend to value literacy in distinct ways depending on factors associated with cultural experiences (Heath, 1983; Leseman & van Tujil, 2006; Ogbu, 1982, 1999). Some ethnic and social groups value obedience, conformity, and practical skills over independence, assertiveness, and play for children. These choices tend to impact language skills development and preliteracy skills negatively. Aside from ethnic and social group variation, parents who hold more traditional and authoritarian beliefs, such as prioritizing

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directive language to the child, have led to lower child reading achievement over time (Campbell et al., 1991; Heath, 1983).

Outside the contexts of English-speaking countries and educational systems, English is commonly viewed as an international language of wider communication. It is often viewed in countries around the world as a language that can provide educational and employment opportunities. For others, it can be seen as a culturally dominating language that harms other cultures and languages. In considering the role of learning to read in English as an L2, there is relatively little large-scale empirical research on the cultural impact of EL reading on other cultures in countries around the world.

9.2.5 Language Stimulation in the Home

The home language environment is crucial for child literacy development. Parental education, cultural values, and family income all influence the type of literacy and language environment that children experience. Parents who own more books and read more often have a strong impact on children's comprehension and vocabulary skills (Mol & Bus, 2011). The language attitudes and education of the mother is a very powerful factor in child literacy development. Maternal education and social class-related factors (often used as SES indicators) also influence differences in more decontextualized language and use of genres that prepare children for later schooling, and these uses of decontextualized (or academic) language and genres predict subsequent child language development (Leseman & Tujil, 2006; Rowe, 2012).

Other parental factors also influence the development of early literacy and prereading skills. The role of the mother in terms of attachment, interactive warmth, contingency sensitivity, more explicit scaffolding, and maintenance of child-directed interest are all important for child expressive language development (Bus & van IJzendoorn, 1988; Landry et al., 2001; Suskind, 2015). Additional factors that can place children at greater risk include family distance from the dominant culture as well as possible neighborhood and community influences on the family (Esposito, 1999; Lawrence & Shipley, 1996; Leventhal & Brooks-Gunn, 2000).

9.2.6 Home Literacy Environment: Shared Reading Experiences

> Whereas children in the middle-income neighborhoods had multiple opportunities to observe, use, and purchase books (estimated at about 13 titles per individual child), few such occasions were available for low-income children (estimated to be about 1 book for every 300 children). (Neuman, 2006, p. 31)

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Shared reading experiences have been a major topic of research on social factors impacting reading developmental all the way up through elementary school grades. There is fairly consistent evidence demonstrating that shared book reading has a benefit, though not large, on child literacy development (Fitton et al., 2018; Mol & Bus, 2011). Homes with more limited shared reading activities will often lead to poorer oral language skills among children. These oral language skills, in turn, influence word recognition skills and phonological awareness during pre-kindergarten through 1st grade and are also important direct predictors of reading comprehension from 3rd grade on (Hindman et al., 2014; Mol et al., 2008; NICHD, 2005; Sénéchal, 2015; Sénéchal & LeFevre, 2014).

The relationship between shared reading and language development may also be due to a number of mediating or underlying factors. Effective child and maternal behaviors are encouraged through shared reading. Maternal education, often viewed as a genetic factor (or an SES factor) rather than an environmental factor (Puglisi et al., 2017; Olson et al., 2014), can influence the effectiveness of shared reading as well as practice in interactions with infants, modeling and teaching of vocabulary, and promoting greater print knowledge. A key mediating factor is the emphasis on a child's participatory role; children need to be active participants in shared book reading for it to have a positive impact, especially for print-related learning (Sénéchal, 2015). There is a major social class (SES) distinction in frequency of shared reading and other literacy related activities. Baker et al. (1998) found that 90 percent of middle-class parents engaged in shared reading; lower-class parents engaged in shared reading at 52 percent (see also Leseman & Tujil, 2006).

Shared book reading varies in how it is carried out. In a large scale study using the Early Childhood Longitudinal Study-Birth Cohort, Hindman et al. (2014) analyzed 700 parent–child (five year olds) interactions around a book sharing task. Parents did not commonly, nor intensively focus on code features while reading together. That is, they did not commonly focus on letters, sounds, or the sounds of particular letters. Much more commonly, parents focused on words, meanings, and story ideas. They also described characters, discussed illustrations, made predictions, and summarized story ideas. The results of this study, in line with prior research results, showed that children learned oral language skills but not a significant amount of print-related skills – alphabet knowledge, letter–sound correspondences, spelling or decoding. The greater the variety of meaning-based talk, the more advanced the child's subsequent oral language skills. This large-scale study confirmed many earlier smaller-scale studies,

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most important of which is that children gain significant amounts of new vocabulary through shared book reading even if they do not immediately connect this new knowledge with print features (see also Sénéchal & Lefevre, 2014).

In a well-controlled meta-analysis involving home exposure to print, Mol and Bus (2011) reviewed ninety-nine studies (N = 7,669) meeting inclusion criteria. They separated their analyses into multiple age groups for independent analyses (pre-kindergarten and kindergarten, elementary school, middle school, high school, and college/university). They found that students who engaged in more print exposure improved in comprehension, word recognition, and in spelling skills. Early print exposure increasingly accounted, respectively in kindergarten, elementary school, middle school, high school, and university, for 12 percent, 13 percent, 19 percent, 30 percent, and 34 percent of variance in oral language skills. They concluded that "shared book reading to preconventional readers may be part of a continuum of out-of-school reading experiences that facilitate children's language, reading, and spelling achievement throughout their development" (p. 267).

Shared book reading, while also engaging in dialogic reading, and often training parents in how to carry out dialogic reading, has been the subject of a number of research studies and meta-analyses. Niklas & Schneider (2015) provided a simple procedure for teaching dialogic reading to parents of six-year-old children in Germany. Dialogic reading focused on a combination of parent–child interaction around a text, the parent asking questions, providing encouraging comments, and expanding on the text through interaction. Parents who agreed to the training and used the training in home literacy activities were compared with a group that did not participate. At the beginning of training, there were no differences in SES, home literacy environment (parent survey), vocabulary, letter naming, and rapid naming. After four months, the children were assessed a second time, and the children of parents who fully carried out dialogic reading were seen to have improved vocabulary significantly over the control group.

This pattern of improvement through home literacy interactions was also found more generally in a set of meta-analyses. Sénéchal and Young (2008) analyzed sixteen family literacy intervention studies carried out in five English-speaking countries. Overall, parental involvement in parent–child engagement had a positive effect on reading acquisition with children from kindergarten to 3rd grade (effect size of $d = 0.65$). Van Steensel et al. (2011) also examined the effects of family literacy programs on children's literacy development. However, the status of training and the ambiguities of reporting student

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grade level for students limited the specificity of the family literacy program. Results reported a significant but low impact with effect sizes of $d = 0.22$ for code-related training and $d = 0.17$ for comprehension training.

Finally, Fitton et al. (2018) reported on a meta-analysis evaluating shared book reading for young EL learners. The analysis included fifty-four studies carried out in the United States. Children were an average age of six, although some studies included children up to the age of twelve. Overall effect size from the combined types of family-based interventions was significant at $g = 0.28$. The study also confirmed a number of more specific challenges that EL children face in the US education context. ELs commonly enter schools with much lower levels of vocabulary knowledge in English. They have gaps in other language and literacy skills as well as in background knowledge that would be helpful to early school success. Among other findings, a number of characteristics did not moderate the core results of the study: SES, L1/L2 pairing, and the child's age. Thus, shared reading practices might work equally well in widely varying child populations.

Additional recent research has reconfirmed the major challenges created in English-speaking (and other language-dominant) school systems needing to improve EL skills as a critical support for student academic success. The challenge is especially acute for L2 children as they move out of preschool settings and through early school grades (Aarts et al., 2016; Foorman et al., 2018; Hoff, 2013; Hoff et al., 2012; et al., 2013; Marchman et al., 2010; Netton et al., 2016; Palermo et al., 2014). The more recent strong evidence confirms that language skills in L2 English (or Dutch) relate strongly to the prior input and experience with language learning in that language. Similar findings can also be taken from research investigating the L1 and L2 reading performances of older L2 students (Alderson et al., 2016; Jeon & Yamashita, 2014; Melby-Lervåg & Lervåg, 2014; Pae, 2019; Yamashita & Shiotsu, 2017) (see Chapter 8).

These results also create significant challenges for bilingual children and their parents. The language of the home has powerful influences on bilingual children, especially on children who grow up in an L1 family environment that is not the language of the school system. Strong family support in the L1 in a child's early years provides a strong positive family environment and positive cultural values. It is unclear how the need for strong sociocultural values works alongside the strong evidence that EL and literacy skills are critical for reading development from birth to 3rd grade. There do not seem to be any simple answers to this challenge at present.

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Aside from shared reading, family literacy programs with intentional instruction have been shown to provide support for parents and children interacting directly in the home. They are most effective when they provide explicit support for parent roles, focus on extensive print exposure, and develop oral language skills. When preschool children are older (ages four to five), parents should also be encouraged to focus on decoding, but not as formal instruction or corrective feedback; rather, efforts to provide hints, propose strategies, provide sound examples, and so on are more likely to maintain the child's interest in literacy activities (Lonigan, 2004). In a meta-analysis involving explicit vocabulary learning, Marulis and Neuman (2010) focused specifically on word learning activities among pre-kindergarten and kindergarten children (67 studies and 216 effect sizes). Significant gains in vocabulary from interventions generated a large effect size of $g = 0.88$. Overall, research seems to support the integration of intentional teaching methods with emergent literacy skills and supportive educational environments.

However, family intervention programs can be controversial, including the following concerns:

1. The identification of specific social groups as being less capable of providing good home literacy experiences and stereotyping these groups.
2. The variable effectiveness of programs, of training materials, and of training parents to carry out programs appropriately.
3. The socialization of parents into accommodating mainstream social values.
4. The variable benefits of the programs for later literacy development.

Two earlier meta-analyses have argued that family involvement has little to no impact on child literacy development (Mattingly et al., 2002; White et al., 1992). In evaluating outcomes of programs, whether home-based or school-based, it is important to recognize that many catch-up efforts do not maintain better performance for the long-term (in part because so many confounding and subsequent factors intervene), but they do provide the building blocks for later literacy experiences and instruction (Lonigan, 2004).

Recognizing that shared reading, print exposure, decoding instruction (phonological awareness and letter knowledge), and oral language development can improve later literacy, many outside-the-home programs have been developed to intervene and improve children's preliteracy experiences. Effective programs are those that (a) focus directly on the child, (b) have a higher intensity of interaction (hours per day), (c) focus on language skills development, (d) promote

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learning as enjoyable, (e) employ well-trained teachers, (f) have adequate resources, and (g) engage children in interactions to promote higher cognitive engagement (Fuligni & Brooks-Gunn, 2004; Lonigan, 2004).

Unfortunately, on the basis of outcomes research, many preschool programs do not provide these types of emphases (Dickinson et al., 2004; Ricciuti et al., 2004). Many preschool programs devote minimal attention to language and literacy development skills and children in these programs. They include few book resources for children and they do not read to children on a regular basis. They engage children in few conversations that promote higher cognitive demands. These poorly supported and structured programs showed no gains when compared with control groups of children (Dickinson et al., 2004).

9.2.7 Training and Interventions for Early Literacy Development: Head Start

> We studied 77 Head Start classrooms … and found that teachers engaged in instructional talk (talk about language, ideas, print, numbers) only 12% of the time. Explicit talk about words was almost absent, being found in fewer than 1% of the interactions. No such interactions were observed at all in 89% of the rooms. (Dickinson et al., 2006, p. 20)

There are several well-recognized programs in instructional centers for preschool children. Head Start is the largest and most widely recognized of these options in the United States.

Head Start is an umbrella federal program that began in 1965 and uses federally funded community, state, and school district programs to fulfill its mission of supporting low SES children with social, behavioral, health, and cognitive support programs (Zill & Resnick, 2006). It has increased in size over the years and, with a budget of more than $9 billion (in 2019; Bauer, 2019), provides services for more than 900,000 children, primarily three- and four year olds, five days a week, about six hours per day (Head Start Program Facts, 2018).

Of the children served, 27 percent are white, 30 percent are black, and 17 percent are Hispanic (Head Start program facts, 2018). In 1998, the US government required that a careful, controlled large-scale evaluation of Head Start outcomes be reported. The first evaluation report (Head Start, 2005) showed that Head Start is consistently more effective than a wide range of comparison options for children and parents. While the effect sizes were small, significant differences were reported for word and letter identification, prewriting skills, vocabulary growth, and number of times a child is read to (Fuligni & Brooks-Gunn, 2004; Head Start, 2005).

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The major follow-up federal Head Start Impact Study (HSIS) from 2002 to 2012 (Puma et al., 2010) has now been analyzed multiple times, and the major findings are important from a social context perspective. The initial interpretations of this study reported that, on exit from Head Start into kindergarten, children scored significantly higher in vocabulary learning than home-based preschool children, but by 3rd grade, these students were not performing better than non-participating students. This finding led to a number of criticisms of the Head Start program and its large budget. However, in a number of recent large-scale reports, it is persuasively argued that Head Start is successful in two major ways. When the HSIS report was reanalyzed to disaggregate control students (who, nevertheless, ended up in other preschool programs) from those who were a true control (no-institutional preschool program), the Head Start students performed significantly better after several years than the so-labeled "home-based preschool students."

Perhaps more importantly, the Head Start students performed better on a number of long-range social factors related to ultimate school (and social) success: fewer behavioral problems, decreased obesity, lower crime rates, higher high school graduation rates, more likelihood of going on for post-secondary study, more likelihood to become economically self-sufficient (Bailey et al., 2018; Bauer, 2019; Feller et al., 2016; Kline & Walters, 2016). Aside from more immediate cognitive assistance during the Head Start program, other SES factors support the longer term educational advantages recently reported for Head Start (more health screening while in Head Start, a more secure daytime environment, much less food insecurity, and lower daycare costs to families; for Head Start parents, more job training and adult education options (Bailey et al., 2018; Head Start Program, 2018; Piper, 2019).

These results show that Head Start does improve children's short-term early literacy skills over children who do not participate in any type of preschool programs and has a number of more general social context benefits as well. For many years, Head Start programs had encountered considerable criticism. Difficulties included low teacher pay, poor teacher training, limited resources, more children from non-English-speaking homes without special teacher support. More recent support for Head Start programs has led to stronger credentials for Head Start teachers and better pay. Seventy-two percent of Head Start teachers have a BA university degree or higher, and 95 percent have at least a two-year associates degree (Head Start program facts, 2018)

While Head Start (a center-based program) and Even Start (home and center support from birth) have moderate success, rather than

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overwhelmingly positive success, it needs to be recognized that these major programs work with the least educated, least employed, and least wealthy families. For example, mothers of children qualified for Even Start are in the bottom 5 percent for word recognition skills, the bottom 2 percent for reading comprehension abilities, and the bottom 1 percent for reading vocabulary. Only 15 percent of Even Start parents had a high school degree or its equivalent (Dickinson et al., 2004). It is easy to see how training parents in the home to help children begin to read would be difficult when parents themselves have great difficulty reading.

9.3 Teacher Professional Training and Teacher Effectiveness

> Teachers of reading require domain-specific knowledge and expertise—expertise, for example, in the language of instruction, knowledge about reading development and its component skills, and the ability to use that knowledge in educational encounters with children. (Cunningham & O'Donnell, 2015, pp. 447–448)

In a review of school and teacher preparation, August (2006) states that schools with high concentrations of EL students were having more difficulty demonstrating average yearly progress towards standards-based goals. Fifty-two percent of these students received extensive EL services, 36 percent received some EL services, and 12 percent did not receive EL support services. Even in cases where extensive services are provided, it is not clear that students are given the support that they need. One of the social context factors that impact the challenges facing EL students, more generally, is instruction provided by reading teachers.

A number of research studies have argued that pre-kindergarten through 6th grade teachers in the United States are not well trained in the range of knowledge essential for teaching early literacy skills (e.g., phonology, phonological awareness, letter–sound knowledge, alphabetic knowledge, spelling, morphological knowledge, regular versus irregular word pronunciation). Many teachers do not have a strong grasp on letter conventions in relation to the phonemic sound systems of English. They are not well trained to identify the number of sounds in a word (e.g., tough, knight, exit: three sounds, three sounds, five sounds), the number of syllables and syllable boundaries (e.g., laboratory: four syllables; human : [m] in second syllable, humble: [m] in first syllable), or the number of morphemes in a word (disappearances [four morphemes]; real, reef, review, react [1, 1, 2, 2 morphemes]).

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Further, when teachers are asked about the key features of effective instruction, they most commonly referred to using children's literature and independent reading (Cunningham & O'Donnell, 2015; Cunningham & Zibulsky, 2009; McCutchen, 2013). With regard to teachers of L2 students, only 12.5 percent of teachers of EL students had received eight or more hours of training to teach ELs in the past three years. Forty percent of these teachers had received no training support in teaching EL students in their classes (August, 2006).

Also with respect to teacher training, Cunningham and O'Donnell (2015) identify a number of issues that call for research in instructional effectiveness specifically for students' developing reading skills. Teachers need to know about phonological processes, orthographic and spelling patterns and exceptions (and why), the critical roles of vocabulary, morphology, and syntactic knowledge, the role of fluency in reading and reading development, the reading comprehension process, the importance of relevant background knowledge, the ability to use strategies to work through challenging texts, and the importance of reading widely and reading a lot. Of course, teachers must also develop a repertoire of effective instructional plans and creative responses to student needs that help develop students' comprehension processes. At present, the outcomes of research on these knowledge and action goals of reading teachers are not encouraging (Carlisle et al., 2011; Cunningham et al., 2009; Lopes et al., 2014; McCutchen, 2013; McCutchen et al., 2002; Seidenberg et al., 2020)

Many reading teachers do not have training to become effective teachers of reading. The National Council of Teacher Quality (2006) reviewed curricula of seventy-two elementary school teacher-education programs in the United States. Eighty-five percent of these programs received a failing grade "for their instruction of students in the scientific evidence related to reading development and instruction," although a passing grade only required 20 percent of the coursework to convey knowledge of the science of reading (Cunningham & O'Donnell, 2015).

Two recent training studies suggest that teachers can be taught effectively to improve the reading skills of their students. Cunningham et al. (2015) developed and assessed a Teacher Study Group Model (a small group of teachers meeting regularly with a highly trained knowledgeable facilitator). Sixteen two-hour sessions were held during the course of the academic year with three cohorts of teachers. Teachers were also assessed on their abilities to teach phonological awareness, print knowledge and oral language to 101 preschool children. At the end of the year, students improved significantly in phonological awareness on a standardized measure. McCutchen (2013) reported on

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a series of studies with elementary school reading teachers to elevate their linguistic and literacy knowledge, as well as appropriate applications for instruction. Teachers in intervention groups significantly outperformed control group teachers at the end of summer institute training programs. More importantly, McCutchen and colleagues followed up to investigate the classroom practices of the intervention teachers. They studied student outcomes of 1497 students across grades from kindergarten to 5th grade. Students in classes taught by intervention teachers significantly outperformed students in classes taught by control teachers (McCutchen, 2013; McCutchen et al., 2002, 2009).

9.4 Language-Minority Learners in Language Majority K-12 Schools

In comparison with research on social contexts of literacy development in L1 settings, the research that has examined the impact of social contexts on L2 literacy development is more limited. Many studies that explore L2 literacy development in social contexts outside mainstream schooling often do not provide data that represent literacy development outcomes. These studies report extent of engagement or persistence, attitudes toward learning, or assess child/student behaviors instead, and these results are assumed to reflect changes in the reading abilities of children being studied. In many studies of cultural and ethnic differences between home and school, the descriptions are clear and believable, but they are not related directly to specific literacy outcomes on the parts of the children. Many studies highlight important insights from qualitative research and raise critical questions for further research. However, there is relatively little follow-up research to test these insights and questions in rigorously controlled studies.

Having noted this limitation, it is still useful to review research that provides a sense of what we know and, by extension, what we still need to know about social and cultural influence on L2 and language-minority reading abilities. Much of the L2 research is shaped by early ethnographic and case study research by Boggs (1985), Heath (1983), Ogbu (1982, 1999), and others. These early studies provided important descriptions of how two or more cultures (and not necessarily from different L1s) can have very different orientations to the roles of literacy in their lives, the types of literacy uses that are practiced, and the impact of different literacy orientations on children from non-mainstream social and cultural groups when attending mainstream schools. In the past twenty years, the question has been how researchers have built on these early demonstrations of difference to identify

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causal factors that impact the success of reading development. In the case of further progress, Goldenberg et al. (2006a) present a depressing commentary in their research review of the sociocultural contexts of L2 literacy development:

> There are few experiments among the studies reviewed. The scarcity of experimental designs is understandable to some extent.... The emphasis ... has been one describing sociocultural factors in specific contexts ... rather than on empirically demonstrating a link between sociocultural factors and student learning or other outcomes of interest.
>
> The most common methodological problems are unsubstantiated claims ... failure to provide evidence ... and insufficient data. In some cases, unwarranted assertions are not necessarily a shortcoming of a particular article. Rather, it is a shortcoming of the broader literature in the area, which tends to be based on propositions assumed to be true, but with inadequate empirical grounding. (2006a, pp. 258–259)

Goldenberg et al. (2006a) reviewed twenty-one studies that examined the impact either of using the L1 more in the home or of using the L2 more in the home, and its impact on literacy development in the L1 or in the L2. They reported seven studies that showed a positive relationship between amount of L2 use in the home and L2 literacy ability in school. They found nine studies that indicated negative relations between amount of language use in the home (whether L1 or L2) and literacy ability in the other language. They reported five studies that indicated no relationship between amount of home language use and literacy achievement in school. Finally, they reported three studies that indicated a positive relationship between amount of L1 home language use and literacy ability in school in the L2 (see also Goldenberg, 2020 for update; Leseman & De Jong, 1998 for L1 Dutch studies).

Overall, these findings do not provide a strong argument for Cummins' Interdependence Hypothesis or his Common Underlying Proficiency theory (see Chapter 8). However, in fairness to Cummins, these studies focused on language use in the home, not on L1 literacy skills development in educational settings. Goldenberg et al. (2006a) note that the majority of this research suggests that the relation between language use and literacy achievement is language specific. That is, the amount of time that a language is used in the home reflects literacy achievement in that language, but that there is not a general transfer of increasing language abilities in one language to literacy skills in the other language (see Chapter 8).

In a second area of sociocultural factors, some evidence exists that the interaction of home variables and instructional variables appears to be an important factor in language-minority literacy improvement.

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Goldenberg and Gallimore (1991) found that teachers tend to underestimate student abilities, but student performance will improve with appropriate positive support from teachers. They also argued that parental involvement can provide additional literacy skills support when asked, though they typically are not asked to help. In other respects, however, there are few large-scale studies reliably assessing institutional influences or other sociocultural variables such as library visits, print material in homes, number of shared reading experiences, and patterns of language interaction around shared book reading.

In reviewing the evidence for social factors influencing literacy among language-minority students (at least in the United States), there is little consistent evidence that these children respond differently from L1 children with respect to the influence of social factors. For example, based on the studies to date, there is no reason to assert that language-minority students have greater difficulties owing to home backgrounds than do social or ethnic minority groups with similar economic, social, and class profiles, but not speaking a different language in the home. However, this finding does not diminish the importance of social issues influencing the literacy development of language-minority children. As social groups, many language-minority children have the same difficulties that other children from low SES background have, and research in improving and supporting their literacy skills development is urgently needed (Goldenberg, 2020). If there is any takeaway from this discussion of L1 and L2 influences as social contexts of literacy development, it is that much important and exciting controlled empirical research is waiting to be done (cf. Kieffer, 2011; Mancilla-Martinez & Lesaux, 2017).

9.5 ESL Students in Academic Settings and EFL Students

The social factors affecting ESL students in more advanced (post-secondary) academic settings and EFL students in language education courses are going to be quite different from those of L1 students from childhood to end of high school. They will also be different from language minority students in the K-12 school system. For ESL students seeking to study in post-secondary educational contexts, the home environment factors may impact academic achievement but are not likely to have a major impact on either L1 or L2 literacy development at that more advanced point in a student's academic career. However, the educational context and prior instructional history of a student will certainly influence advanced literacy development. These factors

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will be prominent when the instructional practices and literacy expectations in advanced L2 courses do not match well with earlier educational experiences and the educational contexts and expectations from the student's L1 and L2 educational background. These issues are addressed in Chapter 8 on L1–L2 differences.

Students in FL learning contexts in school systems around the world present a different set of social context issues to consider. Fortunately, the stakes in learning L2 literacy in foreign language (FL) classroom contexts are often lower. FL students will face a wide range of social and contextual factors as they try to develop their L2 reading abilities; many of these factors will be conflicting, and they will vary from one situation to the next and from one student to the next. Many of these factors will be similar to the wide range of factors impacting young L1 learners and language minority learners in K-12 settings. For example, SES, parental interaction, maternal engagement, books in the home, home reading experiences, home attitudes to the L2, status of the L2, and a number of other factors are all likely to have some impact on the younger FL learner learning the L2 in K-12 classes.

In FL secondary settings more specifically, some of these factors will vary and disappear, while new factors will take on greater importance. In secondary contexts, end of school year exams will be influential; university entrance exams and associated expectations will be influential; job, occupational, or educational goals will matter; and teacher engagement with the L2 will be important as will be teacher skills. Identification with the L2 popular culture, as well as the status of the L2 in students' popular culture orientations, will also be factors. Related to the impact of popular culture, the general status of the L2, sociopolitical overtones associated with the L2, and peer pressures will all interact with strong social factors from elementary school years: SES, family attitudes, prior educational experiences, prior learning skills and strategies, and teacher influences. All of these factors are open to careful investigation, and assessment of the relative impact of these factors on L2 literacy outcomes would be welcome.

Of course, recognizing that there may be dozens of legitimate factors to explore in determining social context influences on FL reading outcomes does not offer encouragement for the faint of heart. In short, it is very difficult to draw generalizations about the social context influences on L2 literacy abilities among students learning the L2 in a FL context. Nonetheless, there are important implications that could be drawn by exploring these issues at the country, regional, and social/community levels.

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9.6 Putting the Contextual Research into Context

This chapter has reviewed a range of social context factors that are commonly associated with the development of reading abilities. A large amount of research has been carried out on US L1 child groups, and these research efforts, in large part, have defined the relationships between social variables and learning to read, at least in the United States. A second major area of research has examined learners from various language-minority groups who are in K-12 educational settings. The added complication for this group is the L1 and L2 interaction in the midst of many other social and cultural variables. The research reviewed suggests that language-minority learners are not fundamentally different from L1 groups of learners with respect to social factors beyond language ability. Issues of non-accommodation to mainstream educational classrooms, low socioeconomic status, ethnic group difference, and social interaction differences are not factors that only impact language-minority learners. Groups of L1 learners in the K-12 educational system, particularly ethnic minority students, face similar challenges. Moreover, not all language-minority groups face significant educational disadvantages. So it is imperative that the social variables commonly associated with language-minority disadvantage be examined carefully to determine what the real underlying social/causal factors might be.

As this chapter draws to a close, it is important to point out a remarkable combination of research on social context factors that shows the very powerful influence of early word exposure and vocabulary learning on later reading comprehension development. Hart and Risley (1995, 1999) and more recent follow-up research has shown that in the first three years of a child's life, the most important factor predicting later academic achievement may be the sheer number of words a child is exposed to and directed to him or her. In addition, how the parent and child interact around language use may be equally important.

Snow et al. (2007) have shown that preschool and home exposure to uncommon words, and extended teacher discourse in preschool, are the strongest predictors of vocabulary knowledge in kindergarten. Furthermore, the level of vocabulary knowledge in kindergarten is the strongest independent predictor of reading achievement in this study (aside from an auto-regressive measure of reading ability), even when students were tested on reading comprehension in 10th-grade. The vocabulary linkage from the age of one to the age of sixteen, and the preschool foundation of this factor, is extraordinary, and it deserves much more research in both L1 and L2 contexts.

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Finally, with respect to the research on social factors and reading development, much work remains to be done. It is not possible in a single chapter to do justice to the full range of social factors involved, to the research issues that need to be controlled and varied, and to the differing learner groups across a country and across countries. This chapter can only be a snapshot of one perspective among many (primarily that of the US educational system). Certainly, additional research is needed in more commonly treated aspects of L2 social contexts, particularly with respect to their impact on reading outcomes. For example, it is evident, based on many descriptive studies, that students from different social groups and different language backgrounds approach reading in different ways, and social context factors play important roles in these patterns of variation. However, research needs to ask specific questions that can be incorporated into larger, well-designed studies, that seek to control many potentially confounding factors, and that directly address reading ability outcomes.

9.7 Implications for Instruction

This chapter has focused primarily on social context research in L1 settings in the United States, and primarily with children from ages one to eleven. It is a natural reaction to ask why so much attention to L1 settings is useful for L2 researchers and reading teachers. One reason is that it provides a well-documented explanation of how social contexts can influence reading development from the earliest ages all the way to university students. A second reason is that the available research reviewed in the chapter indicates what can be examined under the label of social context influences, how carefully designed and controlled research can be associated with reading outcome measures, and what some of the reported outcomes have been. A third reason is that it provides a number of implications for teachers and instruction that are potentially useful in L2 contexts.

No matter the classroom context, every L2 student has a prior history that includes a range of sociocultural influences from both L1 and L2 social and educational experiences. Some of these factors will not be accessible to the teacher, but some questions about reading interests and experiences, prior educational background, home background, and learning goals can provide teachers with a better sense of strengths and possible weaknesses of individual students. A few simple diagnostic assessment tasks at the outset of the year or course would also provide information that could enhance instructional practices and support student learning. Teachers need to find

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out if there are significant weaknesses in students' reading skills and what might be the cause of these weaknesses. It is also important for teachers to explore the extent of students' exposure to L2 reading and their level of motivation and interest.

There are also instructional implications for the classroom. If specific weaknesses are uncovered through early diagnostic exploration, teachers need to consider how to address these weaknesses (e.g., Alderson et al., 2015). Students can be helped with specifically designed assignments as part of individual instruction time. Group activities provide opportunities for students with complementary skills to work together, and stronger students can help weaker students in specific tasks that address student needs.

One likely outcome of exploring social context factors is finding that many students may not have had adequate exposure to L2 texts nor enough opportunities for extensive reading. Many students may not have had access to stimulating books or other material to read in their prior education. They may not have had access to class or school libraries, or not been given time for free reading in classes. They may not have had positive reading experiences in the L2, nor encouraged to read materials that match their own interests. They may not have the relevant background knowledge to support reading comprehension. It is likely that students with low motivation and low interest are missing reading experiences that could make a difference in their attitudes and motivation.

At another level, students may not have had many experiences in talking about texts, what they understand from their reading, and how information from reading can be interpreted and even critiqued. Having conversations around texts and how to understand main ideas can be an important new experience for students. The teacher, for her or his part, needs to learn how to have open interactions around text meaning rather than more controlled questions and answers (see Chapter 13). When students have difficulties understanding a text, they often assume that their own deficiencies are to blame. In this regard, teachers can make a significant difference in students' learning and students' successes.

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10 *Motivation for Reading*

In effective classrooms, the teacher uses many motivational mechanisms and does so often, so that instruction seems to be overflowing with attempts to motivate students. (Pressley & Fingeret, 2007, p. 233)

Many books on reading do not include a chapter on motivation (cf. Pressley, 2006; Schwanenflugel & Knapp, 2016). However, research shows that positive motivation improves comprehension both directly and indirectly through greater amounts of extended reading, more effective uses of reading strategies, and greater engagement with reading comprehension processes. Motivation has an important role to play in reading development, and teachers and classroom contexts can have a major impact on student motivation. This chapter first addresses definitions of motivation and explanations of theories of motivation (never an easy task). It then reviews major dimensions of motivation; recent research on reading motivation and its relationship to comprehension; and second-language (L2) reading motivation, primarily in the classroom. The chapter concludes with principles that can be translated into practice by teachers and curricula in the reading classroom.

10.1 Definitions of Motivation

Motivation refers to goals, values and beliefs in a given area, such as reading; engagement refers to behavioral displays of effort, time, and persistence in attaining desired outcomes…. The preponderance of evidence confirms the linkage and probably causal relations among these constructs. In other words, motivation facilitates engagement, which in turn facilitates achievement. (Klauda & Guthrie, 2015, p. 240)

Addressing definitions for motivation and related concepts is critical for understanding the role of motivation in reading. There are many definitions of motivational concepts and many ways to understand motivation, to the point that people interested in learning more about motivation can often become bewildered (see Guthrie & Taboada Barber, 2019; Ryan & Deci, 2000; Schiefele et al., 2012; Schunk &

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Zimmerman, 2006; Unrau et al., 2018). Definitions arise partly out of which theoretical frame is adopted as the basis for conceptualizing motivation, despite some overlap among theories. However, a number of general criteria go a long way to create a general definition of motivation without insisting on a single controlling theoretical frame.

Most researchers agree that motivation involves a set of beliefs, values, and expectations, and is associated with a set of defining behaviors: engagement (persistence, amount, intensity), strategic problem-solving, and requests for help. Beliefs, values, and expectations usually center on some combination of self-regulation (intrinsic and extrinsic), self-efficacy, interest, goal-setting, value, and attributions of (or reasons for) success and failure. Moreover, these beliefs, values, and expectations are influenced by a range of external social and contextual factors: parents, peers, sociocultural expectations, socioeconomic status (SES), classrooms, teachers, and instructional tasks. Motivated individuals are optimistic, willing to work on difficult tasks, and aware of their capabilities; they expect success, want choice in controlling their environment and their learning, experience pleasure from their work, and take pride in their achievements. In brief, positive motivation is what activates effective learning behavior.

10.2 Theories of Motivation

Theories of motivation can become quite complex because of many overlapping concepts and characteristics. Part of the complexity arises from researchers' different starting points. Fundamental differences exist between researchers who view motivation and its various manifestations as primarily cognitive in nature and those who see motivation as arising primarily from, and being formed by, social and contextual factors. These distinctions are not absolute, but they do shape views on the stability of motivation, the influence of external situations, and the impact of immediate and prior interactions with other people.

The majority of established theories of motivation begin with individuals' internal cognitive beliefs, values, and expectations. Well-developed theories of motivation include expectancy-value theory, attribution theory, social-cognitive theory, goal orientation theory, and self-determination theory (SDT). There are certainly other theories of motivation and related concepts. However, multiple overviews have provided some consistency with respect to leading frameworks for interpreting motivation in reading contexts (Guthrie & Wigfield, 2000; Lazowski & Hulleman, 2016; Schiefele et al., 2012; Schunk & Zimmerman, 2006; Wigfield & Guthrie, 1997).

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10.2.1 Expectancy-Value Theory

Expectancy-Value Theory (Durik et al., 2006; Wigfield et al., 2015) argues that achievement is an outcome of a person's expectancy of performing successfully and the value (or importance) that is given to that potentially successful outcome. Expectancy for success is also associated with past performance on similar tasks as well as more general constructs of self-concept and self-efficacy. Value is associated with received positive messages concerning learner goals to (a) help them engage, (b) view specific goals as important, and (c) achieve their goals. Each half of the theory includes multiple dimensions, depending on the researcher. For example, expectancy might include self-efficacy, locus of control (self or other), view of ability or mindset (can something be improved with effort); value might include intrinsic motivation, self-control, importance, and extrinsic utility motivation among other possibilities.

10.2.2 Attribution Theory

Attribution Theory is another motivation theory with a long history that characterizes motivation as perceiving the causes of success or failure to depend on ability, effort, task difficulty, and luck (Weiner, 1985, 2010). Why people think they might succeed or fail (e.g., ability, effort, luck) will influence whether they exert effort and persist with a task. Attributions for achievement – self-assessing why one might succeed or fail – also depends on perceptions of locus of control (internal or external) over task, stability of task success, and degree of self-controllability. For example, perceived ability to succeed is largely internal, stable, and controllable. Task difficulty, on the other hand, is external, unstable, but still controllable. Luck is external, unstable, and uncontrollable as an attribution of achievement. Perceptions of success from prior experience provide the cues by which a person attributes likely reasons for subsequent success (Weiner, 2010).

10.2.3 Social-Cognitive Theory

Social-Cognitive Theory portrays motivation as the combined influence of cognitive abilities, environmental factors, and behaviors in a given situation. This theory, first proposed in the 1970s and 1980s, has been given more prominence in the past twenty years. As a theory of motivation, it is very task dependent: self-perception to achieve, the effort made, and persistence to achieve will all vary in line with many contextual factors. Self-perception centers on the concept of self-efficacy, a person's belief about his or her ability to learn or

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perform actions successfully. Self-efficacy is a major component of social cognitive theories as proposed by educational psychologists. How people feel about themselves and their abilities to learn or perform affects effort expenditure, persistence, and learning. People gauge their self-efficacy from past successes and failures, vicarious experiences, information from others, and physiological responses (e.g., fear of performing). All of these factors are mediated by environmental factors (Bandura, 1997, 2005; Schunk & Bursuck, 2016; Schunk & Zimmerman, 2006, Unrau et al., 2018).

Self-efficacy is in itself important in predicting learning, motivation, and achievement. Motivation develops when an individual experiences control over the processes and tasks that lead to successful outcomes and also when an individual feels good about him- or herself – particularly in relation to contexts where learning and successful outcomes are expected (Schunk & Bursuck, 2016; Unrau et al., 2018). Self-efficacy is also closely associated with the concept of self-regulation, an expected outcome of strong self-efficacy in academic contexts. Self-regulation, in turn, requires the development of metacognitive awareness while one is engaged in academic learning and the use of many effective learning strategies.

Self-concept is often associated with self-efficacy, and they are sometimes equated. However, self-concept is defined by a self-view of how competent one is in reading on domains of knowledge rather than by task; it is not task specific. Self-efficacy is more oriented to one's attitude related to an ability to complete a specific task. It is useful to note when a research study is focusing on self-efficacy or self-concept. Both are identified as key constructs, or dimensions of motivation (Kavanaugh, 2019; Retelsdorf et al., 2011; Schiefele et al., 2012; Unrau et al., 2018).

10.2.4 Goal Orientation Theory

Goal Orientation Theory is a somewhat more recent orientation to motivation that combines, in complex ways, goal setting, expectations, attributions, ability, self-efficacy, and achievement behaviors in its depiction of motivation. The major concept informing Goal Orientation Theory, and the reason why someone acts, is goal orientation. **Mastery goals** reflect the desire to better oneself and learn, while **performance goals** focus on outperforming others. These two orientations have different effects on achievement behaviors. Mastery goals lead individuals to practice skills and gain competence, and these individuals feel good when they achieve learning goals. In the process, they learn relevant strategies and skills that support their goals. Individuals motivated by performance goals, on the other hand, do

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not necessarily engage in personal skills development as long as they do better than others and gain recognition. Goal Orientation Theory tends to be oriented to older learners in high school and universities. It is also more general in concept and does not usually address reading development.

Overall, learners with a mastery orientation engage in better cognitive monitoring and strategic processing for learning. In addition, learners with a mastery orientation are more willing to take on difficult tasks that are not required. They also have higher self-efficacy and positive attributions (Elliot & Murayama, 2008). Related to goal orientation is whether or not individuals approach tasks willingly or avoid tasks. The idea that learners could have goals for approaching tasks and goals for task avoidance is one that has translated into reading engagement research. Specifically, goals for approaching tasks positively and goals for avoiding tasks are not opposites of the same dimension. They can independently predict engagement behaviors (e.g., Guthrie et al., 2013). At present, there is little research on how goal orientations can be changed through instructional support.

Somewhat related to Goal Orientation Theory is the set of concepts (**growth mindset** or **fixed mindset**) presented in work by Dweck (2006). Many students believe that they or others have inherent skills and abilities to achieve well. Students who succeed have skills that cannot be taught. If students experiences difficulties or do not succeed with a task, they think that they do not have the ability to succeed (a fixed mindset). In contrast, when students understand that their skills and abilities can be developed further, "they are more likely to take on challenges, exert sustained effort, and learn from errors and setbacks" (Lin-Siegler, Dweck et al., 2016, p. 296). This positive motivation is reflective of a growth mindset. The value of this approach is that there are strong well-defined ways to develop a growth mindset and effective instructional practices to support a growth mindset (see also Duckworth et al., 2016; Dweck, 2006; Lin-Siegler, Ahn et al., 2016; Yeager et al., 2016). In a study that explored global growth mindset and reading-specific growth mindset, Petschur et al. (2017) showed that both variables independently predicted reading comprehension performance among 4th grade students. Moreover, both global growth mindset and reading growth mindset contributed indirectly to reading comprehension through word recognition skills.

10.2.5 Self-Determination Theory

SDT, prominent for decades, refers to a person's capacity to choose how to satisfy needs and act on his or her environment. The more self-determined the individual, the more he or she is motivated by

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internal factors that he or she controls (an intrinsic orientation to learning). Self-determination relies on three key concepts that are central to achievement: competence, autonomy, and relatedness. Being able to carry out actions that are personally important (or intrinsic) requires (a) abilities to act successfully (competence), (b) a sense of control over actions (autonomy), and (c) connections to supportive groups (relatedness) (Komiyama, 2009)

Intrinsic motivation, the central notion in SDT, is the desire to do things for their own sake. **Extrinsic motivation**, in contrast, is driven by externally generated motivations to achieve. Intrinsic motivation leads individuals to seek out challenges, engage in activities that involve some degree of self-regulation, use processing strategies to achieve goals, and tolerate difficulty (better than extrinsically motivated individuals). Intrinsic and extrinsic motivations are often described as two opposite ends of a continuum. However, there are also midpoints where initial external motivation contexts can lead individuals to develop more intrinsic motivation (Ryan & Deci, 2000). There are also contexts in which intrinsic and extrinsic motivations are positively correlated. Research shows that changes in intrinsic motivation can be developed through settings that build competence, provide choice, and develop group support (e.g., Guthrie et al., 2007).

10.2.6 Related Concepts

Aside from these five major theories of motivation, a number of related concepts are key to many of the theories. The first key concept is **interest**. Interest determines engagement with a topic, task, process, or skill. *Situational interest* involves a temporary initial curiosity that might transform itself into long-term *personal interest*. The growth of personal interest incorporates intrinsic motivation to persist and gain greater ownership and mastery (see Guthrie & Wigfield, 2000; Guthrie et al., 2007; Retelsdorf et al., 2011). **Locus of control** is a second related concept that is associated with self-determination and attribution building. Locus of control refers to whether the individual has control or if external influences (e.g., the teacher) have control, and how this source of control influences an individual's perceptions, actions, and outcomes. Through locus of control, students learn how to interpret the reasons for their successes and failures.

A third related concept is an individual's **attitudes** (affective responses). Attitudes are often conflated with motivation, but attitudes are seen as emotionally driven perceptions that are not typically subject to overtly reasoned analysis ("How do you feel about

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reading for fun at home?"). Attitudes emerge from various sources (personal experiences, attributions, cultural traditions, socialization practices, and educational experiences), and are associated with **affective responses** (mood, feelings, emotion, and physiological responses) to situations and tasks (Anderman & Wolters, 2006; Guthrie & Wigfield, 2000; McKenna et al., 1995, 2012; Petschur, 2010; Scholes, 2019).

With respect to reading, large-scale attitude surveys have been conducted in the United States by McKenna and colleagues (1995, 2012). Using well-designed survey instruments, they have shown that positive attitudes toward reading are good at arrival, in school at 1st grade, but they decline steadily through 8th grade. In McKenna et al. (1995), both recreational and academic attitudes toward reading declined steadily from 1st to 6th grade; by 6th grade, students were less positive to truly ambivalent in their attitudes toward recreational and academic reading, respectively. The only resistance to this downward slide was that girls and higher-performing students both declined much less for recreational reading. McKenna et al. (2012) extended their attitudes-to-reading research to 6th to 8th grades. They developed and validated a well-designed survey instrument that examined recreational and academic reading attitudes in both print and digital formats. Female students had more positive attitudes to recreational and academic print texts and to academic digital reading, but male students had more positive attitudes to recreational digital texts, possibly in their attitudes to reading related to gaming. The overall trend downwards continued between 6th grade and 8th grade, but not as steep a decline as through the elementary grades.

A final concept that is closely related to motivation, but that comes from research on optimal experiences, is that of **flow**. In its potential association with learning and skills development, the concept is similar, conceptually, to intrinsic learning, and especially the concept of **involvement** (identified with engagement and task persistence) (Guthrie et al., 2007). The concept of flow has been developed over the past thirty-five years by Csikszentmihalyi (1990, 1997). Twelve characteristics of flow experiences are outlined in Table 10.1.

As to the initiation of flow, Csikszentmihalyi (1990) states that some amount of effort and challenge is involved:

> Often children—and adults—need external incentives to take the first steps in an activity that requires a difficult restructuring of attention. Most enjoyable activities are not natural; they demand an effort that initially one is reluctant to make. But once the interaction starts to provide feedback to the person's skills, it usually begins to be intrinsically rewarding. (p. 68)

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The initial connection of flow with a topic, skill, or ability is much like initial curiosity, situational interest, or extrinsic motivational factors (e.g., peers, teacher). The ability of an individual to engage in flow emerges when the initial connection involves most of the characteristics noted in Table 10.1. Flow can be seen as an alternative variation on intrinsic motivation, though characterizations are not exactly the same.

Table 10.1 Twelve characteristics of flow

1. Tasks must have a reasonable chance of being completed.
2. Concentration on the task must be possible.
3. The task has clear goals.
4. The task provides immediate feedback.
5. The person has interest in the task.
6. Involvement in the task precludes worries and frustrations from ordinary life.
7. The person is able to exercise a sense of control over his/her actions.
8. A concern for self disappears.
9. A sense of duration of time is altered.
10. A sense of accomplishment is felt in task completion.
11. An increase in intrinsic motivation results.
12. The ability to carry out tasks at higher levels of complexity increases.

The four most common activities in which people report experiencing flow are the following: challenging work, sports, school study and learning, and reading. If we hope to motivate students, especially in getting students to read, it would seem that one option would be to create flow experiences for students. If flow experience comes from reading, then students are more likely to become lifelong readers. Certainly the concept of flow, as a theory of motivation, provides a strong rationale for promoting extensive reading, both in and out of class.

10.3 Motivation and Reading

Students with high intrinsic motivation, a learning goal orientation, and high self-efficacy are relatively active readers and high achievers. (Guthrie & Wigfield, 2000, p. 408)

Over a period of thirty years, Guthrie and Wigfield have developed a consistent framework for reading motivation that is empirically driven, based on a range of studies that have demonstrated how instruction can improve reading motivation as well as learning and

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reading comprehension (Guthrie & Klauda, 2016; Guthrie & Wigfield, 2000; Guthrie et al., 2004, 2012, 2013; Wigfield & Guthrie, 1997). Guthrie and Wigfield developed the Motivation for Reading Questionnaire (MRQ) that employs multiple theoretical dimensions of motivation, but is strongly grounded in the major distinction between intrinsic and extrinsic motivations (SDT).

They argued that motivation must be understood as a domain-specific construct (see Wigfield, 1997): Motivation for work or for science learning is going to evolve differently than motivation for language learning or for reading. It follows, then, that motivation for language learning generally (e.g., Dörnyei & Ushioda, 2011) will be different from motivation to read. Research on reading motivation must be developed for its own domain and construct.

Motivation research over the past thirty years has resulted in important findings that predict reading abilities and reading development (e.g., Guthrie et al., 2007; Miyamoto et al., 2018; Schiefele et al., 2012; Unrau et al., 2018). Recent research on the relationship between motivation and reading achievement and growth has expanded considerably, primarily in the first-language (L1) reading context. Theories of reading motivation have highlighted several possible dimensions of motivation, leading to a broader consensus on key dimensions of motivation, even with variations across studies. For example, much recent research recognizes the importance of intrinsic and extrinsic motivation, two organizing constructs of SDT. Along with this advance in theorizing dimensions of motivation, a number of the survey questionnaires used to elicit levels of motivation have been strongly validated for specific student populations, primarily for pre-high school grades.

Several more detailed issues/questions have also emerged that are important for research on motivation and reading:

1. Which derived empirical dimensions best reflect intrinsic and extrinsic forms of motivation?
2. Is the relationship between motivation and reading achievement reciprocal?
3. How does reading amount mediate the relationship between intrinsic motivation and reading achievement?
4. What other mediating factors impact the relationship between motivation and reading achievement?
5. How well does reading motivation lead to reading engagement (the behaviors that reflect motivated activity)?
6. How and when does engagement mediate the relationship between motivation and reading achievement/reading growth?

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7. What instructional practices improve motivation and also reading achievement outcomes?
8. How does motivation vary by habitual motivation versus dynamic task-specific motivation?

These eight questions have generally guided a range of research studies by groups looking primarily at 2nd through 8th grades in L1 contexts and are questions that are still important. We will close our general discussion of reading motivation with two less tightly focused issues. How do L2 contexts change the measurement of reading motivation and generate similar or different outcomes for reading achievement? How does current research generate constructive implications for teaching in L2 (and L1) contexts? Some answers to all of these questions are discussed here.

10.4 Dimensions of Motivation and Motivation Measurement

In early work on multiple dimensions of motivation, Wigfield and Guthrie (1997) proposed a number of exploratory dimensions for their first version of an MRQ. These dimensions, drawing on multiple theories, were labeled as follows: curiosity, involvement, competition, recognition, grades, challenge, compliance, work avoidance, social compliance, efficacy, and importance. They further divided the dimensions into an intrinsic motivation group (curiosity, involvement, challenge, importance, and efficacy); the remaining six motivations reflected, in one form or another, aspects of extrinsic (externally driven or utilitarian) motivation. The MRQ listed statements that elementary-grade students agreed with on a 1–4 scale, usually with four to seven questions per dimension (as do a number of other validated questionnaires since the development of the MRQ).

Subsequent uses of the MRQ adapted the dimensions for various audiences, seldom using all eleven proposed dimensions. Follow-up validation research strongly supported an eight-dimension version, including curiosity, involvement, challenge, recognition, grades, social, competition, and compliance. The first three reflected intrinsic motivation and the latter five reflected aspects of extrinsic motivation (see Wang & Guthrie, 2004). A number of other validation efforts examined the MRQ (in both English and German), and developed somewhat different and broader proposed dimensions of motivation.

A major recent synthesis and critique by Schiefele et al. (2012) provided a thorough review across elementary and secondary student levels and across countries (Australia, China, Finland, Germany, New

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Zealand, Norway, Turkey, United Kingdom, and United States) and supported the development of their Reading Motivation Questionnaire (RMQ). Their 2012 validation research suggested the following dimensions: curiosity, involvement, competition, social-recognition, and grades-performance. Another variation on intrinsic and extrinsic motivation was also carried out specifically for young elementary school children (2nd and 3rd grades): the Reading Motivation Questionnaire – Elementary (RMQ-E). Validation research by Stutz et al. (2016) supported the use of this very abbreviated version of the RMQ (as RMQ-E). The RMQ-E included three dimensions: curiosity and involvement (as intrinsic motivation) and competition (as extrinsic motivation).

A somewhat different type of SDT motivation questionnaire, the Dynamic Reading Motivation Measure (DRMM), was developed by Neugebauer and Gilmour (2020) based on three SDT sources of motivation: reading competence, autonomy, and relatedness. Because motivation and attitudes towards reading have been shown to decrease through the school years, they wanted to measure the fluctuations in reading motivation within individual readers based on specific reading tasks and also fluctuations on the same type of task on different days. They also wanted to know if fluctuations in motivation varied by content areas under study (math, science, and social sciences). The DRMM is simple, comprising ten items (five for autonomy, two for competence, and three for relatedness). They followed 161 students across 6th through 8th grades and found few differences across content areas but important differences across environmental, interactional, and task factors.

The Schiefele et al. (2012) synthesis also reviewed key research studies up to 2012 in the following general areas of reading motivation: (a) intrinsic and extrinsic motivation as predicting factors for reading comprehension; (b) reading amount and reading strategy knowledge as mediating factors predicting reading achievement; (c) text genres and reading proficiency as moderating factors; (d) reading attitudes and reading achievement; (e) reciprocal relations between motivation and reading achievement; and (f) reading motivation, engagement, and reading achievement. Since the landmark review by Schielefe et al. (2012), a number of more recent studies have generally confirmed prior research but with certain variations in measurement, extensions of research issues, and qualifications in findings. Overall, it is important to recognize that each study tended to adapt or adjust the dimensions used for intrinsic and extrinsic motivation, partly owing to data collection limitations, student ages, participant numbers, and/or research questions posed. Nonetheless, findings converge across

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a number of well-designed studies. Key research studies are noted here for several of these factors.

10.5 Intrinsic and Extrinsic Motivation

The RMQ, developed by Schiefele et al. (2012), supported the centrality of intrinsic and extrinsic motivation as organizing concepts within which to identify key dimensions of motivation. Schiefele and Schaffner (2016) assessed the construct validity of their RMQ instrument through confirmatory factor analysis with 883 6th grade students. One important finding was the verification of expected outcomes involving intrinsic and extrinsic motivation with reading variables such as reading amount, reading fluency, and reading comprehension. Stutz et al. (2017), in their construct validation study of the RMQ-E, reported similar outcomes. They assessed 1,497 students in 2nd and 3rd grades, and found strong significant correlations among intrinsic motivation, reading amount, and reading comprehension as well as significant negative correlations between extrinsic motivation and reading comprehension (see also Schiefele & Löweke, 2017).

Hebbecker et al. (2019) examined the relationship between reading achievement and intrinsic/extrinsic motivation while also carrying out a longitudinal study ($N = 966$) with three measurement points during 3rd and 4th grades. The goal of the cross-lagged study was to identify the possible reciprocal relationship between reading abilities and intrinsic motivation. Results revealed positive reciprocal relationships between intrinsic motivation and reading abilities. Reading abilities predicted intrinsic reading motivation for both 3rd and 4th grades. Intrinsic motivation predicted reading abilities only in 3rd grade. The autoregressor variables for reading ability from the first two testing periods were strongly predictive of reading abilities during the third time period, and this may have been a factor in the elimination of intrinsic motivation during the third testing period. This study also explored the relationship between extrinsic motivation and reading comprehension. They found no reciprocal relationships between reading abilities and extrinsic motivation (see also Schaffner et al., 2016; Schiefele et al., 2016).

Overall, intrinsic and extrinsic motivation factors behave quite differently from each other across studies (see also van Steensel et al., 2019). Thus, both should be measured when examining the relationship between motivation (intrinsic and extrinsic) and reading abilities. Results appear to change considerably when both are measured as part of a research design as opposed to when just intrinsic motivation is measured (e.g., Schaffner et al., 2013). Research has also

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strengthened the argument that there is a reciprocal relationship between motivation and reading abilities when studied in longitudinal designs. The relationships between reading and motivation also appear to be stronger with grade-level and above grade-level students as opposed to struggling readers. At the same time, as these studies suggest, there are still varying measurements of motivation and reading abilities, and research is being reported for many different grades, across multiple countries, all of which may impact any generalizations.

One strong generalization that emerges is that intrinsic motivation (especially involvement and self-efficacy) is a powerful dimension of motivation that impacts reading achievement, both directly and indirectly (see also Schiefele & Löweke, 2017; Unrau et al., 2018).

10.6 Motivation and Reading Amount

> The amount of reading is one of the strongest and best supported correlates of reading achievement at all levels. (Schwanenflugel & Knapp, 2016, p. 225)

Mol and Bus (2011), Sparks et al. (2014), Stanovich (2000), and others have shown that reading amount for enjoyment predicts reading achievement. The positive impact of reading amount on reading development has been reported in a large number of studies over the past twenty years. The issue then is whether and how reading motivation predicts reading amount. Moreover, if motivation predicts reading amount, does it also predict reading achievement? Research on these issues has expanded considerably in the past decade.

One of the earlier important studies to combine reading motivation, reading amount, and reading abilities longitudinally is that by Becker et al. (2010). They assessed 704 students longitudinally across 3rd, 4th, and 6th grades, measuring reading abilities in 3rd grade; intrinsic motivation, extrinsic motivation, and reading amount in 4th grade; and reading ability in 6th grade. In a first Structural Equation Modeling (SEM), intrinsic motivation in 4th grade strongly predicted reading amount in 4th grade and reading abilities in 6th grade. A second SEM, including extrinsic motivation measures in 4th grade, again identified a clear path from intrinsic motivation to reading amount and then to reading abilities in 6th grade. In addition, extrinsic motivation produced a small negative impact on reading amount, but a large negative impact on 6th grade reading abilities. A final SEM incorporated a 3rd grade measure of reading abilities into the model as an autoregressor variable. In this case, the autoregressor

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variable of reading abilities in 3rd grade was a powerful predictor of reading in 6th grade. In this analysis, neither intrinsic motivation nor reading amount at 4th grade significantly predicted reading abilities at 6th grade.

Stutz et al. (2016) investigated the relations among reading abilities, reading motivation, and reading amount longitudinally with a group of 2nd and 3rd grade students (N = 1,053). They included potential controlling or mediating variables of gender, cognitive ability (processing speed), and SES (measured by a questionnaire administered to parents), but none were significant predictors. They used the RMQ-E, only measuring involvement and competition as intrinsic and extrinsic motivation, respectively. They also used simple measures of word, sentence, and text comprehension as three 3rd grade dependent variables, as well as simple questions for reading amount.

Intrinsic motivation (involvement) predicted reading amount, which then predicted word, sentence, and text reading comprehension. Extrinsic motivation (competition) directly (and negatively) predicted sentence and text reading comprehension. A second SEM used word and sentence reading comprehension as 3rd grade autoregressor control variables rather than as dependent variables. In this case, word and sentence comprehension predicted reading amount and text comprehension. Intrinsic motivation still predicted reading amount, which in turn predicted text comprehension. Extrinsic motivation also directly (but negatively) predicted text comprehension (see also Schaffner et al., 2013).

Miyamoto et al. (2018) carried out a large-scale longitudinal study of older students from 5th grade to 7th grade (N = 4,619) to examine the relationships among reading comprehension abilities, reading amount, and reading motivation with two groups of students: native German students and immigrant students. The students were also divided between academic and non-academic tracks. Both native German and immigrant students were fairly equally reflected in each specialization track.

In the first SEM, for native German students, 5th grade reading comprehension and intrinsic motivation reciprocally predicted performance on the other ability at 7th grade, and at 7th grade each main variable also predicted performance on the other. Thus, 7th grade reading comprehension was predicted independently by 5th grade reading comprehension, 5th grade intrinsic motivation, and 7th grade intrinsic motivation. The same predictors (5th grade intrinsic motivation, 5th grade reading comprehension, and 7th grade reading comprehension), reciprocally impacted intrinsic motivation at 7th grade. For immigrant students, 5th grade reading comprehension

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predicted 7th grade reading comprehension, as did 7th grade intrinsic motivation, but 5th grade intrinsic motivation did not predict 7th grade reading comprehension.

In a second SEM, 5th grade intrinsic motivation predicted 6th grade reading amount, and reading amount predicted 7th grade reading comprehension even with a 5th grade reading comprehension autoregressor variable predicting 7th grade reading comprehension. The significant result was true of both native German students and immigrant students. Reading amount fully mediated the relationship between intrinsic motivation in 5th grade and 7th grade reading comprehension. (Fifth grade intrinsic motivation did not directly predict 7th grade reading comprehension.)

Two additional parallel SEMs were carried out separating academic and non-academic stream students, each also dividing native German and immigrant students. The native German academic track students revealed fully reciprocal relationships between intrinsic motivation and reading comprehension at a later time. The only additional impact involved non-academic students only and showed that reading amount did not significantly predict reading comprehension in 7th grade.

Finally, Kavanaugh (2019) carried out a large-scale study with 6th grade students in Ireland (N = 4,067). The two dimensions used for motivation were intrinsic motivation (enjoyment of reading) and self-concept. Amount of reading, reading achievement, gender, and SES were also assessed. SEM results showed that intrinsic motivation and self-concept were strongly related, and both contributed independently to reading amount. Intrinsic motivation was fully mediated by reading amount. In addition, self-concept directly predicted reading achievement. Finally, reading amount significantly predicted reading achievement (see also McGeown et al., 2016 for a more complex study and variable results).

Overall, reading amount is an important mediating factor in regression analyses and SEM. Intrinsic motivation strongly predicts reading amount, and reading amount predicts reading achievement (with various qualifications in certain studies). Across many student groups in multiple countries, the impact of intrinsic motivation on reading amount is strong. Moreover, reading amount strongly predicts reading achievement. Sometimes reading motivation also independently predicted reading achievement. Possible predictive variables of native versus immigrant status, student gender, SES, and student reading proficiency (cf. Schaffner et al., 2016) generally do not strongly mediate the impact of motivation or reading amount on reading comprehension.

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10.7 Reading Motivation and Metacognitive Awareness of Strategy Use

Strategy-use measures, whether through student-use questionnaires or scenario-based responses, have predicted a relationship between strategy uses with more challenging texts and reading achievement. Strategy use (and metacognitive awareness of strategy use) has been associated with both reading motivation and reading achievement in varying contexts and with varying student groups. Additional aspects of this relationship are also explored by studies that seek to include motivation development as an instructional aspect of reading comprehension improvement.

Guthrie and Cox (2001) carried out a study to examine the impact of motivation and reading strategy use on reading amount (and reading comprehension). They assessed 251 3rd and 5th grade students on motivation (with the MRQ), strategy use (with a strategy-use survey), reading amount (both leisure reading and school reading), and comprehension. Using multiple regression analyses, they showed that reading motivation significantly predicted amount of pleasure reading. For school-based reading, strategy use significantly predicted reading amount.

Miyamoto et al. (2019) incorporated two mediating variables (metacognitive knowledge of strategy use and reading amount) into a longitudinal study of motivation as a predictor of reading comprehension. Students (N = 3,829) were assessed for intrinsic motivation and reading comprehension in 5th grade, for reading amount and metacognitive knowledge in 6th grade, and for intrinsic motivation and reading comprehension again in 7th grade. A key SEM involved all students without subgroups and confirmed prior research. Fifth grade intrinsic motivation and reading comprehension were reciprocally predictive. Intrinsic motivation was fully mediated by a combination of 6th grade reading amount and metacognitive knowledge. Sixth grade reading amount predicted 7th grade intrinsic motivation and reading comprehension. Sixth grade metacognitive knowledge predicted 7th grade reading comprehension but not 7th grade intrinsic motivation (see also Artelt & Schneider, 2015).

10.8 Motivation, Engagement, and Reading Achievement

> We and our colleagues have described engaged readers as motivated to read, strategic in their approaches to comprehending what they read, knowledgeable in their construction of meaning for text, and socially interactive while reading. (Guthrie et al., 2012, p. 602)

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The distinction between motivation and engagement is important because both may be independent variables impacting reading achievement. While motivation is seen as the underlying beliefs about the value of reading, engagement is represented by the actions of readers to dedicate effort, intensity, and persistence to the reading task or reading goal. Engagement is also sometimes represented as the use of self-regulatory or other strategies to guide cognitive effort (Guthrie et al., 2012). Generally speaking, positive engagement can be captured by a concept of dedication to reading; negative engagement can be captured by a concept of task avoidance (or disengagement). Negative engagement is a main challenge to reading improvement (see Fredricks et al., 2004, for a broader review of the concept of engagement.)

One of the main attractions of engagement is that it represents actions and behaviors that are observable and that can be a focus of training and instructional practice. In this way, a direct line can be drawn between engagement support and instructional practice that lead to reading improvement (Eccles & Wang, 2012). We have already seen one aspect of engagement as a support for reading achievement through research on amount of reading (Miyamoto et al., 2019). A second behavior involves the use of reading strategies to improve reading abilities. Both reading amount and reading strategies are influenced by motivational factors, and both contribute to reading achievement.

McGeown et al. (2015) assessed motivation and engagement variables among 312 secondary-level students in the United Kingdom while they were reading different genres (e.g., fiction book, school book, short digital text). They found that motivation and engagement (reading amount) predicted different aspects of reading abilities (word reading, reading speed, general text comprehension, and summarization) using multiple regression analyses. Students' motivation measures predicted word reading, general reading comprehension, and summarization skills. With respect to engagement, they found that the amount of fiction book reading was the strongest engagement predictor for all reading abilities, significant even when using other reading abilities as controls. In contrast, school book reading amount significantly, and negatively, predicted reading abilities. They also explored gender, age and reading proficiency as possible sources of independent variance and found little overall significance among these variables in predicting the relationships among motivation, engagement, and reading skills. These findings are in line with much recent research that highlights the connections among motivation measures, recreational reading amount, and reading ability measures. Academic or school book reading, however, negatively impacted

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the relationship between engagement and reading skills (see also McGeown et al., 2016).

In a recent review article of reading engagement, Alexander (2018) summarizes a number of key ideas from current research on reading engagement. Importantly, engagement is viewed as a multidimensional construct (much like motivation). A number of variables can be used as indicators of engagement (or nonengagement). Positive engagement is a strong predictor of reading skills and reading skills improvement. However, students who are disadvantaged academically or economically do not often have the resources to enable literacy engagement. Perhaps most importantly, behavioral and cognitive aspects of reading engagement are almost always closely tied to reading instructional practices to help students engage.

10.9 Motivation/Engagement, Instruction and Reading Achievement

For the past twenty-five years, a major line of instructional research on academic reading development has been led by John Guthrie and colleagues through an instructional approach known as Concept-Oriented Reading Instruction (CORI). One of the fundamental ideas behind this approach is that students can improve their motivation and engagement in reading through an integrated set of practices around relevant content. A review of the actual instructional practices is presented in Chapter 13. This discussion will specifically focus on the relationships among motivation, engagement, instructional practices, and reading achievement.

Research from 1996 onwards has demonstrated that a CORI approach can be used to improve motivation, reading achievement, and academic content learning (Guthrie & Humenick, 2004; Guthrie et al., 2004, 2007). One important study (Guthrie et al., 2004) reported on the impact of motivation on concept learning, reading strategies, and reading comprehension. In the first experiment, 361 3rd grade students in nineteen classes were either taught through a CORI curriculum or a strategy-based instruction curriculum. The goal was to see if the explicit and focused inclusion of motivation instruction with CORI would lead to significant gains over a set of strategy instruction lessons. Results showed significantly different outcomes in favor of CORI instruction (motivation plus strategies) for reading comprehension, strategy use, and motivation. In the second study, 524 3rd grade students were instructed with CORI, strategy-based, or traditional approaches. Strategy-based instruction significantly outperformed traditional instruction on a standard measure of

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reading comprehension. The CORI students outperformed the traditional classes on reading comprehension and on reading motivation. The CORI group also significantly outperformed the strategy-based classes on one standardized measure of reading comprehension and on reading motivation.

More recently, Guthrie et al. (2013) carried out a CORI training study while assessing 1,159 7th grade students' motivation, engagement, and reading proficiency both before and after the CORI training (854 CORI students and 305 control students). A first SEM before training showed that students were not motivated by informational-text comprehension. Motivation measures across seven dimensions did not indicate any strongly positive motivation. The two engagement measures (dedication as positive and avoidance as negative) predicted reading skills as expected with positive engagement predicting stronger reading abilities. Students were not strongly motivated but were willing to engage.

Six weeks of CORI training with a science unit on animal and plant survival focused on the following instructional supports: enabling success, providing choice, fostering collaboration, emphasizing importance, promoting relevance, learning text content, reading multiple texts, and providing strategic reading support for ninety minutes per day. A second SEM after the CORI unit generated different results. Instruction strongly predicted motivation in all the expected ways. Instruction also predicted dedication. Intrinsic motivation strongly predicted avoidance (negatively, as expected). Three of the seven motivation dimensions also directly predicted reading comprehension. Finally, CORI instruction directly predicted reading comprehension. Together, all the variables in the model accounted for 56 percent of shared variance in reading comprehension (see also Guthrie & Klauda, 2014). Based on these and other results, it is clear that teaching for motivation through CORI makes a difference in reading comprehension development (see also Guthrie et al., 2007, 2012, for additional meta-analytic reviews).

These relationships emerging from research over the past twenty-five years highlight important outcomes for teaching, learning, and teacher training. In the classroom, students who are more intrinsically motivated are more engaged readers. Intrinsically motivated students read more, learn more, use strategies for reading and learning more effectively, are more curious and become more involved in their reading and learning, have a preference for challenge, are more confident, have reasonable expectations for success, and are more self-directed readers. In other words, they are independent learners in control of their reading (Guthrie & Taboada Barber, 2019; Guthrie

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et al., 2004). It would seem that a key to reading improvement and more effective reading instruction would involve increasing students' motivation for reading and reading engagement in the classroom.

Two other motivational approaches have successfully connected motivation, engagement, and instructional practices for improved reading comprehension. Lin-Siegler, Dweck et al. (2016) summarized a guest-edited set of studies examining the instructional impact of a **growth mindset** on improved reading comprehension, as discussed earlier in this chapter in Section 10.2.4. Often growth mindset instructional support includes strategy instruction along the lines that are similar to proponents of self-efficacy motivation. As might be expected, this motivational approach involved the successful use of self-efficacy instruction, a concept that is incorporated into many motivation theories.

Unrau et al. (2018) carried out a meta-analysis on instructional practices that promote reading **self-efficacy**. This research examined motivation, engagement, instruction, and comprehension outcome. Four types of self-efficacy are commonly examined: self-mastery, vicarious experience, verbal and social persuasion, and emotional and psychological states. The most common engagement mechanism is the development of strategies to enhance successful outcomes (e.g., successfully completing a reading assignment, understanding a challenging text). Based on thirty instructional studies in three subsets: [treatment vs. control], [treatment vs. comparison treatment], and [pre-test post-test] designs, the meta-analysis outcomes significantly favored self-efficacy training over both controls and comparison treatments, and in pre- versus post-training designs. Overall, self-efficacy (and sometimes self-control) represents a key dimension of motivation research across several orientations to motivation and reading achievement.

These instructional research studies on the impact of motivation and engagement on reading reveal important insights for improving reading curricula and carrying out effective instruction. To date, no large-scale L2 reading research studies of these types have been carried out (but see Miyamoto et al., 2018). We hope that this gap in L2 reading research changes in the coming years.

10.10 Motivation in L2 Contexts

Motivation research in L2 contexts has followed quite a different path and very little of it addresses reading comprehension. Until the 1990s, motivation for L2 learning had been dominated by Gardner's social psychological theory of integrative and instrumental motivation

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(e.g. Gardner, 2010). Integrative motivation involves a desire to identify with the target culture and the language of the target culture. Instrumental motivation is associated with all other reasons for learning the target L2. Integrative and instrumental motivation is sometimes wrongly associated with intrinsic and extrinsic motivation, respectively. However, several studies have been carried out seeking to combine these two orientations (Noels, 2001; Noels et al., 2000). In some sense, neither integrative nor instrumental motivation fully reflects the concept of intrinsic motivation. Integrative motivation is driven by the idea that a person wants to identify with the target culture, not that the person wants to learn the L2 for personal interest (Noels, 2001).

Noels (2001; Noels et al., 2000) examined the juxtaposition of integrative motivation with intrinsic/extrinsic motivation and developed a framework for explaining when integrative motivation is more influential and when intrinsic/extrinsic motivation is more influential for student academic behavior. Noels argues that these two views on motivation represent two separate motivational substrates. Integrative motivation for L2 learning is driven primarily by ethnolinguistic identity and intrinsic/extrinsic motivations are driven primarily by L2 learning (in school settings). For learning in the classroom, he identified the importance of student competence, autonomy, and relatedness. He suggested that these can be supported through careful scaffolding of instruction, effective feedback, and supportive collaboration that encourages a sense of acceptance. The key to Noel's analysis for this chapter is that reading development is more likely guided in the classroom through instruction that builds on intrinsic motivation.

Dörnyei has also provided a number of important syntheses of research on L2 motivation (Dörnyei & Skehan, 2003; Dörnyei & Ushioda, 2011). Aside from the major themes discussed above, Dörnyei has also focused on two further issues that play major roles in his more recent process-oriented approach to L2 motivation. First, Dörnyei has argued that motivation in academic contexts is often a dynamic variable trait rather than a stable trait. This raises the importance of the time dimension in studying motivation. Within an individual, motivation of various types will vary over time depending on prior learning outcomes, social factors, classroom contexts, and changing beliefs and feelings (Dörnyei et al., 2015; Dörnyei & Ushioda, 2011).

Second, motivation may be best understood as a multistage concept in academic settings, reflecting a process-oriented paradigm (Csizér & Dörnyei, 2005; Dörnyei, 2005; Dörnyei et al., 2015). The *pre-action*

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stage of goal orientations and expectation formation relates to making a choice to act. The *action stage* involves several features, for example, ongoing appraisal, learning success, classroom factors (competence, autonomy, relatedness), teacher influences, strategy uses, and goal setting. The *post action stage* involves evaluation as well as reflection on effort, success, values, goals, beliefs, and feelings. Attributions (causes) related to learning outcomes and self-efficacy concepts are important at this stage (Dörnyei & Skehan, 2003). This multistage view of motivation helps explain the changing nature of motivation over time and the importance of viewing motivation within the language classroom. For Dörnyei, an important outcome of L2 motivation research centers on the role of the classroom in influencing student motivation.

All of these insights are significant advances for L2 motivation in language learning generally; however, this research has limitations for L2 reading. Virtually none of the mainstream research on L2 language learning considers reading comprehension or the development of reading abilities. Drawing on the arguments of Wigfield (1997) and Unrau et al. (2018), it is important that reading motivation be developed within its own domain. Research instruments and case study investigations need to be designed to address reading abilities and motivations for reading. They should not be influenced by issues of a desire to communicate or use of communication strategies. In reading development contexts, learner motivations need to be explored in relation to (a) reading interest, (b) self-efficacy, (c) persistence at reading, (d) acceptance of academic challenge, (e) reading engagement, (f) the willingness to learn content from texts, (g) reading strategically, (h) reading avoidance, and (h) reading for enjoyment. While a number of these factors are relevant to other domains, including L2 learning more generally, the questions themselves would be different. In spite of the need for research specifically on L2 reading motivation, very little research has been done.

Perhaps most distinct between L2 language motivation and L2 reading motivation is a dichotomy generated from educational contexts of motivation. Neugebauer and Gilmour (2019) and several others have discussed the distinction between habitual motivation and situational motivation. Within the construct of reading (whether L1 or L2), it is possible to build intrinsic motivation, even from preschool years, around the enjoyment of reading and a willingness "to be a reader," regardless of whether or not a specific text or reading activity is enjoyable or worth pursuing. More specifically, the expectation of habitual intrinsic motivation applies more to recreational reading than to academic reading. Academic reading motivation appears

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to be less impacted by intrinsic motivation but more by concepts of importance, value, and ability (e.g., Durik et al., 2006). In this latter context, motivation may be more dynamic in fluctuations and more task specific.

But if someone has become a person who reads for enjoyment, much like a person in "flow," that person is likely to retain a habitual motivation to read. If one stops reading a book because of a loss of interest, it does not suddenly make one a habitual nonreader. Much more likely is that the person would still be a "reader" who enjoys reading many types of texts. In a larger context of L2 language learning, engaging in language learning activities may not be especially motivating unless there is something specific about the individual task that sparks interest, curiosity, challenge, or opportunities for increased collaboration. In this way, L2 language learning and L2 reading must be, by the nature of the domain, quite distinct. Reading can be measured as both a habitual motivation construct and as a situational motivation construct.

10.11 Motivation for L2 Reading

Accepting that motivation for L2 reading is more like motivation for L1 reading than it is for L2 language learning tasks, then much of the research on L1 reading motivation, engagement, and training is relevant to L2 reading contexts, albeit with recognition for the individual, social, and cultural differences across L2 students as well as across L1 and L2 students learning to read. Given that intrinsic motivation (and self-efficacy and mastery goal orientation) is so important to learning and reading growth, as well as engagement with reading, what goals would be most important for reading instruction so that engagement becomes a major instructional outcome? How can teachers "teach" motivation and how can teachers themselves be trained to build student motivation for reading?

Relatively few empirical studies have explored L2 reading motivation from a more stable habitual motivation perspective. Mori (2002) developed a thirty-item L2 reading motivation questionnaire based on the eleven traits of the Wigfield and Guthrie (1997) MRQ questionnaire (covering reading efficacy, intrinsic motivation, and extrinsic motivation). She also added questions to reflect Gardner's integrative motivation. She surveyed 447 university students in Japan and carried out an exploratory factor analysis with the data collected. She did not replicate the eleven traits assumed in the 1997 version of the MRQ (or the eight traits in the 2004 version of the MRQ). She identified four factors, all of which were interpretable: intrinsic value of

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reading, extrinsic utility value of reading, importance of reading, and reading efficacy. Except for the independent factor of importance, the general structure of intrinsic motivation, extrinsic motivation, and self-efficacy emerged. The integrative motivation items all loaded on the extrinsic factor (factor 2), which is understandable in terms of the meaning of extrinsic motivation (motivations that are not driven by self-control and enjoyment) (see Noels, 2001). Mori's study demonstrated initially that the three-dimensional framework of intrinsic motivation, extrinsic motivation, and self-efficacy may be a viable orientation for reading motivation research in English as a foreign language (EFL) contexts.

In another study, Takase (2007) examined the impact of motivation on extensive reading with 219 high school EFL students in Japan. Results of an exploratory factor analysis differentiated L1 and L2 reading motivation. Takase found that two factors, L1 intrinsic motivation and L2 intrinsic motivation, both significantly predicted amount of L2 reading. Reading motivation did not correlate with L2 reading comprehension, but the amount of L2 reading did correlate with L2 reading comprehension (cf. discussion of reading amount, p. 236).

Komiyama (2013) carried out a large-scale survey of pre-university and university ESL students across fifty-three intensive English programs in the United States involving 2,018 post-secondary students. She first developed a version of the MRQ based on the revised MRQ version developed by Wang and Guthrie (2004). Through two rounds of piloting questions, she developed a reliable and interpretable Motivation for Reading in English Questionnaire (MREQ). Based on initial data from a large exploratory factor analysis, she developed a forty-seven-item questionnaire based on five factors. There was little overlap across the five factors, each factor exhibited good reliability (alpha at 0.88 to 0.77) and total shared variance across all five factors was 44 percent.

The first factor reflected a unified **Intrinsic Motivation** construct, combining items from curiosity, involvement, and challenge (23 percent). The remaining four factors reflected four likely dimensions of extrinsic motivation in academic contexts. Factor two reflected **Extrinsic Drive to Excel** and only included items reflecting dimensions of competition and recognition (9 percent). Factor three reflected **Extrinsic Academic Compliance** and only included items from dimensions of compliance and grades (5 percent). Factor four, **Extrinsic Test Compliance**, was a four-item composite of competition, compliance, and grades, but almost solely addressing performance on L2 English standardized exams (3 percent). The final factor, **Extrinsic**

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Social Sharing, comprised all four social sharing items (3 percent). For confirmation, one-third of the total set of questionnaires was submitted to a confirmatory factor analysis (CFA) ($N = 562$ after removing outliers). The overall five factor solution was confirmed. The idea that extrinsic motivation is a less unified construct is in line with several L1 results. To date, the MREQ is the only reliable and valid L2 English questionnaire for academic English reading motivation.

Much more research is needed on L2 reading motivation. Theories of reading motivation that are generally supported by research should be developed for L2 contexts. The consistent use of a few validated instruments across research studies is important. Explorations are needed of the relationships between motivation traits and reading measures: reading amount, reading enjoyment, reading strategy use, vocabulary knowledge, and reading comprehension. With this set of research issues being explored in greater depth, it will be possible to consider what factors interact with motivation in the reading classroom and how positive factors can be promoted instructionally. At present, the best resources we have for promoting intrinsic motivation in the L2 classroom is the L1 research on reading instruction that builds motivation (cf. Miyamoto et al., 2018, examining both German L1 and L2 students).

10.12 Implications for Instruction: Teaching Motivation for L2 Reading

Based on the research of Dweck, Eccles, Guthrie, Schiefele, Wigfield, and others, a number of factors (Table 10.2) can be gleaned from various L1 reading motivation research studies, as well as studies of motivation instruction, to support student motivation and reading classroom instruction (Guthrie & Wigfield, 2000; Guthrie et al., 2004).

Table 10.2 Factors that support reading motivation

1. Opportunities for learning success and gains in conceptual knowledge
2. Real-world interactions (demonstrations, data collection, observations, etc.)
3. Autonomy support, student self-direction
4. Interesting instructional texts
5. Opportunities for extended reading
6. Strategy instruction
7. Social collaboration and relationship building for academic tasks
8. Evaluation and feedback that support learning

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Most L2 students take a dim view of becoming good, fluent readers. Students know that reading development is hard work and they need effective motivational support from teachers and the curriculum itself. Teachers commonly think that they do not have a major role to play in student motivation for reading. This view could not be further from the truth. Both L1 and L2 motivation research argue that motivation is strongly affected by what happens regularly in classrooms.

Teachers can promote motivation by drawing on L1 and L2 reading motivation research. In general, motivation growth can be supported in multiple ways in the reading classroom (Dolezal et al., 2003; Dörnyei, 2001; Dörnyei & Ushioda, 2011; Guthrie et al., 2004; Pressley et al., 2003). Three major themes for teaching motivation are especially crucial. First, teachers must gauge student abilities and ensure that students experience success regularly. Second, teachers need to encourage some degree of student autonomy and choice in their instruction as part of engagement in learning. Third, they need to support students in a range of collaborative activities that build student–student and student–teacher relationships. These factors promote student motivation and lead to reading improvement. Table 10.3 outlines a wide range of practices that teachers can engage with to promote motivation.

Table 10.3 Teacher practices to promote motivation

1. Talk about your own reading interests (and why)
2. Share personal examples of motivated task engagement
3. Have students share their interests.
4. Create a pleasant classroom environment.
5. Promote effective goal setting and expected outcomes.
6. Communicate the importance of schoolwork and tasks.
7. Make task purposes and performance expectations clear.
8. Increase students' expectancy of success in particular tasks.
9. Provide examples of successfully completed tasks.
10. Build students' self-confidence.
11. Promote the development of group cohesiveness.
12. Have good lead-ins to all texts and tasks to build initial interest.
13. Match student skills with challenge.
14. Enhance the relevance of the curriculum for students.
15. Promote effective learning strategies.
16. Introduce new books and reading materials to students.
17. Promote active student participation so learning is stimulating and enjoyable.
18. Involve students in decision making related to reading tasks and goals.

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Table 10.3 (*cont.*)

19. Give students choices.
20. Provide support and scaffolding with more difficult texts and tasks
21. Build real levels of student expertise in topics of readings (e.g., with CORI, content-based instruction).
22. Provide motivating feedback on tasks and learning progress.
23. Create communities of learners who support each other with difficult tasks (e.g., cooperative learning approaches).
24. Encourage students to read extensively, both in school and at home.
25. Generate "flow."

Discussions of motivation and reading raise a general two-part question concerning L2 reading motivation: What sorts of unique L2 issues will impact L2 reading motivation, and how can these issues be accounted for in efforts to promote motivation in the classroom? One major L2 issue is students' more limited language knowledge in the L2 and the need for greater scaffolding with language support. Another L2 issue concerns social and cultural literacy practices and expectations that students might bring from their home cultures. A further issue is the more limited exposure to L2 reading in terms of exposure to print, practice with extended reading tasks, and reading fluency. A final issue is the possible differences in student socialization based on prior educational experiences; for example, differences across L1 and L2 in compliance expectations, affirmative feedback, and peer interactions are likely to be influential.

All of these issues need to be considered in teaching for motivation. Motivation for reading is essential so that students choose to develop their reading skills, persistence, and efforts to overcome limitations. Students only become skilled readers when they read a lot, and motivation for reading is critical for addressing this challenge.

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PART III
DEVELOPING READING COMPREHENSION ABILITIES

Part III examines in detail the core components of reading that combine to build reading comprehension abilities. These components include (a) the centrality of extensive vocabulary knowledge, (b) fluent automatic syntactic knowledge and processing skills as well as strategies that support main idea comprehension, (c) the integration of reading strategies and higher-level processing to develop the strategic reader, and (d) the role of discourse knowledge to contextualize ideas and concepts. Part I of this book identified component cognitive skills that combine to form reading abilities, but they included several skills and resources that either were not solely intended to support reading comprehension (e.g., goal setting, inferencing, working memory) or directly influenced reading comprehension only at certain stages of development (and only indirectly at other stages) (e.g., phonological awareness, word recognition efficiency). In contrast, the specific topics discussed in Part III both strongly influence reading comprehension and are key for reading instruction.

The major shift in this section is in the nature of the skills and knowledge resources that form the core of reading comprehension development – words, grammar, strategies, and discourse – and the integration of these abilities to produce the strategic reader who is capable of understanding and using academic texts. Moreover, each of the skills and knowledge resources discussed in Part III is more readily teachable than topics in earlier chapters. As a result, a major focus of each chapter is to consider effective teaching practices that develop each skill and that improve reading comprehension.

Chapter 11 explores the critical foundation for reading comprehension – the importance of lexical quality – involving both lexical items and more abstract construction patterns in relation to reading comprehension. Vocabulary knowledge is perhaps the most important component skill and resource for reading; it both activates relevant long-term knowledge and provides the starting point for word-to-text-integration processes. Major research studies in first-language contexts have shown that vocabulary knowledge

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strongly predicts later reading abilities. This powerful relationship appears to remain even after ten years between a vocabulary measure and the subsequent reading measure. Like the other chapters in this section, a discussion of instructional options appears both in a number of specific subsections and in the final implications section.

Chapter 12 addresses the most fundamental comprehension goal for second-language (L2) readers: developing main idea comprehension; that is, the outcome of the word-to-text-integration process. Whether students are reading a brief two-paragraph text, a two-page text, or a twenty-page chapter, readers must be able to recognize the main ideas of the text. It is certainly a further goal for readers to integrate and critically evaluate text information; using text information appropriately for a range of other academic learning tasks supports many L2 academic learning goals. However, these more advanced goals (usually with more challenging texts) are not possible if students are not skilled at determining main ideas from the text or if students cannot generate a reasonable "standard of coherence" for the text as a whole (Linderholm & van den Broek, 2002; van den Broek et al., 2011). This chapter reviews research that supports the roles of syntax and strategic responses to texts as critical factors in reading comprehension.

Chapter 13 takes key ideas concerning syntactic processing and reading strategies, combines them with many of the higher-order processing systems noted in Chapters 3 and 4, and develops the concept of the strategic reader as a major goal for reading instruction in academic contexts. When text information is new and often challenging, comprehension becomes more difficult. The strategic reader attends more closely to the ideas in the text and more actively builds connections with background knowledge to support coherence-building inferences. The strategic reader directs attention to keywords and sentences that may be sources of difficulty. The strategic reader draws on metacognitive and metalinguistic knowledge, integrates background information, summarizes main points, builds a coherent interpretation of the text, and critically evaluates that text information. All of these abilities require an effective combination of strategy uses that serve the reader's intended goals. A key theme of the chapter is that select instructional practices can develop the strategic reader.

In Chapter 14, the powerful role of discourse awareness is emphasized. Discourse awareness involves a set of skills and processes that incorporates several reading strategies, and, in combination with linguistic knowledge and L2 text exposure, develop the strategic reader. The chapter first reviews the types of discourse knowledge that good

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readers are able to draw on, even if only tacitly, to build coherent text interpretations. It addresses the importance of genre knowledge and its connection to text purpose as a high-level signaling system. It reviews research that supports the role of discourse awareness as well as the effectiveness of different instructional approaches to raise discourse-level awareness. The chapter closes with a discussion of specific options that can be used to develop more effective instruction in discourse knowledge.

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11 *Vocabulary and Reading Comprehension*

> Brysbaert et al. (2016) *tested* [a wide] range of participants (221,268 individuals) [on vocabulary knowledge], and found that the median score of 20-year-olds was 42,000 lemmas (= 11,100 word families) and that of 60-year-olds was 48,200 lemmas (= 13,400 families). On balance, it seems that the average educated L1 English speaker knows broadly 10,000–13,000 word families. (Schmitt & Schmitt, 2020, p. 11)

Over the past twenty years, there has been an outpouring of research studies, reviews, and books on vocabulary knowledge and learning, much of it in first-language (L1) contexts connected to reading abilities. A review of many current surveys of L1 and second-language (L2) vocabulary reveals an important set of ongoing and emergent conceptual issues. By now, there are likely thousands of research and overview articles devoted to the vocabulary–reading relationship as well as many books devoted specifically to vocabulary development. In fact, most publications addressing vocabulary learning highlight strong connections between reading and vocabulary development. One of the most important of these connections made over the past twenty years is the Lexical Quality Hypothesis (Perfetti, 2007; Perfetti & Hart, 2001; Perfetti & Stafura, 2014; see Chapters 2 and 6). In this chapter, we focus on a select set of issues that are critical for understanding the vocabulary-reading connection.

11.1 The Close Relationship Between Vocabulary and Reading

> The Lexical Quality Hypothesis assumes that word knowledge (both form and meaning) is central to reading skill. (Perfetti & Stafura, 2014, p. 31)

After thirty years of research examining the vocabulary-reading relationship, it is now a widely accepted fact that vocabulary knowledge is one of the strongest, if not the strongest, predictor of reading

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comprehension and its development. In L1 reading research across multiple languages, many studies have demonstrated this strong relationship (Castles et al., 2018; Seidenberg & MacDonald, 2018; Snow et al., 2007; Spencer et al., 2017; Stanovich, 2000; Verhoeven et al., 2019). Similar findings have demonstrated the equivalent importance of vocabulary knowledge for L2 reading comprehension development (Alderson et al., 2015; Elgort et al., 2018; Elgort & Warren, 2014; Jeon & Yamashita, 2014, 2022; Schmitt et al., 2011; van Steensel et al., 2016; Verhoeven, 2017; Zhang & Zhang, 2020).

Stanovich (2000) and Seidenberg (2017) highlight the roles of vocabulary and reading as reciprocal predictors of each other in longitudinal L1 research. Not only does vocabulary strongly predict reading comprehension but also reading comprehension and amount of reading over long periods of time lead to significant gains in vocabulary knowledge (lexical quality) (see also Adlof, 2019; Cunningham & O'Donnell, 2012; Mol & Bus, 2011; Nation, 2013; Seidenberg & MacDonald, 2018; Verhoeven, 2017).

The link between the amount of vocabulary and subsequent reading comprehension has been persuasively demonstrated in several key studies. Verhoeven et al. (2011) carried out a longitudinal study using a national sample in the Netherlands of students from 1st grade to 6th grade (N = 2,790). Assessment of vocabulary and reading comprehension occurred each year. Using Structural Equation Modeling, they found that students made significant progress in vocabulary and reading comprehension each year. In addition, for three of the last five years, vocabulary scores predicted subsequent reading comprehension scores in the following year. Finally, reading comprehension in 2nd grade predicted vocabulary gains in 3rd grade, indicating a reciprocal relationship between vocabulary knowledge and reading comprehension.

Snow et al. (2007) carried out an eleven-year longitudinal study to examine the role of vocabulary knowledge on reading comprehension (and vocabulary knowledge in later years). They began their study with eighty-three preschool children and measured the children's reading comprehension and vocabulary in 4th grade (N = 59), 7th grade (N = 54), and 10th grade (N = 41). Correlations between kindergarten vocabulary knowledge and reading comprehension in 4th, 7th, and 10th grades (r = 0.62, 0.69, 0.60, respectively) remained strong throughout the eleven years. Similarly, correlations between vocabulary knowledge in kindergarten and vocabulary knowledge in 4th, 7th, and 10th grades were even stronger (r = 0.77, 0.63, and 0.68, respectively; see also Ahmed et al., 2016; Sénéchal et al., 2006; Suggate et al., 2018).

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The link between the amount of vocabulary development and reading comprehension has also been persuasively demonstrated in several key L2 studies. Three meta-analyses provide support for the relationship between vocabulary knowledge and reading comprehension. Jeon & Yamashita (2022) carried out a meta-analysis on the impact of component skills on reading comprehension. They reported a correlation between vocabulary knowledge and reading comprehension of 0.799 (after trim and fill) (r^2 = 64 percent). Similarly, Zhang & Zhang (2020) carried out a meta-analysis on the relationship between vocabulary knowledge and reading comprehension. Overall (across 276 effect sizes), they reported a correlation between vocabulary knowledge and reading comprehension of 0.57 (r^2 = 32 percent). Uchihara et al. (2019) carried out a meta-analysis examining the effects of new-word repetition frequency from reading on vocabulary gains. They analyzed forty-five effect sizes from twenty-six studies and reported a significant medium effect size of r = 0.34 between frequency of word repetitions and vocabulary learning. Although there were some limitations among the studies included in the meta-analyses, results confirm several earlier research studies and provide a strong argument for the relationship between vocabulary and reading. Finally, Shiotsu (2010) and Yamashita and Shiotsu (2017) (reviewed in Chapter 8) both provide compelling evidence that vocabulary knowledge strongly supports reading comprehension abilities (see also Jeon & Yamashita, 2014; Qian, 2002).

Reciprocally, multiple studies have demonstrated the impact of extensive reading on vocabulary growth through exposure to print/extensive reading (Elgort et al., 2018; Pellicer-Sánchez, 2016; Suk, 2017). Pellicer-Sánchez (2016) carried out a study during which thirty-seven L2 university students read a 2,300-word text. The text included six nonwords repeated eight times each. After a single reading, students recognized the meanings of 75 percent of the nonwords from incidental exposure.

Elgort et al. (2018) used a similar methodology with forty L2 university students but with a much longer text (12,152 words) read over two days. Some words had many exposures and others had fewer exposures. Students completed a meaning-recall assessment, and they recalled the right meanings of 34 percent of the unknown words after one reading. Mohamed (2018) carried out an eye-tracking study with forty-two L2 university students. They read a 5,400-word graded reader and answered comprehension questions at various points to focus students' attention away from the twenty pseudowords in the text. After completing the reading, students recognized the meanings of 30 percent of the pseudowords.

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These studies, along with several studies on the impact of lexical quality on reading comprehension (see Chapters 2 and 6), provide compelling evidence of L2 relationships between reading and vocabulary knowledge. These results demonstrate both that vocabulary knowledge strongly predicts reading ability and that large amounts of reading lead to significant gains in the meanings of unknown words. These and many other studies over the past thirty years show that vocabulary knowledge and reading comprehension are strongly related and most likely reciprocally support each other over longer time periods.

As Perfetti has argued for two decades, the lexicon, and lexical quality, is at the heart of reading comprehension abilities (see also Chapters 2, 3, and 6). While vocabulary knowledge is not the only major factor to impact reading abilities, it is perhaps the most important knowledge resource for fast and accurate reading abilities. It is also closely associated with background knowledge and linked networks of information that support implicit inferencing while reading. This insight raises two key, interrelated questions about vocabulary requirements for reading: How much vocabulary is required for reading (i.e., the required size of learners' lexicons), and how well do those words need to be known (the quality of knowledge about the individual lexical items)?

11.2 Amount of Vocabulary Needed for Reading Comprehension

> A substantial proportion of readers' written language vocabulary is acquired through reading. Of the 60,000 to 90,000 unique words known by the average high school graduate, as few as 200 are explicitly taught at school and less than 20,000 are encountered outside the school context. (Andrews, 2015, p. 135)

To determine how much vocabulary is required to read, we first must decide how we are going to measure and count lexical items. Reading and vocabulary research has typically used four different units: individual word forms (types), lexemes, lemmas, and word families. **Word forms** are the distinct grapheme combinations that make the word physically unique. **Lexemes** refer to individual word meanings, much as we might find in a comprehensive dictionary. Some meanings can be closely associated with other meanings, and some might be metaphorical extensions (creating polysemy). **Lemmas** are word forms that are distinguished by different parts of speech. For example, all noun forms of "break" reflect a single meaning entry and all verb

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forms of "break" represent a distinct single meaning entry (extending also to adjectival and adverbial categories as distinct meaning entries). **Word families** are word forms that include the same stem form and include every part of speech form as a single core meaning entry. The latter three categories of words represent three different ways to identify distinct numbers of words in a text or a corpus, each with its own advantages and drawbacks (e.g., McLean, 2021). Vocabulary is also the informal term for **lexical entries**.

Some preliminary information on word frequency and basic word counts in texts is helpful here. Word frequency and basic word counts are commonly provided in terms of word families and lemmas (especially in L2 research), the two most tractable ways to carry out automated word counts by computers. In most English texts for nonspecialized nontechnical uses, the most common word is *the*, usually representing 6–7 percent of the words in a text. The 100 most frequent word families in the English language represent about 44 percent of the words appearing in a text. The 1,000 most frequent word families from the General Service List (West, 1953) that appear in a text usually represent about 71–75 percent of the total words in a text. The 2,000 most frequent word families usually represent about 80–86 percent of total word coverage in an English text (Nation, 2013; Schmitt & Schmitt, 2020). When one adds the British National Corpus (BNC) 3,000-word list (1,000 additional word families; Nation, 2004), coverage of most academic texts reaches 88–90 percent (see Table 11.1).

From this overview, a goal for teachers and curriculum developers might be to identify the most frequent word families and teach them in order to account for the greatest number of words appearing in a text; this goal has been a source of much research and instructional advice on vocabulary teaching. However, the problem for reading comprehension is quite a bit more complicated than just teaching the 2,000 or 3,000 most frequent word families.

One problem with this way of word-count coverage of texts is that the genre and specific content of texts can have an impact on these generalizations, although the variation created is not huge (e.g., see Webb & Nation, 2017). The bigger problem is the number of words (families) that need to be known after 89 percent coverage. About 9,000 word families, or about 36,000–40,000 lemmas, are needed to provide 98–99 percent coverage for most general texts in English (Brysbaert et al., 2016; Nation, 2006; Schmitt & Schmitt, 2020). This changing relationship beyond 89 percent word coverage is the major problem for vocabulary learning and reading comprehension; the number of lemmas or word families needed to comprehend a text increases exponentially for each percentage of additional word coverage.

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Table 11.1 Word frequency coverage of academic texts

	Total word coverage (%)
the	6–7
most frequent 10 word families	22
most frequent 50 word families	37
most frequent 100 word families	44
most frequent 1,000 word families	75
most frequent 2,000 word families	80–86
BNC 3,000 word families	88–90
most frequent 5,000 word families	95
most frequent 9,000 word families	98

(See Horst, 2019; Nation, 2013; Laufer, 2000) (not including counts of proper nouns)

With this background in mind, deciding on the vocabulary size required to read can involve multiple perspectives. The first addresses how much vocabulary educated L1 adults need to know to read fluently. Schmitt and Schmitt (2020) suggest that skilled L1 readers know anywhere from 10,000 to 13,000 word families. Brysbaert et al. (2016), and Schmitt and Schmitt (2020) state that a relationship of roughly 4:1 between lemmas and word families may be a reasonable estimate. As a result, the fluent L1 reader is likely to know 46,000 to 50,000 distinct lemmas in English. (There are, of course, many more lexemes – distinct word meanings.) This may be as close as we can get to a reasonable statement about the number of "words" known by a skilled L1 reader.

A second issue explores competing assertions about the amount of vocabulary that a reasonably fluent L2 reader should know in order to read most texts independently with good comprehension. A helpful explanation of vocabulary size that is needed to read a range of English texts has been provided by Nation (2006, 2013). He argues that about 4,000–5,000 word families (including all proper nouns) are minimally needed for reading *with instructional support*, covering approximately 95 percent of words known in a given text (roughly equivalent to 16,000 to 20,000 lemmas). About 9,000 word families (approximately 36,000 lemmas), comprising 98–99 percent of words known in a text, are needed for fluent reading of most texts in English (see also Schmitt et al., 2011; Schmitt & Schmitt, 2014, 2020). (Note that lemmas are not always in a 4:1 ratio with word families for two simple reasons. More frequent words have more completely distinct meanings than less frequent words. At the same time, a base word form does not readily

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lead to four variants for the major parts of speech: noun, verb, adjective, and adverb. For example, *consume* does not have an adverbial form, and the noun *consumption* could arguably be distinct.)

A benchmark of 4,000 to 5,000 word families (16,000 to 20,000 lemmas) gives an L2 reader a reasonable chance at a general understanding of an academic text, assuming that the instruction of some kind helps students learn key thematic vocabulary related to the topic of a given text. However, it is not reasonable to expect that L2 students can read almost any L2 text that they encounter with fluency (aside from graded readers); thus, the more advanced educational goal for academic purposes may be a vocabulary level for L2 students well above 5,000 word families (20,000 lemmas), with the more words known, the more opportunities for fluent reading.

It is important to reflect in a concrete way on the idea that readers should know 95 percent of the words in a text to read it successfully with instructional support. After all, knowing 95 percent of the words on a page seems quite reasonable initially. However, at 95 percent coverage, the rate of unknown words is one to two words for every two lines of continuous text. Students reading a text in which they do not know twenty words on *every 400-word page* (95 percent coverage), such as in a book like this one, will need some instructional support to comprehend the text well, especially considering that the unknown words may carry a good percentage of the new information in the text. And twenty unknown words would *recur on every single page*. So this level of word coverage in a text would make it an instructional reading text at best. Students can read and understand the text with help, support, and good strategies. At 99 percent coverage, there will be four unknown words on a 400-word page. This level of word coverage would allow for fluent independent reading. (Note that L1 students who really do not know eight words on every page of a 400-word-per-page text [98 percent] might find that reading to be a challenge or at least an irritation.)

Following this logic, good instructional texts in reading classes need to aim for a minimum of 95 percent of text coverage for texts encountered. Even so, this level of text coverage could pose a serious challenge for L2 students, whether English as a foreign language (EFL), English as a second language (ESL), or English as a K-12 instructional language. Texts with below 90 percent known words are pointless for reading comprehension. No instructional reading text should go below 90 percent coverage of words known in a text by students for any reason and any text with less than 95 percent coverage will be a major challenge for an L2 reader. Over time, any text in which more than twenty of the more important words on a 400-word page are unknown would count as an extreme frustration-level text.

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The logic of word-coverage percentages reinforces the more general message that an L2 student with academic expectations in the L2 needs to develop a very large receptive vocabulary knowledge base over time to become an independent reader. It is also worth pointing out that the relatively small size of an L2 student's vocabulary does not prevent that student from building word knowledge by reading (primarily graded readers at first), though it is harder to learn words from context incidentally when words in the immediate context are also unknown (Pulido & Hambrick, 2008; Seidenberg & MacDonald, 2018; Steacy et al., 2017). That is, the more words known, the better the learning of new words (Elgort et al., 2015; Nation, 2013; Perfetti, 2007; Schmitt & Schmitt, 2020; Webb, 2020b).

As a third and final issue for students' L2 vocabulary learning, trying to decide the exact number of words an L2 student needs to function in an advanced academic setting is never going to be fully successful. Too many variables influence student comprehension. Moreover, the methodology for deciding what counts as an independent word may never be resolved adequately, for both researchers and teachers (see example of "cut" for word meanings below). It is evident that academically oriented L2 students need to learn many words beyond the 2,000 most frequent word families, yet the notion that L2 students still need to know the first 2,000 word families in English well retains its force as an important starting point for vocabulary learning (Nation, 2013).

11.3 Identifying Individual Vocabulary Items: Exploring Lexical Quality

> Lexical quality, which grows word by word over time, can be associated with lexical depth. However, the purpose of the Lexical Quality Hypothesis is not to contrast lexical breadth and depth. [Instead, it is meant] to explain how reading development emerges as more and more words are expanded into higher-quality representations over time and how these words then become sight words for automatic access … to a wide range of other knowledge—lexical, syntactic, and discoursal. (Grabe & Stoller, 2020, p. 69)

Vocabulary research has shown that knowing a lexical item (a single word or formulaic sequence) entails a complex constellation of lexical knowledge. It is now well established that lexical items (reflecting unique semantic content) can appear in any of the thirteen forms itemized in Table 11.2.

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Table 11.2 Lexical-item forms

1. Single words (*break*)
2. Proper names (*Pentagon, Gallipoli, Mt. Fuji*)
3. Initialisms and acronyms (*UN, FBI, UNESCO, radar*)
4. Phrasal verbs (*break down*)
5. Open compounds (*spring break, break dancing*)
6. Hyphenations (*break-neck speed*)
7. Complex discourse markers (*in addition to*)
8. Stock phrases (*Let's take a break*)
9. Complex prepositional phrases (*over in between two cars*)
10. Prefabricated strings (lexical bundles or lexical strings: *A break in the…*)
11. Idioms (*break the bank*)
12. Statistically linked collocations between co-occurring words (*break the chair, break the rules*)
13. Abstract construction patterns (NP V NP NP: e.g., *I gave the teacher the book*)

Despite the complexity of lexical item types, we begin this exploration by considering what it means to know a single word (as a demonstration of the complexity of even a simple lexical item). We will then explore a number of the other lexical-item categories.

Even simple words can involve a complex network of meanings, some related among themselves, some not. Many words have multiple meanings: Some forms have related meanings to varying degrees (**polysemy**: *cut carrots, cut my finger, cut the budget*). (Note that one does not cut a finger the way one cuts carrots.) Other forms have multiple unrelated word meanings (**homonyms**: *bank, band, break*). Each separate word meaning counts as a different lexeme.

For a fairly large number of words, word families include word forms that do share meaning similarities or only have one or two common meanings, particularly for less frequent words, even if some members of the family are not very close in form (e.g., *statesman, stateless*). However, a number of word forms, particularly more common words, have quite a few distinct meanings (see *cut*, discussed next). Lemmas provide some additional level of discrimination beyond word families. Lexemes are the closest to what a specific word in a specific context means, but they are hard to identify in corpus analyses.

One database that has focused on lexemes in English is Wordnet (wordnet.princeton.edu). Anyone can type in a word and be given a list of the form-meaning alternatives (word senses) for that word. One example should highlight the challenges to knowing what a word

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means when simple words can be used in so many different meaningful ways. For example, for the word *cut,* Wordnet provides a list of twenty different noun form-meaning possibilities, forty-one different verb form-meaning possibilities, and nine different adjective form-meaning possibilities. Some of these different senses are close polysemy and could be viewed as sharing some common core concept, but many senses do not share any possible common core meaning.

Cut as Noun

1. A cut of the profits (a share).
2. The cut to the next scene was too abrupt (a film edit).
3. He is a cut above the rest (a step on a scale).
4. That is a nice cut of meat (a selected piece of meat for eating).
5. The unkindest cut of all (a hurtful comment).
6. He played the first cut of the new CD (a musical selection).
7. His cut eliminated the awkward and wordy passage (an edit in writing).
8. The cut of the deck was deceptive (an action with playing cards).
9. The barber gave him a good cut (a trimming of the hair).
10. The student put a bandage over his cut (a gash or slash of the skin).

Cut as Verb

1. The student cut classes all week (did not attend).
2. He cut a check for $1,000 (wrote out a check).
3. The coach cut two players (eliminated).
4. The car cut to the left (swerved).
5. They decided to cut back health benefits (reduce).
6. The glass cut into his forehead (pierced).
7. They cut a new CD last year (produced).
8. The soap usually cuts the grease (dissolves, removes).
9. They cut through the neighbor's backyard (took a shorter route).
10. The boat cut through the water (moved quickly through).
11. We had to cut short the conversation (stop the conversation).

Cut as Adjective

1. Those were outstanding cut diamonds (shaped).
2. He usually has neatly cut hair (well-trimmed).
3. We saw the drastically cut film version (shortened).
4. Blood flowed from his cut forehead (wounded).

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In considering these many senses of the lexical form *cut*, it is possible to identify related meanings (polysemy) that suggest a sort of core meaning among some of these word family members. But other specific meanings of *cut* are quite distinct and can cause challenges for learning, especially for L2 learners (Boers, 2020; Peters, 2020). A number of these distinct meanings are determined by common collocational pairings (*cut short*, *cut classes*, *cut benefits*). Other meanings emerge from specific lexical items in the "co-text" (specific words within a few words in the same clause); these are word linkages that are not as readily identified as word-pair collocations, but they clearly provide an association that generates the specific meaning (*cut a CD*, *the coach cut two players*, *those are cut diamonds*, *cut the wordy passage*). The above examples of co-text create unique meanings, but they are not common pairings.

This sort of deep dive to explore many senses of a word is not so rare (e.g., check wordnet.princeton.edu for *catch*, *check*, *place*, *play*, *work*). (See Gardner, 2013, for analyses of *break*, *go*, *hard*, *move*, *run*.) Gardner (2013) also highlights the distinctions among collocation, co-text, and context (the larger network of words across multiple sentences or in a paragraph that generates thematic linkages to help determine a precise sense). Gardner and Davies (2007) examined the further challenge of phrasal verbs for word families and lemmas. They point out that 12,508 distinct phrasal verbs are found in the BNC. To add to this challenge, the verb *put* combines with fifteen different adverbial particles (preposition forms) (e.g., *across*, *away*, *back*, *behind*, *down*, *forward*, *in*, *off*, *on*, *out*, *through*, *up),* many with their own sets of multiple meanings. Gardner and Davies do provide good news in that the twenty most frequent verbs in phrasal verbs, combined with the eight most frequent phrasal particles (*back*, *down*, *in*, *off*, *on*, *out*, *over*, *up*), cover just over half of all the phrasal verb occurrences in the entire BNC. In total, just 160 phrasal verb lemmas in all do a lot of the work for phrasal verbs. Unfortunately, each phrasal verb generates a fairly large number of distinct lexemes, so the glass is only half full, so to speak.

Another type of lexical item that is problematic is the category of initialisms, acronyms, and abbreviated word forms (TV, fridge, plane). Crystal (2019) specifically addresses initialisms (CD, FBI, IBM, PC, UN) and acronyms (AIDS, NASA, radar). He notes that there may be half a million abbreviated forms in English (very many admittedly obscure). Nonetheless, a vast number of these lexical items are fairly commonplace and not spelled out when they occur in many more-general texts. (For the curious, see the 2017 *Acronyms, Initialisms, and Abbreviations Dictionary* [noted in Crystal, 2019].)

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One could argue that these forms are types of proper nouns and that names do not need to be counted as independent word families or lemmas (a common assumption). Such an argument does not change the fact that a reader may well miss critical information by not knowing these abbreviated lexical items. Moreover, proper names are not always so straightforwardly interpretable as transparent lexical items in a given text. Certainly, *Aunt Bee*, *Freddie*, *or Billy* are names that could be transparent and need no definition in appropriate texts. But *General Motors*, *the Pentagon*, *Mount Fuji*, *Parliament*, *The Alamo*, *Hiroshima*, *Johns Hopkins*, *The White House*, *Obama*, *Ataturk*, *Gallipoli*, *Joan of Arc*, *The Ark of the Covenant, Indiana Jones*, *Toronto Maple Leafs*, etc. activate associations, network linkages, and connotations for the reader who knows the names well. These associations and linkages could be absent for a reader on the first encounter with these terms and other names if they appear in passing in a text. So proper names can generate lexical association linkages that could help or hinder reading (see example in Castles et al., 2018, p. 30; see also Compton et al., 2014; Steacy et al., 2017). Such associational linkages will also impact word processing and word learning. These types of lexical items are not expressly included in many word family or lemma counts, but perhaps some subset of this type should be (see also Crystal, 2019).

One problem with automated computer analyses of word forms is that they tend not to account for a variety of multiword lexical units such as multiword idioms (*the glass is half full*), two-word compound forms (*hard core*), multiword discourse markers (*so to speak*), hyphenated words (*face-to-face*), lexical bundles (*in the light of*), stock phrases (*holy-moly),* and collocations *(holy-moly Batman)* (with credit to the 1960s TV show). As one example of these multiword challenges, Jackendoff (1997) estimates that there are 25,000 idioms in English. Automated computer counts will not identify co-text relations among nearby words or the looser contextual network of words across sentences that help determine specific senses of words unless specifically programmed to do so. There are many thousands of these multiword expressions with their own unitary meanings. Automated computer counts generally ignore these, but all of these lexical items contribute to a reader's "lexical quality" (as well as significant L2 lexical learning challenges; Boers, 2020). The limitations of automated computer counts of word family forms and lemmas radically undercount what good readers of English know when they learn, and then understand, form-meaning relationships.

This exploration of lexical items expands considerably the range of lexical knowledge that a skilled reader develops to read fluently and

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generate text representations as very fast, automatic processing operations. All these meaning-bearing lexical items contribute to the overall network of connections that readers bring to reading, and they trigger the network of associational knowledge that readers call on (especially for linking words into interpretable clauses and multiclause text representations via passive resonance processing; see Chapter 3).

Lexical quality, for Perfetti, is not limited to the form-meaning relationship described here. A number of vocabulary researchers have pointed out the many ways to know a word beyond the form-meaning relationship; this simple relationship, by itself, does not provide an accurate picture of the types of vocabulary knowledge that we all learn for any lexical item (cf. Gardner, 2007, 2013; Nation, 2013; Schmitt & Schmitt, 2020). Aside from the many form-meaning relationships already noted, we also know spellings, morphological possibilities, parts-of-speech variations, pronunciations, co-text linkages, contextual associations, and more. In the case of the reading-vocabulary connection, when we know a word well, we access at least ten components of word knowledge (Table 11.3; cf. Nation, 2013); form-meaning relations cover only a few of the ten.

Table 11.3 Components of word knowledge

1. Orthography (spelling)
2. Morphology (word family relations)
3. Parts of speech
4. Pronunciation
5. Meanings (referential range, variant meanings, homonyms)
6. Collocations (words that commonly go with the word)
7. Co-text relations (*cut a CD*)
8. Meaning association linkages (e.g., topical links, synonyms, antonyms, hyponyms, meronyms, converses)
9. Specific uses (technical vs common)
10. Register associations (power, politeness, disciplinary domain, formality, slang, dialect form)

Greater lexical quality is also at the heart of reading fluency development. More words known, and known well, will gradually lead to faster and more accurate processing, faster and more complex lexical associations, more accurate spellings, faster and more accurate morphological processing, faster and more accurate co-text connections, and faster, more accurate syntactic-frame generation (Perfetti, 2007; Perfetti & Stafura, 2014). All of these incremental gains in processing and knowledge over time generate text reading fluency that is so important to skilled reading comprehension.

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11.4 The Development of Vocabulary

Students become more skilled readers through the development of greater lexical quality (a lifelong learning process). If this is a central goal of learning to read, how does any lexical unit (e.g., a simple word) first emerge and what is its likely developmental path? When we learn words, we continually add information to our mental lexical entries throughout our lives. At first, incidental encounters with words may only leave a brief impression of the word form or the word's part of speech. A reader may register a word or two in the co-text that leads to an initial lexical entry. The lexical and phrasal co-text items are likely to help establish an initial part of speech and a vague meaning placeholder for the newly seen form. At times, the co-text and the context together may lead to fast mapping, a fast form-meaning linkage – a first meaning sense to be stored in long-term memory (LTM; Carey, 1978; Steacy et al., 2017; Seidenberg & MacDonald, 2018).

Much of our word knowledge develops over time in this way through multiple encounters in multiple contexts. Given the many types of word knowledge to be learned, it should be evident that word learning must be an incremental process and much of the learning involves incidental processing through extensive amounts of reading. Even when we know a word, we continually update the entry and fill in additional pieces of the puzzle. Simultaneously, each time we access a word while reading, we increase our word recognition fluency until we achieve automatic access for that word. Through the same incremental process, we develop three types of knowledge that are essential for skilled reading: orthographic knowledge, language knowledge, and background knowledge (LTM) (see Chapters 2, 3, 6, and 9).

This broad and deep range of word knowledge that we build while reading points out the strength of the argument made by Perfetti (1992, 1999, 2007; Perfetti & Hart, 2001). The ability to know words thoroughly is one of the best indicators of reading comprehension. It is reasonable to assume that the information in Tables 11.1 and 11.2 represents the network of information that can be accessed automatically with thorough word learning by skilled readers. A further goal of the Lexical Quality Hypothesis is for readers to generate a more complex network of appropriate background knowledge (as general LTM) to support text comprehension through lexical linkages (see also Compton et al., 2014; Steacy et al., 2017). As Perfetti and Stafura (2014) note, "A word, as it is read, 'resonates' with [prior text and background knowledge] memories, and connections are made without an active construction process" (p. 33).

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11.5 The Value of Word Family and Lemma Analyses: Word Lists and Core Words

To this point, much of the discussion has highlighted the vocabulary learning challenge, both in terms of the number of lexical items that need to be learned and also in terms of how well they need to be learned. But the discussion only addressed the learning of lexical items in general terms; it did not specify *which* items are more important. This limitation raises the question of what vocabulary needs to be addressed in a reading-vocabulary program. Once we recognize the challenge that students face in developing lexical quality – to know as many lexical items as possible, as well as possible, and connect these items to a large store of world knowledge, then we need tools to prioritize effective vocabulary learning and teaching.

A common way to support effective and efficient vocabulary learning is to use various types of corpora analyses. In these contexts, analyzing words as word families and lemmas have practical value (even if less precise than a lexeme-based analysis of needs). Corpus analyses provide manageable ways to consider what vocabulary needs to be learned, and potentially at what proficiency levels. Making use of word frequencies in corpora provides important insights into instructional possibilities (and limits).

One outcome of the research on word families and more recently on lemmas has been the effort to develop basic word lists to help teachers, materials developers, and administrators. These lists can help teachers and materials developers build reading curricula by identifying vocabulary demands based on the texts most likely to be included in reading instruction. These lists are particularly useful in L2 contexts where students have less time to learn all the vocabulary that they will need, and having effective ways to address vocabulary shortcomings is critical for success.

Multiple general online sites can assist anyone in analyzing the types of words and the frequencies of words in a given text. For L2 learning contexts, four major websites are broadly useful and worth exploring: *Corpus of Contemporary American English*, www.english-corpora.org/coca (Mark Davies, n.d.); *Compleat Lexical Tutor*, www.lextutor.ca (Tom Cobb, n.d.); https://www.wgtn.ac.nz/lals/resources/paul-nations-resources (Paul Nation, n.d.); and http://www.newgeneralservicelist.org/nawl-new-academic-word-list (Charlie Browne et al., 2013a, 2013b, nd).

An early influential word list in English was the General Service List compiled by Michael West (1953); it is still used in some corpora research and instructional word frequency lists. The publication of

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the Academic Word List (AWL; Coxhead, 2000) was the first modern corpus-developed academic word list for wide use, and it is still in use. More recently, these two word lists have been updated and seem to be significantly improved upon.

Brezina and Gablasova (2015) developed a new version – The New General Service List (NGSL) using the 12 billion word Cambridge corpus. The NGSL, developed in lemma format, is available only on *Applied Linguistics online* (Brezina & Gablasova, 2015); it is not yet widely available. Gardner (2013) developed a lemma-based Common Core Vocabulary List that is included in his book, but it is not on any of the general online vocabulary sites. The Corpus of Contemporary American English (COCA) is the source of the Academic Vocabulary List (AVL) (Gardner, 2013; Gardner & Davies, 2014). This is also a lemma-based list that seems to improve on the original AWL. A second NGSL, and a New Academic Word List, are provided in both word family and lemma formats (Browne et al., 2013a, 2013b; http://www.newgeneralservicelist.org/nawl-new-academic-word-list). While these last two resources developed by Browne and colleagues appear to be significant revisions and improvements, they have yet to be strongly tested and validated publicly.

In addition to supportive websites, a general hierarchy of word frequency bands has emerged and, more or less, coalesced. Some 1,000-word (word families) frequency bands continue up to 25,000 base words (each band adding 1,000 words). Frequency bands based on word families are found on Paul Nation's or Tom Cobb's websites listed earlier. Generally, the first 1,000 most frequent word families and the second most frequent word families represent a starting point for further analyses related to the core vocabulary that students need. A number of additional discipline-specific word lists have become available on multiple websites over the past two decades (see Schmitt & Schmitt, 2020; Webb & Nation, 2017)

11.6 L2 Reading and L2 Word Knowledge

A final key finding from studies of word knowledge and word frequency lists reports on the limited success of L2 students learning vocabulary after many years of study. Schmitt and Schmitt (2014) have argued that many L2 students receive instructional support that takes them to 2,000 to 3,000 word families. This level is generally recognized as the upper end of high-frequency vocabulary knowledge for (EFL and ESL) L2 learners. But if an eventual goal for L2 learners is to advance to academic or professional reading skills, they will require reasonable fluency in recognizing 8,000 to 9,000

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written word families. Schmitt & Schmitt have proposed a tripartite vocabulary learning scheme comprising high-frequency vocabulary (up to 3,000 most frequent word families), mid-frequency vocabulary (3,000 to 9,000 word families), and low-frequency vocabulary (9,000+ word families). These three levels can be examined by looking at frequency bands that are available on the Nation and Cobb websites (see Section 11.5). The issue that is pressing is how to help students learn a significant percentage of the mid-frequency words, especially when L2 instruction more commonly focuses on the high-frequency words (see also Nation, 2013; Schmitt & Schmitt, 2014; Webb & Nation, 2017).

A number of studies have been reported on the levels of vocabulary knowledge (as word families) typically achieved by English L2 students across several nations (Table 11.4). These levels provide additional perspectives on the challenges faced by many L2 students.

Table 11.4 *Individual reports*[a] *on EFL word family learning in primary and secondary school*

Country	Number of word families learned	Instructional time
China	4,000	1,800–2,400 hours
Denmark	2,000	9 years of instruction
France	1,000	400 hours
Germany	1,200	400 hours
Greece	1,680	660 hours
Indonesia	1,220	900 hours
Israel	3,500	1,500 hours
Japan	2,000–2,300	~1,000 hours
Oman	2,000	1,350 + hours

[a] Based on individual research studies, not national figures (see Laufer, 2000; Schmitt & Schmitt, 2020)

Table 11.4 can be compared with an expected English L1 growth of 1,000 word families per year (generally speaking, 3,000 to 4,000 lemmas per year) for each year to the end of secondary school (see Section 11.7). Given the pervasive nature of the L1 environment for L1 vocabulary learning, it is not expected that L2 learners would match the vocabulary learning of L1 students. Yet with a dedicated L2 vocabulary program, they could still learn a lot. Webb and Nation (2017) suggest that an L2 vocabulary learning goal of 500 word families per year is a realistic expectation (see also Schmitt & Schmitt, 2020).

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The real challenge is how L2 students in most countries can learn a large percentage of the mid-vocabulary words. It is certainly the case that most English L2 students in many countries around the world will not need to become fluent readers of English. Learning 2,000 word families after four to six years of EFL instruction could be a realistic target expectation. But depending on a learner's academic goals (e.g., EFL university English majors, ESL students in secondary levels, pre-university ESL students), eventually acquiring 8,000–9,000 word families for independent reading in English can seem like an overwhelming challenge (even though many advanced English L2 students do achieve this goal). How such a goal can be achieved on a consistent basis for many English L2 students with academic ambitions remains an outstanding target for future instructional research worldwide.

11.7 Learning Words from Context

The serious way to improve reading—how well we comprehend a text, and yes, speed and efficiency, is this:

Read. As much as possible. Mostly new stuff. (Seidenberg, 2017, p. 82)

One of the strongest implications from discussions on the size of vocabulary needed by students is that a good percentage of word learning needs to occur by extensive exposure to print and incidental learning of words from context. It is not possible to force-feed 8,000–9,000 word families through direct instruction. Based on all current explicit word learning research, direct instruction, while very important, will not generate adequate knowledge of 9,000 word families (or ~36,000 lemmas). Some version of the alternative – implicit word learning through massive amounts of exposure to print or incidental learning from context – is likely to be the only realistic solution, assuming that a more advanced academic English is a goal (Castles et al., 2018; Cunningham & O'Donnell, 2012; Mol & Bus, 2011; Seidenberg & MacDonald, 2018; Stanovich, 2000). (Note that oral English language exposure through various means will not generally include most of the mid-vocabulary level words; see Schmitt & Schmitt, 2020.)

Three major issues arise in more general discussions of learning words from context. One issue is how incidental word learning from extensive exposure to texts leads to large vocabulary gains. The second is how the use of vocabulary learning strategies while reading improves vocabulary learning. The third is the role of students learning to guess word meanings from context. These three issues are potentially independent of each other.

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11.7.1 Incidental Word Learning from Extensive Exposure

In L1 settings, researchers have estimated that children learn somewhere between 3,000 and 4,000 words (1,000–1,200 word families) per year, for each year of schooling (Andrews, 2015; Graves, 2016; Graves et al., 2013; Stahl & Nagy, 2006). Even in an intensive L2 program (twenty to thirty hours per week), it is unlikely that students could learn close to the 9,000-word minimum for fluent independent reading through direct vocabulary instruction over the course of a year of intensive L2 instruction (though some intensive programs may approximate the estimates for L1 children – 3,000 to 4,000 lemmas at some level of word knowledge over the course of a given year). However, this intensive L2 learning environment generally cannot continue for multiple years and is usually only appropriate for pre-university L2 programs.

Learning words from context (as opposed to guessing words from context) entails incidental exposure to new words. The goal of the learner is to read and understand, not to notice and then try to learn new words. Exposure to new words may involve some passing word attention as comprehension is constructed, but a new word may not even be noticed in any conscious way. If it is noticed, it may be skipped, or some minimal possible meaning may be assigned to it in order to continue the effort to understand the text.

A series of recent studies of incidental learning from extensive reading and word exposure argues that word forms are recognized within two to five occurrences and word-meaning linkages develop within eight to twelve occurrences as a rough average, although several other factors impact rates of incidental vocabulary learning (Elgort et al., 2018; Hashimoto & Egbert, 2019; Mohamed, 2018; Pellicer-Sánchez, 2020; Uchihara et al., 2019; Webb, 2020a). What is clearer is that extensive reading is essential for incidental vocabulary learning that is a slow, incremental, cumulative experience with written language, and requiring a large amount of reading. One key point that is often overlooked in research studies identifying the percent of new words encountered when reading a passage is that every word being read in a given text is being registered (implicitly) (see Seidenberg & MacDonald, 2018). So the value of extensive reading is not only incremental knowledge gained about unknown words but also an incremental gain in knowledge of every word being read. And incremental gains for known words in the context of unknown words will often accelerate the learning of the new words by strengthening the context in which the new word occurs.

Multiple researchers agree that incidental word learning through extensive reading is useful (Nation & Waring, 2020; Schmitt &

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Schmitt, 2020; Webb & Nation, 2017). Nation (2013) suggests that reading 1 million words in a year (ten to twelve shorter novels or sixty-five graded readers – two graded readers a week for thirty-three weeks) would have a significant impact, possibly leading to more than 3,000 new word families learned (at a recognition level). This goal would place most English texts to be read by L2 students within the 95 percent word coverage range (4,000 to 5,000 word families). With a three-year curriculum of 1 million words-per-year being read (the last two years involving L2 texts beyond graded readers), there is a good possibility of students achieving vocabulary knowledge at the 9,000 word family level (see Nation, 2014; Webb & Nation, 2017, p. 91). For the shorter term, researchers have proposed that extensive reading programs should require a minimum of 200,000 words read per semester (Suk, 2017). And, as Nation (2001, p. 238) notes: "Learning rates can be increased considerably by some deliberate attention to vocabulary" (see also Nation 2013).

It is important to stress that learning the vocabulary required to become a good reader does not mean making a choice between direct vocabulary instruction and extensive exposure to words through reading. Both paths to vocabulary learning are needed and they support each other in complementary ways. Direct instruction can target the most frequent thematic words, key related topical words, and generally useful academic words. Direct instruction also permits explicit vocabulary practice that is needed as learners work to build larger recognition vocabularies. Often, direct instruction of keywords provides a focal point for building and reinforcing larger networks of meaning relationships among words (Adlof et al., 2019; Graves, 2016; Graves et al., 2013; Kame'enui & Baumann, 2012; McKeown, 2019; Nation, 2013; Schmitt & Schmitt, 2020; Webb & Nation, 2017). At the same time, extensive reading, especially beyond the levels of graded readers, reinforces the more frequent words, connects many more topical words, helps build elaborated meaning networks to connect other related words, and exposes readers to many less frequent words (Adlof et al., 2019; Cervetti et al., 2016; Elleman et al., 2019; Gardner, 2013; Landauer & Dumais, 1997; Lindstromberg, 2020; McKeown, 2019; Nation, 2013; Schmitt & Schmitt, 2020; Webb & Nation, 2017).

11.7.2 Using Vocabulary Learning Strategies

Learning words from context leads naturally to a discussion of consciously making inferences about word meanings from context, a far more complex issue. Making inferences about meanings based on

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context is a general skill practiced by all readers to varying extents (Beck et al., 2013; Graves, 2016; Nation, 2013). When we see a new word, we may notice it and (tacitly) recognize its form and part of speech; we may notice some aspects of the word form – some affixes or word stem parts that contribute to a guess; we may quickly associate some meaning with the word – a property, a thing, an action – as it relates to the topic of the reading passage; we may quickly decide on a meaning that seems to work well enough in the immediate context of trying to understand the text. These decisions are all inferences made about words. In some cases, the inference may be fairly accurate, but in more cases, the inference may not be accurate at all (van den Broek & Kendeou, 2017). When an inference is not very accurate, it may not affect overall comprehension, though sometimes the new word may carry important meaning and disrupt comprehension.

In many instances, the inferred meaning of the word will be quickly lost. On further encounters with the word, the process repeats itself, but with more supporting information available on each iteration. Over many encounters in differing contexts, a reasonable meaning (or meanings) of the word can take shape and develop into an ever-wider range of knowledge about the word. It is important to point out that this way to learn new vocabulary is relatively inefficient if replicated as a type of classroom activity. But if one recognizes the need for multiple exposures to a word and the very gradual nature of vocabulary acquisition, then the strategic process of building word knowledge from context, as a learned comprehension strategy, over time, takes on much greater importance (see also Nagy, 2005; Nassaji, 2003a; Nation, 2013).

Making conscious inferences from context (in L1 reading situations) represents a reasonable way to problem-solve one's way quickly through a few unknown words in a text, a way of doing the best one can with what one has available without seriously disrupting the reading process itself. Teaching students common strategies for guessing from context is often proposed as a good technique for supporting reading comprehension and enhancing word learning (Gardner, 2013; Nation, 2013; Schmitt & Schmitt, 2020; Stahl & Nagy, 2006; Webb & Nation, 2017).

11.7.3 Guessing Word Meanings from Context

Arguments that promote explicit vocabulary learning by guessing word meanings from context exercises need to be qualified by the extensive research conducted on this issue over the past twenty years. First, the contexts in which new words appear can vary radically

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(Beck et al., 2013; Gardner, 2013; Nassaji, 2003a). In addition, any context, to be at all useful, requires that almost all of the surrounding words are known to the learner (98 percent known words, Nation, 2014; Schmitt & Schmitt, 2020). It also seems that most useful clues are in the immediate context of the word – within a few words of the new word – and guessing works better when there are no confusing alternative clues in the immediate context. There is also persuasive research evidence that guessing words from context is not an effective way to learn the precise meanings of specific words (see also Chapter 4).

Despite these qualifications, guessing words from context represents an important independent word learning strategy over time. It also represents an important way for learners to cope with difficult texts in the absence of online translators, dictionaries, or an available knowledgeable person. To help students develop appropriate word inferencing skills, students benefit by (a) becoming more aware of new words while reading, (b) having opportunities to practice recognizing clues that may be useful (e.g., discourse markers, punctuation, word-part information, part of speech, examples, descriptions, associational relations – synonyms, antonyms, keywords in the same clause), and (c) learning (and automatizing) productive clues for guessing from the context in texts that they are reading. As Fukkink and DeGlopper (1998) report, "in a meta-analysis of 21 studies involving native speakers, found that training resulted in better guessing, particularly if learners' attention was directed to clues in the context" (cited in Nation, 2001, p. 251).

A reasonable conclusion to draw from the debate on teaching context clues is that conscious inferencing can identify some level of partial knowledge or reinforce partial knowledge (e.g., a word as a part of speech, a word that is descriptive, a word that is associated with a known concept). Guessing words from context is a strategy that may be helpful in maintaining comprehension when there is no better option for determining the meaning of a key word. It helps the reader continue reading without major interruption. Although it is not the best way to consciously learn individual word meanings, it can be a useful part of an overall vocabulary-reading program.

11.8 Background Knowledge and Word Learning Networks

> As Carey (1978) pointed out in her seminal research … every learner is working on as many as 1,600 word meanings that are in various stages of being known. (McKeown, 2019, p. 467)

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Most focused efforts in L1 settings to teach words explicitly do not cover more than 300 to 500 words per academic year (Andrews, 2015; Beck et al., 2013; Cunningham & O'Donnell, 2012; Stahl & Nagy, 2006). Vocabulary instruction in L2 contexts, involving widely varying contexts and different types of demands on learning, may make it possible to learn many more words per year in certain situations. Even in foreign-language learning contexts (e.g., EFL), there is a much greater emphasis on word learning (and time for reading) as part of instruction than occurs in L1 learning contexts. It is possible to argue that 1,000 word families per year (twenty-five words per week x forty weeks) could be taught directly to L2 learners in fairly intensive instruction (twelve to twenty hours per week).

However, most word learning over longer time periods (multiple years) is going to involve implicit learning, especially as learners gain in vocabulary knowledge and develop more complex conceptual relations around existing and new word meanings and uses (Compton et al., 2014; Elgort & Warren, 2014; Hirsch, Jr., 2018; Seidenberg, 2017; Steacy et el., 2017). This perspective on vocabulary and reading returns us to a broad theme relating vocabulary learning to background knowledge and reading comprehension. This is a theme that runs through most chapters of this book, focusing on the importance of background knowledge, passive resonance, and implicit inferencing while reading.

As students increase their language proficiency, learn more words, and integrate more linked background knowledge, they develop greater efficiency in word learning because they already know a larger set of words to build upon. (The more words a learner knows, the easier it is to make connections to new words and to use textual contexts.) For example, the word *mild*, or even *tepid*, are easier to learn when a learner already has control over *hot*, *cold*, *cool, freezing*, and *warm* (Beck et al., 2013). L2 learners have many such sets, based on L2 words already learned and on L1 vocabulary knowledge. Nagy and Scott (2000) highlight another example. The word *dolphin* is more likely to be learned quickly when a learner already knows the words for *fish*, *shark*, *fin*, and *whale*.

L2 students have one important advantage over L1 learners with respect to vocabulary development. In many cases up until advanced academic reading, L2 students already know the concepts that the L2 words refer to, as well as related concepts and related L2 words. They only need the appropriate label for these concepts in the L2, and there is likely to be a ready-made space in the L2 lexicon that is waiting to be filled. While conceptual overlap may not be complete between two languages for any given word pairing, the overlap is

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generally sufficient for the building of an initial entry of the new L2 word in the learner's lexicon.

These quick L2 connections, as a labeling process for already known knowledge, have some parallels to a concept known as "fast mapping" in L1 vocabulary development among young children (Carey, 1978). It seems that certain words are learned by children very quickly with very few exposures. (They are "fast mapped" into the young learners' lexicon.) Whether because of immediate needs, or because the word fills a perceived gap in words being learned, or because a word is implicitly partially learned already, or because the word simply attracts attention, fast mapping is possible (though this is probably not done with a large percentage of learned words in the L1). It is reasonable to suggest that L2 students have their own favorable conditions for some type of fast mapping with some subset of encountered words (see Steacy et al., 2017; Yurovsky et al., 2014).

The argument that words are ready to be learned because they can fill a cognitive space may seem, at first glance, to be an unusual idea. One might ask why the word *dolphin*, from an earlier example, might fill a cognitive space said to be well established across L1 knowledge networks as well as a growing L2 network. Theoretically, the idea that *dolphin* is "ready to be learned" is because of ready access, conceptually, to a highly developed network of relationships among known words. This conceptualization is the same as passive resonance across background knowledge (and word relationships in LTM). The network is ready to plug in the new word. This view also gains support from the theory of Latent Semantic Analysis (Landauer, 1998; Landauer & Dumais, 1997). As Stanovich (2000) notes:

> Landauer's (1998) work … has demonstrated how the paradox of vocabulary growth—how children's vocabularies grow at prodigious rates despite the seeming inefficiency of direct instruction in vocabulary—can be explained by the effect of mere exposure. Specifically, when a word is encountered in the context of other known words, it is not just the representation of the unknown word that is sharpened, but that of all related words in the lexicon (which, in the abstract, includes all words in the lexicon). (p. 254)

To put the idea simply, the more words that regularly appear in the semantic neighborhood of the word *dolphin*, the easier it will be to acquire the meaning of the word *dolphin*. This argument parallels the arguments made by Perfetti for the centrality of lexical quality. When we learn about whales and sharks, we also learn about the sea, fins, swimming habits, predators, and so on. As a result, many concepts

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associated with certain fish and sea mammals are readily transferable to a new word, *dolphin*, and *dolphin* becomes easy to learn (see also Seidenberg, 2017).

Landauer and his colleagues (e.g., Landauer, 2007, 2011; Landauer & Dumais, 1997) demonstrated this phenomenon empirically, drawing on conceptualizations from connectionist modeling and large-scale statistical analyses. They created a computer program to "learn" many words simply by being exposed to many texts (having many thousands of texts loaded into the computer's storage for Latent Semantic Analysis). The performance of the connectionist learning program on a vocabulary test indicated that many words could be learned by the computer from fairly minimal direct exposure if the words were associated with large networks of related words that were given many exposures. As Landauer (2007, 2011) states, "LSA scores well into the high school student range on a standardized multiple-choice vocabulary test" (p. 5).

As a final related perspective on implicit word learning, the vocabulary learning task is quite different when vocabulary learning is implicitly driven. Unlike direct instruction of, for example, ten to fifteen important words, implicit learning through exposure means that students could be building some incremental knowledge of hundreds, or even thousands of words at the same time (McKeown, 2019). In some weeks, students may develop sufficient knowledge of only a few words. In other weeks, they may develop sufficient knowledge of several dozen words if they are reading extensively and being exposed to words on a continual basis.

11.9 Direct Instruction of Vocabulary

Discussions of learning words from context and incidental exposure to words do not represent the sole way to promote vocabulary learning in support of reading comprehension. In fact, intentional vocabulary learning is a more effective way to learn those words that are identified and taught, but intentional instruction cannot come close to the number of words needed for more academic reading comprehension. For this reason, most vocabulary researchers argue that effective vocabulary learning involves a combination of learning words incidentally from context through extensive reading, receiving direct instruction in learning new words along with sufficient practice (preferably spaced practice), developing word-learning strategies, building word recognition fluency, and developing word appreciation (and motivation).

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While the number of words learned through explicit instruction may not be very large, they usually represent keywords for comprehension, words that associate with many other words conceptually and thematically, and words that form the foundation for less powerful contextual word learning. A number of research studies and syntheses have identified several specific approaches for direct vocabulary instruction that lead to effective word learning outcomes (Gardner, 2013; Grabe & Stoller, 2020; Graves, 2016; Horst, 2019; Nation, 2013; Schmitt & Schmitt, 2020; Webb & Nation, 2017). The techniques and activities outlined in Table 11.5 provide ways for students to learn vocabulary through direct instruction.

Table 11.5 Direct instruction that promotes vocabulary learning

1. Engaging in semantic mapping and word mapping.
2. Developing concept-of-definition maps.
3. Attending to glosses in texts.
4. Learning keywords before reading.
5. Experiencing multiple exposures to words (practice):
   a. Rereading prior texts for new purposes;
   b. Recycling many words at one time (e.g., word-sorting);
   c. Encountering words in multiple contexts;
   d. Manipulating words in multiple activities and for multiple purposes;
   e. Encountering words in structured overviews, reading guides, and advanced organizers before reading.
6. Developing strategies for independent word learning:
   a. Using mnemonic strategies (keyword methods) as well as analogies and imagery;
   b. Using word parts, word roots, and word affixes;
   c. Reading ahead, rereading, verbally repeating the word, paraphrasing, substituting synonyms;
   d. Using a dictionary (print or digital) effectively;
   e. Working with synonym word lists and flashcards.
7. Raising awareness of words and motivation for learning:
   a. Becoming more aware of words;
   b. Selecting individual words to learn;
   c. Increasing interest in words and motivation for word learning.

A focus on relatively few keywords per text allows students to learn a small number of important words and not try to learn long lists of words that are quickly forgotten. Keywords should provide connections to sets of additional thematic or associated words that appear in a given text, providing students with opportunities to work with many good vocabulary items while only being required to learn well a small set of words central to the text.

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11.10 Implications for Instruction

> Learners build rich networks of connections among words, contexts in which words are typically found, and experiences that relate to word meanings.... Words are not isolated pieces of information in memory. (Crosson et al., 2019, p. 197)

Instructional activities that involve students in repeated exposures to words and opportunities to manipulate words in various contexts improve vocabulary learning. Beck et al. (2013), Graves (2016), Horst (2019), Nation (2013), and Webb & Nation (2017) review research and describe a variety of vocabulary learning activities that support effective learning through instruction. Activities that ask students to use words in new contexts or for new purposes require students to see words in new contexts and manipulate them in new ways.

Raising students' awareness of new words that they encounter in texts represents an important learning goal. Almost every current review of vocabulary now stresses the importance of making students aware of some new words that they encounter; having students collect, use, and share words; and motivating students to develop an interest in words. Arguments for the role of word awareness are discussed in Beck et al. (2013), Graves (2016), and Nation (2013).

A number of already cited researchers have generated important principles for direct vocabulary instruction. Drawing on these ideas, eight key implications for planning vocabulary instruction emerge:

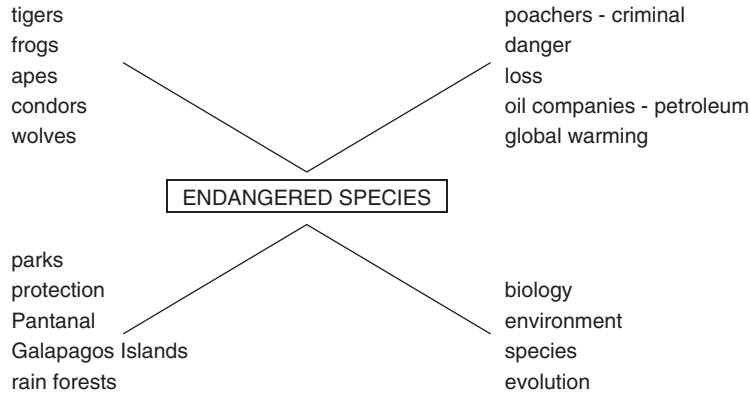
1. Provide vocabulary exposures in multiple contexts.
2. Teach words while working with the reading texts in which they are used. Teach at the point of contact; use discussion around texts to teach vocabulary.
3. Develop efficient procedures for selecting words to teach.
4. Focus on word relationships (parts-of-speech variations, word families, synonyms, antonyms, graded relations, affixes, and stems).
5. Use visual supports and mapping techniques to work with large numbers of words and their relationships (see Appendix).
6. Work with dictionary definitions and rewrite more accessible definitions.
7. Give students some choices in word learning.
8. Develop student motivation and provide a supportive learning environment.

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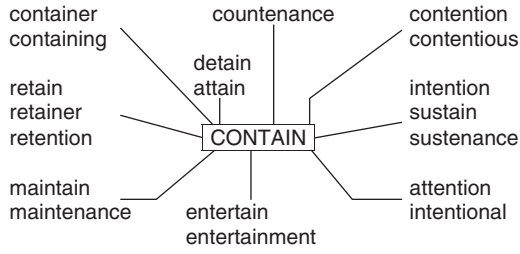
These principles represent important implications from vocabulary research for building a vocabulary learning curriculum (and that will support reading comprehension development as well). And finally, students need to engage in a lot of extensive reading.

Appendix: Vocabulary Activities Using Graphic Organizers

Semantic Map

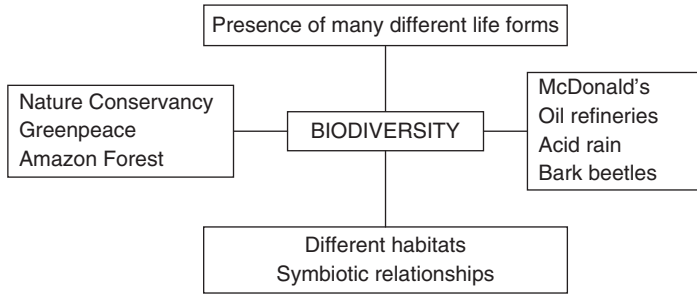


Word-stem Map



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Concept-of-Definition Map



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12 *Building Main Idea Comprehension: Syntax and Strategies*

> The ability to find the main idea of a paragraph is a precursor to being able to summarize larger amounts of text.... The skill involves identifying the subject of the paragraph and the most important ideas about the subject. (Klingner et al., 2015, p. 92)

Identifying main ideas from a text is the fundamental comprehension process that drives how we understand a text and use that information for whatever goals we have set as readers. It is what emerges from the word-to-text-integration process and gives text representation its discourse structure (see also Chapters 3, 6, and 14), or what van den Broek and colleagues would refer to as sensitivity to structural centrality (van den Broek et al., 2013). Achieving main idea comprehension requires not only the ability to identify the main ideas but also the ability to integrate them into a text representation and develop an appropriate situation model of reader interpretation (see Chapters 3 and 6). Main idea comprehension, viewed in this way, also involves a reasonable knowledge of grammar, a reasonable level of reading fluency, effective comprehension strategies with more difficult texts, relatively automatic processing abilities to maintain comprehension for extended periods of time, appropriate levels of prior knowledge, and a large and densely linked receptive vocabulary (lexical quality) (Castles et al., 2018; Hirsch, Jr., 2018; Klingner et al., 2015; Pressley, 2006; Seidenberg, 2017; Stafura & Perfetti, 2017; Taboada Barber, 2016).

One major challenge to this introduction is that it is not straightforward to identify the process of main idea comprehension directly (unlike pointing to a vocabulary item or a subordinate clause). Readers must engage internal cognitive processes and knowledge resources – based upon their prior reading experiences, their goals, and their background knowledge – to identify main ideas. As Wiliam (2018a) notes, "getting the main idea of a passage depends on knowing a lot about what is being discussed in the text" (p. 148). Somehow the reader must extract the more general idea from the more specific

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information, the more general point from the example, the key idea from the overlapping references and repetition of words and their meanings, and the sentences that are closer to the main idea than other supporting sentences (see also Goldman et al., 2007; van den Broek et al., 1996).

Usually students intuit how to recognize main ideas early on through reading practice with easier texts, basic genre knowledge and expectations, and conversations around texts. In later, more academic settings, students can identify main idea comprehension based on more extensive reading experience, feedback from reading task outcomes, interactions with others around text information, and various reading exercises and assessment practices (Hirsch, Jr., 2018; Klingner et al., 2015; Taboada Barber, 2016). In Chapter 11, we explored vocabulary knowledge as one key resource for main idea comprehension. In this chapter, we examine two further resources that support the development of main idea comprehension: syntactic processing skills and basic cognitive strategies to support main idea recognition. Together, they provide two of the foundations for assembling text comprehension.

12.1 Syntactic Processes, Knowledge, and Awareness

> The grammar-lexicon distinction is blurred because lexical items are just another type of construction, and it is assumed that there are no grammatical rules over and above the collection of constructions. That is, all the interesting structure in the language is presumed to be inherent in the constructions (including individual words), rather than in some set of potentially very abstract, complex, and subtle grammatical rules. (Christiansen & Chater, 2016b, p. 230)

Much recent research relating the role of syntax to reading comprehension has established its importance in two ways. First, the contribution of syntactic awareness to reading comprehension has been demonstrated through high correlations with reading and, more recently, through regression analyses and structural equation modeling (SEM) that identify the independent contribution of syntax. Second, syntactic awareness represents a key component of language comprehension. Recent research argues that syntactic and lexical knowledge together represent two key forms of a single expanded concept of lexical storage (long-term memory [LTM]) of words and constructions as the core of language resources for reading (and listening) ability.

It is important, at this point, to note that syntactic processes are distinct from syntactic knowledge and syntactic awareness. The former (syntactic processes) comprises a set of cognitive processes that

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are acquired implicitly, much as any underlying cognitive skill develops, and is not open to conscious reflection. The latter pair (syntactic knowledge and awareness) is sometimes viewed separately from each other, but sometimes as a single more general concept of knowing about syntax, even if it is more often measured in research studies without requiring explicit conscious reflection on how or why syntax works the way it does. In this book, we use the term **syntactic awareness** as a more general cover term for both knowledge and awareness. (We also use **syntactic parsing** as an alternative version of syntactic processing when the construction is "interpreted" specifically to provide information in support of comprehension.)

12.1.1 Syntactic Processing

Strong research programs over the past two decades have led to an emergentist, implicit, statistical processing view of how language is acquired and how syntactic processes (as opposed to awareness) develop and are employed in real-time during reading (and listening). These processes were explained in Chapters 2, 3, and 4. Here we provide a brief synthesis of these various components that drive syntactic processing during fluent reading as well as the role of emergentism in building these reading comprehension processes. As Christiansen & Chater (2016b) state, "language is a skill, like other skills, we acquire by doing. From this usage- or item-based perspective on language acquisition, the cumulative impact of many years of … myriad … interactions will be the piecemeal accumulation, construction-by-construction, of a mastery of language" (p. 227).

Syntactic processing in support of language learning and reading comprehension involves a long incremental process that begins in the first years of life (Chapter 9). Implicit syntactic knowledge is acquired item by item, from early verbs, nouns, noun phrase options, verb phrase options, to verb complement structures, to simple subordination structures, and more. Each part of speech and simple phrase construction is acquired one by one and registered in LTM, most likely alongside the lexical-head items of phrases that are also learned one by one. This emergent syntactic processing resource develops over thousands of hours of meaningful input through age five (Ambridge & Lieven, 2015; Bannard et al., 2009; Chater & Christiansen, 2018; Diessel, 2004, 2019, 2020; Ellis & Ogden, 2017; Seidenberg & MacDonald, 2018; Theakston & Lieven, 2017; Theakston et al., 2015). It is further reinforced through additional reading throughout elementary school and beyond. The items are stored, reinforced, and combined by implicit mechanisms of statistical learning and associative

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processing, and further reinforced by frequency, saliency, relevance, animacy, concreteness, and input complexity.

As words are learned and phrases are parsed repeatedly, the phrases are abstracted, but not fully disassociated from the lexical items that occur within the phrases. The words are stored in LTM and the phrase structures (constructions) are stored in LTM as well (along with statistical linkages to the most frequently associated lexical items). Words are processed as they are read; simple chunking mechanisms lead to the recognition of continually recurring syntactic phrases associated with lexical items. These phrase chunks are stored in LTM over time, and syntactic information is extracted (i.e., parsing) to assist the semantic disambiguation process as part of the process of comprehending text. Phrases are also chunked into clauses and into complex clauses over time, and these structures are abstracted and stored with statistical weightings linked to the associated lexical items (see Chapters 2 and 4). In this way, lexical items and syntactic structures represent two parts (and two levels) of a larger set of LTM resources. This incremental learning process provides the foundation for the very fast now-or-never processing arguments of Christiansen, Chater and colleagues (e.g., 2016a, 2016b; McCauley & Christiansen, 2019) that connect with the emergentist arguments of Tomasello, Ellis, and others (Ambridge & Lieven, 2015; Bannard et al., 2009; Diessel, 2019; Ellis, 2019; Ellis et al., 2015; Tomasello, 2003).

This set of processing mechanisms also addresses the basic question raised by Perfetti (Perfetti & Stafura, 2014): Where is syntax in the brain? Is there an independent syntactic component in the brain for language processing? Perfetti's Reading Systems Framework (Perfetti & Stafura, 2014; Perfetti, Stafura et al., 2013; see also Chapter 5) argues that syntax is primarily a part of the lexical entries stored in LTM. If that is so, then the abstracted structural units (syntactic constructions) are stored in LTM with statistical linkages to the lexical items most frequently used or most salient in these structures. Moreover, drawing back to the neurocognition of comprehension (Chapter 5), it is possible to link neurocognitive processing and language processing to combined lexical and syntactic structures stored in LTM.

First, we can assume that LTM storage is distributed across the parietal and temporal lobes of the brain rather than just in any single location. Second, the semantic area of the anterior temporal lobe is likely to be a collection hub for semantic pathways (rather than the "location" for word and multiword unit meanings in LTM). Third, Broca's area (inferior frontal lateral premotor cortex) is a collection hub for connecting word semantics with abstract construction assembly. Fourth, both the anterior temporal lobe and Broca's area have strong

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linkages to the neighboring prefrontal lobe areas involved in working memory (WM) and higher order cognitive processing. Neurolinguistically, syntactic parsing need not be considered an independent language processing component in the brain, in cognition, or in reading comprehension (see Banich & Compton, 2018, Seidenberg, 2017; Slotnick, 2017). At issue is whether or not further evidence exists for the tight linkages between the lexicon and syntactic constructions.

12.1.2 Syntactic Processing and Syntactic Awareness while Reading

Much research in sentence processing and language comprehension argues for a strong relationship between syntax and reading. In multiple studies, syntactic awareness appears to be an important resource for first-language (L1) reading comprehension abilities (Brimo et al., 2017; Deacon & Kieffer, 2018; Foorman et al., 2015; Nagy, 2007; Netton et al., 2011). At present, research suggests that syntactic awareness and processing skills have an impact on comprehension abilities, though generally not as strong as word recognition during beginning reading, and perhaps mostly indirectly through other language and memory skills such as vocabulary knowledge or as common variance with vocabulary (Cartwright et al., 2020; Silverman et al., 2015).

Deacon & Kieffer (2018) carried out a longitudinal study of 100 L1 students from 3rd to 4th grade to examine the role of syntactic awareness on reading. Students were assessed on reading comprehension as well as on a number of component skills that commonly predict reading abilities among elementary grade students (word recognition, vocabulary, morphological awareness, phonological awareness, syntactic awareness, and nonverbal reasoning). The researchers ran three SEMs to examine the relationship between the component skills and reading comprehension in 3rd and 4th grades, and the longitudinal impact of 3rd grade skills to predict 4th grade reading comprehension. Third-grade word recognition and syntactic awareness were the only skills that independently predicted 3rd grade comprehension. With the development of several components skills in 4th grade, comprehension was predicted by each of the following: syntactic awareness, word reading skills, morphological awareness, and vocabulary. In the final SEM, including a 3rd grade comprehension autoregressor variable from 3rd grade comprehension, the only other variables to predict comprehension independently were syntactic awareness and word reading skills. This study demonstrates the importance of syntactic awareness as a direct predictor of reading comprehension.

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Brimo et al. (2017) carried out an SEM analysis that also demonstrated the impact of syntactic awareness on reading comprehension for 179 students in 9th and 10th grades. Control component-skill variables included vocabulary, word-level reading, working memory (WM; measured as short-term memory), and nonword repetition. Both syntactic knowledge and syntactic awareness were measured (with sentence–picture matching and syntactic error correction tasks, respectively). The SEM showed that vocabulary and syntactic knowledge both independently predicted reading comprehension, and syntactic awareness indirectly predicted comprehension through syntactic knowledge. This study further demonstrates the importance of syntactic knowledge/awareness in predicting comprehension, this time with secondary-school students.

More generally, the Simple View of Reading (SVR) provides a strong argument for the combined view of lexicon and syntactic processing components. In several studies validating the SVR, the oral language component is a combination of vocabulary and syntactic abilities (or studies use listening comprehension – an equivalent amalgam) (e.g., Hulstijn, 2015b; Lervåg et al., 2018; Verhoeven & van Leeuwe, 2012). Additional studies directly support the concept of an overall language factor as the major contributor to reading comprehension in L1 contexts, especially from 4th grade onwards, including Cartwright et al. (2020), Foorman et al. (2018), Hjetland et al. (2020), Kieffer et al. (2016), Language and Reading Research Consortium and Logan (2017), Quinn and Wagner (2018), and Uccelli et al (2015). As Kieffer et al. (2016) note, "Modeling the common variance underlying performance on vocabulary, morphological awareness, and syntactic awareness tasks may be useful to appropriately capturing language comprehension as it predicts reading comprehension" (p. 451).

In an important large-scale study, Foorman et al. (2015) assessed 1,792 students (in 4th to 10th grades) on a number of component oral-language skills as well as reading comprehension. A major goal of the study was to determine if the Simple View of Reading model would explain reading comprehension across grades 4 through 10. The researchers carried out SEMs for 1, 3, 4, or bifactor models (assuming a coherent subgroup of component skills would form together as a single predictor). The bifactor model was the best fit for all seven grades. The one (very) strong predictor was a combined oral language variable incorporating vocabulary, syntactic knowledge/awareness, and morphological awareness – becoming a vocabulary–syntax variable. It explained 72 percent to 99 percent of the variance in reading comprehension across the seven grades. Decoding fluency was not a strong independent variable and did not contribute to the

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oral language variable, a result not surprising for students primarily in secondary school. In 4th grade, the syntactic knowledge/awareness variable was a small significant independent predictor and in 7th grade, vocabulary was a small independent predictor. In five of the seven grades, shared variance predicted reading comprehension at higher than 91 percent. In essence, the oral language factor almost completely predicted reading comprehension abilities across seven grades and almost 1,800 students.

Additional research supporting the combination of syntax and vocabulary (and morphology) as a major language comprehension factor is shown in studies by Babayiğit (2014), Foorman et al. (2018), Lonigan et al. (2018), Proctor et al. (2012), Sabatini et al. (2010), and Silverman et al. (2015). These studies, and those reported earlier in this chapter, provide a powerful behavioral validation of the unified vocabulary-syntax conceptualization and directly support arguments by Perfetti and his Reading Systems Framework Approach.

In second-language (L2) contexts, syntactic awareness has a strong well-established relationship with reading comprehension. Van Gelderen et al. (2003) reported a very strong correlation among Dutch students (Dutch L1 and Dutch L2, the latter with Turkish and Moroccan L1s), comparing their Dutch reading comprehension and component knowledge resources (correlations with vocabulary 0.78, grammar 0.73, and metacognition 0.74). Students' English as a foreign language (EFL) reading comprehension correlated with EFL grammar (0.78), vocabulary (0.57), and metacognition (0.72). In other L2 studies, the relationship between grammar and reading has demonstrated surprisingly strong relations. Alderson (1993), reporting research for the development of IELTS, noted correlations between reading and grammar of 0.80. Similarly strong correlations were reported regularly for the earlier form of the TOEFL when a sentence analysis subsection was part of the reading section. Enright et al. (2002), presenting research involving the development of TOEFL (TOEFL iBT), reported a very strong relationship between the grammar and reading subsections of the Computer-Based TOEFL ($r = 0.91$) and a strong relationship between the structure section of the Computer-Based TOEFL and the piloted reading section of the TOEFL iBT ($r = 0.83$).

More recently, the strong impact of syntactic knowledge on L2 reading has been reported by Farnia and Geva (2013), Geva and Farnia (2012), Jeon and Yamashita (2014, 2022), Martin and Ellis (2012), Netton et al. (2011), Shiotsu (2010), and Yamashita and Shiotsu (2017). In addition, a number of these studies point to a combined language comprehension component consisting primarily of lexical

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and syntactic knowledge. Jeon and Yamashita (2014) carried out a meta-analysis on component skills as predictors of reading comprehension with L2 students. The researchers included fifty-eight studies and sixty-seven independent samples and analyzed the impact of ten component skills (four high-evidence skills and six lower-evidence skills) on reading comprehension. The two strongest correlations among high-evidence skills were L2 grammar knowledge (0.85) and L2 vocabulary knowledge (0.79). The strongest low-evidence skill was listening comprehension (0.77). The strength of these individual correlations suggests a very high level of common variance, much like the findings of Foorman et al. (2015) for L1 students.

Similarly, Shiotsu (2010) examined the role of component skills on reading comprehension with 219 Japanese EFL university students. He reported overall correlations between grammar and reading and between vocabulary and reading at 0.84 and 0.70, respectively. Grammar and vocabulary themselves correlated at 0.77. A subsequent SEM analysis showed that both syntax and vocabulary predicted reading comprehension with the two largest path coefficients (0.95 and 0.67, respectively). This carefully designed study closely matches the results reported by Jeon and Yamashita (2014, 2022).

Yamashita & Shiotsu (2017) carried out a study with 325 EFL Japanese university students that analyzed the influence of L2 components skills and L1 reading comprehension on L2 reading comprehension. Using multiple measures of listening comprehension, L2 vocabulary, L2 syntax, and L1 reading comprehension, they carried out an SEM involving L2 listening, L2 knowledge (vocabulary and syntax combined), and L1 reading as predictor variables. The SEM accounted for 94 percent of shared variance with L2 reading; L1 reading was not a significant contributor. For purposes of the present discussion, the correlation between L2 vocabulary/syntax and L2 listening comprehension was $r = 0.65$, suggesting a very high common variance among the key predictors of L2 reading.

Similar results can be found across a number of studies that have concluded that L2 language knowledge accounts for an overwhelming percentage of shared variance with L2 reading comprehension (see also Babayiğit, 2014; Goodrich & Lonigan, 2017; Goodwin et al., 2015; Guo & Roehrig, 2011; Hulstijn, 2015b; Joh & Plakans, 2017; Mancilla-Martinez & Lesaux, 2010, 2017; Melby-Lervåg & Lervåg, 2014). As Hulstijn (2015b) notes:

> From a usage-based perspective, there is no ground to view lexical and grammatical knowledge as independent components of language cognition. Most lexical knowledge is acquired through exposure not to isolated words

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but through exposure to utterances. The utterances provide a grammatical context for the words appearing in them and, similarly, provide a lexical 'furnishing' of grammatical structures. In virtually all settings of language acquisition, the acquisition of lexical and grammatical knowledge will go hand in hand. (p. 113)

12.1.3 Syntactic Knowledge (Awareness) and Reading Comprehension Abilities

Until recently, the role of grammar in reading comprehension has not been a common topic in publications on L1 or L2 reading. In L1 instructional contexts, grammar instruction had not been emphasized for at least the past thirty years. In L2 contexts, grammar was not emphasized in L2 communicative methods. The weak link between grammar and reading might also be due to teachers' inabilities to assess and support syntactic awareness in either L1 or L2 contexts, as well as their concerns that a reading course or curriculum may become a covert grammar course (and this does happen). Finally, there is relatively little discussion among reading researchers and teachers that identifies the need for readers to use information from grammar to build comprehension. In brief, there is little recognition (or even awareness) of how grammar (or syntactic awareness) works to support comprehension (cf. Grabe, 2005). However, there are compelling conceptual reasons to consider the role of grammar knowledge in reading comprehension.

It is first important to recognize that grammar knowledge – whether referred to as grammatical knowledge, syntactic knowledge, syntactic awareness, or syntactic parsing – is not a linguistic resource or processing skill that is used "as needed" while reading (a common view among L2 teachers and L2 methodologists). The process of parsing incoming text phrases and clauses for structural information that supports comprehension is something that happens every second of fluent reading (see Christensen & Chater, 2016a; McCauley & Christiansen, 2019). The fact that most readers are not generally aware of this processing and knowledge resource is because they are such fluent readers. It is also likely that the implicit development of grammar knowledge makes structural processing all but invisible to both L1 and L2 students learning to read. Struggling readers, and L2 students, in particular, are much more aware that something is not working at the clause level when they do not have the grammatical resources needed for comprehension. A careful review of current reading research indicates that grammar knowledge resources are critical even at very advanced levels of comprehension.

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12.2 Grammar as Functional Text Processing Knowledge

To claim … that syntactic processing is not necessary [for reading] is frankly unbelievable. (Urquhart & Weir, 1998, p. 60)

While it should be clear that grammar is an important component of reading comprehension, especially for L2 students, the strength of the relationship does not, by itself, explain how grammar knowledge and processing support reading comprehension. As a reader begins to look at a text, visual word recognition processes are engaged, the first words are recognized, and the extraction of syntactic information begins. Syntactic processing assembles the phrasal and clausal units that support the construction of semantic propositions. Structural information is taken from the words being recognized, and specific word groupings are recognized for the structural information that they provide (DeKeyser, 2001).

For example, the word *the* signals the opening of a noun phrase unit *(the man*, *the student*). The verb *cut* will set up the syntactic expectation that it will be followed by an upcoming noun phrase. The verb *cut* also looks back to the subject noun phrase and/or forward to the complement structure for its specific meaning (*The man cut the carrots*; *the student cut all her classes*). This information, in some cases, is part of the meanings of words themselves (e.g., verb subcategorization – the grammatical forms that are required to follow certain verbs. For example, the verb *intended* commonly requires an infinitive complement: *They intended to go quickly*). In other cases, syntactic information emerges from specific word groupings as phrases and clauses that modify verbs and nouns (e.g., prepositional phrases, adverbial clauses, relative clauses). Moreover, the appearance of a word in a slot specified for a noun, adjective, or verb will signal the appropriate meaning sense for the word form. *Bank*, for example, can be a building or an edge of a river as a noun, but, in a verb slot, it can mean a type of pool shot (and the subject must be human), or it can mean the way an airplane turns (the airplane is a nonanimate subject), or in an adjective slot, the word can modify a noun, as in a *banking decision*.

Syntactic processing also supports a number of other types of information that is important for comprehension:

1. Disambiguation processes (suppressing alternative meanings, activating semantic priming within clauses that spreads across all lexical items within the clause).
2. Referent tracking (pronouns, demonstratives, articles).

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3. Default processing strategies that anticipate subject-verb-object ordering or anticipate certain phrase structures (e.g., the more frequent linking of one type of prepositional phrase and the preceding verb; *he **talked about** the lecture incessantly*), or that use specific repair strategies (e.g., rereading, considering alternative structures, finding the main clause subject and verb among multiple subordinate clauses).

When words are being recognized and the syntax is being processed, the meanings of clauses and sentences are also being constructed (Kintsch, 1998). The information from both the activated words and the syntactic parsing is integrated into meaning units (semantic propositions). Again, this process is ongoing, starting with the first words being recognized. In addition to forming the basic meaning units of clauses and sentences, semantic propositional units establish key referents and predicates, track overlapping referents, and index the relative importance of referents, events, and descriptors. In this way, words and grammatical constructions provide the information needed to build the meaning units for text comprehension (word-to-text integration). The meaning units formed by semantic proposition integration are combined to generate the text representation and the situation model of reader interpretation (see Chapters 2 and 3).

The key idea to draw from this syntactic processing research is that syntactic information provides many discrete sets of information and contributes to ongoing discourse understanding. One of the clearest ways to understand how grammar supports comprehension is through an extended example of informational signaling in sentences.

12.2.1 Grammatical Information as Discourse Signaling System

At a functional level, grammatical signals provide the reader with information about how to interpret sentences and how the sentences should be integrated into the text meaning network being developed. For L2 contexts, Celce-Murcia made this point on numerous occasions (e.g., Celce-Murcia, 2002). Grammatical structure serves discourse communication needs, and this fact is driven home by a careful exploration of reading comprehension abilities. Grammatical information tells us how to understand the content, how the content fits with the ongoing discourse, and whether or not we should maintain the general frame of reference for our interpretation or prepare for a shift in perspective.

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One way to consider how sentence-level grammatical information does all this work is by analyzing the elements of a sample sentence to see how meaning is signaled through grammatical resources (see Chapter 2; see also Urquhart & Weir, 1998; Widdowson, 1984, for related explanations). Consider the sentence elements in (1); we can process the content words, or content information, but it is not apparent what the real meaning might be.

(1) *new, think, police, students, run, money, they, car*

Sentence (1) provides content but no grammatical signaling.

If we put the words in the right order, as in (2), there is more information that helps the reader because the word order is a major syntactic contributor to language comprehension in English.

(2) *new students, think, money, they, run, police car*

It is remarkable how much support is provided in English simply through intended word ordering. But there is still a lot of information that is vague or left missing.

We do not know when the events happen, how sure the writer is about the information, the identifiability of the people and other nouns, or the direction of movement being described. Identifiability is signaled, in part, by articles in the sentence. Adding this information results in (3):

(3) ***The*** *new students, think,* ***the*** *money, they, run,* ***the*** *police car*

So now we know that three of the nouns should be identifiable in some way from the prior discourse or our background knowledge. At this point, the reader is better able to anchor the sentence information into an existing network of prior information.

If we add tense/aspect information, we know that the events happened at some time in the past, adding perspective to the reader's interpretation (4):

(4) *The new students,* ***have thought****, the money, they,* ***ran****, the police car*

If we add signaling about modality (how certain the writer/speaker is), we get a more complete understanding of the uncertainty of events (5):

(5) *The new students* ***might*** *have thought, the money, they, ran, the police car*

However, we still do not know how the two events are related to each other or how the nonsubject nouns are related to the verbs.

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When we add a clausal adverb as a signal, we see that the two events are parallel in time. A transition word, between clauses, in this case, helps the reader establish a clearer time relationship between two events. The location of the adverbial subordinator signal (*while*) also reinforces the interpretation that *they* refer back to *new students* (subject to subject linkage). Finally, the addition of prepositions helps us decide the relation between *thought* and *money* and the location/direction of the second event (6). In this way, the specific meaning of the sentence is brought into sharp focus.

(6) *The new students might have thought* ***about*** *the money* ***while*** *they ran* ***to*** *the police car.*

It should be apparent that the sample sentence, even by itself with no surrounding discourse, includes a number of grammatical signaling systems that help us interpret the sentence meaning beyond a simple list of content words. Each element of grammatical information, in effect, reduces ambiguity and adds precision to the potential meaning of the sentence.

12.2.2 The Contribution of Grammar Knowledge to Reading Comprehension

The idea of grammatical knowledge as a network of cueing systems operating conjointly is very important. Table 12.1 lists the types of knowledge that grammar provides to build text comprehension.

All of these specific knowledge resources are active, and operating implicitly, during reading comprehension and contribute to a more accurate and coherent text model network that represents reading comprehension.

The grammatical signaling systems – indicating information about time, certainty, location, identifiability, event relations, and noun linkages (among other information signals) – provide a continuous low-level stream of information that anchors comprehension processing. The extended example given earlier points out the value of grammatical information for understanding, but it does not explain theoretically how such information might contribute to text understanding. Work by Gernsbacher (1990, 1997) and Givón (1992, 1995) have provided useful ways to begin building such an explanation.

12.2.3 Structure Building Model of Comprehension and Linguistic Cueing Systems

A plausible explanation for *how* words and grammar processing (word recognition and parsing) contribute to reading comprehension

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Table 12.1 Grammar-system support for reading

1. Grammatical word order constrains alternative meaning potential. It specifies and sharpens the information being communicated.
2. Grammatical structure identifies parts-of-speech categories for words, the semantic roles of noun phrases in relation to the verb, and the relations between phrasal and clausal units for comprehension processing.
3. Grammatical structure distinguishes main from subordinate information (stressing relative importance of information) and signals given and new information in the sentence.
4. Grammatical information helps readers identify (a) major referents in the text (via demonstrative determiners, relative clauses, and focusing constructions); (b) the continuity and reappearance of referents; and (c) the continuation or shift of events and ideas via tense, aspect, modality, and location information.
5. Grammatical information indicates the author's attitudes toward events and ideas through prepositional phrases, adverbial phrases, and lexical choices.

emerges from Gernsbacher's (1990, 1997) Structure Building Model of discourse comprehension. As noted earlier, reading begins as word information starts to "enter" WM. Almost simultaneously, the processes of syntactic parsing and proposition formation begin. These latter two processes act on the lexical information, using syntactic information from the words themselves as well as information from word ordering constraints (sequential ordering of words, phrases, and their combinations). As words are accessed and the grammatical structure parsed, the reader engages in structure building operations (creating the text representation). Gernsbacher (1990) developed her Structure Building Model to explain how the textual structure is built as a type of word-to-text integration process (see also Chapter 2).

In this model, as any clause is processed, it will contribute to the text model network in one of the three ways; it will

1. Lay the first foundation for a network structure (often first clauses of paragraphs);
2. Map new information onto an existing structure; or
3. Shift to build a new network structure.

These processes draw on the vocabulary and grammatical information of the clause being processed as well as information already active in the network structure.

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Typically the first sentence of a new paragraph lays a new foundation structure that will require greater effort to incorporate into the full-text model. Clauses that have overlapping material and that continue various grammatical cueing systems (same tenses, topic, participants, setting, event, etc.) tend to map new information onto foundation structures more easily. Clauses that do not overlap and that appear to require a new foundation cause a shift in processing. The arguments for this set of processes are extensively documented in a large number of reaction-time experiments carefully described in Gernsbacher (1990; see also Gernsbacher, 1997). In addition, the three structure building processes are facilitated by structure suppression and structure elaboration mechanisms (executive control processes). As memory is activated, information that is inappropriate or irrelevant is rapidly suppressed to keep processing from slowing down. Gernsbacher's theory provides a general mechanism for explaining how grammatical information builds the meaning units that lead to discourse comprehension.

Paralleling Gernsbacher, Givón explains how structural signaling assists in structure building operations. In multiple analyses, Givón (1992, 1995) has argued that grammatical systems provide basic cueing information to the reader for building discourse coherence. In his 1995 article, he elaborates on these systems and the roles that they are likely to play in discourse comprehension. These systems are outlined in Table 12.2.

Givón presents syntactic evidence to show that these tracking systems provide continuous low-level signaling that helps to build reader interpretations of coherent segments of texts (see also Chapter 14). As Givón (1995) notes: "Grammar must have evolved as a mechanism for speeding up the processing of both local and global aspects of text coherence. Grammar cues are fast-processing, multiple, continuous, course-grained information resources for building text understanding" (p. 81). This cueing also indicates to the reader when to expect a shift in the discourse and a new informational segment. These cues work in combination to assist the reader in building a text representation; Givón suggests that Gernsbacher's Structure Building Model provides the processing framework for this ongoing cueing.

In this section, the contributions of syntax to reading comprehension have been explored. It is important not to underestimate the impact of grammar (or the implicit processing underlying syntactic awareness) on reading comprehension, and especially L2 reading comprehension. This processing and signaling apply in particular to the reader's development of main ideas in the text. Grammatical cueing systems provide continuous information for building the

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Table 12.2 Givón's grammar cueing systems

1. Local coherence systems:
   a. Referent tracking (e.g., pronoun linkages, definite article inference);
   b. Temporal tracking (same time perspective or shift in time);
   c. Locational tracking (same location or new location);
   d. Event tracking (the same event continuing or new event beginning);
   e. Modality tracking (certainty of the information or intention of a writer);
   f. Frame/script tracking (setting remains the same or changes).
2. Global coherence systems:
   a. Adverbial transition cues (advance warning of shifts about to occur);
   b. Vocabulary driven processes (specific words that signal discourse continuities and shifts);
   c. Cues for the generation of new discourse units (marked structures, new paragraphs, new sections, new events).

text representation and for identifying those ideas, issues, events, and objects that become the main ideas of the text model. These same cueing systems play central roles in the development of situation models (Zwaan & Rapp, 2006).

12.3 Academic Main Idea Comprehension

> In reading comprehension, a more effortful strategic approach is often triggered when automatic processes do not lead to a sufficient level of comprehension. Evaluation of the level of comprehension is based on the reader's standard of coherence … the degree of comprehension that the reader wants to obtain. When the standards are not met through automatic processes, strategies can be used to reach a sufficient level of comprehension. (Beker et al., 2017, p. 39)

As described previously, readers establish the main ideas of a text from the words being identified while reading, the information being drawn from syntactic parsing, the text representation being developed from idea overlap and bridging inferences, the "standard of coherence" being set by reader goals (or by specified tasks) and reader motivation (Beker et al., 2017; van den Broek & Kendeou, 2017; van den Broek et al., 2011). When good readers read for enjoyment or when they have high levels of appropriate topic background knowledge, they generally do not need to work consciously and effortfully to build main ideas from texts. Such readers are not challenged to understand the text, and they recognize and generate main ideas relatively automatically. However, main idea comprehension can sometimes be challenging, especially with informational texts that

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present new information, involve higher academic learning expectations, and introduce conceptually difficult ideas (Beker et al., 2017; Britt et al., 2018; Lorch, Jr, 2015, 2017).

These contexts for reading comprehension often require some level of demand on attentional processes, metacognitive awareness, and strategic support (see Chapters 3 and 4). More challenging texts (and tasks) assigned by teachers are often read with the expectation of learning from the text (rather than comprehension at the moment). Reading to learn generally will involve more explicit efforts to engage in strategic processing (Chapters 13 and 15). Students must develop a greater metacognitive awareness of what good readers do to build main idea comprehension (Pressley, 2002b, 2006). When students have difficulties in understanding a text, they are expected to engage in specific reading strategies that will help them achieve their goals, even if the goal is simply to recognize the main ideas and understand the text. There is a long history of research to identify individual reading strategies to improve comprehension. Two of the most important outcomes of this research are the need to develop students' metacognitive awareness for text comprehension (Chapter 13) and the need for students to develop a repertoire of effective strategies to support comprehension (explored further in Section 12.4).

12.4 Reading Strategies That Support Comprehension

> Strategy instruction should be explicit, intensive, and extensive. The ultimate goal is to have students using the trained strategies autonomously, skillfully, appropriately, and creatively. Strategies should be taught to students directly over an extended period of time as part of the existing curriculum. (Pressley & Woloshyn, 1995, p. 11)

The notion that effective reading strategy use is a hallmark of the good reader is now widely accepted among both L1 and L2 reading researchers (N.J. Anderson, 2009; Ardasheva et al., 2017; Cohen, 1998; Pressley, 2006; Schwanenflugel & Knapp, 2016). The beginnings of this research emerged in the early 1980s with the identification of specific reading strategies and efforts to determine if specific strategy instruction was effective (Pressley, 2006; Pressley & Afflerbach, 1995; Trabasso & Bouchard, 2002). By the mid-1980s, the emphasis shifted to which strategies were the most important for reading comprehension, and which strategies, when taught to students, significantly improved reading comprehension abilities (e.g., Pressley et al., 1989). Many individual strategies were the subject of research studies in the 1980s and 1990s.

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L2 reading strategy research has a somewhat distinct starting point. First, reading strategies have often been embedded within broader discussions of L2 language learning strategies and communicative strategies, neither of which are significant issues for L1 reading researchers (e.g., Ardasheva et al., 2017; Cohen, 1998). Second, L2 reading strategy research includes some topics that are not a common concern for L1 researchers. These include the effect of mental translation, the impact of L1 transfer, and the potential metalinguistic awareness advantage of the L2 learner (and explicit instruction in vocabulary and grammar). Third, the amount of L2 reading strategy research is limited, making it difficult to generalize most results or claims except when they confirm similar findings from L1 reading research. As it turns out, several L2 research studies on strategy use converge with L1 strategy research findings and confirm the relevance of comprehension strategies for L2 students (see Akkakoson, 2013; Ardasheva et al., 2017; Dabarera et al., 2014; Koda, 2005; Taylor et al., 2006).

Based primarily on L1 strategy research over decades, a number of specific comprehension strategies have been identified as being empirically supported by multiple research studies. The ten strategies listed in Table 12.3 represent a synthesis of the various commentaries and research studies that have explored the importance of specific strategies to improve main idea comprehension. Each of these strategies will be discussed further in the following sections.

Table 12.3 Effective reading comprehension strategies

1. Previewing (e.g., pictures, titles, headings)
2. Activating prior knowledge
3. Predicting
4. Forming questions (self-interrogation)
5. Answering questions about the text
6. Summarizing
7. Monitoring comprehension
8. Using text structure awareness and graphic organizers
9. Visualizing and making mental representations
10. Generating appropriate inferences

12.4.1 Previewing and Activating Prior Knowledge

Previewing is a prereading strategy that helps the reader anticipate the possible organization of text information and possible main ideas. It allows the reader to use headings, subheadings, visuals, and titles to activate background knowledge, connect knowledge to reading task,

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and consider the level of effort required to read the text successfully. It also allows the reader to establish a purpose for reading and provides an opportunity for readers to become more motivated to read and engage with the text. Activating background knowledge is the more general goal of connecting possible knowledge in the text with knowledge the reader brings from prior educational and personal experiences (Almasi & Fullerton, 2012; Schwanenflugel & Knapp, 2016).

Activating prior knowledge appears to improve recall of information among a range of students. In fourteen studies involving activation of prior knowledge across 1st to 9th grades, comprehension improved in all but one study (Trabasso & Bouchard, 2002). Background knowledge activation is widely recognized as a key to building better text comprehension, assuming that the way in which background is activated is effective. In an L2 context, Chen and Graves (1995) showed that guiding students through a preview of targeted texts, and supporting background knowledge through reading guides, improved comprehension significantly better than telling personal stories about the general topic of a text. More recently, Joh and Plakans (2017) and Shin et al. (2019) showed that greater background knowledge increased L2 reading comprehension.

Activating prior knowledge can also be a two-edged sword. Efforts to activate prior knowledge that is incompatible with the text (and often wrong) do not lead to improved comprehension (e.g., Kendeou & O'Brien, 2016). Typically in these cases, prior knowledge activation can be driven by a task or text that is too difficult for the student, leading to a wrongly formed situation model and a loss of comprehension (Beker et al., 2017; Rapp et al., 2007; Schwanenflugel & Knapp, 2016). It is important that knowledge activated by students prior to reading be consistent with information presented by the text. At the same time, less background knowledge is sometimes not a hindrance, depending on text, task, and metacognitive skills (reading strategies).

12.4.2 Predicting

The role of predicting as a reading strategy goes back to the beginnings of Reciprocal Teaching (Palincsar & Brown, 1984). It is a common strategy for activating background knowledge. This strategy helps students develop expectations for upcoming information (Schwanenflugel & Knapp, 2016). Predicting can also be seen as a way to formulate questions that may be answered by the upcoming text. Checking predictions and engaging in discussions about student predictions also provide straightforward ways to keep students on track as they build main idea comprehension. Predicting is commonly incorporated with multistrategy instructional approaches (see Chapter 13).

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12.4.3 Forming Questions and Answering Questions

Forming questions is commonly recognized as an important strategy among L1 reading researchers (a component strategy in Reciprocal Teaching, Questioning the Author, and Collaborative Strategic Reading; see Chapter 13). Question forming strategies lead students to interrogate their expectations about the information that will be in a text, raising their awareness of what to expect. Forming questions about possible upcoming text information is closely related to predicting upcoming information in a text. A reader might be aware that information is only partial and can form a question about (or predict) what may be needed. As a strategy to be used by students, useful question formation often requires training in how to generate appropriate questions in relation to a text. There is strong evidence that question generation improves memory for text information, accuracy in answering questions, and identifying main ideas (Schwanenflugel & Knapp, 2016).

One problem with a question formation strategy is that it may generate less than useful questions, much like an exercise with no real goal of trying to understand the text or some challenging part of the text. A further limitation is that the individual strategy (i.e., question forming) is often examined in research studies as part of a combination of strategies, so it is not always easy to identify question forming as the major factor in comprehension improvement. In these contexts, forming questions is generally recognized as an important contributing factor to comprehension development. One major approach to the development of comprehension abilities (Questioning the Author) centers specifically on students' abilities to form questions and explore answers (Beck & Sandora, 2016). There is little empirical research specifically on the effectiveness of student questioning in L2 reading contexts.

Answering questions has long been recognized as an important cognitive ability, and certain aspects of question answering are strategic in nature. In general, answering questions after reading significantly improves comprehension for adults if questions require using information from the text (Trabasso & Bouchard, 2002). In seventeen studies of question answering instruction across 3rd to 8th grades, students improved memory for text information and developed strategies for finding answers (Trabasso & Bouchard, 2002). Elaborative Interrogation, a particular type of comprehension questioning by teachers, is centered on follow-up *why* questions intended to improve comprehension with difficult expository texts (Ozgungor & Guthrie, 2004; Pressley, 2006). Ozgungor and Guthrie (2004) demonstrated its positive effects for text recall, inference making, and coherence building with university students.

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12.4.4 Summarizing

Summarizing to demonstrate reading comprehension is a major strategy for students; it requires them to recognize or produce an overarching macrostructure for understanding a text. Summarizing also requires greater attention to the text that has been read, with the goal of identifying main ideas and their connections (see also Chapter 15). Numerous early studies have shown that summarizing leads to significantly better comprehension skills among students in L1 contexts (Graham & Hebert, 2011; Trabasso & Bouchard, 2002). In one meta-analysis of comprehension strategy research, Trabasso and Bouchard (2002) reviewed eighteen studies on the use of summarizing across 3rd to 8th grades. Consistently, the quality of summaries improved with instruction and students recalled more information as a result of summary practice. Graham and Hebert (2011) carried out a meta-analysis of the impact of writing on reading development (3rd to 12th grades). In the section on the impact of summary writing on reading abilities, they found that seventeen of nineteen studies reported moderate effect size outcomes for the impact of summarizing information from texts on reading comprehension (d = 0.52).

In L2 contexts, a number of individual studies have examined the role of text summarizing. Most directly to the question of improving comprehension via summarizing, Marzec-Stawiarska (2016) carried out a study involving eighty students, with an experimental group (N = 40) writing summaries ten times over a six-month period. The experimental group far exceeded the control group (involving standard postreading coursework) on a standard measure of reading comprehension (the Cambridge FCE, or First Certificate in English). In other studies involving training L2 students with more demanding expository texts, students have had significant difficulties in producing effective summaries (Baba, 2009; Keck, 2014). More importantly, with respect to reading, the rating scores on student summaries in these studies were significantly related to their reading comprehension skills.

12.4.5 Monitoring Comprehension

Monitoring comprehension is commonly discussed as a major reading strategy that improves comprehension. It has also often been identified as an important executive control skill (Pressley, 2002b). Monitoring typically incorporates many strategies under its umbrella.

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Table 12.4 identifies several strategies that can be used to monitor comprehension.

Table 12.4 Strategies used for comprehension monitoring

The reader
1. Has a reason for reading and is aware of it.
2. Recognizes text structure.
3. Identifies important and main idea information.
4. Relates text to background knowledge.
5. Recognizes relevance of text to reading goal(s).
6. Formulates questions about aspects of the text and information presented.
7. Recognizes and attends to difficulties.
8. Rereads text segments when needed.
9. Reads carefully.
10. Clarifies misunderstanding.
11. Translates mentally to the L1 (for L2 learners).

In fact, almost any strategy that supports main idea comprehension could be seen as an option for monitoring comprehension under appropriate circumstances. It should be clear from Table 12.4 that comprehension monitoring is not just a simple process of recognizing main ideas and detecting difficulties. Thus, viewing monitoring as a matter of metacognitive control rather than as a specific strategy may be more appropriate. For example, Baker et al. (2015) note that the "clarifying strategy" in Reciprocal Teaching constitutes a key comprehension-monitoring strategy. Pressley (2002a) notes that student monitoring of text comprehension can be difficult to teach because there are so many ways a reader can monitor comprehension (see also Yang, 2006).

Nonetheless, many researchers treat comprehension monitoring as a specific strategy. In research studies, monitoring tasks usually involve recognizing gaps in information, recognizing less coherent sequencing of information, or detecting errors in texts while reading. In a review of twenty studies with L1 readers in 2nd to 6th grades who were taught directly to monitor their comprehension, significant improvements were found in detecting text difficulties, improving memory of text material, and performing better on standard reading comprehension tests (Trabasso & Bouchard, 2002; see also Oakhill & Cain, 2012; Schwanenflugel & Knapp, 2016). There is relatively little research on comprehension monitoring and its impact on reading comprehension with L2 readers.

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12.4.6 Using Text Structure Awareness

Using text structure awareness has been shown to be a powerful means for improving reading comprehension and recall of information. Text structure awareness includes recognizing and attending to a number of discourse signaling systems, including those outlined in Table 12.5.

Many studies centering on expository prose have shown that students who are knowledgeable about text structure and make use of text structure resources in their recalls and summaries demonstrate better text comprehension (Jiang & Grabe, 2007; see also Chapter 14 for further discussion of discourse awareness).

Table 12.5 Discourse structure signaling systems

Attend to:
1. Levels of importance of information in texts.
2. Headings and subheadings.
3. Paragraphing choices.
4. Coreferential connections across ideas in a text.
5. Relations of part-to-part and part-to-whole information.
6. Transition and signal words.
7. Patterns for organizing text information (cause and effect, problem and solution, comparison and contrast, description, classification, analysis, argument and evidence, procedural sequence, chronology).

12.4.7 Using Graphic Organizers

Using graphic organizers (e.g., Venn diagrams, matrices, flow charts) results in an important combination of text structure awareness, main idea recognition, and imagery. As a strategy modeled for learners and then practiced by learners, the use of graphic representations to organize text information leads to improved memory of information and significantly better comprehension. Much of the L1 research and instructional studies in L1 contexts focus on the five overarching text structures identified in Meyer's early work on discourse structures in expository texts: description, sequence, cause/effect, comparison/contrast, and problem/solution (see Chapter 14). L2 approaches with graphic organizers that reflect discourse structure of texts propose a wider range of consistent text structures that apply sometimes to the overall text organization, but more often to multiple subparts of longer and more complex texts (Jiang, 2012; Jiang & Grabe, 2009; see Chapter 14). In general, graphic organizers have been shown to help students recognize text structure and highlight main concepts and their relations with supporting information (Dexter & Hughes,

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2011; Jiang, 2012; Jiang & Grabe, 2007; Shanahan, 2020; Wijekumar et al., 2017; Williams et al., 2016).

12.4.8 Inferencing

The role of inferencing in reading comprehension was described in Chapter 3. Inferencing, like monitoring, is a more general cognitive skill that develops from an early age, certainly before learning to read. When applied to reading comprehension research and instruction, four aspects of inferencing need to be kept in mind. First, inferencing is a fundamental general cognitive skill. Second, most inferences made during reading are carried out implicitly (as associations between a concept being processed and a well-developed associational network of related ideas in a reader's LTM as part of a reader's highly developed lexical quality). Third, explicit attention-demanding inferences during reading are only common during challenging reading comprehension tasks and texts. This level of inferencing usually occurs when readers are trying to learn new information from difficult texts or when a reader's task requires synthesis or critical evaluation skills. Fourth, explicit inferencing tasks carried out in many research studies (and in assessment measures) involve the processing of text after it has been read and in response to a prompt that requires inferencing; explicit inferencing does not necessarily occur while reading. (See also discussions in O'Brien et al., 2015; Kintsch, 1998.)

Explicit inferencing instruction does appear to raise conscious awareness of how to engage in appropriate inferencing to reason about information in a text or to problem-solve an appropriate solution to the task. In this context, inferencing skills are generally viewed to be useful for comprehension improvement. However, relatively few experimental studies provide explicit training in inferencing as a way to improve comprehension among grade-level or better readers. There is strong evidence that inferencing abilities represent a major difference between poor readers and grade-level readers (Barth et al., 2015; Elleman, 2017).

However, inferencing, as an instructional cognitive skill/strategy, is not easy to establish independently of other processing skills and strategies. For example, appropriate inferencing is dependent on the amount of prior knowledge activated, vocabulary knowledge, text structure awareness, the level of focus on comprehension monitoring, and the use of other reading strategies. Much like comprehension monitoring, inferencing abilities might be better thought of as an overarching form of metacognitive processing that engages many specific strategies, depending on the situation, task, and reader goals (Pressley, 2002b; see also Chapters 3 and 4).

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12.4.9 An L2-Specific Comprehension Strategy: Mental Translation

L2 contexts provide additional options for comprehension strategies, one of which has received persuasive research support. Kern (1994) carried out a study asking French L2 students to think aloud while they read an instructional text. Comparing students' mental translations at the beginning and end of the semester, he found that there were positive reasons for students to engage in such translation processes. While mental translation is commonly seen as a problem for comprehension, Kern provided evidence that mental translation supports L2 student comprehension as they try to work through the meaning of difficult passages, particularly for students with weaker abilities. The mental translation process provided students with a more accurate understanding of the text and allowed students to integrate stretches of discourse for better understanding (see also Cohen, 1998; Kern, 2000).

Other studies could be cited in discussions of L2 reading strategy research, but the overall picture remains unclear, as indicated through the research reviewed above. While the advances made in L1 reading strategies research converge on a clear set of instructional implications and actions, the L2 research is, even if consistent with this picture, somewhat less clear (Taylor et al., 2006). To the extent that one can generalize across L1 and L2 populations, there are important instructional practices that could improve L2 students' reading comprehension. At the same time, there is a large and open research territory for future studies on L2 reading strategies.

12.5 Strategies and Comprehension Development

The discussion of reading strategies to this point has focused on individual strategies and their impact on reading abilities. These strategies were all identified on the bases of empirical evidence to support their connections to reading comprehension outcomes. However, strategy instruction, as a generic term, does not guarantee improved student comprehension. Effective comprehension instruction is not simply teaching a selected strategy a week or filling out postreading guides that call for checking predictions, writing a summary, or explaining mental images used when reading. Pressley (2006) has argued persuasively that using individual reading strategies is not how skilled readers deploy strategies while engaged in reading comprehension. Research over the past thirty years has demonstrated greater effectiveness in strategy instruction when strategy use involves multiple strategies in combination, consistent practice with appropriate key strategies and

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strategy instruction while engaged in reading and discussions about the text (Block & Pressley, 2002b, 2007; Pressley, 2006; Schwanenflugel & Knapp, 2016; Trabasso & Bouchard, 2002; Wilkinson & Son, 2011). This focus on reading strategies in combination will be taken up in Chapter 13, with a focus on the strategic reader.

12.6 Implications for Instruction

> Helping students become self-regulated comprehenders is hard work, and methods will likely take more than a year for most teachers to master. (Block & Pressley, 2002a, p. 3)

Main idea comprehension involves a number of important foundation skills and language resources. This chapter has outlined the importance of two of these foundations: fluent syntactic processing and strategies to support comprehension with difficult texts. In this final section, implications for instruction are explored both for grammar knowledge and syntactic processing and for comprehension strategy instruction. In both cases, complexities arise for instruction, though in distinct ways.

12.6.1 Implications for Grammar Instruction

At one level, the implications for grammar instruction are obvious with respect to L2 reading comprehension. Instruction needs to give attention to some amount of directed grammar teaching, particularly at less-advanced levels. Moreover, readers need to develop fluency and automaticity with syntactic processing. Finally, they need extensive exposure and practice in reading as well as examining relevant and appropriate texts when instructive. At a second level, however, this simple advice is not entirely useful because there are many ways to teach grammar, and not all ways will be equally effective for purposes of reading comprehension development. Nor is it always appropriate to include grammar instruction as part of reading lessons.

As a general comment, most L2 reading instruction occurs above the level of the beginning L2 student. For this reason alone, it is not necessary to have a grammar review in a reading course. Some subset of grammatical knowledge should be taught if it is appropriate for text comprehension. Grammatical knowledge, in some cases, can make a difference in reading comprehension with more difficult texts, particularly if the grammatical form occurs multiple times and is required for comprehension. In these situations, some subset of this knowledge should be taught, first directly from the text material itself, and then through additional activities as appropriate. Most importantly, a reading course should not simply embed a grammatical syllabus.

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12.6.2 Implications for Strategy Instruction

Teachers need to know how to allow readers to learn and use individual strategies in the context of reading a text and in conjunction with several other reading comprehension strategies. (Trabasso & Bouchard, 2002, p. 184)

There are several obvious implications for strategy instruction that would support the development of main idea comprehension instruction. A number of important principles, as outlined in Table 12.6, support effective instruction (Almasi & Fullerton, 2012; Baker, 2017; Duke & Martin, 2019; Grabe & Stoller, 2020; Pressley, 2006).

Table 12.6 Effective reading strategy instruction

1. Strategy learning requires intense, persistent awareness-raising with continual recycling.
2. Strategies should be taught directly to students through modeling and in the process of teaching text comprehension.
3. Strategy instruction should be part of negotiated discussions over texts.
4. Explicit inferencing instruction is most useful in more advanced academic contexts with more demanding tasks.
5. Summarizing is the most direct way to support identifying main ideas.
6. With more reading experience, students will be better able to call on background knowledge, combined with reading strategies, to support comprehension.

As Pressley has argued in multiple publications, reading strategy instruction *is* a form of comprehension instruction when done in the context of reading a text. In fact, it can be the part that most directly explores what a specific text means. For this reason, reading strategies and strategy instruction are best explored within a pre, during, and postreading framework (Grabe & Stoller, 2020; Hedgcock & Ferris, 2018; Peregoy & Boyle, 2016; see Chapters 13 and 19).

The research reviewed in this chapter strongly supports the inclusion of direct and explicit strategy instruction as part of reading comprehension development. The teaching of specific strategies involves introductions and practice one by one, gradually building up to a repertoire of ten to twenty effective strategies over the course of a semester or a year. Every strategy, once introduced and practiced, must be recycled consistently and often, usually in combination with other strategies as part of pre, during, and postreading activities. The class should keep a chart of "effective strategies for reading" that is always visible and grows as new strategies are introduced and practiced. Students need to talk about these strategies regularly and model their use for each other while working on understanding text meaning.

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Finally, main idea comprehension is most directly supported and engaged by interactions around a text. Teachers and students talk about what the text means, what difficulties might arise in interpreting the text, how text difficulties can be resolved, where important information is found, and why the information identified is so important. Interactions that occur while reading a text for comprehension are one of the best ways to scaffold students' growing metacognitive awareness of how to develop main idea comprehension (Duke & Martin, 2019; Garas-York & Almasi, 2017; Murphy et al., 2009; Pressley, 2002b; Wilkinson & Son, 2011). The important point to note is that teachers can show students how to interact with texts in developing main idea comprehension. Moreover, discussions about the main ideas in a text – how to find them and how to use them – help identify strategies needed by students to support main idea comprehension. In Chapter 13, we examine strategy uses and instruction in combinations that support strategic reading, typically in more advanced reading contexts.

Appendix: Major Reading Strategies*

Empirically validated reading comprehension strategies	Indirectly supported reading strategies used in validated multiple-strategies instruction
Activating prior knowledge	Clarifying
Forming questions	Inferencing (using context with challenging texts)
Answering questions	Translating mentally
Checking back in the text (and Elaborative Interrogation)	Paraphrasing
Constructing images	Predicting
Making associations	Rereading
Inferencing	Reading aloud (for modeling, for fluency)
Monitoring comprehension	Synthesizing information
Previewing	Creating graphic organizers
Summarizing	
Taking notes	
Raising awareness of text structure and story grammars	
Using graphic organizers to improve comprehension	

* See also Almasi & Fullerton, 2012; Block & Pressley, 2002b Duke & Martin, 2019; Grabe & Stoller, 2020; Peregoy & Boyle, 2016; Trabasso & Bouchard, 2002; Wharton-McDonald & Erickson, 2017.

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13 *Becoming a Strategic Reader*

The ultimate goal of strategy instruction is that readers become *strategic*. (Schwanenflugel & Knapp, 2016, pp. 218–219)

In Chapter 12, reading strategies were introduced as an important means for building effective main idea comprehension. A number of individual strategies were introduced because of the research on their effectiveness in supporting comprehension. In this chapter, issues focus on the development of the **strategic reader,** rather than strategies themselves. Strategic readers are those who automatically and routinely apply combinations of effective and appropriate strategies, depending on reader goals, reading tasks, texts being read, and strategic processing abilities. Strategic readers are also aware of their comprehension success in relation to reading goals and apply sets of strategies appropriately to enhance comprehension with difficult texts (Beker et al., 2017; Britt et al., 2018; Schwanenflugel & Knapp, 2016; van den Broek et al., 2016).

Before exploring the advances made toward developing strategic readers, it is necessary to first address three major issues surrounding strategy instruction in reading: (a) the relationship between skills and strategies, (b) the relationship between metacognition and strategies, and (c) the role of metalinguistic awareness in comprehension.

13.1 Skills and Strategies

The same procedures (e.g., finding the main idea) can fit under both the skill and strategy categories. The appropriate label rests on whether the reader consciously evokes the procedure or is simply functioning in a typical, automatic way. (Alexander & Jetton, 2000, pp. 295–296)

Varied points of view exist on the relationship between skills and strategies. In many cases, deciding what is a strategy and what is a skill is not clear, and there is likely to be less of a difference between the two concepts than a number of researchers have argued (though

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the distinction between intentional and automatic is important). We will start off with a simple position and then explain this perspective so that it is not taken as a misleading and simplistic statement: Strategies are cognitive processes that are open to conscious reflection but that may be on their way to becoming skills. This perspective allows room for distinguishing skills and strategies, and it recognizes that strategies are controlled, intentional, conscious applications, usually for the understanding of difficult texts or for carrying out challenging tasks. At the same time, the distinction between skills and strategies blurs in situations where what we would call strategies (e.g., inferencing, activating background knowledge) are generally not consciously applied processes, nor are they intended to be applied consciously (see also Afflerbach et al., 2017; N.J. Anderson, 2009; Cho & Afflerbach, 2017; Veenman, 2016).

In most discussions of this topic, reading skills are commonly not defined explicitly but are implied, whereas strategies are defined explicitly. However, Afflerbach et al. (2017) provide a good definition of reading skills:

> Reading skills are automatic actions that result in decoding and comprehension of texts with speed, efficiency, and fluency…. Reading skills operate without the reader's deliberate control or conscious awareness. They are used out of habit, practiced, and mastered to the point where they function automatically. (p. 38)

The many automatized processes in word recognition can be seen as skills, including phonological processing, orthographic processing, and lexical access. Other reading skills include the automatized processing of syntactic parsing and semantic proposition formation. Skills may be automatic for fluent readers, but they were first developed through active attention and conscious processing while learning, in most cases in the form of problem-solving to achieve tasks, or to register new information with the support of knowledgeable others. Conscious attention is needed for the first registration of new information. That information later becomes available from memory when the input is practiced (and thereby becoming open to proceduralization and then to automaticity; Anderson, 2015; Ellis, 2005; Veenman, 2016).

Two fairly obvious examples highlight this movement from conscious attention to automaticity. At a general level, anyone who has learned to drive a car or ride a bicycle as an adult knows that automatic skills begin as highly focused attentional processes. In the case of reading, even decoding does not start with automaticity, but with attentional resources actively engaged in problem-solving

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by beginning readers. Anyone moving into a situation that involves learning a new language knows that even the most basic knowledge resources require active attention up to some point at which the processing becomes less demanding.

Moreover, processes that are generally labeled as strategies are often employed in a nonconscious way (thus, being used as skills). For example, most fluent readers have had the experience of reading an article, then being asked by a friend or student what a word in the article means, and only then realizing that a ready definition is not available even though the word seemed to have no impact on text comprehension or on our attention. Skilled readers apply many word analysis strategies unconsciously as part of the fluent-reader repertoire. Similarly, readers often mentally summarize a prior section of a text before moving on without any specific conscious intention to do so. Skilled readers often also evaluate the text and the author without specifically intending to do so.

The gradual process of proceduralization and then automatization allows readers to use strategies in combinations because those combinations have been successfully used thousands of times in the reader's past experiences. These combinations (e.g., previewing, predicting, checking goals, skipping words, inferencing, skimming ahead, rereading a sentence, mentally summarizing) become default habits of skilled readers, not consciously intended goals. The more conscious attentional level typically re-emerges when the default combinations and initial strategic responses do not seem to work for some reason and the reader becomes aware of a problem. One could then say that metacognitive awareness and control of strategic options begin to play a role. But here again, the issue is not the use of a separate set of comprehension strategies but an awareness of, and greater control over, those strategies that are part of the strategic reader's repertoire, usually with a challenging text or task, and a higher standard of coherence set by a reader (van den Broek et al., 2016).

13.2 Metacognition and Strategies

> One of the greatest accomplishments of reading research in the past quarter century is the portrait of the metacognitively sophisticated reader. (Pressley, 2002b, p. 305)

Metacognition is a key executive-control ability crucial for strategic reading. Metacognition refers to the knowledge and control that we have over our cognitive processes. With respect to reading, it is common to talk about metacognitive awareness (or metacognitive

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knowledge – what we know) and metacognitive regulation or control (knowing when, where, and how to use strategies – what we can do).

On a general level, metacognition involves awareness and control of planning, monitoring, repairing, inferring, revising, summarizing, evaluating, and so on (see Chapter 4). Essentially, metacognition in reading emerges as we learn awareness of our comprehension processing (Baker, 2017). More specifically, we learn strategies to support our comprehension (our awareness of strategies) and we learn how to carry out these strategies effectively (our control of strategies) (Baker et al., 2015; Bialystok, 2001; Pressley, 2002b). It is useful to note that the term "*metalinguistic awareness*" is also commonly used in reading research. Metalinguistic awareness could be thought of as a subset of metacognition that deals specifically with linguistic knowledge – and a good part of metacognition in reading deals with linguistic knowledge (see Chapter 4).

The distinction sometimes made between metacognitive strategies and cognitive strategies is not useful when applied to reading. Instead, strategies can be used for more metacognitively aware purposes (Baker, 2002; van den Broek & Kremer, 2000). This intentionally bold statement is meant as a response to some common misperceptions about strategies that have often been defined as either cognitive or metacognitive. Cognitive strategies have commonly been described as strategies that a reader is trained to use, such as guessing from context, noting discourse organization, recognizing a transition phrase, skipping a word, repeating a word to memorize it, identifying a known word part, writing down words and their definitions, identifying a main idea, and so on.

Metacognitive strategies, on the other hand, have been described as strategies that require an explicit awareness of reading itself and that most strongly support the goals of more challenging reading tasks. For example, learning to monitor comprehension might be considered a metacognitive strategy in that it requires a conscious recognition of miscomprehension or a need to maintain heightened comprehension. Similarly, intentional repairs to miscomprehension or strategies with the intention to learn information from texts more effectively are often seen as metacognitive strategies.

Monitoring comprehension or repairing miscomprehension, however, are not themselves specific strategies (e.g., Baker 2002; Bialystok, 2001; Pressley, 2002b; see Chapters 4 and 12). Instead, a number of specific strategies can be used to monitor comprehension or repair miscomprehension (e.g., checking a factual statement, rethinking a prior inference, noticing a discourse signal, recognizing the organization of a text segment, making a new prediction, rereading the

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prior sentence, reflecting on a reading goal, adjusting a reading goal) (Pressley, 2002b). The same could be said of identifying main ideas, summarizing, forming inferences, synthesizing information, or setting a purpose for reading. With respect to comprehension monitoring, for example, what is being applied to a text is a heightened level of metacognitive awareness of text miscomprehension. In such instances, readers are able to think consciously about what they are comprehending and what they can do to enhance or restore comprehension. Following the logic of this explanation, there are no uniquely identifiable metacognitive strategies. Rather, there are strategies that can be more consciously directed to support reading comprehension.

When we raise text comprehension processes to a level of metacognitive awareness before and during reading, usually with more challenging text and task demands, we may consciously carry out any of a set of metacognitively aware processes (Table 13.1). At the same time, it is worth noting that the initial trigger for a metacognitively aware process such as monitoring is likely to be the initial implicit activation of some process by the reader that does not match the reader's expectation, thereby calling conscious attention to the issue. One can argue that every point in Table 13.1 can be carried out successfully using multiple different specific strategies rather than any one single process used every time.

Table 13.1 Metacognitive processes for comprehension

1. Set (or reset) reading goals.
2. Build a coherent interpretation of a text and determine the main ideas of a text.
3. Make inferences, as necessary, in line with goals.
4. Monitor comprehension to maintain a coherent interpretation and awareness of main ideas.
5. Recognize loss of comprehension and seek clarification.
6. Summarize the main ideas of a text.
7. Synthesize information across texts.
8. Evaluate the reading input in various ways beyond simple understanding.

To sum up, we do not believe that skills and strategies are so obviously distinct in many reading situations. It is not possible to make a simple list of skills and a contrasting list of strategies with the assumption that these lists must be different. Similarly, there are no metacognitive strategies as distinct from cognitive strategies. Rather, metacognition about comprehension represents what we know about strategies and how to use them effectively. This view of skills,

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strategies, and metacognitive awareness (or simply metacognition) is represented in several discussions of reading strategies and metacognitive processing (Afflerbach et al., 2017; Baker et al., 2015; Pressley, 2002b; Veenman, 2016). The result is that reading researchers and teachers should talk about strategies, how they can be learned best, and how students can become more strategic readers.

13.3 Metalinguistic Awareness and Strategic Reading

Part of what makes skilled readers more strategic is reflected in a much more heightened metalinguistic awareness in response to challenging texts and/or tasks. Metalinguistic awareness is one's ability to identify and manipulate facets of one's linguistic knowledge (Kuo & Anderson, 2008). Most commonly, metalinguistic knowledge applies to the development of early word recognition. Phonological awareness, a prerequisite of letter–sound correspondences and the alphabetic principle, is important for word recognition in all alphabetic languages. The overt awareness of how to sound out letters and words is a central skill for recognizing words (Verhoeven, 2011).

Metalinguistic awareness is also relevant for the concept of strategic reading (Snow et al., 2005). Metalinguistic awareness has been proposed for all important language systems: phonological, orthographic, morphological, lexical, syntactic, semantic, discourse, pragmatic, and (language-based) strategic awareness systems. At all these levels, metalinguistic awareness allows a reader to reflect on language knowledge and act on, or manipulate that knowledge consciously (Koda, 2008; Kuo & Anderson, 2008; Nagy, 2007).

Syntactic awareness typically distinguishes first-language (L1) and second-language (L2) learners as L2 learners (especially foreign language learners) learn L2 syntax explicitly much more often. L1 learners simply internalize the distribution patterns and their variations through thousands of hours of exposure and from both speaking and reading experience; they often do not have detailed syntactic awareness of their own L1. When the L1 (and L2) learner does gain metalinguistic awareness of syntax, that learner is more capable of (a) parsing syntactically complex clauses, (b) reflecting on what is grammatical or not grammatical and fixing the ungrammatical structure, and (c) recognizing acceptable syntactic variants. This knowledge of language also allows readers to control language interpretation and language use in more strategic ways. Metalinguistic knowledge of syntax allows a learner to reflect on the language of a text and engage more strategically in comprehension or task problem solving.

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Metalinguistic knowledge of lexical items also allows readers to be more strategic. These readers are more aware of various ways to understand word meanings (colloquial, formal), of morphological word parts, and of multiple meanings and ambiguities with words and word uses. They are able to form many associational linkages among sets of words and concepts that words identify. They recognize the many different senses of words and possible relationships among the different meanings of words (heightened lexical quality). They are also more aware of the syntactic context and the information that these contexts provide for acquiring new words or additional word meanings, as well as for disambiguating word meanings and knowledge concepts in a text (see Nagy, 2007, and his Metalinguistic Awareness Hypothesis).

Heightened metalinguistic awareness allows readers to use a range of skills and strategies that are important for reading. They are more aware of how texts are organized and how information is presented as patterns of discourse structure. While Nagy's Metalinguistic Awareness Hypothesis is a general system supporting reading comprehension, many specific studies have already shown that metalinguistic awareness at levels of phonology, morphology, syntax, and discourse correlate with, and lead to, better reading comprehension (see Deacon & Kieffer, 2018; Meyer & Wijekumar, 2017; Nagy, 2007; Trabasso & Bouchard, 2002). Metalinguistic awareness, as a potentially separable aspect of reading abilities, or as a key component skill of reading, is perhaps best understood as part of what makes a learner a more strategic reader.

When reading new, challenging information, or information for complex and difficult tasks, both metacognitive and metalinguistic knowledge and control come into play. In this way, being a strategic reader not only involves knowledge of and control over reading strategies but also the abilities to reflect on and manipulate all levels of language knowledge. This growing knowledge and control over metalinguistic awareness develops gradually over many years, and for many readers (both L1 and L2), will never be fully realized. These are the resources, along with content knowledge and metacognitive problem-solving skills, that lead to expertise in various disciplines including reading as a cognitive problem-solving skill, and such expertise is an end goal that is only variably realized (Ericsson, 2018; Ericsson & Pool, 2016).

13.4 Promoting Strategic Reading

> Although learning even one key strategy can positively impact readers' comprehension abilities, [multiple strategy] instruction teaches strategies as part of a meaningful whole, in the context of reading and comprehending a variety of texts. (Schwanenflugel & Knapp, 2016, p. 218)

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A major contribution of reading strategies to fluent reading is their increasing automaticity as a reader becomes more proficient (Afflerbach et al., 2017; N.J. Anderson, 2009; Block & Pressley, 2007). The overall developmental goal to routinize (and automatize) strategic processing still allows a learner to reflect consciously on a strategy when asked to do so, when engaged in problem-solving, or when being taught the strategy. The ultimate goal for developing comprehension strategies is the effective use of strategies without continuously needing to move to a level of conscious problem solving. As N.J. Anderson (2009) notes, "A skill is a strategy that has become automatic.... The goal of explicit strategy instruction is to move readers from conscious control of reading strategies to unconscious use of reading skills" (pp. 133–134).

Aside from building efficiency in strategic processing, strategic readers know when, how, and why to use strategies effectively and recognize appropriate contexts for using strategies. They build efficiency and automaticity in strategy use for situations that they commonly encounter; they control heightened levels of metacognitive and metalinguistic awareness that they can use when needed; and they engage difficult and challenging texts and tasks more consciously with sets of strategies that work well for them in combinations (Almasi & Fullerton, 2012; Klingner et al., 2015; Pressley, 2006; Pressley & Afflerbach, 1995). As a prerequisite, they also have the linguistic resources, cognitive processing fluencies, and reading experiences to become skilled strategic readers. Before exploring these issues in more detail, it is important to highlight some of the general findings on strategy use in reading that provide the background for more recent investigations of strategic reading. The most important developments over the past two decades from combined L1 and L2 reading strategy research are summarized in Table 13.2.

Many of the general findings noted in Table 13.2 are reviewed extensively in L1 contexts by Almasi & Fullerton (2012), Pressley (2002b, 2006), and Schwanenflugel and Knapp (2016), and in L2 contexts by N.J. Anderson (2009), Koda (2005), and Taylor et al. (2006).

It is not useful to assume that poor readers do not use strategies extensively (although they may not use the best strategies for accomplishing targeted tasks). Similarly, there are no specific sets of strategies that are only used by skilled readers. The common assumption that poor readers use local strategies (at the word and clause level) while skilled readers use global strategies (previewing, goal setting, connecting, summarizing, etc.) is also somewhat misleading; this pattern of variation between local and global strategies is more the result

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Table 13.2 Findings from research on reading strategy use

1. All readers use many strategies.
2. All readers engage in more basic and more local strategies when reading frustration-level texts.
3. Skilled readers and poor readers use the same types of strategies.
4. Skilled readers use strategies more effectively than do poor readers.
5. Skilled readers are more metacognitively aware of strategic responses to text difficulties.
6. Skilled readers use repertoires of strategies in combination rather than overuse individual strategies.
7. Skilled readers automatize certain combinations of strategies as routine effective responses to reading comprehension needs.
8. Skilled readers are more actively engaged in reading comprehension.
9. Reading strategies can be taught effectively.
10. Strategy instruction can improve reading comprehension.
11. Strategy instruction should be a central component of reading comprehension instruction.

of the difficulty of the text and task rather than an inherent trait of poor readers. A normally skilled reader who is reading a frustration-level text (e.g., when readers know fewer than 90 percent of the words in the text or do not know technical content) will engage in more "local" strategies and behave like a poor reader with respect to strategy use (problem-solving clause by clause). There are, however, a number of criteria that do distinguish skilled readers from poor readers, that reflect strategic reading abilities, and that can be taught and learned. These criteria include active engagement and the use of multiple strategies in combination.

13.5 Active Engagement in Reading

> In line with our general frame, Motivation – Engagement – Achievement, we suspect that motivation exerts its power to increase achievement through increasing students' amount of cognitively intense, personally significant reading activity. (Guthrie & Klauda, 2016, p. 45)

Strategies for reading comprehension build on linguistic resources (words, phrases, and structures) and support the basic comprehension model developed by the reader. When skilled readers read for careful comprehension, for subsequent task completion, and for challenging learning purposes, they actively engage academic texts through multiple strategies, motivation to succeed, and a heightened level of

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metacognitive awareness (Afflerbach et al., 2017; Guthrie & Klauda, 2016; Klauda & Guthrie, 2015). According to Pressley (2002a, 2006; Pressley & Afflerbach, 1995), strategic readers make a reading plan before reading (or as they start reading); they know why they are reading, and they often preview the text, activate prior knowledge in appropriate ways, and form predictions about the text.

During and after reading, and in line with their reading goals, skilled readers engage in several strategic processes. Table 13.3 provides an example of strategies used by actively engaged readers (Pressley, 2002b), giving a powerful illustration of how strategies support active comprehension.

Table 13.3 Strategies used by engaged readers

Engaged readers
1. Read selectively according to goals.
2. Read carefully in key places.
3. Reread as appropriate.
4. Monitor their reading continuously and are aware of whether or not they are comprehending the text.
5. Identify important information.
6. Try to fill in gaps in the text through inferences and prior knowledge.
7. Make guesses about unknown words.
8. Use text structure information to guide understanding.
9. Make inferences about the author, key information, and main ideas.
10. Attempt to integrate ideas from different parts of the text.
11. Build interpretations of the text as they read.
12. Build main idea summaries.
13. Evaluate the text and the author and, as a result, form feelings about the text.
14. Attempt to resolve difficulties.

Adapted from Pressley (2002b)

One key insight for this view of active reading comprehension is that the skilled reader has a fairly large repertoire of strategies to use as needed to achieve reading goals.

This depiction of active reading involves the many reading strategies that are described and reviewed in the reading literature (see Chapter 12). The application of many strategies throughout the reading process also demonstrates the continuous role of higher-level processing during text representation and situation model construction. These strategies all reveal the potential for conscious reflection on the

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part of strategic readers (Alderson, 2000; Pressley, 2002b, 2006). In effect, readers can reflect metacognitively on the strategies that they use if they are asked to, though they often do not do so while reading fluently. Instead, many strategic responses are internalized as skilled, automatic routines for comprehension.

13.6 Strategic Reading and Strategies in Combination

Students need to learn how to orchestrate the use of reading strategies to achieve the desired result. (N.J. Anderson, 2009, p. 132)

A second major part of what makes a skilled reader so effective (in addition to being an engaged reader) is the efficient application of combinations of strategies to achieve comprehension. Even applications of metacognitive processing (planning, monitoring, evaluating, and repairing) are often not purely higher-level applications because of the routine nature of their use during fluent reading. For example, we often have plans for reading and establish goals for reading without consciously articulating these plans and goals. When we read and we do not understand a sentence or a paragraph, we may start rereading the text segment even before we have a strong conscious recognition that we did not follow what the text was saying and what we should do about it. We often skip words that we do not know without giving conscious thought to the decision. We often engage in minimal summary activation of the story as we pick up our bedtime novel and begin to read. So while a goal of a skilled reader is to be an active reader, it also becomes a (tacit) goal of a skilled reader to routinize those strategies and combinations of strategies that work so well for us time and again.

It is routinized strategic processes that allow for combinations of strategic responses to be activated roughly at the same time. Because full attention can only be devoted to one activity at a time, routinization is needed if strategic responses are to involve multiple strategies (and also allow attention devoted to other reading processes). It is worth noting that the combination of metacognitive awareness along with the routine application of strategy combinations automatically work together, despite the seeming contradiction. Learners have to become aware of strategies, learn when and why they are effective, and then practice them consistently while reading appropriate texts over a long period of time. The outcome of extensive practice and consistent use is a submergence of effective strategy combinations into efficient routines to support fluent strategic reading (Afflerbach et al. 2017; Block & Pressley, 2007).

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13.7 Research on Multiple Strategies Instruction

The National Reading Panel's (2000) analysis of 38 multiple strategy studies led them to conclude that 'the evidence supports the use of combinations of reading strategies in natural learning situations'. (Baker, 2002, p. 81)

Most reading researchers agree that teaching **repertoires of reading strategies** improves comprehension and recall of information from texts. Among comprehension researchers, there is general agreement that instruction focusing on students learning repertoires of strategies is more effective than individual strategy instruction (Almasi & Fullerton, 2012; Block & Pressley, 2007; Klingner et al., 2015; Pressley, 2006). Many research and instructional approaches involving multiple strategies tend to focus on four to eight major strategies, though other approaches may incorporate up to twenty or so distinct strategies over a longer period of time. The following discussion emphasizes research evidence for eight empirically supported multiple-strategies instructional approaches (itemized in Table 13.4).

Table 13.4 Multiple-strategy approaches to strategy instruction

1. KWL: Know–Want to Know–Learned
2. DR–TA: Directed Reading–Thinking Activities
3. Reciprocal Teaching
4. Collaborative Strategic Reading
5. Questioning the Author
6. Transactional Strategies Instruction (TSI)
7. Promoting Adolescents' Comprehension of Text (PACT)
8. Concept-Oriented Reading Instruction (CORI)

13.7.1 KWL and DR–TA

KWL and DR–TA are acronyms for well-known instructional approaches that engage students in multiple strategies (see Table 13.4). These two approaches generally have not been strongly supported by empirical research that directly tests the approach. Instead, they draw their support from the research on specific strategies (see Chapter 12) that are incorporated into the approach (e.g., questioning, predicting, inferencing, summarizing). KWL represents a three-stage instructional process for understanding texts: what students *Know*, what they *Want* to know, and what they have *Learned*. The approach combines activating prior knowledge, planning, goal setting, monitoring for key points, evaluating text information, and relating text

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information to reading goals. Perhaps most importantly, it creates opportunities for discussion around uses of strategies (Blachowicz & Ogle, 2008).

DR–TA stands for Directed Reading and Thinking Activities. In this approach, students relate background knowledge to the text and then engage in predicting activities at set stopping points throughout the text. The predicting practice develops monitoring processes (confirming predictions). The discussion of predictions and confirming (or disconfirming) predictions in turn promotes main idea comprehension as well as the summarizing of main ideas at key points. This process leads students to develop main ideas and summaries through discussions about the text while reading. DR–TA draws on empirical research that demonstrates the effectiveness of predicting, clarifying, monitoring, summarizing, and evaluating strategies. In this way, it has indirect but powerful support for its instructional activities (Kern, 2000; Trabasso & Bouchard, 2002).

13.7.2 Reciprocal Teaching

Reciprocal teaching is the first multiple-strategy instructional approach that demonstrated significant improvement in a standardized measure of comprehension. Research in the 1980s and early 1990s demonstrated that children taught in groups to use four strategies (form questions, predict upcoming information, clarify information, and form summaries) performed better than control students on general reading comprehension measures (Palincsar, 2003; Palincsar & Brown, 1984). Rosenshine and Meister (1994) reviewed sixteen studies involving reciprocal teaching and found improvements across 1st through 8th grades. Strong improvements were found consistently in 6th grade and above, with mixed results below 6th grade. In eleven additional studies reviewed by Trabasso and Bouchard (2002), similar improvements were found.

Overall, this approach to strategy instruction has received consistently strong support from a wide range of research studies. The biggest limitation with reciprocal teaching is that it is designed only for use every day with small reading groups rather than a whole class. It is not easy to form multiple reading groups of four students for everyday instruction over months and support their use of strategies without multiple trained aides in the classroom.

13.7.3 Collaborative Strategic Reading

Collaborative Strategic Reading (CSR) is an approach to combined strategies instruction that draws on both reciprocal teaching and

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cooperative learning, and that has been used with both L1 and L2 students. The innovation from reciprocal teaching and cooperative learning is to shift the scope of collaboration solely from small group instruction to also include full class instruction. Students are introduced to key strategies as a whole class and practice using these strategies. Then, working in groups, they read a text while they practice activating prior knowledge, making predictions, monitoring comprehension difficulties, clarifying information, restating important ideas, summarizing the text, and forming appropriate questions about the text. Group work is organized around cooperative learning principles with each student in a group assigned a responsibility for the task. CSR also incorporates whole-class follow-up discussions about main ideas and using strategies to identify these main ideas. It is particularly interesting from an L2 standpoint because CSR has been effective to date with struggling readers and language minority students.

In three earlier studies, Klingner and Vaughn (1996, 2000; Klingner et al., 1998) demonstrated that CSR provided positive support for student learning and students made significant improvements in different aspects of reading abilities. More recently, an independent study of CSR by Hitchcock et al. (2010) did not show significant differences for CSR in comprehension outcomes with L1 5th grade students. However, the study has several methodological problems (e.g., teacher training, fidelity of implementation). As Klingner et al. (2004) noted in earlier research, getting teachers to use strategy instruction when they are on their own is very challenging, and training effects wear off fairly quickly. A more recent study by Vaughn et al. (2011) demonstrated a small but significant positive effect ($g = 0.12$) in favor of CSR with 7th and 8th grade students, and moderate positive effect ($g = 0.36$) for CSR with struggling students (see also commentary in Wharton-McDonald & Erickson, 2017). Two recent overview resource books provide extensive information on the uses of CSR (Klingner et al., 2012, 2015).

13.7.4 Questioning the Author

Questioning the Author (QtA) is an approach to multiple strategies instruction in which students respond to, and form questions about, the text. Typically, the teacher works with texts that provide some degree of challenge to students. (See Bjork, 2018, for the concept of desirable difficulty.) Students develop skills in asking questions about all aspects of the text and the author, and engage in comprehension discussions around questions that are meant to identify

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main ideas and the authors' purposes for writing. The teacher provides relevant background knowledge to build relevance and engagement. The teacher then works with students text segment by text segment, with questions interspersed between segments. The teacher helps students generate their own questions about the text to build their main idea comprehension (Beck & McKeown, 2006; Beck & Sandora, 2016).

Generalized examples of these questions are listed in Table 13.5 (see also Beck & Sandora, 2016). Through these and other questions, students participate actively in comprehension discussions and learn to connect key information, form inferences, establish main ideas, monitor comprehension, repair difficulties, review goals for reading, and engage in critical evaluation of the text. (See also Duke & Martin, 2019; McKeown et al., 2009.)

Table 13.5 Questioning the Author (QtA) generalized questions

1.	What difficulties am I having in understanding the text?
2.	What are the main ideas in the text?
3.	Why does the author say what she does?
4.	Does the author explain this clearly?
5.	How could the author say this more clearly?
6.	How does that fit with what the author already said?
7.	What types of examples should have been added?
8.	How does the author signal main ideas (and how well)?
9.	Did the author give us the answer to the issue that she raised?
10.	What biases or perspectives does the author reveal?
11.	What is the significance of the author's message?
12.	How does the information presented here connect to what we read yesterday?
13.	How effectively are the ideas presented?
14.	What is the usefulness of the text information?

As seen in Table 13.5, the questions generated by teacher and students are not limited to text exploration and comprehension monitoring, but also critiquing the author's writing, noting the lack of examples provided by the author, questioning the author's tone and bias, and suggesting additional content that could have made the text more comprehensible or interesting. In addition to practicing important strategies through questioning, students are encouraged to take a strong evaluative stance to text comprehension (Beck & McKeown, 2006; Beck et al., 1996; Beck & Sandora, 2016).

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13.7.5 Transactional Strategies Instruction

Transactional Strategies Instruction (TSI) represents another major approach to combined-strategy instruction around content. Students are taught a repertoire of strategies over time that are modeled by the teacher and then practiced by students while they work to comprehend instructional texts. It is a long-term, high-intensity approach that involves a multi-year curriculum plan rather than a single class over a year's span (or shorter). A version of TSI that involved an entire multi-year school curriculum, known as SAIL (Students Achieving Independent Learning), has demonstrated the success of this approach on a large scale (Williams, 2002), and the Benchmark School curriculum has been the inspiration for the development of TSI (Gaskins, 2005; Gaskins & Elliot, 1991; Pressley et al., 2006). Strategies taught include predicting, relating to prior knowledge, building associations, constructing images, thinking aloud, clarifying, looking back in texts to reread, generating questions, summarizing, and evaluating comprehension through discussion. Strategies are typically taught and reinforced through negotiated interactions among students about the content and meaning(s) of the texts. (See also Almasi & Fullerton, 2012: Brown, 2017; Janzen, 2001, 2010; Klingner et al., 2015).

More generally, TSI begins with mini-lessons on specific strategies that become a major focus of the text comprehension process. Students are introduced to a few strategies in a given curriculum unit, and an effort is made to keep strategy instruction to a manageable number of strategies that have demonstrable effectiveness. (The actual number to introduce would depend on the program and the students.) Teachers model strategy use to groups and to the whole class (often using think-alouds), and reminders to use key strategies are presented regularly to students over an extended period of time. Teachers consistently explain what, when, how, and why to use strategies after they are introduced. Strategies are discussed at the same time that students are learning content information from texts. Students are encouraged to model strategy use for others and develop self-awareness of strategy use. As Pressley and Woloshyn (1995) explain the goal of TSI:

> A large part of TSI involves groups of children applying comprehension and decoding strategies as they read text, using the strategies as part of discussing the content of the text. What students are learning in these groups is how to be active readers in the same ways that skilled readers are active—they predict, question, make evaluative reactions, and draw conclusions. (p. 93)

Thinking aloud is strongly supported by TSI. A brief demonstration of how an L2 student thinks aloud while reading to students

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is provided by Janzen (2001). In this example, a group of students is reading a text related to a content unit on special effects at the movies; the particular excerpt concerns the activity of a stuntman in a movie, *The Towering Inferno*. (The material in italics below represents the text segments being read aloud, and the bold notations indicate the strategy being used by the student while verbalizing her thoughts aloud while reading.)

> I think the next paragraph is about an example of a movie because they write the name of a movie and what they use to make these special effects [**Predicting**]. *In the Towering Inferno, the stuntman doubling for Susan Flannery had to wear several layers of protective clothing*. The prediction was right [**Checking Prediction**]. *Next to his skin he wore long, fireproof underwear*. So he's explaining the kind of clothing that the actor has to wear to be safe [**Summarizing**]. *Over this he wore a "silver suit," the same kind of aluminum-based fire protection worn by race car drivers*. This is all the description about his clothes [**Summarizing**] and I don't know what is silver suit, but if it is similar to the race car driver's I guess it's a pants and also sweater together [**Guessing Meaning and Using Background Knowledge**]… (p. 384)

In this read aloud, the student is making use of strategies (e.g., predicting, checking, summarizing, guessing meaning, and using background knowledge) that the teacher had previously modeled for the class. This reading by a student provides the means for the teacher and other students to then comment on strategies used and other strategies that could be used. The reading strategies used by the teacher and students in their read-alouds are reinforced by a wall poster that lists major reading strategies already introduced.

13.7.6 Promoting Adolescents' Comprehension of Text (PACT)

In 2010, the US Institute for Educational Sciences awarded $120 million to six teams of researchers to demonstrate effective comprehension instruction and comprehension assessment practices with students from 3rd to 12th grade. Three of the six teams specifically addressed the needs of adolescents to develop reading to learn literacy skills. Each of the six teams was required to develop at least one large-scale randomized control trial to demonstrate instructional effectiveness within five years (see Pearson, Palincsar, Biancarosa, & Berman, 2020a; see also Chapter 15). This section briefly introduces the work of one of these teams (PACT), in part because the experimental intervention involved a multicomponent strategy approach somewhat similar to TSI and CORI (see Section 13.7.7), and in part

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because it involved a study specifically with English language learners from 6th to 8th grade.

PACT research focused specifically on improving students' disciplinary knowledge and academic comprehension skills in 8th grade US history. The major instructional study involved three multiweek units in US history: Colonial America, the Road to Revolution, and the Revolutionary War (see Vaughn et al., 2013, 2015, 2017). PACT addresses motivational supports for disciplinary reading and learning, reading strategies that support content learning, conversation around text comprehension and content learning, and cooperative learning techniques. The intervention incorporated a number of key strategies for reading to learn while focusing on the five key features presented in Table 13.6.

Table 13.6 PACT instructional features

1. A comprehension canopy: Introduce the topic to students; build relevant background knowledge, motivation, and purpose; include an introductory video; present guiding questions to support learning; and include a discussion about issues raised by the video. Students work in pairs or groups to answer questions. Strategies include activating background knowledge and establishing goals for reading.
2. Vocabulary prereading: Introduce a set of essential vocabulary for the unit along with discussions and activities to support their use in the current (and future) unit(s).
3. Text-based knowledge acquisition: Introduce a variety of close-reading activities with students working in various groupings. These activities also address key comprehension strategies to improve comprehension: summarizing, comprehension monitoring, inferencing, using graphic organizers, and responding to questions in pairs or groups. Emphasis is given to question-answering and note-taking activities that link back to the comprehension canopy.
4. Team-based learning activities: Introduce a three-step cycle to (a) respond to questions/tasks independently, (b) work in small groups to improve responses, and (c) join together in a whole-class discussion led by the teacher.
5. Culminating team-based knowledge application: Develop a culminating activity to extend understanding of text(s) and content.

Results of the Vaughn et al. (2017) study that involved English language students showed significant effect size gains favoring experimental classes over control classes for content knowledge learning ($d = 0.40$) and for better comprehension of core texts used in the units

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(d = 0.20). Overall, this research study showed that students could comprehend the assigned texts better and acquired significantly more content knowledge within the school curriculum goals.

13.7.7 Concept-Oriented Reading Instruction (CORI)

Concept-Oriented Reading Instruction (CORI) is the most intensively studied comprehension approach to reading that promotes (a) multiple comprehension strategy use along with thematic content instruction from texts, (b) the reading of multiple texts on the thematic content, and (c) motivational practices to support student engagement. CORI is the most coherent and comprehensive approach to developing strategic readers and better comprehenders. It was developed in the 1990s by Guthrie and his colleagues (see, e.g., Guthrie & Humenick, 2004; Guthrie & Wigfield, 2000; Guthrie et al., 2004, 2006, 2007, for overviews of earlier research) and extensive empirical research has continued for over thirty years (Guthrie & Klauda, 2014; Guthrie & Taboada-Barber, 2019; Guthrie et al., 2013; http://cori.umd.edu).

The approach for each unit is organized around four stages over six weeks (90 minutes per day): (a) immersion into a main theme through personal engagement with the topic ("observe and personalize"), (b) wide reading and information gathering on the theme across multiple information sources ("search and retrieve"), (c) reading strategy instruction to assist with comprehension ("comprehend and integrate"), and (d) project work that leads to the creation of a product demonstrating what students have learned ("communicate to others"). A typical CORI unit begins with a visitor to the class or students observing a real event, object, or video to stimulate an interest in a content theme. Students are given a "big question" for each week and students spend a number of weeks searching for information, comprehending and integrating the information, and communicating the information to others. The weekly big questions help guide students, build student engagement, and promote the reading of multiple texts. More specific questions are explored each day.

Throughout the content unit, students are instructed in and practice comprehension strategies (such as forming questions, noting text structure, activating background knowledge, answering questions, taking notes, determining main ideas, synthesizing information, paraphrasing, summarizing, integrating information through graphic organizers, and carrying out a range of project tasks). These strategies are developed in the course of instruction with teachers providing direct teaching of strategies while students are reading content texts.

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This teaching involves consistent modeling, scaffolding, discussion, extensive practice, and eventually independent use of the strategies by students.

CORI emphasizes student motivation to read and to learn, and it builds in many aspects of self-regulation motivational theory into the instruction (relevance, student choice, student success, collaborative practice, and thematic units). The approach involves many discussions that center around content, reading goals, strategies, and learning while students are engaged with multiple texts. Students learn to guide their own reading and control their own learning by forming questions, monitoring comprehension, and summarizing. Group work and collaboration among students and with the teacher are strongly encouraged. Finally, students engage in extended reading and read many interesting texts to find information related to their projects. As Guthrie and Ozgungor (2002) note, "CORI begins with knowledge goals and situates the critically important reading comprehension strategies within a rich subject-matter domain" (p. 281).

Rigorously controlled CORI research studies have been carried out with students in 3rd, 5th, 6th, and 7th grade, and six-week thematic units have covered science, history, and social studies topics. Results from CORI studies have shown that students at multiple grade levels outperform control groups in text comprehension, uses of strategies for learning, motivation for and engagement in learning, and learning from coherent content resources (Guthrie & Klauda, 2014; Guthrie & Ozgungor, 2002; Guthrie & Taboada-Barber, 2019; Guthrie et al., 2007, 2013).

The power of focusing on content while teaching literacy skills and strategic reading is emphasized in a meta-analysis by Guthrie and Humenick (2004). When content learning goals were prominent, students improved their conceptual learning significantly over control groups whose focus was on learning for performance purposes. Moreover, the mean effect size of content learning goals on motivation was $d = 0.72$ and the effect size on reading achievement was $d = 0.87$. Giving students choice of texts, responses, and partners had an effect size increase on motivation of $d = 0.95$ and on reading achievement of $d = 1.20$. Using interesting texts generated an effect size of $d = 1.15$ on motivation and $d = 1.64$ on reading achievement. The impact of social collaboration generated an effect size of $d = 0.52$ on motivation and effect size of $d = 0.48$ on reading achievement. Overall CORI has demonstrated that teaching strategic reading while emphasizing content learning goals has a powerful positive influence on reading development (see also discussion of CORI and motivation in Chapter 10).

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13.7.8 Developing More Strategic Readers

To summarize the current research on multiple-strategies instruction, most contemporary discussions among L1 researchers center on the use of and training in multiple strategies to achieve comprehension (commonly including identifying main ideas, summarizing, clarifying, predicting, imaging, forming questions, activating prior knowledge, monitoring, and recognizing text structure). As the multiple-strategies research suggests, most researchers now see the real value in teaching strategies as combined strategies instruction – supported by coherent content, motivational practices, and appropriate language support – rather than strategies learned as independent processes or as processes taught independently of basic comprehension with instructional texts (Baker et al., 2015; Guthrie & Taboada-Barber, 2019; Klingner et al., 2015; Pressley, 2006; Wharton-McDonald & Erickson, 2017).

In L2 contexts, there is relatively little research on strategy instruction specifically for reading. Instructional training studies by Brown et al.,(1996); Janzen (2001); Klingner & Vaughn (1996, 2000); Klingner et al. (2004); and Vaughn et al. (2017) assess the use and effectiveness of multiple-strategy instruction. Additional resources on L2 multiple-strategy instruction include Dabarera et al. (2014), Goldenberg (2013), Janzen (2010), Manoli et al. (2016) and Taboada-Barber (2016). In an earlier meta-analysis on the effectiveness of L2 reading strategy instruction, Taylor et al. (2006) reported only ten published research studies on the effectiveness of L2 strategy use covering a twenty-year period. There is a great need for additional research on L2 reading multiple-strategy instruction.

13.8 Reading to Learn and the Challenge of Disciplinary Reading

> It is one thing to implement strategy instruction for a certain number of minutes each day for the ten weeks of a pedagogical experiment, but it is quite another to sustain a strategy emphasis over an entire school year. In short, it is easy to teach strategies in short spurts, but it is hard to curricularize them. (Pearson & Cervetti, 2017, p. 35)

In recent years, international comparative reading assessment exercises (the Progress in International Reading Literacy Study) have incorporated task items that require more challenging responses than might be expected for reading comprehension evaluation. US students in 4th and 11th grades have not compared favorably with the leading countries in more advanced education (Parris et al., 2015). These tasks require overt inferencing, synthesis skills, and applications of

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learned knowledge – in short, these tasks identify more strategic readers. In the United States., the National Assessment of Educational Progress (NAEP), known as the nation's report card (NAEP, 2017, 2020) has also begun to incorporate more challenging reading tasks in its reading assessments. This shift in reading expectations in the United States responds to concerns that reading instruction there, especially at middle school and high school levels, does not educate student sufficiently to be successful in reading to learn and reading to synthesize and evaluate.

First, in 2000, the US government published the National Reading Panel report. The report summarized a set of meta-analyses of several areas of reading research, based on true experimental research studies only. The major outcome of the report was a set of research results highlighting the efficacy of five areas of reading research for improved comprehension instruction: phonological awareness, phonics instruction, vocabulary development, fluency instruction, and strategy instruction for comprehension development. During the 2000s, these results translated into better instructional outcomes for lower level reading skills, primarily at elementary school grade levels. However, these outcomes did not seem to translate into better reading comprehension skills at higher grade levels or with more challenging texts or reading-to-learn tasks (Madda et al., 2019; Palincsar et al., 2020; Pearson & Cervetti, 2017).

Second, the many NAEP research reports published over the past twenty years on 4th, 8th, and 12th graders' reading comprehension have not shown progress in students' reading scores despite the focus on strategy instruction in the 1990s and the impact of the National Reading Panel (2000). A major gap in educational progress found by these research reports is the very large percentage of students (4th, 8th, and 12th grades) who perform below "proficient" in reading comprehension and a large percentage who perform below "basic." Table 13.7 illustrates a fairly consistent average of percentages of students scoring at three levels during the years noted.

Table 13.7 Multi-year patterns in NAEP results (averages across years)

	Proficient (%)	Below proficient (%)	Below basic (%)
4th grade (2007–2019)	35	65	33
8th grade (2011–2019)	35	65	26
12th grade (2002–2015)	37	63	26–28 across different years

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As Table 13.7 shows, over several reports, about 65 percent of secondary level students perform at below proficient, and about 30 percent perform even below basic. (The percentages below proficient and below basic are also much higher for L2 students.)

Third, discontent among educational researchers has been raised due to the limited success of standard content-area reading instruction with secondary school students in the United States. From the early 1980s, more advanced reading demands and reading instruction at the secondary school level has generated research and teacher training efforts in content-area reading instruction. For multiple reasons, these efforts have largely failed, as indicated by NAEP results (see also Hirsch, Jr., 2018; Palincsar et al., 2020). In response to these challenges, educational researchers and teacher trainers began to expand the concept of academic literacy and reading for academic purposes (including the need for students to become more strategic readers).

This expansion also highlighted a need for disciplinary-specific reading skills with more advanced texts and more challenging academic tasks (e.g., reading skills for history texts, biology texts, literary texts, or math texts) (Pearson & Cervetti, 2017; RAND Reading Study Group, 2002; Shanahan & Shanahan, 2008). The shift from more general content-area reading skills development to disciplinary reading comprehension skills also represented a shift in emphasis from a set of more general reading skills and strategies to strategic processes that could be directed to discipline-specific instruction in support of academic skills development (Duke & Martin, 2019; Shanahan & Shanahan, 2008).

In the mid-2000s, the National Governor's Association & Council of Chief State School Officers (NGA-CCSSO) (2010) assembled reading experts to create a national core curriculum to improve the reading comprehension skills of all K-12 students. The resulting curriculum guidelines (commonly labeled as CCSS) were developed as a states-led effort for a national set of curriculum standards for K-12 instruction to be adopted by all states (rather than a single national education directive). This has been a new and relatively difficult undertaking as US schools have never been guided by national standards, but by thousands of separate local district school boards and overseen by fifty separate state departments of education, each with its own general curricular guidelines. (The same is true for US territories.)

In 2010, the NGA-CCSSO released the English Language Arts (K-12) Common Core State Standards (NGA &CCSSO, 2010) and sought the endorsement of all state and territory governing bodies. As of 2019, forty-two states and five nonstate entities have adopted the

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CCSS in some form (Duke & Martin, 2019). A major innovation was that the CCSS guidelines reverse engineered developmental goals. The guidelines began at the expected endpoint of student achievement – the end of secondary school and with an appropriate preparation for post-secondary study. The result of this process was a much more challenging curriculum plan for both students and teachers.

A significant byproduct of the NGA-CCSSO (2010) in the United States has been a far greater emphasis on students becoming more strategic readers, with a larger view of reading comprehension abilities. Not only do students' cognitive reading skills need to improve, but students also need to develop skills to work with more challenging texts of varying kinds and also more challenging academic tasks. Thus, US curricular goals now focus on students' differing needs to comprehend texts along disciplinary lines, and also require more challenging tasks to demonstrate mastery of more complex academic skills. To what extent this major effort in K-12 instruction in the United States will realize its goals is an open question. Nonetheless, the CCSSO document is reshaping more advanced reading instruction in the United States – instruction that necessarily requires the development of a more strategic reader.

13.9 Implications for Instruction

There has been increasing awareness of how difficult it is for teachers to learn how to teach comprehension strategies. (Pressley & Harris, 2006, p. 273)

The more complex the pedagogy, the lower the likelihood of implementation. (Palincsar et al, 2020, p. 5)

Teaching for strategic reading requires consistent modeling, scaffolding, extensive practice, and eventually independent use of appropriate strategies by students. An effective way to build multiple-strategies competency is through discussions and practice that center on comprehension (and learning) while students are reading informational texts. Activating background knowledge, predicting, monitoring, summarizing, synthesizing, and applying new ideas and information should be regular features of instruction. In this way, strategy instruction is seen as part of everyday reading instruction, and not as separate lessons (Afflerbach et al., 2017; Block & Pressley, 2002a, 2007; Grabe & Stoller, 2019, 2020; Guthrie & Taboada-Barber, 2019; Palincsar et al., 2020; Pressley, 2006; Stoller & Grabe, 2017; Taboada Barber, 2016). A long-range goal across grades (or levels in a language program) is to automatize strategy use for more fluent reading. Teaching students to become more strategic readers is

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central to comprehension instruction and deserves greater instructional attention than it is usually given.

Implications for developing the strategic reader can be drawn from the various research-based instructional approaches introduced in this chapter, which combine comprehension instruction with multiple-strategy use while students read content relevant texts. In particular, Reciprocal Teaching, Collaborative Strategic Reading, Questioning the Author, Transactional Strategies Instruction, Promoting Adolescents' Comprehension of Text, and Concept-Oriented Reading Instruction provide many good ideas for curriculum development and classroom instruction. (See also Goldman et al., 2016; Guthrie et al., 2004; Klingner et al., 2015; Pressley 2006; Taboada Barber, 2016; Wharton-McDonald & Erickson, 2017.)

There is good evidence to support the instructional and curricular approaches to reading comprehension and strategic reading outlined in this chapter and in Chapter 12. This research supports the instructional guidelines provided in Table 13.8.

Table 13.8 General teacher guidelines for strategic reading instruction

The teacher should

1. Combine a focus on reading comprehension, strategies instruction, and content learning.
2. Use discussion, centered on text comprehension and comprehension monitoring, as a regular feature of instruction.
3. Incorporate strategy instruction as a part of everyday reading instruction, not as separate lessons. Introduce key strategies when most appropriate to support comprehension of difficult texts.
4. Recycle key strategies regularly and in appropriate combinations while working with texts.
5. Show students how to combine multiple strategies in flexible combinations in strategy instruction.
6. Work toward automatizing strategy use for fluent reading through practice.
7. Build curricular connections between strategy use and comprehension fluency through the recycling of key strategies while students read challenging texts.
8. Recognize that strategies are one component of good comprehension instruction.
9. Build students' motivation for reading and engagement with reading goals/tasks by providing topical relevance, opportunities for success, student choices, and collaborative group interactions.
10. Have students read a lot, providing a lot of practice, preferably with content-linked readings.
11. For researchers and teacher trainers, emphasize teacher professional development to help students become more effective strategic readers.

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To carry out these instructional goals while reading more challenging reading texts, and engaging in more complex tasks, takes considerable teacher effort and training (Grabe & Stoller, 2019; Stoller & Grabe, 2017). In fact, one of the major challenges to developing the strategic reader is the difficulty that teachers have in implementing effective instructional practices (Afflerbach et al., 2017; Baker, 2017; Cunningham & O'Donnell, 2015; Pearson, Palincsar, Afflerbach et al., 2020b). However, results to date suggest that it is worth the effort to support and promote strategic reading abilities. Although reading strategy instruction is not carried out regularly in the majority of reading classrooms, in either L1 or L2 settings, evidence strongly suggests that working to develop more strategic readers is the foundation of reading comprehension development for students with academic goals and with tasks involving complex (multiple) expository prose texts.

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14 *Building Awareness of Discourse Structure*

One important way for readers to build a coherent mental representation of what a text means is to use the structure of the text to help organize their memory for text-based content. (Pyle et al., 2017, p. 470)

The evidence from this meta-analysis indicates that teaching students about expository text structures improves their expository reading comprehension across all comparison groups used in the studies located for this review. (Hebert et al., 2016, p. 621)

It is well established that reading comprehension is impacted by a reader's awareness of how discourse is structured. Skilled readers are tuned into how information is organized, how central themes emerge, and how signaling mechanisms provide cues to this organization. Skilled readers are able to identify the main or topic sentences as they appear in a text and are sensitive to text structures that help identify where to find main idea sentences. Skilled readers recognize when new topics are introduced, how they are maintained through pronouns and other anaphoric cues, and when there is a topic shift. They are able to recognize the vocabulary that signals continuation or shifts in discourse information as well as lexical forms that commonly identify specific organizational patterns in texts (e.g., cause–effect, comparison–contrast, problem–solution) (Meyer et al., 2011; van den Broek et al., 2013).

Discourse structure awareness is often associated with specific reading strategies or sets of strategies (e.g., identifying main ideas, inferring connections among parts of a text, recognizing organizational patterns in texts, recognizing signal words, identifying typical genre features of a text). Following the discussion in Chapter 13, discourse structure awareness is viewed as a type of metalinguistic awareness at the text level (Nagy, 2007). This awareness includes knowledge of strategies to interpret discourse-level organizational patterns. Greater metalinguistic awareness allows skilled readers to reflect on ways that discourse supports specific interpretations of text information (Cain & Nash, 2011; Welie et al., 2017; Wijekumar et al., 2017).

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Research on written discourse and comprehension has shown that (a) top-level structural information, or rhetorical macropropositions (e.g., problem-solution), influence comprehension and recall, (b) better students recognize and use top-level structuring to assist recall and comprehension, and (c) top-level structuring can be taught so that students recognize this aspect of texts and use it to assist in their own comprehension. Additional research on discourse structure has highlighted signals and cues that help shape clause-by-clause and paragraph-by-paragraph connections and support top-level structuring and genre identification.

This chapter describes the wide range of discourse-level information that readers use while processing texts. Some aspects of this information are processed tacitly during fluent reading. As texts become more challenging, readers use more overt awareness of discourse structure, as well as a range of strategic responses, to comprehend texts (Hebert et al., 2016; Meyer & Wijekumar, 2017; van den Broek & Helder, 2017). These research findings and several associated instructional applications have emerged out of a broad array of explorations into the nature of discourse structuring, patterns of text organization, and specific cuing systems. A considerable body of research evidence supports the use of discourse analysis and text structure instruction as a means for improving reading comprehension. A key goal for reading development becomes how to raise a learner's level of discourse awareness and how to guide learners in applying this awareness for more effective comprehension (Duke & Pearson, 2002; Hebert et al., 2016; Jiang, 2012; Meyer & Poon, 2001; Meyer & Wijekumar, 2017; Meyer et al., 2011; Pyle et al., 2017; Wijekumar et al., 2017; Williams et al., 2014, 2016).

14.1 Two Directions in Written Discourse Analysis

Research that highlights the consistent structuring of texts emerged out of the early years of written discourse analysis (1975–2000). Findings from the work of cognitive psychologists, educational psychologists, functional linguists, and applied linguists all provided insights into aspects of discourse structure (Beaugrande & Dressler, 1981; Biber, 1988; Gernsbacher, 1990; Givón 1983, 1995; Grabe & Kaplan, 1996; Halliday & Hasan, 1976, 1989; Hoey, 1983, 1991; Hyland, 1998; Kintsch, 1998; Mann & Thompson, 1988; Meyer, 1985; Sinclair, 1991; Singer, 1990; Swales, 1990, 2004; van de Kopple, 1986; van den Broek et al., 1996; Van Dijk & Kintsch, 1983). These early efforts to identify formal aspects of discourse structure, and to focus on the functional usefulness of discourse structure, demonstrated that

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(a) texts are hierarchically organized and that readers tend to focus on and remember information at higher levels in the text hierarchy, (b) various syntactic patterns support discourse-level structuring, and (c) various lexical-syntactic variables converge to highlight latent dimensions of discourse organization. Much of this work has continued into the present as efforts are made to translate the earlier findings on text structuring into ways to improve students' reading comprehension, especially when reading more challenging academic texts, as well as academic tasks that use information from texts.

From the 1990s onward, the second strand of discourse research dominated research, focusing on the importance of inferencing and deep comprehension as two keys to reading comprehension (Cervetti, 2020; Graesser & Britton, 1996; Graesser et al., 1996, 2015; Millis et al., 2019). These lines of research require readers to engage actively in generating a range of reasoning processes and inference types to fill in gaps in a reader's background knowledge or infer text meanings that are not explicitly stated. This type of reading is usually most relevant in "reading to learn" or "reading to evaluate" contexts (see Chapters 1 and 13). The types of inferencing that have been targets of this type of research have focused primarily on elaborative inferences, inferences that actively generate new knowledge by combining both background knowledge and prior text knowledge.

Much like elaborative inferencing with its overtly strategic problem-solving processing, deep comprehension assumes the need to learn from texts, to problem-solve difficulties posed by challenging texts and tasks, and to use learned information for other academic tasks (Britt et al., 2018; Goldman & George, 2019; Millis et al., 2019). Goldman and George (2019), for example, are quite explicit in stating that the goal of deep comprehension is not simply reading comprehension of a text, but learning content from a disciplinary text to use for a task that enhances learning.

In the last ten years, however, the concept of active, elaborative inferencing has only been seen as a major mechanism for reading comprehension when comprehension demands and task difficulties create significant challenges to comprehension (van den Broek & Helder, 2017; van den Broek & Kendeou, 2017). For general reading comprehension (see Chapter 1), understanding the main ideas of most texts – not intended specifically for learning new and challenging academic content – involves inferencing processes that are primarily passive (implicitly and automatically activated across networks of connections to background knowledge). This agreement to view most inferencing processes as passive reflects a more recent transition to memory-driven inferencing rather than

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strategy-driven inferencing for most reading situations. The emergence of implicitly driven inferencing has been discussed already in Chapters 3 to 5 (see also Beker et al., 2016; O'Brien & Cook, 2015; O'Brien et al., 2015; Stafura & Perfetti, 2017; van den Broek & Kendeou, 2017).

At the same time that research on elaborative inferencing has become more constrained, and less central to reading comprehension, educational psychologists and reading educators have been responding to a growing concern that K–12 reading abilities in the United States have not improved over the past fifteen to twenty years. They have argued that academic reading skills need to emphasize reading to learn new information, reading to evaluate, and reading to apply text information to academic tasks that go beyond reading comprehension abilities more generally. This perspective requires that students learn more demanding academic reading abilities such as close reading of informational texts, reading to learn, and deep comprehension. Part of this shift includes developing students as more strategic readers and readers who are more aware of how informational texts themselves are organized (see Chapters 13 and 15).

Research on written discourse analysis – especially how texts can be organized to support comprehension – has become a key part of exploring ways to train students to become more strategic readers with more difficult texts and tasks. Earlier research in discourse analysis sought to understand how various discourse structuring systems play roles in developing a reader's text representation and situation model. These discourse structuring systems helped explain how reading comprehension could emerge through word-to-text integration. More recently, the discourse structure of texts is viewed as an important resource to help students learn from texts and engage in deep comprehension. This foundational discourse-analysis research supporting effective comprehension is addressed in Section 14.2.

14.2 Text Structure: How Texts Signal Discourse Structure

The ability of readers to recognize discourse structure and make use of this text-level knowledge as part of reading comprehension is supported by a number of linguistic systems interacting with comprehension processing. The linguistic systems include cohesive signaling, information structuring, lexical signaling, anaphoric signaling, topic continuity systems, and text coherence (Goldman & Rakestraw,

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2000; Grabe & Kaplan, 1996; Meyer & Poon, 2001). Research on these systems primarily was carried out from the 1970s to 2000. Each of these systems is described here to indicate how they contribute to text structuring and reader comprehension.

14.2.1 Cohesion

Cohesion refers to surface-level signals that reflect the discourse organization of the text and the intended purposes of the writer. These systems include anaphora, antonymy, converseness, ellipsis, hyponymy, meronymy, parallelism, paraphrase, repetition, substitution, synonymy, transition markers, and other lexical relations that link parts of a text together. Despite the fact that cohesion is not the same as coherence, as we have all come to agree, it is nonetheless true that cohesive structuring in texts (the surface-level signals) represents the linguistic signaling that is meant to reflect the semantic intentions of the writer (Halliday & Hasan, 1976). While it is possible to demonstrate that surface signaling could be misleading in contrived texts, or that coherence does not always require surface signaling, it is nonetheless true that texts (and especially expository ones) are generally intended to obey Grice's (1975) cooperative principle as much as spoken interaction is (and maybe much more so). That is to say, we should believe that the author is trying to communicate clearly to the reader when using cohesive signaling.

Efforts by Halliday and Hasan (1989) to describe cohesive harmony (a seldom cited but improved iteration of cohesion), and efforts to use this framework by other researchers in the 1990s, have indicated that cohesive harmony in texts is a useful tool for text structure analysis, one that helps explain differences in language comprehension and production (Cox et al., 1990). Lexical relations in this framework are still a major focus of text structure signaling, though these relations are more constrained in cohesive harmony (limited to clearly definable lexical relations such as synonymy, hyponymy, and so on, rather than the vaguer notion of collocation). Halliday and Hasan (1989) also argue that simply counting the number of cohesive devices should *not* be the goal in exploring the relationship between cohesion and comprehension. Overall, a number of research studies and analytic extensions with respect to cohesive harmony suggest that it is an effective framework for understanding how text systems direct a reader's interpretation of a text. This evidence argues that the surface structure of texts correlates strongly with underlying textual coherence and that coherence (as discussed later in this chapter) is, in part, generated from the text itself.

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14.2.2 Information Structuring

Other surface linguistic patterning in texts provides a number of additional supportive signaling systems that (a) alert the reader to the flow of information structure (e.g., use of grammatical metaphor, parallelism), (b) signal more important from less important information (backgrounding and foregrounding), and (c) distinguish new information from previously given or readily inferable information (given and new information) (Finegan, 2015; Grabe & Kaplan, 1996; Martin, 2002). Research that examines the influence of given and new information in texts, the relations between lexical coreferents, and various thematic, foregrounding, and transition devices demonstrate that information structuring plays a major role in directing the coherent reconstruction of ideas for the reader.

For example, given and new relations give preference to given information (already introduced or inferable) at the beginning of sentences and new information (not previously mentioned and not readily inferable) toward the end of sentences. Research has shown that the given–new relation, as a preferred way to organize sentences, leads to improved comprehension and recall (Beck et al., 1991; Britton & Gulgoz, 1991; Singer, 1990; Vande Kopple, 1986). These forms of information structuring are signaled by linguistic elements and provide an important resource for text comprehension (Grabe & Kaplan, 1996; Rayner et al., 2012).

14.2.3 Lexical Signaling

A well-recognized aspect of discourse structure signaling is carried out by transitional words and phrases as well as transition sentences that indicate the wrapping up of a topic or a shift to a new topic. Transition adverbials, transition sentences, and lexical words that indicate certain patterns of discourse organization are all signals that directly influence reading comprehension abilities. For example, causal structure is signaled by words and phrases such as the following: *as a result*, *because*, *since*, *for the purpose of*, *thus*, *in order to, if/then*, *so*, and *therefore*. (See Grabe & Stoller, 2020, for lists of signal words.) Many content words that convey information also provide structural signaling (*the reason*, *led to*, *created*, *provided*, *difference*, *required*), though a generalized and comprehensive list of such words is not feasible.

14.2.4 Anaphoric Signaling

One major aspect of text structure signaling, and also one that is central to discourse processing research, involves the linking back to a prior reference in a text through anaphoric markers. Referring back

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to information earlier in a text evokes "given" information. Lexically, an anaphoric signal refers back by means of a pronoun, a demonstrative (this, that), a repeated full noun, a synonym, a hyponym (superordinate form), or a paraphrase. Syntactically, an anaphoric signal can involve pronouns, ellipsis, substitution, use of a comparative form, or use of a definite article with a full noun. Simpler connections occur when the distance between antecedent and anaphor is small and the signal is simple. More difficult connections are created by greater distance between antecedent and anaphor, and by more complex antecedents (antecedents in earlier paragraphs, antecedents that involve a full clause, information across multiple prior points, a loose paraphrase, etc.). Good readers are able to find the appropriate prior reference easily no matter the anaphoric marker or antecedent. Poor readers have considerable difficulty in locating prior references, especially with more complex anaphoric markers and more distant and more complex antecedent referents (Ehrlich, 1996; Ehrlich et al., 1999; Pretorius, 2005).

Less skilled English as a second language readers, in particular, have difficulties in establishing bridges between anaphoric signal and antecedent information. This difficulty is compounded by the need for inferencing in many instances of antecedent connection (Pretorius, 2005). However, making these connections is an important part of reading comprehension as these linkages generate part of the coherence in emerging text representations and situation models of comprehension. A number of studies have shown that abilities to identify the antecedents of anaphoric signals are correlated with reading comprehension (Ehrlich et al., 1999; Oakhill & Yuill, 1986; Pretorius, 2005).

14.2.5 Topic Continuity Systems

In the early 1980s, Givón (1983) proposed that the organization of text included systems for tracking topical information. He proposed that three systems, in particular, were important to a reader's ability to maintain/reinstate the topic in the foreground: topic continuity, topic persistence, and referent competition. These systems made systematic use of syntactic and lexical structures for tracking main referents in a text (see Givón discussion in Chapter 12). In some respects, this view of central referential elements to support coherence is not unlike Halliday and Hasan's notion of cohesive harmony; that is, certain mechanisms in texts serve to highlight central, or thematic, referents in a given text. Through the early 1980s, most of Givón's efforts were focused specifically on issues of topic continuity and the linguistic marking systems that signaled referential distance earlier in the text in order to reinstate a given topic.

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In the 1990s, Givón (1992, 1995) developed a broader argument, moving from topic continuity to a more general theory of discourse coherence. In particular, he argued that many syntactic systems, and not simply topic-signaling structures, are centrally involved in discourse processing for text comprehension and production (see Chapter 12). Topic continuity systems are also compatible with the Landscape Model of reading comprehension (Chapter 6), in which readers develop a greater sense of thematic centrality for key concepts (van den Broek et al., 2013; van den Broek et al., 1996; see also Hoey, 1991, for thematic centrality development).

14.2.6 Text Coherence

Research on text coherence has been an ongoing enterprise since the mid-1970s. More recently, discussions of coherence have centered around the relationships between surface linguistic forms and underlying interpretations of texts, with surface linguistic forms acting as directions for building the underlying discourse representations. A critical issue has been the extent to which coherence is constrained by text processing or reader's background knowledge (Barsalou, 1992; Gernsbacher, 1990, 1997; Givón, 1992, 1995; Grabe & Kaplan, 1996; Kendeou & O'Brien, 2016; Kintsch, 1998; Mann & Thompson, 1988; Singer, 1990). Explanations for coherence in texts have emerged from several discourse processing models starting from the early work of Kintsch and Van Dijk (1978). Three of the most influential of these models are the Structure Building Model (Chapter 12), the Construction-Integration Model (Chapter 6), and the Landscape Model (Chapter 6). These models highlight discourse processing that builds text coherence, or word-to-text integration (and lead to text representations and situation models of comprehension).

Most text processing models view the text itself as providing a rich and complex set of processing directions for text comprehension. Background knowledge is important for text processing, but all major discourse processing models (e.g., Structure Building Framework, Construction-Integration Model, Landscape Model) suggest that a good part of online coherence building is generated from text processing rather than only from background knowledge. Many cognitive psychologists can accept that a reader's overall understanding of a text may vary depending on background knowledge, but also argue that coherence at the level of a text representation is also driven by prior text information. Thus, text structuring and the semantic relationships signaled by a text contribute strongly to a notion of text coherence.

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14.3 Text Genres and Text Purposes

In addition to the lexical and structural signaling systems that run across texts, there are specific patterns and systems of text organization that reflect writers' goals, the purposes of specific texts, and the expectations of skilled readers. When groups of people begin to use certain conventions for organizing texts in ways that reflect group goals and purposes, the patterns of use stabilize into sets of genre conventions. These genre conventions are also crucial for skilled reading because these genre cues convey crucial information about the text.

Text genres can be described in many different ways and at many levels of generality or specificity (Johns, 2002). For nondiscourse analysts, the term "genre" invokes literary and cultural contexts where one discusses poetry, fiction, drama, and nonfiction; or one discusses film genres such as westerns, dramas, comedies, action/adventure, fantasy/science fiction, or documentaries. For discourse analysts, genres involve more functional and differentiated structuring of texts that serve important social and communicative purposes (Hyland, 2002; Johns, 1997; Martin, 2002; Swales, 1990, 2004). Genres have been described as "staged, goal-oriented social processes" (Martin, 1993, p. 142); as "rhetorical actions that … respond to perceived repeated situations … as representing effective ways of getting things done in familiar contexts" (Hyland, 2002, p. 116); and as "socially established strategies for achieving purposes in rhetorical situations" (Coe, 2002, p. 198).

Genres can be discussed in terms of real-world functional uses of texts such as the business memo, newspaper advertisement, science research paper, news report, editorial, letter of solicitation, CVs, directions for assembling furniture, subpoenas, medical chart notes, or warning labels on medicines. Multiple genres are specific to academic settings, but are still functional: the poster, research proposal, abstract, academic CVs, academic job application, tenure review letter, and so on. Genres can also be discussed as "instructional genres" such as the textbook chapter, novel, poem, magazine feature article, course reader, report, summary, class notes, and so on. Many genres are parts of families of genres such as types of textbooks or types of letters (e.g., letters of invitation, complaint, warning, congratulations, offer, negotiation, personal exchange). With respect to individual disciplines, much variation is due to register (lexical use) rather than genre differences (with some exceptions for occasional unique genres within a discipline). At a more abstract level, there are macro-genres, encompassing large varieties of text types that can be identified as conveying a type of logic, including expository, narrative, persuasive,

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advisory (Grabe, 2002) or as narrative, recount, argument, and report (for instructional contexts) (Hyland, 2002).

The importance of genres for reading comprehension is that they introduce distinct levels and types of discourse structuring. Skilled readers learn to recognize the specific features of genres that are relevant to their needs and goals. A major genre distinction that is central to student comprehension arises when students read narrative texts versus expository texts (Grabe, 2002; Lorch, Jr., 2015, 2017; Snow et al., 2005).

14.4 Narrative and Expository Texts

> The skills needed to read and comprehend expository text are different than those needed to read and comprehend narrative text. Expository text often includes abstract concepts, difficult vocabulary, and unfamiliar content.... Ideas presented in expository text are not always clearly connected, increasing the difficulty level of the passage and lowering student engagement.... Authors of expository text use multiple text structures to organize information (Hebert et al., 2018, p. 2116).

Skilled readers understand how several types of narrative genres are organized. They expect narrative settings and appropriate descriptions; they expect character development, conflicts, episodes, and conclusions. They expect that much of the text development will be motivated by causal sequences, episodes following a time sequence, and many require interpretive inferences. In instructional contexts, narrative texts are generally discussed in terms of story structure and its impact on comprehension (Hebert et al., 2018; Labov & Waletzky, 1967; Pearson & Fielding, 1991). Story structure will typically involve awareness of setting, characters, motives, and episode sequences.

Instructional research involving narrative texts demonstrates that younger children make significant improvements in comprehension when they are taught story structure features and use these features to carry out various tasks (Oakhill & Cain, 2007; Trabasso & Bouchard, 2002). By the end of 4th grade, however, the results of narrative structure instruction are less effective with grade-level and good readers. As students get older and more skilled, they do not demonstrate as much improvement in narrative comprehension from explicit training. Older students are likely to have well-developed implicit knowledge of generic narrative structures, and instruction has little impact (cf. Duke & Pearson, 2002).

Much as with narrative texts, skilled readers are also aware of the discourse structuring common in expository texts, although expository texts of various types often present more difficulties for learners

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(Hebert et al., 2016; Kraal et al., 2018; Lorch, 2015, 2017; Meyer & Wijekumar, 2017; Williams, 2018). Expository prose is generally more difficult because it conveys conceptual information (rather than episodic information) organized by a number of abstract logical frameworks. There is less of a connection to background knowledge and personal experiences. In many cases, expository prose comprehension is more bound to the text, that is, more bottom-up and text driven; it usually requires stronger local coherence linkages in addition to global linkages (Lorch, 1995, 2017).

Expository prose is most often used in educational settings to introduce and teach new information rather than well-practiced ideas and situations; it involves more detail recognition and less emphasis on a single major causal chain of events. Motivationally, it is well known that stories have great potential to captivate and involve the reader in situations and conflicts that resonate with the reader's interests. Expository prose engages readers with examples, facts, details, and visual graphics that may engage readers, but such an array of details can often overwhelm poorer readers with information overload.

The implications of the distinctions between narrative and expository prose are that text coherence for expository prose, as it is built by the reader, operates differently from that of narrative prose (Grabe, 2002). Moreover, the structural and textual signaling provided directly by the text play a major role in text comprehension for expository texts. Students need to understand the more abstract patterns of text structuring in expository prose because it informs the reader's efforts at comprehension. While advanced expository texts are typically denser and present more complex information than texts of a more general nature, they are, nevertheless, assumed to be understandable by informed readers with relatively little ambiguity. One of the major reasons for this assumption is the role played by informational discourse patterns in expository texts.

14.5 Patterns of Discourse Organization

Aside from the genres that students must comprehend and learn from (textbooks, trade books, internet resources, magazine articles, etc.), they also must interpret the abstract patterns of information organization that underlie all types of prose, and especially expository prose. These patterns of information organization have been referred to as rhetorical patterns, knowledge structures, text structures, and discourse structures (Grabe, 1997, 2003; Grabe & Kaplan, 1996; Meyer & Poon, 2001; Mohan, 1986; Williams, 2018). These patterns

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represent ways that information is conveyed logically and coherently in texts (Mohan, 1986). For expository prose, these structures generally include description, sequence, procedure, cause and effect, classification, comparison and contrast, definition, problem–solution, and analysis (cf. types of narrative patterns for literary, personal, and historical texts) (cf. Martin, 2000). Patterns of discourse organization have functional purposes, which are recognized by skilled readers and writers, if only implicitly in some cases. Patterns of discourse organization also lead readers to certain expected interpretations of texts (Hebert et al., 2016; Meyer et al., 2011).

These patterns of discourse organization are actually relatively few in number (perhaps twelve to fifteen patterns) and recur in many combinations. In reading a given text, it is usually possible to identify one or two overarching structures that organize the text information, and there are usually a number of discourse structures that organize subsections of a longer text. For example, a text with a strong problem–solution organization is almost always going to have cause–effect patterning as part of the "problem" section. Sometimes problems are compared with other problems, and more than one solution may also be compared. Sometimes there is a sequential chain of problem-solution-new problem-new solution, and so on. In expository texts, definitions are common; new concepts or terms are often defined and are given an extended explanation or example. There are a number of possible minor variations in analyzing these subsystems of major patterns, but the general patterns are consistent across most texts. Moreover, these text structures reappear regularly; thus, they are worth pointing out instructionally (see Appendix A and B).

Similar patterns in discourse organization appear in narrative texts of all kinds. Narratives are usually organized according to chronological sequence, though not always. There is usually a conflict or issue that impels a set of cause and effect sequences of actions. Sometimes, episodes can be identified clearly as problem–solution patterns. Usually, narratives incorporate extended descriptions of settings and characters. Occasionally, narrative-like texts are combinations of anecdotes and short examples of actions and episodes. In these cases, the texts are often building a psychological profile of a person or an event; in a sense, then, the text is a descriptive text being assembled inductively. The key point is that all normally developed and reasonably coherent texts are built on these knowledge structures that convey the intended information. Skilled readers recognize this discourse-level information as part of their comprehension abilities.

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14.6 Research on Discourse Structure and Reading Comprehension

> Structural information is important because it helps readers organize the content and thus aids in the process of constructing a mental representation, that is, the meaning of the text. (Williams, 2007, p. 200)

Up to this point, the chapter has outlined many ways in which discourse is structured in texts as well as the features and signals within texts that alert the reader to the text structure. Recognizing that there are levels of structuring in texts beyond the sentence level is an important first step in exploring the relationship between discourse structuring and comprehension. The next step is to survey research that demonstrates the importance of discourse structuring for improving reading comprehension. Both the recognition of text structure and research on the impact of text structure are explored in multiple ways in this section.

14.6.1 Discourse Structure Awareness and Discourse Signaling in Texts

One line of research involves direct instruction that explicitly raises student awareness of text structuring through discourse signaling (Goldman & Rakestraw, 2000; Lorch, 2017; Lorch & Lorch, 1995, 1996; Meyer et al., 2018; Wijekumar et al., 2017). This research emphasizes the uses of signal and transition words, topic sentences, anaphoric linkages to prior text ideas, and the role of various grammatical structures to build coherence in texts. As defined by Meyer and Poon (2001), "Signals are stylistic writing devices that highlight aspects of … structural organization…. Such devices may include headings, preview statements, summary statements, pointer words, or words that explicitly state the relational structure among main propositions of the text" (p. 141).

Earlier studies have shown that transitional discourse-markers connecting sentences improve comprehension as compared with texts that do not have these markers, and better students benefited more from signaling than did weaker students (see Degand & Sanders, 2002). In a series of studies in the 1990s, Lorch and Lorch (1995, 1996; also Lorch et al., 1993) provided strong evidence for the benefits of discourse signaling in comprehension. More recent research by Cain and Nash (2011), Crosson and Lesaux (2013), Meyer and Wijekumar (2017), and Welie et al. (2017) has shown that lexical signaling contributes directly to reading comprehension with multiple types of discourse patterns.

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Extending this finding to instruction effectiveness, a recent study by Meyer et al. (2018) examined the extent to which a text awareness training program (Intelligent Tutor Structure Strategy, ITSS) could improve awareness of and use of connective signal words. Fourth through 8th-grade first-language (L1) students (N = 7,145) were trained with the ITSS for thirty minutes a week over seven months as part of a language arts curriculum. Control students were taught the regular language arts curriculum. Students who had the ITSS training outperformed control students on a four-blank cloze type of measure requiring comparative signal words for short expository texts. This study showed that the ITSS can significantly improve students' awareness and use of signaling words in expository texts. In second-language (L2) contexts, two studies noted earlier, Crosson and Lesaux (2013) (for 5th graders) and Welie et al. (2017) (for 8th graders), demonstrated that English L1 students/Dutch L1 students had significantly greater knowledge of connective lexical forms than did L2 students, and that greater knowledge of connective forms predicted reading comprehension ability.

14.6.2 Structural Hierarchy in Texts: Top-Level Structuring

Research on discourse analysis and comprehension has increasingly demonstrated that levels of text structure exist and that they have a strong impact on reading comprehension (Alexander & Jetton, 2000; Duke & Pearson, 2002; Wijekumar et al., 2018; Williams, 2018). This research applies more to expository texts than to narrative texts. This work has also shown that better students seem to recognize and use top-level structuring to assist recall and comprehension. Top-level structuring can be taught so that students recognize this aspect of texts (Hebert et al., 2016; Meyer & Poon, 2001; Meyer & Wijekumar, 2017; Pyle et al., 2017; Shanahan, 2020; Wijekumar et al., 2017). When students are taught that paragraphs can be organized as comparison–contrast, cause–effect, or problem–solution, this awareness improves comprehension. A number of research studies by Meyer and her colleagues have demonstrated that students with a better awareness of higher-level text structuring recall more information from the texts and recall more top-level, main idea information (Meyer & Poon, 2001; Meyer & Wijekumar, 2017).

In studies using ITSS, Meyer and Wijekumar (2017) have trained over 14,000 students since 2003, focusing primarily on 4th to 8th grades. A key part of this training involves multiple iterations of practice in identifying and using top-level text structures, with at least

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twelve examples of each top-level discourse structure, to learn a strong set of comprehension strategies beginning from recognizing the overall structuring of texts. These training studies also used both discourse structure graphic organizers and main idea sentence frames that explicitly reinforce the type of text structure organizing information in a given text.

Research adapting Meyer's structure strategy approach (and ITSS) was also carried out in an L2 context that involved thirty-one classes of mostly Spanish speaking 4th and 5th-grade students learning an enhanced variation on the intelligent Tutor Structure Strategy approach (Strategy instruction on the Web for English Language Learners, SWELL; Wijekumar et al., 2018). Results of this training, compared with a control group, revealed strong and significant effect sizes for students receiving SWELL training, including a strong and significant effect size gains with a standardized measure of reading comprehension across both 4th and 5th grades.

While Meyer and colleagues have explored the impact of using discourse structure training as a springboard for building comprehension strategy instruction with students from 4th to 8th grades, Williams and colleagues have focused primarily on 2nd-grade students. For more than twenty years, Williams (e.g., 2007, 2018) has demonstrated repeatedly that text structure awareness (with simple expository texts) can be used effectively by children as early as 2nd grade to improve their reading comprehension. In a number of important studies, Williams and colleagues have shown that young children can learn to recognize basic cause-effect, comparison, sequence, description, and problem–solution text structure patterns and improve their comprehension skills. These gains have been demonstrated with both grade-level students and at-risk students, and also when embedded as part of content instruction (Williams et al., 2005, 2009, 2014, 2016). One key finding from the studies by Williams and colleagues is that it is never too soon to work with expository texts and teach text structure awareness.

14.6.3 Discourse Structure Awareness and Graphic Organizers

The third line of research has involved student awareness of text structure through various types of visual representations: semantic maps, anticipation guides, concept maps, outline grids, Venn diagrams, tree diagrams, hierarchical summaries, and discourse-based graphic organizers (Armbruster et al., 1991; Jiang, 2012; Jiang & Grabe, 2007, 2009; Meyer & Wijekumar, 2017; Trabasso & Bouchard, 2002).

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This research demonstrates that students comprehend texts better when they see how text information is organized (along with the linguistic clues that signal this organization). However, there are many types of graphic options for students to work with, and it is not clear how well various types of graphic organizers work to improve text structure knowledge or comprehension abilities over time.

In some cases, graphic representations of information are widely recommended, but there is relatively little empirical support. For example, limited research support exists for concept mapping (in which students generate their own maps of the ideas in the texts) specifically for reading comprehension (Chularut & DeBacker, 2004). Similarly, limited evidence supports the use of semantic mapping (Carrell, Pharis, & Liberto, 1989) despite its instructional popularity (Duke & Pearson, 2002; Heimlich & Pittelman, 1986; Hyerle, 1996). Outlining can provide visual support for discourse structuring in terms of hierarchy of information; however, little evidence exists that outlining improves reading comprehension. The same limitation can be applied to the use of anticipation guides, despite their prevalence in textbooks of all types.

A particularly powerful option for representing text information and main ideas is the use of graphic organizers that explicitly reflect structuring in the text (e.g., comparison–contrast, problem–solution) (Hebert et al., 2016; Meyer & Wijekumar, 2017). A wide range of L1 research in the 1980s demonstrated that graphic representations of discourse organization enhance reading comprehension and the learning of new information from texts (see Jiang & Grabe, 2007; Meyer & Wijekumar, 2017; Williams, 2007).

In an important L2 study, Jiang (2012) demonstrated significantly better reading comprehension outcomes for a group of English L2 Chinese university students who received Discourse Structure Graphic Organizer (DSGO) training. The study carried out by Jiang embedded graphic organizer forms reflecting the actual discourse organization of the textbook texts assigned during an English as a foreign language (EFL) reading course rather than a standalone text-structure instructional component. That is, she did not use generic organizers (e.g., T-bars, outlines). The DSGOs created for and used in the study reflected the discourse structures of the course-book texts, with all their complexities. (See Appendix B for an example of a DSGO that reflects the real complexity of an instructional text, while maintaining consistent structural pattern representations.) In this respect, Jiang's approach exhibited an ecological validity in that it could be replicated within any reasonably intensive reading course, using reading course textbooks, whether for L2 student or L1 students.

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Jiang's (2012) study involved 1st and 3rd semester Chinese EFL students. Twelve classes (N = 340) participated in the study with random assignment to experimental or control groups, each class meeting four times per week. Experimental groups followed the same curriculum as the control group 75 percent of the time. The remaining 25 percent of the time was dedicated to instruction on text comprehension, during which students worked with course texts and DSGOs. Jiang developed the DSGO materials for each assigned text during one forty-five-minute class meeting each week. In each experimental lesson, the discourse structures were highlighted, as were signal words, main idea development, and summary writing. Gaps in the DSGO were filled in by students rereading and analyzing the text. After seventeen weeks, students in the experimental sections performed significantly better than control classes on both a proximal comprehension measure identifying discourse structures in texts and also on a standardized measure of reading comprehension (a retired Test of English as a Foreign Language reading section).

As an unintended confirmation of DSGO effectiveness, the university required all sections to take achievement tests based on the course curriculum every four weeks (vocabulary, grammar, and main idea text comprehension). Despite using the course curriculum only 75 percent of the time with the experimental classes, those students outperformed control classes in terms of gains in all three areas that represented goals for the curriculum (see Williams, 2007, for a similar unexpected outcome). The key takeaway was that the introduction of a DSGO instructional component for 25 percent of the curriculum did not negatively impact the experimental students with respect to the standard curriculum goals of the university course, highlighting strong ecological validity while incorporating discourse structure awareness training.

14.6.4 Meta-Analyses Involving Graphic Organizers

In an early review of eleven studies involving graphic organizers with L1 students from 4th to 8th grade, students improved significantly in reading comprehension (Trabasso & Bouchard, 2002). Two more recent meta-analyses by Hebert et al. (2016) and by Pyle et al. (2017) focused on text structure awareness based on Meyer's five text structure patterns (Meyer, 1985). Overall, the average effect size reported by Hebert et al. was significant across all forty-five studies at g = 0.57. Pyle et al. reported d = 0.93 as an overall positive effect size.

Hebert et al. (2016) reported on studies with students from 2nd to 12th grade. They examined the effects of text structure instruction

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(TSI) using both proximal measures (i.e., assessment measures that reflected the taught text structures and related strategies) and distant measures (i.e., standardized reading comprehension measures). Across the forty-five studies (323 effect sizes), text structure instruction varied widely, even within specific categories (such as teaching signal words, using graphic organizers).

A number of more specific findings are important. Positive effects were found in 85 percent of the studies. Instruction involving more types of text structures resulted in significantly greater effects. For each new structure type taught, effect sizes increased $g = 0.13$ (suggesting that the more distinct text structures taught, the greater the benefit for reading comprehension). Writing activities as part of TSI significantly increased the effect size of training (increasing effect size by $g = 0.38$) (see also Chapter 15). Effect sizes were greater when the control group engaged in Business As Usual instruction rather than an alternative competing instructional plan. TSI was robust across grade levels and was effective with explicit instruction and the teaching of signal words. Finally, standardized tests indicated a significant difference between experimental and control groups but the effects were minimal ($g = 0.15$). Certainly, additional well-designed studies that include standardized measures are called for.

In a second meta-analysis by Pyle et al. (2017), outcomes were generally similar, even though inclusion requirements were much more restrictive (nineteen studies, forty-eight effect size comparisons, and different moderator variables). One specific moderator variable that was distinctive was the amount of time allocated to TSI; the researchers found that TSI instruction was most effective when carried out for eleven to twenty hours. Overall, they confirmed the effectiveness of TSI, and they also cautioned that there was great variation in how TSI was carried out and how outcomes were assessed (see also Bogaerds-Hazenberg et al., 2020).

In brief, there is considerable evidence that students who recognize hierarchical text structure and make use of it in their comprehension processing are likely to comprehend better and recall more information. This outcome seems to apply equally to well-designed L1 and L2 studies. The studies employing TSI also demonstrated many ways that important reading strategies could be incorporated into TSI (e.g., discussions around text comprehension, monitoring comprehension, rereading for specific information, summarizing, forming questions and finding answers, using background knowledge), thus highlighting the role of discourse structure awareness as an approach that is capable of developing more strategic readers.

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14.7 Refutational Texts, Simplification, Revision, and Comprehension

Much recent discussion about the role of discourse structure has involved the concept of deep comprehension to learn new information and to use that information for additional academic tasks (Braasch et al., 2013; Cervetti, 2020; Millis et al., 2019; see Chapter 15). The demands of reading to learn often create text difficulties for many students (and for many teachers). In response, the structure and overall organization of texts themselves can be examined or altered to improve comprehension and enhance learning. Ways in which the metalinguistic awareness of discourse structure can improve comprehension and learning are addressed in this section in terms of refutations, simplification, and revisions.

14.7.1 Refutations

In situations where subject-matter teachers are teaching students new content (e.g., secondary school discipline-specific content), students often activate prior knowledge that may be incompatible with new text information, especially in cases involving multiple texts. In these cases, students typically retain their pre-established knowledge and disregard the correct but counter-intuitive information of the text (Braasch et al., 2013; Ecker et al., 2014; Guzzetti et al., 1993; Hacker, 2014). Students are often led astray in their comprehension by their own naive conceptions of the text material. This problem is particularly notable with science and history texts and with tasks intended to improve reading to learn and reading to evaluate (Cervetti, 2020; Millis et al, 2019). Both of these types of tasks have led to research that examines ways to counter naïve understandings.

Naïve or intuitive perceptions of information that are contradicted by texts have examined the use of refutational texts (Alexander & Jetton, 2000; Beker et al., 2019; Ecker et al., 2014; Guzzetti et al., 1993; Kendeou & O'Brien, 2014). These refutational texts, typically written by researchers, explicitly point out the difference between an intuitive understanding of the topic and a more technical, possibly counterintuitive, account that also happens to be the right explanation, often with the simple preamble, "This statement is incorrect. The correct explanation is…." General results of this research indicate that explicit refutational texts do improve comprehension and learning, and these texts, when combined with other adjunct tasks and representations, provide even better results. The problem for teachers, in these cases, is being able to

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identify what information in texts will require students to reconceptualize their prior knowledge and then adapt instruction and texts accordingly.

14.7.2 Simplification

In less demanding instructional settings with main idea comprehension as the goal (rather than reading to learn or reading to apply), a response to text difficulty would be for teachers to revise the text, either at the level of words and sentences, or in its entirety. Texts may simply be inaccessible for students' reading ability levels (owing to unknown vocabulary or very complex sentences). The goal, in this case, might be to make the text more accessible through the simplification of the language. This approach raises the question of how, when, and/or why to simplify texts to improve comprehension.

The most common response to text difficulty involves efforts to simplify texts in one or more of several ways. A fairly standard way is to use readability formulas, make simplifications in line with the formula used, and in principle make a text easier to understand. Changes suggested in Table 14.1 would be in line with the Flesch-Kinkaid readability formula, the Fry readability formula, the New Dale-Chall readability formula, and others (Chall & Dale, 1995; Fry, 1989; Kincaid et al., 1975). Microsoft Word also provides grade level and reading ease calculations to decide if a text may be too difficult for students.

Table 14.1 Options for revising text language to simplify texts

1. Substitute a more common word for an uncommon word.
2. Use a less technical term for a more technical term.
3. Convert a long sentence into two shorter sentences.
4. Simplify a sentence with multiple clausal embeddings by creating multiple shorter sentences.
5. Alter a sentence with many words and clauses *before* the main clause subject by making the main clause subject NP more prominent and placing the main clause at the beginning of the sentence.
6. Add transition words and other signaling words between sentences or at the beginning of paragraphs.

In all of these cases, the goal is to make the text, and text content, more understandable. More complex approaches have also been explored although their usability for teachers is not well documented (see Arfé et al., 2018; Crossley et al., 2019).

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The text changes for simplification enumerated in Table 14.1 are often used. These adjustments are also used commonly in research studies to make two or more texts more comparable in difficulty level. This approach to simplification is so variable in its implementation that it is not always so straightforward to say if the texts are actually easier to understand (except through teacher expert judgment and through student success at the task). Teachers will also be able to judge if students learn the relevant information from the text. This issue is not a question of working with an authentic text versus nonauthentic text, but whether or not students can understand a text that would be made more appropriate for their level of prior knowledge and/or language skills. And, to quickly address a related issue, "authentic texts" are whatever texts help students and teacher achieve authentic teaching and learning goals, as well as maintain students' motivation for learning. There are no other authenticity benchmarks for using texts in the academic context.

14.7.3 Text Revisions

An alternative approach to addressing inconsiderate texts is to consider the text as a whole and revise it in line with text structuring research in order to clarify content, highlight main ideas, add signaling information, and provide background information. The results of this discourse-oriented approach to readability have created effective revisions of instructional texts in a number of studies. Beck et al. (1991) created revisions (not simplifications) to 4th-grade history texts, using discourse-based concepts and making revisions in line with research on text processing. For example, text revisions were driven by possible sources of reader failure such as lack of word meaning, lack of background knowledge, and need to recognize the relevance of specific prior information. Results demonstrated significant improvements in student comprehension and learning from revised instructional texts. Britton et al. (1993) surveyed research studies centered on text revisions and found that whole-text revisions led to better comprehension in forty-six out of fifty-two reported studies.

Research demonstrates that text revision efforts based on coherence-building mechanisms in texts improve reader comprehension. A major problem with conventional instructional materials is that students encounter many texts where it is not practical to rewrite the text to assist students' comprehension. In these cases, students need strategy training to develop appropriate textual resources for comprehension. Nevertheless, the coherence-building approach to text revision, despite its limited practicality, highlights the importance of text organization and text signaling for improving reader comprehension.

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Most students trying to learn new information from texts, and especially L2 students, do benefit from some degree of considerate signaling. Following the arguments made in earlier sections of this chapter, students typically benefit because well-written texts help readers construct a coherent understanding of the information, allowing students to integrate new information with prior knowledge.

14.8 Research on Teaching Discourse Structure Awareness

> Many studies have shown that instruction designed to teach students to recognize the underlying structure of text improves comprehension. (Williams, 2007, p. 201)

A major issue concerning the influence of text structure is the extent to which such knowledge can be directly taught to students so that it will lead to improved comprehension. Three major lines of instructional research are reviewed in this chapter on the effects of text structure instruction: (a) direct signaling of discourse structures in texts, (b) the use of graphic organizers to display rhetorical structures, and (c) comprehension strategy instruction that highlights discourse structure awareness. In each case, evidence exists for their instructional effectiveness. All three lines of instructional research argue that instruction focusing on text structure increases comprehension and learning. These three research trends also indirectly suggest that more "considerate" texts themselves provide coherence-building directions to be used by readers. However, it is up to the students (as readers) and the teacher (as facilitator) to determine the standard of coherence that is necessary for task success (Oudega & van den Broek, 2019; van den Broek et al., 2011).

The third line of research on instructional training noted above – comprehension strategy instruction to develop discourse structure awareness – follows from training studies on reading strategies (see Chapters 12 and 13). Because a number of reading strategy training approaches focus on top-level structure, main idea identification, and text processing skills, this line of instructional research is both a resource for building strategic reading and also a resource for supporting text structure awareness. Thus, strategy training that includes identifying main ideas, establishing text purpose, summarizing, predicting, forming questions about sections of a text, using adjunct questions, monitoring comprehension, generating discussions about text understanding, and connecting information from various parts of a text may all appear to improve awareness of text structure and text comprehension (Block & Pressley, 2002a; Pressley, 2002b, 2006; Pressley & Afflerbach, 1995). A number of instructional programs

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for improving comprehension focus on text structure awareness while also engaging students in becoming more strategic readers in the process. In L1 contexts, both Concept-Oriented Reading Instruction (CORI) and ITSS (the former introduced in Chapter 13) combine text structure awareness and student engagement in strategic processing while reading. In L2 contexts, Jiang (2012) taught students to use various reading strategies within the context of using DSGOs.

This chapter has outlined various ways that discourse structuring in texts provides resources for comprehension and for learning from texts. Key discourse awareness knowledge and skills that support comprehension include (a) becoming more aware of the organization of texts and knowledge structures in texts, (b) using discourse-oriented strategies effectively to support comprehension, (c) identifying multiple signals and patterns of discourse structuring in texts, and (d) reflecting on how this structuring promotes main idea recognition. All of these knowledge resources will promote discourse awareness of texts and strategic responses to text complexity that will support more effective comprehension abilities.

14.9 Implications for Instruction

Teaching students to become more aware of text structure should be a central component of reading instruction and curriculum planning. The implications for instruction from this chapter intersect strongly with instructional implications in Chapters 12 and 13 (focused on main-idea recognition and strategic reading). Implications for instruction with respect to greater text structure awareness, discourse signaling, hierarchical patterns of text structures, graphic organizers, and strategy use are noted here. Implications are pertinent for any reading class, textbook, or curricular materials.

Direct instruction of discourse structure involves explaining to students how texts have various types of discourse structure and how these aspects of discourse structure can help the reader to identify the main ideas in the text.

1. Students can examine headings, subheadings, paragraphing, pictures, visuals, sentence-initial phrases, and subject nouns ("theme" identification) to examine how the text provides clues to comprehension. (pre-reading).
2. Students can circle various types of transition markers to explore how these signals help connect information in texts. (during-reading).
3. Students can determine what aspects of discourse structuring help them identify main idea sentences. (during-reading and postreading).

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4. Students can underline anaphoric signals and find the antecedents, then discuss those that are more difficult to identify. (postreading).
5. Students can identify and circle lexical forms (in addition to transition words and phrases) that provide signals about text structure. (postreading).

Many aspects of discourse structuring can be brought to the attention of students to raise their discourse awareness and support comprehension. Various signaling mechanisms can become sources of class discussion and reflections for identifying main ideas. Specific instructional techniques are noted in Table 14.2. These instructional techniques and others can develop the awareness of signaling in discourse structure. At the same time, these techniques would benefit from more support involving controlled instructional research (see also Grabe & Stoller, 2020; Meyer & Wijekumar, 2017).

Table 14.2 Discourse awareness activities

1. Preview texts and highlight keywords that signal text structure.
2. Highlight a paragraph (or multiple paragraphs) and decide its function in the text.
3. Make predictions about the information in the next section of a text based on information up to that point in the text.
4. Use semantic mapping to identify conceptual and thematic linkages.
5. Fill in an outline of the text and determine the main units of the text. Decide what makes each section identifiable as a separate unit.
6. Locate effective paragraph breaks in a single continuous text.
7. Compose headings for subsections of text.
8. Use the best connective to link two sentences in a text.
9. Unscramble sentences in a paragraph and unscramble paragraphs in a text.
10. Determine which sentence does not belong in a paragraph or short text.
11. Write summaries by drawing on completed Discourse Based Graphic Organizers of texts. These can then be used for more complex postreading tasks and projects.
12. Reread a text, identify likely main idea sentences, and discuss why these sentences are good candidates for presenting main ideas.
13. Examine a subsection of a text, identify the discourse pattern, and describe how it is organized. Identify specific words that signal this pattern of organization.
14. Choose the main idea that incorporates information from more than one part of the text. Ask students to identify multiple parts of the text that contribute to the main idea or top-level structure in one way or another (a definition, a description, an example, a problem, etc.)

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Finally, discourse-based graphic organizer instruction is a powerful way to raise discourse structure awareness, but it involves somewhat more specific demands on teachers because most textbooks and class readings do not include graphic organizers that reflect the discourse structure of a text. In Appendix A, we include a set of nine simple graphic organizer options to match up with passages being used in class. It is not necessary to create graphic organizers that capture the top-level structure of an entire text, particularly for longer and more complex texts. In these cases, it is not always clear what the top-level structure is because multiple structures appear in the text. Rather, the goal is to identify a section (or a few sections) of a text and highlight the structure for that section, have students recognize the type of structure in the section, fill in gaps in a graphic organizer, and note a few keywords that might act as overt signals of the text structure. As teachers become more comfortable with identifying text structure and using graphic organizers, more of the text can be exploited with graphic organizers (see Jiang & Grabe, 2009, for additional recommendations).

With text structure instruction, much like other types of knowledge and skills to be learned, some key principles promote successful learning. First and foremost, this type of instruction must be consistent and continual. Second, teachers must use the texts that students are reading for other purposes so that students see the pervasiveness of discourse structure; students should not be provided with "special" texts just to show discourse structure except as an initial introduction. Students can use the filled-in graphic organizer to transition to writing activities. Finally, students should discuss, with teachers and classmates, how texts are structured and how the discourse structure is signaled.

Teachers themselves likely will need some support and practice in recognizing discourse structuring in texts, and they may need to spend time (and work collaboratively) to identify these levels of discourse structure as part of instructional planning. It is unlikely that they were taught in teacher-training programs how to do this, and they will need some practice and collaboration among themselves to become comfortable in seeing text structuring. One useful resource for teachers was written by Mosenthal and Kirsch (1989–1993). They produced an extraordinary series of forty brief articles outlining the incremental complexity of text structures under the heading of reading documents. Students, for their part, need to learn that discourse structuring is not arbitrary; writers' goals and expectations determine basic discourse organization, and the specific information that a writer presents has a major impact on how a text is organized. A teacher with some knowledge of text organization and discourse signaling markers can help students build their knowledge of text structure and discourse organization.

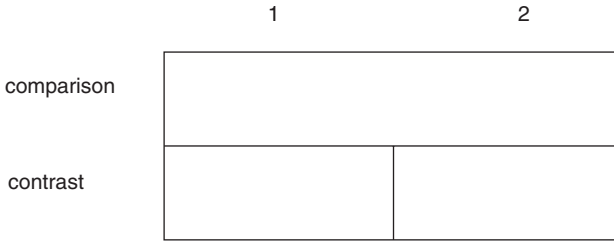
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Appendix A: Examples of basic GO forms for commonly used text structures

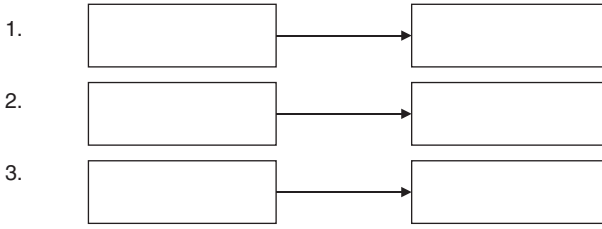
1) Definitions



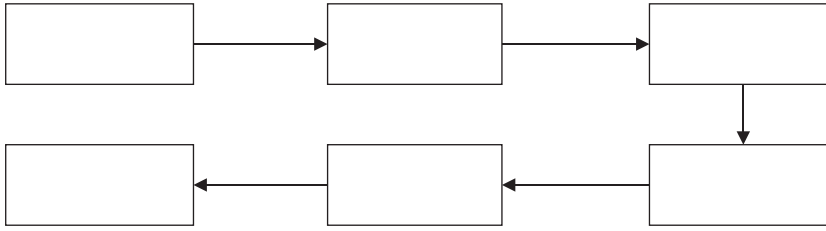
2) Comparison-contrast



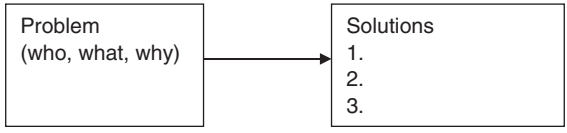
3) Cause–effect (in any number as is needed)



4) Process–sequence

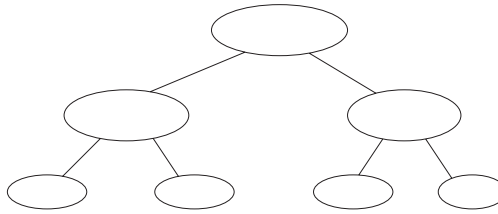


5) Problem–solution (in any number as is needed)

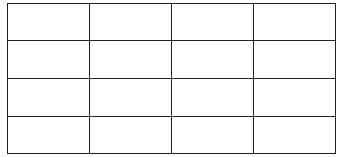


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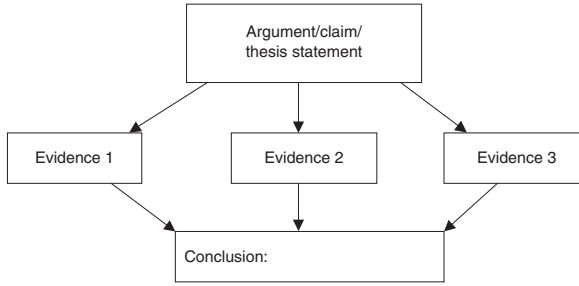
6) Description/classification



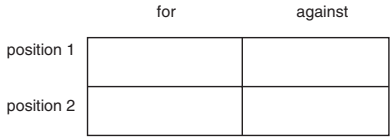
or



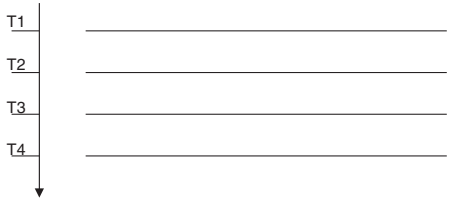
7) Argument



8) For–against (cf. comparison–contrast)



9) Timeline



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Appendix B DSGO that Reflects the Complexity of an Instructional Text (from Grabe & Stoller, 2020, pp. 192–193)

Appendix B-1 Student Worksheet: Discourse Structure Graphic Organizer [created for "Looking into the Eyes of a Robot," Savage (2017); see Appendix B-2 for answer key]

1. Reread paragraph 2. Define "uncanny valley."

Uncanny valley	is	a person's negative _____ to _____	that	look like _____.

2. Reread paragraphs 4 and 5. Identify the causes of "uncanny valley" feelings and their effects.

Cause		Effect
Robots look human-like. They a. have hair and _____ b. express emotions, such as _____, anger, and _____ c. can speak d. can answer _____ e. have _____conversations	⇨	People feel _____ around human-like robots. a. uncomfortable b. _____ c. disgust d. worried e. _____

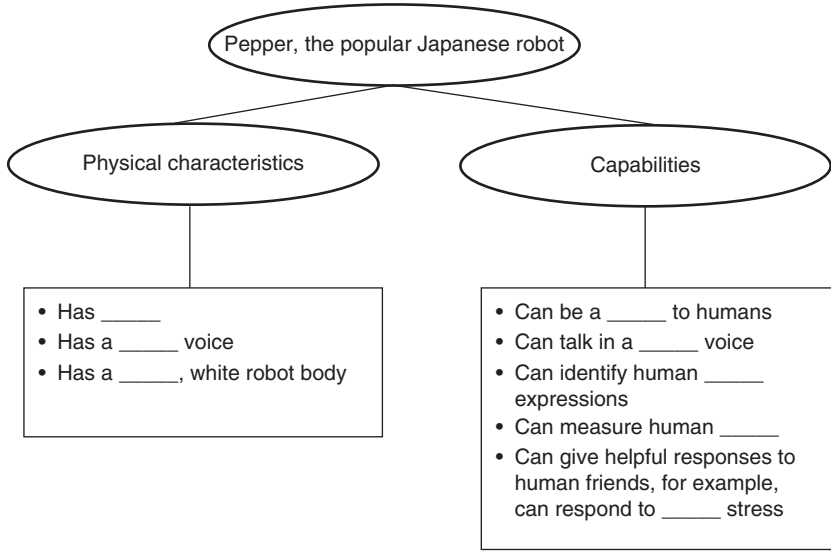
Cause		Effect
Robots look human-like, but not _____ human.	⇨	To people, these robots appear _____. a. creepy b. _____ c. unpredictable d. _____ e. dead

3. Reread paragraph 6 for the basic solution to the problem with human-like robots.

Problem		Solution
People react negatively to human-like robots.	⇨	Robots have to_____ and _____ like machines.

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4. Reread paragraph 9. Describe Pepper, the popular Japanese robot.



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Appendix B-2 Answer key to DSGO in Appendix B-1

1. Reread paragraph 2. Define "uncanny valley."

Uncanny valley	is	a person's negative **response** to **machines**	that	look like **humans**.

2. Reread paragraphs 4 and 5. Identify the causes of "uncanny valley" feelings and their effects.

Cause		Effect
Robots look human-like. They a. have hair and **skin** b. express emotions, such as **happiness**, anger, and **sadness** c. can speak d. can answer **questions** e. have **simple** conversations	⇨	People feel _____ around human-like robots. a. uncomfortable b. **afraid** c. disgust d. worried e. **nervous**

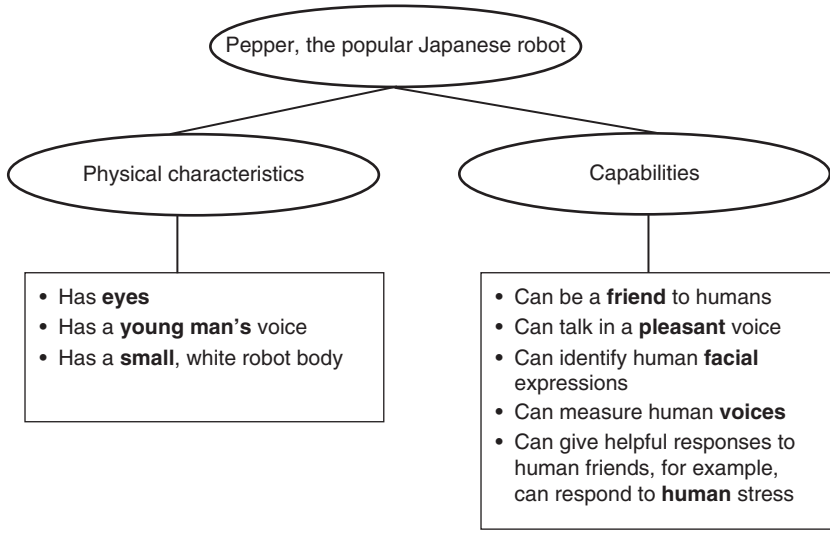
Cause		Effect
Robots look human-like, but not **completely** human.	⇨	To people, these robots appear a. creepy b. **sick** c. unpredictable d. **dangerous** e. dead

3. Reread paragraph 6 for the basic solution to the problem with human-like robots.

Problem		Solution
People react negatively to human-like robots.	⇨	Robots have to **look** and **act** like machines.

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4. Reread paragraph 9. Describe Pepper, the popular Japanese robot.



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PART IV
EXPANDING READING COMPREHENSION SKILLS

In Part III, Chapters 11 to 14 described the core skills that comprise reading comprehension. These include vocabulary knowledge, syntactic knowledge, main idea comprehension, reading strategies, and discourse knowledge. In Part IV, Chapters 15 to 18 extend the discussion of core skills and knowledge resources by introducing themes for expanding comprehension abilities: the integration of reading–writing skills, the challenges of digital literacy, the development of reading fluency skills, and the importance of engaging in extensive reading.

Chapter 15 explores the many ways that reading and writing abilities intersect, especially within academic literacy-skills development. The chapter addresses several fundamental questions about the relationship between reading and writing. It then reviews a number of research studies that support specific ways by which writing can support reading development.

Chapter 16 examines the impact of digital literacy environments on reading development. It begins by summarizing general research that compares reading print text and reading digital text. It then examines the impact of online digital reading (as opposed to fixed-text digital reading) on reading comprehension, both in first-language (L1) and second-language (L2) contexts. Given the widespread uses of online reading, the chapter provides recommendations to support online reading instruction.

Chapter 17 addresses reading fluency, a topic that is gaining increasing attention as a key aspect of reading abilities. In L1 reading contexts, oral passage reading fluency has demonstrated a strong relationship with reading comprehension. In experimental training research, fluency is also a strong predictor of comprehension abilities. These two findings have led to a much greater awareness of the role of fluency as a type of component skill. In L2 contexts, relatively little fluency research has been carried out, and fluency is not yet a major element of reading instruction.

Chapter 18 extends the concept of fluency, and reinforces the core skills introduced in Part III, through a commitment to extensive

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reading/amount of reading. Extensive reading is a topic that has been widely discussed in both L1 and L2 contexts. In fact, there are few teachers, administrators, or researchers who would not agree that we learn to read by reading. However, instructional difficulties center on how much counts as enough reading, and how much students should be encouraged to read on their own, among other issues. The chapter reviews the evidence, in both L1 and L2 contexts, supporting the benefits of extensive reading on comprehension development. It also introduces criteria for implementing a successful extensive reading program.

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15 *Reading to Learn and Reading–Writing Relationships*

> Having students … summarizing what they read, writing answers to questions that require extended analysis or evaluation … or synthesizing multiple texts to write reports and essays that transform the information from those multiple sources into original compositions—all exert powerful impacts on student reading and writing achievement. (Shanahan, 2019, p. 328)

One might ask why a book focused on reading would include a chapter on reading–writing integration. By the end of this chapter, we hope that we will have made a convincing argument that such a chapter belongs in both a reading research book and a writing research book. In fact, extensive recent research has explored the relationship between reading and writing. The focus of this research has been on how writing can support more advanced reading comprehension, and how engaging students in complex content-based texts and tasks will better prepare students to become both more proficient academic readers and more effective writers. This instructional trend to develop more proficient academic readers and writers is true for both first-language (L1) and second-language (L2) students, and in both secondary and postsecondary contexts.

The recent emphasis in US secondary school education on reading to learn and reading to use content information for challenging literacy tasks has become central to new definitions of advanced reading comprehension in the United States (Britt et al., 2018; Millis et al., 2019; Palincsar et al., 2020). This emphasis is now a prominent goal for academic reading development from 6th to 12th grade. It also reflects a response to poor performance outcomes of US students on the National Assessment of Educational Progress, a national assessment exercise funded by the US government to assess students' reading, writing, and math abilities in 4th, 8th, and 12th grades(Johns, 2016; see also Chapter 13).

The focus on reading to learn and reading for synthesis and critical analysis tasks also addresses more challenging reading–writing tasks

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as two closely related academic literacy abilities. This chapter reviews specific research on aspects of reading–writing relationships in both L1 and L2 contexts. In L1 contexts, these issues have been associated with "deep comprehension" (Millis et al., 2019). In L2 contexts these issues are central to English for Academic Purposes (EAP) research and instruction (Cumming et al., 2016; Hirvela, 2016; Hyland & Shaw, 2016).

15.1 Reading, Writing, and Content Relationships

> That reading and writing are not just reverse images of each other is one reason why students must receive instruction in both reading and writing. (Shanahan, 2016, p. 198)

Reading and writing are not the same basic cognitive process carried out in opposite directions: they are not mirror images of the same process. Most obviously, as reading becomes more fluent and automatic, the language and knowledge processing central to making meaning become largely implicit and seemingly effortless. As writing becomes more skilled, and to an extent more fluent, it requires the writer to become more self-conscious, the processing more explicit, and the tasks more metalinguistic in terms of awareness of goals and outcomes. Despite this divergence across long-term reading and writing skill development, the two tend to be moderately to highly correlated abilities, reflecting a number of shared underlying cognitive and linguistic resources and processes. Shanahan (2016), for example, in recent studies examining the relationships between reading and writing cites shared variance of 72–85 percent between word-level factors (e.g., word recognition and spelling skills in elementary grades), and up to 65 percent for text-level factors (see also Berninger et al., 2002).

In this section, the many important relationships among reading, writing, and content learning are examined. There is general consensus that reading and writing are closely related cognitive skills, and both of them are important for learning new content knowledge (Graham, 2020). These relationships can be expressed in a number of more specific questions (Table 15.1).

Recent research over the past decade, much of it by Steven Graham and colleagues, has explored many of these questions through large-scale research studies and meta-analyses. These studies provide strong evidence in response to all of the above questions. Overall, the meta-analyses carried out, and their positive outcomes, make strong arguments for the integration of reading and writing instruction. These studies also offer tremendous resources for researchers to explore.

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Table 15.1 Key issues for reading–writing–content relationships

1. Does reading improve writing abilities?
2. Does writing improve reading abilities?
3. Do reading and writing together develop both skills most effectively?
4. Does reading more improve content learning?
5. Does writing more improve content learning?
6. Does more content knowledge improve reading abilities?
7. Does more content knowledge improve writing abilities?
8. Do reading and writing together lead to better content knowledge learning?

15.1.1 Reading Improves Writing Abilities

In a recent meta-analysis by Graham, Liu, Bartlett et al. (2018), two questions were explored: First, does reading instruction improve writing production? The researchers reviewed fifty-four experiments, involving 5,018 students from pre-K to 12th grade, teaching students to read in order to improve writing performances. Studies were carried out in eleven different countries with 81 percent in the United States, Canada, and the United Kingdom. Sixty percent of the studies involved elementary grades (1–6). Effect sizes (Hedges *g*) were moderately large for phonological awareness instruction on spelling at $g = 0.69$ and similarly large for comprehension instruction on text production (e.g., writing quality) at $g = 0.66$.

Second, does increasing reading instruction improve writing production more? The researchers examined thirty-six experiments, involving 3,060 students, where providing more, rather than less, reading instruction increased writing performance to a significantly greater extent. Studies were carried out in eight different countries with 80 percent of the studies in the United States, Israel, and the Netherlands. Effect sizes were small to medium: $g = 0.35$ (all studies), $g = 0.44$ (studies that specifically assessed writing quality as outcomes).

In looking at moderator effects, effect sizes for quasi-experiments ($g = 0.99$) versus true experiments ($g = 0.46$) was significantly different. Effect sizes for secondary ($g = 0.57$) versus elementary levels ($g = 0.46$) was also significantly different. No other moderator effects were significant. The authors conclude with the following generalization: "Reading can and should be part of our instructional efforts to teach writing" (Graham, Liu, Bartlett et al., 2018, p. 274). In their conclusion, the authors are also clear in arguing that reading instruction *alone* is not the answer for improving writing; writing instruction also improves writing outcomes (Graham et al., 2012, 2015; Graham & Perin, 2007; Hirvela, 2016).

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15.1.2 Writing Improves Reading Abilities

In a meta-analysis, Graham and Hebert (2011) provide strong evidence that writing improves students' word recognition, reading fluency, and reading comprehension. They posed three questions: (1) Do specific writing tasks about reading material improve students' comprehension of that material? (sixty-six studies); (2) Does writing-skills instruction strengthen students' reading skills? (twenty-eight studies); (3) Does increasing the amount of writing also increase how well students comprehend a text? (nine studies). They examined various types of writing and writing instruction, for example, writing a summary, writing an extended response, writing short responses to questions, and writing notes. They were also interested in moderating influences of grade-level, subject area, student instructional training, and experimental study quality.

For question 1, significant effect sizes were found for all four types of writing activities examined: $g = 0.68$ for extended writing, 0.54 for summary writing (see also section below on L2 summary writing), 0.45 for note-taking, and 0.28 for answering questions. With respect to types of reading assessments used, the effect size was $g = 0.37$ for studies using norm-referenced tests of comprehension and $g = 0.50$ for researcher-designed measures. Both effect sizes were significant for the combined uses of reading and writing compared with control groups (almost always only reading instruction). There was no statistical significance contrasting the two types of reading assessment measures. The majority of studies involved middle school (34 percent) and secondary school (41 percent) students. Fifty-five percent of readings involved science and social studies texts, and 68 percent of the studies focused on expository prose tasks.

For question 2, significant effect sizes were found for writing instruction on reading comprehension ($g = 0.22$ for norm-referenced measures and $g = 0.27$ for researcher-designed measures). Significant effect sizes were also found for reading fluency ($g = 0.66$) and word recognition ($g = 0.62$) outcome measures. For question 3, increasing the amount of writing instruction/practice created a significant effect size of $g = 0.35$ on reading outcomes.

As the authors conclude, "The evidence from this meta-analysis shows that having students in grades 2–12 write about material read enhances their comprehension of it. This was true for students in general and students who were weaker readers or writers" (p. 733). As one key addendum to the role of writing to enhance reading, Graham and Santangelo (2014), carried out a meta-analysis to demonstrate that spelling support and instruction significantly enhanced students'

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abilities in word recognition and reading comprehension. This outcome was also reached in question 2, with the impact of spelling on word recognition.

15.1.3 Reading and Writing Together Develops Both Skills Most Effectively

One topic that has been a source of debate and discussion for decades is if reading and writing together, as integrated skills instruction, leads to greater improvement in both literacy skills rather than just reading-for-writing or writing-for-reading. Another way to state the issue is to ask if reading and writing have significantly stronger bidirectional support for literacy skills development than either one on the other one. Sections 15.1.1 and 15.1.2 suggest that reading and writing instruction should have a reciprocal positive influence on both literacy skills (Graham, 2020). Recently, Graham, Liu, Aitken et al. (2018) sought to address this issue more directly through a meta-analysis of programs that provide a balance of reading and writing instruction to enhance both reading and writing skills as compared to other types of instruction. Graham and colleagues addressed two questions: (1) Do balanced literacy approaches improve both reading and writing skills more effectively than just instruction of either skill on the other? (2) Is there a relationship between specific features of the studies and effect sizes for reading and writing?

Nine types of balanced reading and writing instruction were included. There were also multiple types of reading assessment measures and multiple types of writing assessment measures, requiring a fairly complex set of analyses. In all, forty-seven studies were included in the meta-analysis. The four most common types of balanced reading/writing programs included cooperative learning, writing to read, early instruction, and remedial instruction. Of the forty-seven integrated-instruction studies, twenty-eight included both reading and writing outcome measures. Ten studies included only reading outcome measures and nine others included only writing outcome measures. Seventeen studies involved pre-K to 1st grade, sixteen studies involved 2nd to 6th grades, and fourteen involved middle and high school students.

The average effect size for all programs that assessed *reading* outcomes was $g = 0.33$ and was significant compared to some alternative control instruction. Thirty three studies included norm-referenced measures, and the effect size was $g = 0.28$. The effect size for researcher-designed assessment measures was 0.91. The average effect size for studies that assessed *writing* outcomes was $g = 0.37$. Twenty-five

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studies included norm-referenced measures of writing with an average effect size of 0.35. The average effect size of researcher-designed assessments was $g = 0.41$. In sum, all types of outcome measures involved significant effect sizes compared to control groups (which could involve primarily reading comprehension, word decoding, and/or vocabulary; or writing quality, writing mechanics, and/or writing output). Of the nine program types, all achieved significant differences in reading or writing compared to a control group. Five achieved significant differences in both reading and writing. The other four did not, for differing reasons. Interestingly, secondary-school students generated larger effect sizes than did elementary students, despite the more specialized subject-matter coursework that is part of secondary education.

The researchers conclude by stating that combined literacy skills can be taught together effectively, but more well-controlled research studies need to be conducted to develop further clarity as to which balanced programs may be more effective and which separate reading and writing programs may be as effective. Overall, this meta-analysis provides specific evidence for the theoretical concept of bidirectional support between reading and writing skills as two related literacy abilities. As Shanahan states, "Students who engage in writing about reading usually improve their reading and writing skills, as well as increasing their knowledge of the content" (Shanahan, 2019, p. 328).

15.1.4 Reading More Improves Content Learning

The relationship between reading exposure and the development of content knowledge has been well documented for more than three decades. Stanovich and Cunningham (1993) demonstrated this relationship by showing that people who read more, including students, knew more content information. In a later longitudinal study, Cunningham & Stanovich (1997) showed that early reading exposure predicted major differences in content knowledge ten years later. Amount of print exposure in 1st grade accounted for unique variance in 10th grade declarative knowledge (50 percent shared variance). Sparks et al. (2014) carried out a ten-year longitudinal replication of Cunningham & Stanovich (1997) and found the same results. First grade amount of print exposure accounted for 52 percent of the shared variance with general knowledge in 10th grade in a regression analysis even after 1st grade reading ability had been entered first as an autoregressor variable. There is little question that reading ability improves the learning of general knowledge (see also Cunningham and Stanovich, 1998; Stanovich, 2000).

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15.1.5 Writing Instruction Improves Content Learning

A recent meta-analysis by Graham et al. (2020) demonstrated that writing instruction centered on content knowledge significantly improved content learning across science, social studies, and mathematics. The researchers included fifty-six studies with students in 1st to 12th grade. Nineteen studies involved writing expository texts, eighteen studies involved journal writing, eight experiments involved creating/completing a graphical representation of key content, and seven experiments involved narrative writing. Overall, writing about content improved content learning ($g = 0.30$). Results were consistent across science, social studies, and math as well as across grade levels. The likely mechanisms that facilitate learning from writing includes greater engagement with the information in texts, the many connections with associated knowledge in long-term memory (LTM), decisions about what to select from texts, and the additional cognitive demands of transforming text language into the writer's own words (see also Galbraith & Baaijen, 2018; Graham & Hebert, 2011; Klein & Boscolo, 2016; Luo & Kiewra, 2019; Reynolds & Perin, 2009).

Multiple other studies have argued that multitext synthesis writing, in particular, provides important avenues for learning from writing. van Ockenburg et al. (2019) carried out a meta-analysis of sixteen synthesis-writing studies and identified six studies with large positive effect sizes above $g = 0.80$. They then reviewed these six studies to highlight writing-from-text activities that supported the framework of selecting, organizing, and connecting information for synthesis writing and learning text information (Spivey, 1997). Key activities included in the six studies evaluated source reliability, use of concept maps and graphic organizers to organize information, answering questions to identify main ideas, and answering questions on authors and titles of texts read. (See also Luo and Kiewra, 2019, for experiments with the Select, Organize, Associate, and Regulate [SOAR] learning system that closely reflects core processes of synthesis writing [cf. Spivey, 1997] and that also led to better learning outcomes.)

15.1.6 More Content Knowledge Improves Both Reading and Writing Abilities

Reading comprehension begins with background knowledge associations among concepts in LTM that are relevant to the topic of the text; these knowledge associations enable inferencing, comprehension monitoring, and integration of new information in the developing *text representation* and *situation model* during the reading process

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(Beker et al., 2017; Hirsch, Jr., 2018; van den Broek et al., 2016). Similarly, Perfetti's lexical quality hypothesis and word-to-text integration process demonstrate that more background knowledge generates better word learning and text comprehension. In similar ways, the concept of passive resonance to support a reader's text representation (O'Brien & Cook, 2015) relies on a highly networked set of associations to build fluent comprehension processing (see also Elleman, 2017; Kendeou et al., 2016). A related argument from latent semantic analysis research (Landauer & Dumais, 1997) demonstrates how greater content knowledge leads to better reading comprehension (see also Brantmeier et al., 2014, for a similar L2 perspective).

Greater background knowledge obviously improves writing production based on studies of disciplinary experts versus nonexperts (Ericsson et al., 2018; Ericsson & Pool, 2016). Expert historians draw on their extensive background knowledge to shape their reading and writing of texts in ways quite different from nonexperts (Shanahan & Shanahan, 2012). Similar disciplinary distinctions and patterns of reading and writing distinguish experts from nonexperts in chemistry, biology, physics, mathematics, and literary criticism (Goldman & George, 2019; Goldman et al., 2016; Shanahan et al., 2012). Cumming et al. (2016) highlight the argument that more knowledge, as a general concept, improves synthesis writing as one of their five conclusions from a systematic synthesis of sixty-nine studies of writing from sources covering both L1 and L2 writing. More generally, the cognitive psychology field of expertise is built upon the idea that greater knowledge (and practice) leads to more expert performance (Ericsson et al., 2018; see also Hirsch, Jr., 2018).

Overall, it is very likely that a bidirectional relationship also exists between content knowledge resources (LTM) and reading and writing development through combined reading and writing instruction. That is, the greater the network of background knowledge, the better the reading and writing outcomes; and the more reading and writing practice, the greater the network of related background knowledge. Shanahan (2016) also makes the argument that reading and writing together is effective in producing greater learning of content information as opposed to a one-directional dominance of reading or writing. As he states, "It is evident … that using reading and writing together can make students more effective learners in their content subjects and allows them to produce more effective research texts" (Shanahan, 2016, p. 202). However, there are at present no studies that directly address the idea that reading and writing together provide a better path to greater content learning (but the need for such studies is real).

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15.2 Specific Aspects of Writing That Support Reading Comprehension Development

> Teaching reading in a writing course may seem like an odd idea, if not an entirely unnecessary one. It may also be the case that L2 writing teachers feel ill-prepared to teach reading, especially in connection with writing. How many [writing teachers] have actually been taught to teach reading, let alone the two skills together? (Hirvela, 2016, p. 2)

In addition to large scale analyses of reading–writing relationships, a number of important research studies have examined how specific writing tasks support the development of reading comprehension. A number of these will be reviewed briefly here, with an emphasis on L2 EAP contexts (Hyland & Shaw, 2016). Specific skills that involve writing in support of reading comprehension include question answering, graphic organizer uses, note-taking, paraphrasing, summarization, and synthesis. Additional EAP (and L1) contexts, which involve more advanced reading-to-write tasks, include content-driven essay exams, term papers, theses, and dissertations, among other tasks. They all involve reading–writing relations and bidirectional literacy skills development (Grabe & Zhang, 2016; Hirvela, 2016). These core academic tasks become even more complex when we add digital texts, web page resources, and other media sources (see Chapter 16).

Learning to write from textual sources (e.g., integrating divergent sources of information, interpreting conceptually difficult information) represents a major challenge for students, especially when these tasks are not practiced sufficiently. Tasks that require reading/writing integration, such as summarizing, synthesizing, critically responding to text input, or writing a research synthesis paper, involve a lot of practice. Unfortunately, consistent opportunities to learn and connect reading and writing seldom happen in many L1 or L2 settings. L2 students in academic contexts, in particular, face a wide range of difficulties related to L2 reading/writing integration. Difficulties stem from (a) limited reading and writing proficiency, (b) challenges with reading long passages, (c) a lack of fluency in reading and writing, (d) limited L2 content background knowledge, and (e) limited L2 linguistic knowledge (vocabulary and grammar). Finally, L2 students also face challenges with L2 reading/writing tasks that require a large amount of inferencing (Ferris, 2009; Grabe & Zhang, 2013; Hirvela, 2016; Tardy, 2009).

In this section, we address two specific types of academic writing tasks that are foundational in academic learning contexts: Summarizing and

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synthesizing information across textual resources (Grabe & Zhang, 2013). These two reading/writing tasks are (a) common in university courses; (b) central to a number of other reading/writing tasks (e.g., critical commentary and argumentation, essay exams, research papers, theses and dissertations); and (c) sources of difficulty for many L2 students. These reading-based academic writing tasks also raise issues of direct copying, citation use, and plagiarism as serious problems for L2 students. Moreover these types of writing require students to understand and use text information accurately; that is, summary and synthesis writing are reading-responsible writing tasks.

15.2.1 Summarizing

Effective summarizing abilities turn out to be quite difficult for L2 learners as they develop their EAP skills. L2 students often do not have strong enough vocabulary knowledge to paraphrase effectively. Their sometimes limited comprehension of reading material in content courses creates a limitation on summary performance. Their more limited composing skills pose difficulties when producing summaries (e.g., extensive direct copying of sentences), and their more limited opportunities for practice with summarizing lead to less effective summaries. All of these issues have been shown to affect L2 students' summary writing performance (Baba, 2009; Keck, 2014).

Baba (2009) studied sixty-eight Japanese university students, and found that students' English summarizing abilities were related to their reading comprehension skills and also to their vocabulary knowledge. One of the consequences of limited vocabulary knowledge and comprehension skills, as well as limited practice in related writing tasks, is that EAP students at lower proficiency levels commonly copy much more than students at higher proficiency levels. Keck (2014) studied 227 summaries written by English L1 and L2 students at a US university. She found that there were differences between L1 and L2 students in copying and near copying, but that most L2 university students with adequate English proficiency levels did not engage in extensive copying from texts. Rather, a small percentage of L2 students copied extensively, skewing any simple L1/L2 comparison (see also Weigle & Parker, 2012). She also found that L1 and L2 students both focused their attention on the same key points from the text, so the problem with summarizing was more a case of linguistic limitations for a subset of L2 students.

The use of extensive copying does appear to be more prominent among L2 students with lower English literacy skills, particularly for L2 students who may not be adequately prepared for summary writing tasks (McDonough et al., 2014). These results suggest that

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students do the best they can with the skills and resources available to them rather than intentionally seeking to plagiarize from the text. Studies by Shi (2012) and Li and Casanave (2012) highlight the complexities that students encounter in learning to paraphrase and refer to textual information appropriately. It is not viable simply to accuse students of plagiarism when they misuse sources in their writing; rather, instructors need to (a) be consistent about what counts as appropriate versus unacceptable source text use, (b) convey their expectations explicitly to students, and (c) devote more time to teaching students to quote, summarize, and paraphrase source information (Li & Casanave, 2012; Pecorari & Shaw, 2012).

Another issue associated with copying while summarizing is whether or not direct copying of the appropriate main-idea sentences is an acceptable practice in students' L1 cultures. For example, Shi (2006) interviewed forty-six English as a second language (ESL) university students in a Canadian context and found that the students from China, Japan, and Korea did not practice citation and quotation skills in their own countries. While the injunction against plagiarism may have been understood by these students, it may not have been reinforced by their L1 literacy practices. At the same time, copying sentences during a summary activity with a text known to both the teacher and the student is not the same act as intentionally handing in someone else's work as one's own. However, it is also clear that EAP students, as they become more skilled, engage in much less direct copying of longer sequences of words from source texts.

15.2.2 Synthesizing Information

A more demanding reading/writing task that is commonly assigned in academic settings is one that combines information from two or more texts (Hirvela, 2016). This sort of task can involve, for example, a set of text-based solutions to address a set of text-based problems, or texts that identify multiple aspects of an issue, or texts that require the writer to form an argument. The development of writing skills that allow students to use multiple textual resources to synthesize and interpret text information is a quintessential academic task. It requires students to identify the main ideas and the supporting information from texts. It also requires the ability to assemble these ideas effectively and choose which ideas to highlight around a central writing goal. It is certainly a difficult writing task to master, even for many L1 students, and it requires extensive practice (Shanahan, 2019).

Empirical evidence for the development of synthesis writing skills among EAP students is quite limited (and deserves much more research

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attention). Plakans (2009, 2010), in a series of studies, examined the synthesis writing of twelve ESL students in US university contexts. In her 2009 study, she found that better students used more "mining" and global strategies than less skilled students. That is, students who wrote more effectively looked for additional specific information that would be appropriate to include in their writing (a mining strategy); they also looked back over their writing and considered their goals for writing (global strategies). Plakans (2010) analyzed the same students' task representation of independent writing (personal opinion writing) and synthesis writing. She found that many students did not interpret the two types of tasks differently, thus she emphasized that synthesis writing be explicitly taught to EAP students (see also Plakans et al., 2018).

Research reviews by Cumming et al. (2016) and van Ockenburg et al. (2019) identify a fairly large number of empirical studies examining different aspects of writing from sources. Cumming et al., reviewing sixty-nine studies, confirmed the challenges that students face in writing from sources, but also pointed out that students do develop abilities to integrate information from multiple sources as they develop their writing skills and receive instructional support. They also note that differences between L1 and L2 students can be traced to varying task conditions and the types of texts read and used as sources. van Ockenburg et al. identified sixteen experimental intervention studies and developed a set of generalizations for instructional design for teaching writing from sources. Overall, relatively few experimental intervention (training) studies, especially with L2 students, involved experimental and control groups.

15.3 Intervention Studies on Writing from Sources

> Much work remains … about the role that writing can play in promoting integration and analysis of key textual ideas. (Palincsar et al., 2020, p. 8)

Two studies with L1 students sought to demonstrate specific strategy-instruction approaches to writing from sources. Martínez et al. (2015) assessed an instructional design that was labeled Strategies for Writing Syntheses to Learn (SWSL). Sixty-two 6th grade students formed experimental and control groups. Both groups were taught the same content during twelve one-hour sessions over four weeks using history texts from the school curriculum. The SWSL students were explicitly taught strategies for writing three synthesis tasks (in four sessions each) while the control group followed the standard curriculum but also completed the same synthesis assignment at the end

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of each four-session unit on the same history topics as the experimental group. The strategy training for the SWSL students was a variation on Spivey's (1997) selecting, organizing, and connecting framework augmented by cooperative learning techniques. Students were given a pretraining prior-knowledge test, a reading comprehension test, and a synthesis writing task using two source texts. Post-tests covered content learning from the three synthesis tasks completed during the treatment and a quality assessment of a fifth synthesis assignment from two additional texts. Experimental students significantly outperformed control students on learning of content, writing quality based on the final synthesis task, and better text processing of inferential questions.

Luo and Kiewra (2019) carried out a brief experimental intervention study with university students using a Selecting, Organizing, Connecting, Regulating (SOAR) strategy framework. The study was completed in two sessions one week apart. The SOAR training study, involving fifty-eight experimental and fifty-eight control students, only lasted twenty-seven minutes, and primarily provided resource materials to support comparative writing from sources. The students wrote a preintervention synthesis assignment on a psychology topic and a post-treatment synthesis on a second psychology topic. All texts were very brief and the two topics were counterbalanced across pre- and post-treatment tasks. SOAR-trained student wrote significantly better synthesis essays.

In L2 settings, two intervention studies with experimental and control groups are reported here. Marzec-Stawiarska (2016) investigated the impact of summary writing on the development of students' reading development. Eighty first-year university students participated in a six-month study. All students were tested using the First Certificate of English reading section as pre- and post-test measures of reading comprehension abilities. Both experimental and control groups followed the same syllabus and read the same texts, except that the experimental students were trained specifically in summary writing and wrote ten text summaries during the six months. The control group was assigned other longer writing assignments (two reviews and two narrative writing assignments, approximately the same amount of total writing over the six months). At the end of the treatment, the experimental group performed significantly better on the post-test measure of reading comprehension. The actual quality of written summaries did not correlate strongly with the reading comprehension gains.

The only L2 experimental intervention study involving synthesis writing from sources, with students randomly assigned to experimental and control groups, was carried out by Zhang (2013). The goal

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was to determine if direct explicit instruction in synthesis writing, combined with extensive practice in the task over the course of a fifteen-week semester, would lead to significant differences in comparison with a control group that followed a standard textbook curriculum for reading and writing instruction. Zhang taught both an experimental and a matched control ESL reading and writing class. The experimental class emphasized explicit instruction in synthesis-paper writing, provided examples and models of synthesis writing, and engaged students in five cycles of the synthesis-paper process (while still following most of the reading and writing textbook curriculum). The control group followed the reading and writing curriculum defined by the course textbook and engaged in equivalent amounts of reading and writing.

Both classes completed a series of pre- and post-course measures of their reading and writing abilities. At the end of the training, the experimental group significantly outperformed the control group on a synthesis writing task as well as measures of organization in writing and better use of text information from reading resource materials with a large effect size (d = 1.41). This study demonstrated that L2 students can (a) be given explicit instruction in how to synthesize information from two different texts effectively, (b) engage in sufficiently intense practice to significantly improve their synthesis writing skills, and (c) become more aware of the task demands and the writing processes involved in synthesis writing. Additional training studies on reading/writing integration need to be carried out to strengthen the argument and implications for more effective reading/writing integration.

15.4 Summing Up the Research on Reading-Writing Relations

A number of key themes have emerged over the past thirty-five years that deserve mention:

1. Reading and writing have bidirectional developmental paths. They are two aspects of literacy abilities that can be mutually supportive.
2. Reading is a common source of input for writing tasks in academic settings, and university writing tasks across disciplines almost overwhelmingly require the use of textual input of some type (including the use of digital texts).
3. Direct instruction in multiple reading-writing skills significantly improves abilities to work from texts and improve associated academic writing tasks.

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4. Understanding the organizational structure in reading texts will not only improve students' reading comprehension but also writing production (see Chapter 14).
5. The approach to understanding integrated reading-writing tasks by Spivey (1997) has held up well as a formulation of effective use of text sources for writing tasks in L1 and L2 contexts. That is to say, discourse synthesis skills should be guided by selecting, organizing, and connecting relevant input (as a minimum) for a given writing task.

15.5 Implications for Instruction

Based on the studies reviewed, students with better reading abilities performed better on reading/writing tasks. Implications from these studies suggest that teachers and curricula need to focus explicit attention on reading comprehension activities with the texts that students must use in reading/writing tasks. In addition, students need many practice opportunities to become more comfortable with the expectations of EAP reading/writing tasks. Furthermore, multiple studies have pointed out the serious limitations that L2 students experience with academic vocabulary knowledge. For more advanced reading/writing tasks, students need a large academic vocabulary to comprehend academic texts and write skillfully.

Studies have also highlighted the importance of student awareness of tasks and corresponding expectations. Students need to become aware of the skills needed for reading/writing tasks and how to carry out writing processes effectively. Teachers can raise students' awareness by integrating models of writing-from-text-resources into their instruction, reinforcing the importance of being responsible for text-source information rather than relying on personal opinions (Tardy, 2009). Teachers can also raise awareness as they guide students in developing effective paraphrasing skills. In addition, teachers must show students explicitly how to "interrogate" reading/writing tasks (understanding what specific tasks require by seeing examples and discussing them with a teacher; Johns, 1997) so that students can make use of the skill in other classes. A related goal is the need for students to take part in discussions about text information as a way to use information from texts more effectively. Efforts should also be made to explicitly teach paraphrasing skills to help L2 students use text information more appropriately.

Perhaps most importantly, students need the time and practice to develop their reading-writing integration skills. L2 students are

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simply not going to have the same levels of exposure to reading and writing tasks that L1 students have. The best general approach to instruction is to begin instruction on reading-writing tasks much earlier, much more explicitly, and with much more iterative practice. This recommendation also means that reading-writing tasks need to begin from very simple tasks and brief texts. Such thinking requires some creativity on the parts of teachers, curriculum developers, and materials writers.

To help L2 EAP students succeed in their acquisition of academic literacy (reading/writing together), we suggest a set of reading-support activities, reading-writing support activities, and awareness-raising activities for teachers (Table 15.2)

Table 15.2 *Instructional activities to support reading–writing relationships*

1. Use a reading guide to facilitate students' reading comprehension with more difficult texts. A reading guide might ask students to (a) make a brief list of key ideas, (b) describe the perspective or bias of the author, (c) provide an interpretation that requires "between the lines" thinking, (d) offer some identification of the intended audience, and/or (e) propose a controversial issue that might also be a lead-in to class discussion.
2. Provide opportunities for students to focus explicit attention on text organization and the rhetorical patterns used to present the major information.
3. Focus attention on key thematic vocabulary and unusual words or metaphoric uses of words in the form of an activity, for example, making glosses for key terms or underlining metaphoric forms in the text, helping students locate and identify key words, asking students to circle five to eight words they don't understand, and/or pre-teaching thematic words.
4. Ask students to generate a list of key ideas from a reading text and then write summaries to support their reading-writing together (see also Shanahan, 2019).
5. Analyze model writing assignments explicitly, especially in relation to teacher/task expectations.
6. Model and scaffold integrated reading–writing tasks leading to the evaluation, selection, integration, and citation of information from (multiple) texts.
7. Provide many opportunities for students to practice reading/writing tasks (even if short tasks).
8. Use peer-feedback guidelines that have explicit directions for what to attend to and how to attend (see Grabe & Kaplan, 1996, pp. 382–392, for various format options).

Writing teachers might justifiably say that teaching reading and writing together creates complexities in their classes. One of the most

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useful ways to address this problem is for groups of teachers to explore ways to integrate reading/writing tasks with larger instructional goals. Teacher groups can begin with a set of instructional issues and prioritize which ones are most important. They can experiment in small ways with teaching practices and report back to their group on difficulties and successes. Discussions among teachers, over time, are likely to lead to useful techniques and tasks that will make a difference for L2 students who are struggling with both reading and writing.

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16 *Reading in Digital Contexts*

Using online information to read, solve problems, and learn is now such an integral part of our lives … that it must become the central focus of the thoughtful preparation of the next generation. (Kiili et al., 2018, p. 304)

Don't throw away your printed books. (Delgado et al., 2018, p. 23)

Digital reading has now become a major form of information communication worldwide. It is a form of literacy that deserves explicit attention in all instructional settings. Large numbers of students globally, both first-language (L1) and second-language (L2), enter secondary and postsecondary schools reasonably skilled in using social media platforms, messaging on their smartphones, watching YouTube videos, and more. Students, at almost all ages, are learning to read and use digital media for a wide range of purposes.

However, discussions around digital reading, specifically in educational contexts, generate many complexities that need to be unpacked. This chapter uses a number of terms that identify important general distinctions. **Digital reading** (and **digital texts**) are cover terms for all forms of electronic texts and reading activities, including texts that are essentially equivalent to print texts, but in a digital medium (e.g., e-books, digital journal articles, and emails). These texts are essentially frozen, much as print texts are frozen, and are referred to as **fixed texts**. Digital texts also include social media texts on the Internet (such as on Facebook and Twitter, and apps for texting and related interactive social media).

The Internet is also an open online source of information accessed through browsers such as Google Chrome and Firefox. These browsers make available a wide range of information that can be read for social purposes, for news, or for academic learning. Almost all academic digital information read via browsers is in the form of hyperlinked texts, including commercial advertisements. These sources of information are dynamic, with multiple texts to choose from. Reading

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materials selected via browsers are referred to as **online digital texts,** and associated reading processes are referred to as **online digital reading,** or simply **online texts** and **online reading.** This latter set of terms refers to the many text options on the Internet (and the many hyperlinks that are embedded within each text and on the screen).

16.1 The Growth of Digital Literacy

DataReportal (2021) notes that 4.66 billion people worldwide are Internet users (60 percent of the world's population) and 4.2 billion worldwide (56 percent) are social media users (90 percent of all Internet users). In its US report, authors state that 90 percent of US Internet users are on social media platforms. In the United States, the average daily use of media in four categories (Internet, television, radio, and games on game consoles, with some overlapping uses across the categories) is over fourteen hours per day. Much of this media time is Internet use (seven hours, eleven minutes per day). The US population, overall, is media saturated during waking hours (retrieved April 6, 2020, from https://datareportal.com/reports/digital-2021-united-states-of-america).

As we move further into the twenty-first century, the role of digital literacy in the lives of both L1 and L2 readers will take on greater importance. Students are becoming increasingly more adept at using digital devices. They use their devices (e.g., mobile phones, e-readers, tablets, computers) for a variety of purposes, but mainly for online social networking (e.g., texting, emailing, chatting, blogging), entertainment (e.g., watching movies, listening to music, gaming), accessing QR codes, and engaging in informal English study (e.g., with Google Translate, online dictionaries, language learning apps, YouTube videos). Some students use their devices to stay informed about the news, consulting online newspapers, or listening to news broadcasts. Others read for pleasure on their devices (e.g., novels, graphic novels). In fact, most students seem to spend much more time on their electronic devices than with print texts (Kervin et al., 2018).

However, most of these forms of digital literacy do not support the development of advanced literacy skills needed in academic and professional settings, particularly for reading-to-learn and reading-to-synthesize purposes. Although data on readers' uses of digital media for academic purposes are difficult to find and compile, what is well known is that using online sources for academic purposes can introduce challenges for students over and above reading tasks in print format (Alexander, 2020; Baron, 2021; Clinton, 2019; Delgado et al., 2018).

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16.2 Print and Digital Reading in Academic Contexts

The two quotes at the beginning of this chapter highlight the many discontinuities that arise when print reading and online digital reading are discussed. To be sure, there are also many continuities, but a large number of recent publications emphasize differences between print reading and online digital reading (see Cho & Afflerbach, 2017; Coiro, 2015, 2021; Kiili et al., 2018; Leu et al., 2015). What is particularly striking about this discontinuity is the somewhat radical claim that online digital reading is the future of reading theory and practice (without sufficient persuasive research to support this claim). Other distinctions raised between print and digital texts generate considerable confusion and can also inhibit useful controlled research on reading comprehension and reading-to-learn in varying print and digital contexts. Given the challenges of reviewing advances in digital literacy, we have four perhaps overly ambitious goals for this chapter.

First, we identify distinctions among types of digital reading and complexities that arise when readers move from print to digital reading. To the extent that these distinctions are not always specified in research studies, there is much room for misinterpretation. Second, we review select recent studies and meta-analyses to identify strengths and weaknesses of print and digital literacy when they are being directly compared. Third, we consider the challenges of advanced online reading. Fourth, we respond to these challenges by exploring implications for instruction.

16.3 Identifying Categories and Variables for Digital Reading Research

We begin with a categorization of types of digital reading needed to support comparisons with print reading. Drawing on Baron (2021), Baron et al. (2017), Clinton (2019), Coiro (2021), Kiili et al. (2018), Leu et al. (2015), Rouet and Britt (2014), and Singer and Alexander (2017a) as foundations, we make five major distinctions between print and digital reading, and among types of digital reading (Table 16.1).

These five distinctions are not often identified in many digital-reading studies, perspective-taking articles, or digital applications as ways to subcategorize digital reading. It should, however, be obvious that each distinction operates as alternative conditions and likely generates different outcomes. Until many studies of digital reading are appropriately categorized, the value of such research will be limited (see Baron, 2021; Clinton, 2019; Delgado et al., 2018; Singer & Alexander, 2017a). Certainly, the five distinctions, at a minimum, are needed to interpret distinct reading outcomes in comprehension and learning.

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Table 16.1 Five distinct digital reading contexts

1. Digitally reading single fixed texts versus reading the same in print.
2. Digitally reading for academic purposes versus reading social media for nonacademic purposes.
3. Digitally reading single texts versus digitally reading multiple texts for a given task (e.g., reading-to-learn, reading to take a position).
4. Digitally reading with a fixed text (e.g., an e-book, PDF, or e-magazine) versus digitally reading an online text.
5. Digitally reading multiple texts provided for a task versus readers locating their own multiple sources for a given reading-to-learn task.

The print and digital differences generate variables that *need to be considered* alongside many other variables noted as critical for understanding reading comprehension and more advanced purposes for reading in academic settings. Cross-secting the print-digital distinctions and the within-digital distinctions (items 2–5 in Table 16.1) are the major dimensions introduced by the Rand Reading Study Group (RRSG) and Snow (2002). According to RRSG and Snow, research on reading comprehension and reading-to-learn (broadly viewed) must address four dimensions: reader abilities, text types, tasks and purposes for reading, and reading contexts (see also Coiro, 2021 for one alternative interpretation of these four dimensions). Digital reading, not so prominent in 2002, was not then identified as a fifth major dimension of reading abilities. A large set of regularly examined variables emerge out of the RRSG framework: age of the learner (elementary, secondary, postsecondary), L1 versus L2 learner, assessment practices, length of texts, types/genres of texts, types of tasks, single text versus multiple text reading tasks, degree of distractibility, motivation and attitudes, cost, access, and others (Baron, 2021).

Other cross-secting variables are also not commonly measured or explored in controlled data collection in relation to types of digital reading or digital versus print reading (cf. Coiro, 2011, 2021): component linguistic skills and resources (e.g., the Reading Systems Framework); knowledge resources (background knowledge, lexical knowledge, working memory); prior task experiences; and sociocultural factors (social and economic status [SES], family factors, community factors). The emerging picture, from a research perspective, is that of a set of variables that can limit controllability for validity purposes.

So many variables, in multiple combinations, can be difficult to control and can seem overwhelming. At the same time, this type of complexity has been addressed in reading comprehension research

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more generally by researchers who have contributed to incremental progress over extended periods of time. Just considering print text reading, great progress has been made in understanding combinations of many component skills and processing variables, age variables, text and task variables, and contextual variables (Chapters 1 to 15). These advances did not emerge suddenly from a few outstanding studies. Instead, accumulating results across thousands of studies, across decades, have led to converging findings as the best evidence to date. And a "best-evidence perspective" is often powerful enough to improve instruction, learning, and assessment practices.

It is also important to recognize that qualitative research, with descriptive reporting of how an individual or group of individuals works (or learns to work) with digital texts, provides insights, discoveries, and challenges that can be incorporated into future applications of digital media and future research studies. At the same time, findings from qualitative studies need to be combined with more objective measures of student abilities and student reading outcomes to identify and validate the factors that have the greatest impact on reading abilities. Similarly, the collection of self-report data (surveys, questionnaires, observations, and interviews) needs to be validated at some point with controlled quantitative data that meet reliability and validity standards and that identify the most important variables driving reading outcomes.

The research on digital literacy over the past thirty years has provided a record, not unlike many other educational fields at similar relatively early stages of inquiry. Much of the earliest research using digital formats focused on what could be used in instructional settings and the viability of these innovations for student learning. This research typically involved texts or reading-support activities onscreen with student case studies and fairly simple outcomes analyses. The advent and spread of the Internet, new types of computers and mobile devices, and the availability of online apps, led to expectations that these innovations would transform instructional learning (including reading-to-learn, to synthesize, to analyze critically, and to create new knowledge) (Coiro, 2011, 2021; Kervin et al., 2018; Leu et al., 2015; see also Chapter 1). For the most part, we are now a bit wiser about the potential and the drawbacks of digital literacy environments.

16.4 Assessing Digital Literacy and the Limits to Reading Online

One of the stronger arguments for a growing emphasis on learning to read using online environments (with multiple self-selected texts) is that search, selection, and synthesis skills will become increasingly

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more critical for effective reading comprehension and application purposes. This view is supported by recent efforts to incorporate online reading tasks in international assessments (e.g., Programme for International Student Assessment [PISA]; OECD, 2011, 2019) and the US National Assessment of Educational Progress (NAEP, 2017, 2020) (see also Kervin et al., 2018). As Kervin et al. argue, "It is no longer sufficient to continue to position online reading as secondary, and tangential to offline reading. Using online information to read … must become the central focus for the thoughtful preparation of this generation" (p. 286). It is certainly the case that Internet access and digital reading will play increasingly important roles in reading development and advanced reading skills. But the expectation that all students will need critical evaluation and application skills in complex digital multitext environments may be creating performance goals that are beyond many secondary school students and beyond a number of postsecondary students.

In the International 2018 PISA reading evaluations (OECD, 2019), 77 percent of fifteen year olds (from seventy-nine countries) could perform at level 2 (out of a possible 6), showing reasonable digital mastery at understanding a single moderately long text. Performing at level 3 or higher would suggest that they have reasonable mastery on a multitext digital assessment task that required locating, understanding, evaluating, and reflecting on information from multiple texts sources in a closed digital context (without searching on their own for additional text material). Sixty percent of US students performed at level 3 or higher, suggesting that 40 percent were significantly challenged by evaluative tasks within a digital multitext environment.

Despite the strong push for advanced online digital reading skills, The DataReportal facts of Internet penetration into the US population (87–94 percent) can give a somewhat misleading picture of how much informational/academic reading via digital format is actually occurring or is available for students to access (as has been revealed by the educational challenges of the COVID-19 pandemic of 2020–2022). Similar gaps in real access may also be true in many countries around the world (DataReportal, 2021; UNICEF, 2020). In the United States, data on Internet access are constantly changing, but it is reasonably clear that families (a) living in rural areas and small towns, (b) with lower incomes, and (c) from minority ethnic backgrounds have lower rates of Internet access. Recent data from the Pew Research Center (Pew, 2018; Vogels, 2021) indicate that significant access gaps remain for a subset of US K–12 students. The Pew Research Center reports that for families with incomes below $100,000, 15 percent of households do not have smartphones, 17 percent do not have desktop or

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laptop computers, and 19 percent do not have broadband service in their homes. One-in-four students in families with less than $30,000 annual income do not have Internet access to a home computer. (However, these data may be changing in the COVID-19 and post–COVID-19 educational environment.)

It is also evident from years of NAEP data on student progress in reading that only 35 percent of students in 4th and 8th grades are proficient in reading comprehension (see Chapter 13). If the majority of students in US schools are struggling to perform at or below basic levels in reading, how do school systems provide fair and equitable environments by raising the bar for reading skills beyond proficient reading comprehension of a single text? How does asking weaker readers to synthesize and critically analyze multiple texts, some of which they are required to select on their own, lead to better literacy learning outcomes? Such demanding reading performance levels are likely to unfairly impact students from rural locations, minority students, and low SES students the most. If we are to help all students improve their reading skills, perhaps reading a single text (in print or fixed digitally) and being able to understand the text, learn main idea information, and use the information for some further purpose (e.g., reading-to-learn, reading-to-write) remains a valid midstage curricular goals.

Given the many complicating factors reviewed here, the goal of privileging complex multitext digital environments may be taking academic expectations too far with respect to reading comprehension and reading-to-learn goals. Even university students, in many disciplines, begin their first two years of university study learning from disciplinary course textbooks (whether as print books or as e-books); they are primarily asked to understand the textbook and learn from the textbook to establish a disciplinary foundation for later studies. Textbooks may often include companion websites, but they remain in a closed environment and the authors' authority is a given.

16.5 Recent Research on Print versus Online Digital Reading

> The strong appeal of digital-based assessment and learning environments has led many educational systems to adopt them. As findings from the current work reveal, however, digital environments may not always be best suited to fostering deep comprehension and learning.… Providing students with printed texts despite the appeal of computerized study environments might be an effective direction for improving comprehension outcomes. (Delgado et al., 2018, p. 33)

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Proponents of multitext online reading have suggested that the hallmarks of reading skills needed for secondary schooling and beyond include searching for the most relevant resources, analyzing and selecting the most appropriate sources that match with a literacy task, synthesizing online information, and using the information effectively for a specific purpose. They have stated that online reading instruction and assessment should be preferred curricular goals, even for elementary-grade students. For them, because online reading is assumed to be different from print reading, online reading needs to be addressed explicitly and in some depth. But in these cases, the issue does not appear to be reading print texts versus digital texts; rather, the challenging online digital tasks proposed – in which readers find their own relevant text resources through a sometimes misleading, and often a minimally informative browser search – would appear to be a case of a different task from most print-reading tasks.

Students can also gradually learn to engage with more complex multitext tasks within a print environment, such as has been done with research on Concept-Oriented Reading Instruction (CORI), as described in Chapters 10 and 13. For this reason, it is important to establish that reading print does not differ in significant ways from reading digitally when the tasks are comparable and only the medium differs (although more well-controlled research studies comparing complex multitext tasks in both print and online environments are needed). The issue of medium comparison has been the source of a number of studies and meta-analyses over the past decade, and they provide evidence that print texts support comprehension skills better than digital versions of the same texts.

Singer and Alexander (2017a) carried out a descriptive review of recent research comparing print reading and digital reading to identify reading comprehension differences. Studies included in their review had to assess both print and digital literacy, carry out empirical research, involve more than self-reporting data, and measure comprehension as one outcome. A final set of thirty-six studies (from 2001 to 2017) was included for review, fourteen of which included the reading of multiple texts. Singer and Alexander found a number of indications that digital-reading research was still at a fairly early stage even though research goes back to the 1980s. Of the thirty-six studies reviewed, only nine provided a definition of reading comprehension and only five provided a definition of digital reading in any form. With respect to reading comprehension measures, only twenty of the studies used multiple-choice questions or short-construction questions. Thirty-three of the studies (91 percent) did not provide reliability or validity data. Task procedures were minimally reported.

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Length of texts read was only reported in approximately 40 percent of the studies. Almost no additional individual reading differences (e.g., vocabulary, fluency, topic knowledge) were measured among the thirty-six studies.

Singer and Alexander's findings included the following: Shorter texts read digitally were comprehended better; longer texts in print were comprehended better. No differences were found when students answered main idea questions, but more detailed comprehension was better when participants read in print. While the authors noted that digital reading was well established and increasing in the United States, they concluded that neither print nor digital reading should be privileged over the other as somehow better for student learning.

Two meta-analyses were carried out comparing reading comprehension with digital and print texts. Delgado et al. (2018) included fifty-four studies from 2000 to 2017. Thirty-eight studies involved between-participant designs and sixteen involved within-participant designs. For both designs, comprehension, reported as effect sizes, significantly favored reading in print format (g = -0.21 and d = -0.21, respectively). For the studies reviewed, print and digital texts were matched. When the reading task involved time constraints, the advantage for print reading increased. Print reading was better with informational texts and with combined informational and narrative texts, but no differences were found when only reading narrative texts. Print reading comprehension also increased over digital reading with recency of the study publication. With respect to moderator analyses, students from all grades, from 1st grade to university undergraduates, had significantly better comprehension with print texts. Both short texts and long texts favored print-based comprehension. Comprehension measures with standard assessments and researcher-created measures both significantly favored comprehension of print texts.

In a second meta-analysis, Clinton (2019) included thirty-three random-sample empirical studies (2008–2018). Reading print versions of texts significantly improved reading comprehension in comparison with digital formats (g = –0.25). Comprehension of print was significantly better for expository texts (g = –0.32) but not for narrative texts (g = –0.04). Students had better calibrated (more accurate) self-assessments of their performance when reading print-format texts.

Additional research provides further support for better comprehension outcomes when reading texts in print format. Baron et al. (2017) collected survey data from 429 students in five countries (Germany, India, Japan, Slovakia, and the United States). Students affirmed the advantages of reading in print. Singer and Alexander (2017b), in a second study, showed that students *believed* they

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comprehended best when reading in digital formats, but students tended to overestimate their comprehension. In contrast, student beliefs were more closely associated with actual comprehension performance when reading print texts. So students were better able to self-calibrate their comprehension with printed texts. Finally, they noted that main idea recognition was the same in print and digital formats, but students recalled key points related to main ideas and other relevant information better when reading in print formats (see also Alexander, 2020; Mangen et al., 2013; Singer Trakhman et al., 2018).

16.6 The Unique Challenges of Advanced Online Digital Reading

> All the skills needed for successful reading of traditional written texts are also important for reading digital text.... Nevertheless, some characteristics of digital reading ... are different from reading print text. Hyperlinked online reading passages are multimodal, interactive, and non-linear. Navigating them demands more flexibility, attention, focus, and quick judgment than reading traditional text in order to distinguish trustworthy and valuable content from junk. (Geva & Ramírez, 2015, p. 142)

Despite the lack of well-controlled evidence that medium alone (print or digital) is a cause of greater challenge for reading comprehension, it is also likely that many students need to learn how to navigate an Internet browser, find relevant texts, and then read and use texts located through online digital searches, assuming that the specific task is appropriate for students' skill levels. At least in the United States, education associations and educational psychologists have promoted the need for better performance on ever more demanding reading tasks and sequences of tasks, including online multitext tasks (NGA–CCSSO guidelines, 2010; Millis et al., 2019; Pearson, Palincsar, Biancarosa et al., 2020). This goal can be problematic for students just learning how to search effectively.

When considering differences between print and online text resources for academic tasks, it is first useful to recognize that many earlier digital reading studies involved close replications of tasks carried out in print environments. Reading frozen text on-screen is essentially not different from print reading (assuming reasonable familiarity with digital interfaces); tasks that provide a closed set of reading materials to work from can be equally challenging in print and online. In some cases, even tasks involving open access to text resources, whether in print or online, share a number of similarities and invoke similar strategic

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processing to carry out academic tasks successfully (e.g., CORI units combining reading and content learning; see Chapter 13).

However, when online reading tasks involve multiple online texts that must be (a) located by students, (b) assessed for their relevance, accuracy, and importance for a specific task (e.g., synthesis, critical evaluation of a topic, or applications in writing), and (c) read with the support of a unique array of strategies for more advanced reading goals, it is possible to argue that digital reading imposes a unique set of reading processes and strategies. This would be especially true for online multiple-link pathways with many potential distractions (e.g., Baron, 2021; Cho & Afflerbach, 2017; Coiro, 2011, 2015, 2021; Kiili et al., 2018).

The recent US national report *Reading for Understanding* (Pearson, Palincsar, Biancarosa et al., 2020) provides important perspectives on advanced reading-to-learn and reading-to-synthesize (as reported in Chapter 13). In a review of the six major funded research efforts supported under the *Reading for Understanding* program, the review authors identified briefly the role of online digital reading progress and challenges (Pearson, Palincsar, Afflerbach et al., 2020, pp. 277–279).

Pearson, Palinscar, Afflerbach et al. began their review by commenting on the need to incorporate research and instruction using online digital environments. They noted the importance of reading strategies needed for successful online reading with more advanced tasks, referring specifically to Cho and Afflerbach (2017). Cho and Afflerbach suggest that there are more than thirty-five online digital strategies that students need to learn. Even more specifically, they list more than forty-five strategies (incorporating many of the thirty-five strategies noted earlier) that students should learn when they are locating and building coherent informational pathways among texts in the open-ended space of the Internet.

It is important to point out, however, that almost all of the strategies Cho and Afflerbach listed for online environments can also apply to CORI multitext instruction, without assuming a digital environment. Similarly, in many L2 settings, more advanced language and content programs include multitext instructional units for which students search for additional resources. These settings require almost all of the same strategies listed by Cho and Afflerbach. So, once again, the core issue may not be the medium but rather task demands. In fact, one potential pathway for building longer-term online instruction may be through challenging, multistage language and content units in which students have many practice opportunities with available sets of print texts before being thrown fully into challenging digital online tasks. This incremental sequence would treat advanced online digital tasks as a task difference rather than as a media difference.

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Table 16.2 Strategic reading processes while reading online

1. Navigate the convoluted pathways inherent in online information searches.
2. Locate academically relevant online information.
3. Read online sources critically.
4. Avoid distractions from the Internet environment.
5. Judge the accuracy, reliability, and bias of online sources.
6. Determine authorship.
7. Make connections within and across online texts.
8. Use online information responsibly to demonstrate critical evaluation skills.

In addition to identifying and teaching reading strategies for digital reading, the second set of recommendations by Pearson, Palincsar, Afflerbach et al. (2020) involves developing additional research designs to investigate the specific challenges and learning outcomes of digital online learning. They recommend the development of research designs that lead to stronger outcomes based on instructional treatment experiments such as longitudinal research designs and the examination of several cognitive and contextual factors. They point out that teacher training and support are lacking for much online digital instruction and many research studies should also focus on this gap.

Pearson, Palincsar, Afflerbach et al. further note that repeated practice at tasks, spaced training, and the development of fluent and accurate student responses must be included in any proposed learning theory supporting instruction (e.g., Meyer & Wijekumar, 2017, for an example of skills development through repeated cycles of practice). This view on the important role of practice aligns with current perspectives on learning theory (J.R. Anderson, 2020). It may also be useful to consider training and learning perspectives from expertise research (J.R. Anderson, 2020; Ericsson & Pool, 2016; Ericsson et al., 2018; see Chapter 19 and the concept of deliberate practice).

To summarize, many students – as skilled and as comfortable as they are using digital devices for nonacademic purposes – face significant challenges using their electronic devices effectively for academic purposes (Alexander, 2020; Baron, 2021; Coiro, 2015, 2021; Dobler, 2015; Dobler & Eagleton, 2015; Zawilinski et al., 2019). Indeed, struggling students typically lack the experience, practice, and fluent strategic responses with online digital tasks. Table 16.2 lists key strategies that are needed for advanced online reading tasks.

These strategic processes are difficult for many struggling students to master. It is probably not realistic to expect that all students (at secondary and postsecondary levels) will straightforwardly become

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skilled at more advanced online reading tasks. After all, many university graduate students have trouble with advanced synthesis tasks such as research literature reviews (whether print or online). Many students will need extensive practice and instructional support.

This more moderate perspective places more advanced reading skills development in a quandary: How can we engage stronger students in multitext online reading activities, but still value (and apply) the many key skills needed for reading comprehension and reading to learn with print texts? Possible answers to this question require a considerable number of well-controlled instructional research studies, in relation to both student learning and teaching effectiveness.

16.7 Implications for Instruction

> Given the unavoidable inclusion of digital devices in our contemporary educational systems, more work must be done to train pupils on … reading tasks in digital media, as well as to understand how to develop effective digital learning environments. (Delgado et al., 2018, p. 34; also in Baron, 2021, p. 132)

One of the today's major gaps in literacy instruction is our lack of attention to teaching students explicitly how to navigate digital information resources when engaging in reading-to-learn tasks. Language teachers need ways to address academic online digital literacy explicitly in their classrooms (Cobb, 2017; Dobler & Eagleton, 2015). This goal is one that requires appropriate resources and an appropriate learning theory – one that (a) provides staged sequences of tasks, (b) ensures sufficient time-on-task practice at each stage, (c) gradually builds up to advanced academic performance, and (d) incorporates a number of relevant assessment-for-learning opportunities (see Chapters 1, 13, 15, and 20). Such a perspective, of course, cannot be addressed in one course or in one academic year.

The successful reading of both print and digital texts requires many similar skills and strategies. In particular, skilled readers of both print and digital texts are, by definition, strategic. The goal for instruction is to extend strategic processing from print to online contexts because digital reading creates new contexts for reading with new text types and tasks. In digital contexts, especially those with reading-to-learn expectations, successful readers typically use appropriate keywords and descriptors to guide their online searches. Successful digital readers must intentionally suppress the distractions inherent in digital reading, stay focused on their goals for reading, and strive to find information needed to achieve those goals. Finally, they also need skills to recognize biased and/or unreliable online information, which may actually be promoted by Internet browsers (Coiro, 2015).

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These same online readers must also keep track of the array of digital materials accessed while in the midst of moving from one website or medium to another. Effective digital readers have learned to recall where relevant information is located and can backtrack to find it. Writing down URLs or pasting them on a resources page before clicking on a new link will give students simple guidance in getting back to a core text (and a lot of practice doing this will help). Finally, skilled readers must find ways to evaluate and integrate multiple sets of information that are not in clear view at the same time (as they might be with multiple books and/or photocopies of readings spread out on a desk). This range of online reading abilities is especially important for students in reading-to-learn contexts.

16.7.1 Challenges

Many of the challenges that are faced by digital readers stem from the fact that the Internet is massive, comprising countless, constantly changing nonlinear connections among interconnected links. The Internet itself can be the ultimate "inconsiderate" text. That the Internet is multimodal, unfiltered, and unbounded certainly creates formidable challenges. Furthermore, the Internet comprises within itself many inconsiderate texts, which may be disorganized and lack lexical and organizational cues, requiring the reader to work hard, through inferencing, to synthesize information from different parts of a digital text or from multiple texts. Digital readers can also become easily distracted by hyperlinks to, for example, audio files, podcasts, glossaries, embedded images, videos, advertisements, and unrelated sites. Hyperlinks interrupt comprehension as readers move from one site to another and from one modality to another. Further complicating matters is the fact that Internet readers typically spend a fair amount of time looking around the Internet, leaving limited time for actual reading and information processing (Dobler & Eagleton, 2015).

At present, relatively few instructional materials exist to assist teachers with their lesson planning. Furthermore, in contexts around the world, some schools may not permit or cannot guarantee Internet access. In many countries, Internet access and reading resources are available only through smartphones, which create a cumbersome reading environment. Moreover, teachers may, themselves, feel uncomfortable with technology and their own digital-reading skills. Their own students, in fact, may be more knowledgeable about digital applications. Because of teachers' incredibly busy lives, they may also be reluctant to devote the time required to revise their lessons and incorporate digital literacy into instruction. Particularly if they work in L2 settings largely defined

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by national curricula and/or standardized exams, teachers may not be in the position to modify their teaching to incorporate digital literacy into instruction. Some of these teacher challenges could be lessened if digital literacy were addressed both explicitly and intensively in preservice teacher-training programs. (See Damico & Panos, 2016, for a description of a teacher-training effort that guided preservice teachers in evaluating web sources about climate change and reading for bias, authorship, claims, and evidence.)

16.7.2 Opportunities

When digital reading is addressed explicitly in language classes, numerous opportunities become available. Students can be guided in using appropriate strategies for managing browsers, search engines, and keyword searches through many brief practice exercises. These strategies are especially important for novices to online reading for academic purposes because those readers typically just click the first source listed (often an advertisement), without scrutinizing it, and then work their way down search engine results (Zawilinski et al., 2019). Students can also be guided in maintaining their goals for reading and staying on task, with teachers prompting students to explain specific goals while they are searching for information. Teachers can also build students' capacity to self-regulate – to monitor comprehension, adjust strategy use for reading purpose, and coordinate multiple processes, including navigation, selection, and evaluation (Goldman et al., 2012). The key for instruction is to break more complex tasks into a number of more manageable subtasks and subgoals. These subtasks and subgoals need to be practiced consistently until some level of automatic processing develops. The digital-reading instructional practices should also incorporate student-group tasks and opportunities for discussion about reading resources, reading strategies, and reading goals.

Even though relatively few ready-made digital-literacy teaching materials are widely available to language teachers, the Internet can be brought into classrooms through screen projection so that all students can work together on search and selection exercises. After a text selection is made, students must learn to read the text on their own computers or other devices without distractions or the temptation to click on hyperlinks that can lead students away from their reading goals. Just as in more traditional reading lessons, we should structure our digital-literacy lessons around explicit instruction, modeling, scaffolding, student engagement, guided practice, classroom discussion, and feedback. The twist involves adding new text types, tasks, and strategies to digital reading instruction.

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17 *Reading Fluency, Reading Rate, and Comprehension*

S.J. Samuels (2007) … asserts that fluent readers not only read accurately, expressively, and with appropriate rate, but they also simultaneously comprehend what they read. (Rasinski et al., 2011, p. 307)

In the 1970s and 1980s, lonely voices pointed out the need for reading practice and reading fluency. In first-language (L1) contexts, Allington (1983) wrote an article entitled, "Fluency: The neglected reading goal." In second-language (L2) contexts, Bismoko and Nation (1974) and Quinn and Nation (1974) focused on the need for reading fluency and practice that involved speed-reading texts (timed readings followed by comprehension questions). For Nation, the fluency message has continued for over forty years (Nation & Waring, 2020). The challenge for the modern day is to understand where reading fluency stands in relation to reading comprehension after all this time. The quick answer is that reading fluency is now being recognized as essential for reading comprehension, whether at initial levels with word reading fluency, or at more advanced levels with passage reading fluency while demonstrating text comprehension.

Many research studies have associated fluent word reading skills with reading comprehension abilities in L1 contexts involving K to 4th-grade learners. Oral passage reading rate and amount of reading (extensive reading) are also strongly associated with L1 reading comprehension abilities at multiple age levels (van Bergen et al., 2020; Klauda & Guthrie, 2008; NRP, 2000; Stanovich, 2000; Tighe & Schatschneider, 2014). L1 fluency research and teacher-resource books on fluency instruction have become more frequent since the 2000 National Reading Panel report (National Reading Panel, 2000) and the oral passage reading research of Fuchs et al. (2001). (See also Kuhn & Schwanenflugel, 2017; Rasinski & Cheesman Smith, 2018; Rasinski et al., 2017; Schwanenflugel & Benjamin, 2017; Schwanenflugel & Kuhn, 2016; Silverman et al., 2013.)

It is important to note at the outset of this chapter that word recognition skills (following the Simple View of Reading, see Chapters 2

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and 6), conceptually, are strong general predictors of L1 reading comprehension for young readers. So word-recognition skills are an important predictor of reading comprehension, whether labeled as fluency practice or comprehension training (cf. Silverman et al., 2013, who showed that fluency skills mediate the impact of word recognition as a predictor of reading comprehension). This dual perspective on word recognition suggests that fluency, as an independent predictor of comprehension, needs to include evidence from students beyond 4th grade (cf. Chapter 7, where predictors of reading comprehension in more transparent alphabetic languages include word recognition fluency well beyond 4th grade as speed of processing measures).

The situation is different for L2 reading research beyond early grade bilingual L2 contexts. With English L2 students from 5th grade through postsecondary contexts (i.e., English as a foreign language, EFL, and English as a second language, ESL), relatively little research has been conducted on word reading fluency or on oral reading fluency (words correct per minute while reading a text passage) (but see Jeon, 2012; Jiang et al., 2012; Lems, 2006). Instead, L2 fluency research has largely focused on silent reading rates with speed reading passages, reading rate improvement through repeated reading practice, and extensive reading (primarily with graded readers) (e.g., Gorsuch & Taguchi, 2008; Huffman, 2014; McLean & Roualt, 2017; Nation & Waring, 2020).

17.1 Understanding Reading Fluency

> To most reading researchers, fluency denotes the ability to read connected text rapidly, smoothly, effortlessly, and automatically with little conscious attention to the mechanics of reading. (Jiang et al., 2012, p. 326)

Reading fluently is what good readers do on a continual basis with most reading material that they encounter. Fluency in reading is the ability to read rapidly with ease and accuracy and to read with appropriate prosodic word stress and phrasing while understanding the text. Fluent L1 readers can recognize almost every word they encounter in a text automatically. They can read a passage aloud at a rapid steady rate with good comprehension and with little hesitancy owing to the basic syntax or the words encountered. They read most texts silently at between 240 and 300 words per minute (varying somewhat across different L1s and different purposes for reading). Finally, they can read for extended periods of time without difficulty or effort.

In principle, fluency is what allows readers to process much larger amounts of input, expand the breadth and depth of their vocabulary

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knowledge beyond direct instruction, increase content knowledge, develop automatic word recognition skills, read for additional learning, and build reading motivation (Beglar et al., 2012; Stanovich, 2000; Suk, 2017). In English-medium university contexts, English L2 fluency allows students to read the large amounts of material that might be assigned weekly. Moreover, fluency is one of the keys to (L2) learning outside the classroom. Students who have some degree of reading fluency and who are motivated to read will also improve their reading comprehension skills.

Fluent reading requires a long incremental learning process, and improved text comprehension is an expected outcome of fluent reading. Fluency development also includes certain assumptions about comprehension. In almost all reviews of reading fluency, the relationship between fluency and comprehension assumes that comprehension is a capacity-limited cognitive process. Fluency, and especially automaticity, allows readers to attend to the meaning of the text, the textual context, and required background knowledge without being slowed down by intensive attentional word recognition and inferencing demands. The assumption that reading is a capacity-limited cognitive process has led to the study of many subcomponents of reading fluency. Four central subprocesses are automaticity, accuracy, rate, and prosodic expression (see Grabe & Stoller, 2020; Kuhn & Schwanenflugel, 2017; Schwanenflugel & Kuhn, 2016; Tighe & Schatschneider, 2014).

Aside from automaticity and accuracy, a third important component skill of fluency is the ability to maintain a fairly rapid reading rate over time. This skill is particularly an issue for L2 reading development in academic settings (secondary school and university contexts). It is actually fairly common for L2 students to read in an L2 with fair comprehension but with limited fluency. L2 students in secondary and university contexts can perform reasonably well on comprehension tests when given sufficient time to complete the tests. However, these students commonly read at only 70–120 words per minute, reading at one-half to one-third the rate of L1 students (e.g., see Beglar & Hunt, 2014; Beglar et al., 2012; Huffman, 2014; McLean & Roualt, 2017; Yoshizawa et al., 2018, for Japanese university and secondary students).

A final component skill needed for reading fluency is the processing of prosodic phrasing and intonation contours while reading (Kuhn & Schwanenflugel, 2017; Schwanenflugel & Benjamin, 2017; Schwanenflugel & Kuhn, 2016; Smith & Paige, 2019; Wolters et al., 2022). Differences in reading fluency along these lines are most evident during oral reading as opposed to silent reading although

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prosodic processing applies as well to silent reading. One complication for the reliable assessment of prosody in L2 contexts is disfluencies due to the oral production of the L2. A second complication is that it commonly requires a one-on-one rating system. Each of the four components of reading fluency noted above (automaticity, accuracy, rate, and prosodic structuring) can be seen as complex cognitive activities in themselves. However, each component represents some key part of an overall definition of reading fluency.

17.2 Multiple Settings for Fluency Development

The development of fluency varies widely depending on students' ages, students' relative proficiency as skilled or struggling readers, and the language in which reading is carried out (L1 or L2). Children and adolescents differ considerably in their abilities to engage in fluent practices. Children need to focus much more attention on the word-level development of automaticity; older students, in general, have much greater facility with word recognition automaticity. Skilled readers reading at grade level are better able to engage in fluent reading as a matter of course or while working with instructional materials. Struggling readers, in contrast, almost never have fluent reading experiences and typically lack one or more critical subcomponent skills essential for fluent reading.

It is fairly obvious that fluency development in L1 reading is different from fluency development in L2 reading. The automaticity, accuracy, rate, and prosodic requirements of reading fluency are much more challenging to meet in the L2. Even within L2 settings, a major division exists between students in ESL and EFL contexts, as well as between EFL students needing the L2 for advanced academic studies and those simply fulfilling an L2 requirement.

Relatively little research on fluency training has been conducted with L2 populations aside from vocabulary and reading rate gains from extensive reading. In addition, the role of oral reading performance itself is different for L2 students (versus L1 students). Considerable importance is given to pronunciation (and intelligibility) in *spoken* L2 fluency assessment, but there is little discussion of the impact of pronunciation and oral fluency on measures of L2 reading fluency. This is largely a byproduct of the relative lack of research on L2 reading fluency. While there are several different ways to assess reading fluency, much L1 fluency research assumes reasonable L1 speaking fluency and uses a variety of measures (e.g., oral rereading, paired readings, rapid naming of words, informal reading inventories,

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standard tests of oral reading fluency) that presume speaking fluency. In L2 contexts, preliminary research is needed to examine major subcomponents of this issue (e.g., spoken fluency and its impact on reading fluency with different L2 populations, different L2 proficiencies, different types of measures, as well as reasonable accommodations for pronunciation and intelligibility). In L2 fluency measures, there may or may not need to be intelligibility constraints on word or text pronunciation. This issue would seem to be an empirical one rather than a matter for theorizing.

While research on reading fluency in both L1 and L2 contexts can be traced back to the late 1970s and early 1980s, a key turning point emerged around the turn of the twenty-first century. We highlight four factors that contributed to the growth of interest in reading fluency.

17.3 Fluency Research and the National Reading Panel

> It is generally acknowledged that fluency is a critical component of skilled reading.... Students who are low in fluency may have difficulty getting the meaning of what they read.... There is common agreement that fluency develops from reading practice. (National Reading Panel, 2000, p. 3–1)

The first, and possibly the most important factor, at least in the US context, was the publication of the National Reading Panel (NRP) (2000) report. This report identified five areas of reading research with strong true experimental evidence for improving conprehension. One of the five areas was reading fluency and its impact on reading comprehension. Specifically, the report presented evidence supporting the practice of oral repeated reading for improving accuracy, fluency, and comprehension.

With respect to oral repeated reading, the NRP meta-analysis found ninety-nine comparison experiments that met their criteria for experimental research. The majority of these studies involved elementary school students but studies extended through to college-level students. The research reviewed strongly demonstrated that oral repeated reading of texts improved reading fluency and overall reading comprehension (especially in K through 4th grade). Across all the studies, the NRP found a stable moderate overall effect size of $d = 0.41$. Group experiments compared various grade-level groups (K–12th grades) and were useful for examining the impact of repeated readings on reading improvements. "In all but two of the studies, comparisons resulted in significant differences for the guided repeated oral reading groups over the control groups" (NRP, 2000, p. 3–16). Effect sizes were similar for normal and poor reader populations.

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Overall, the results of the NRP had a major impact on reading research and instruction in the United States. The analyses of fluency studies led to more attention to fluency in on-going research and greater attention to instructional practices promoting fluency development (e.g., Paige et al., 2014; Rasinski & Cheesman Smith, 2018; Rasinski & Padak, 2013; Rasinski et al., 2012; Schwanenflugel & Kuhn, 2016; Shanahan, 2006; Wolters et al., 2022). Since the appearance of the NRP report, three additional approaches to the study of reading fluency have emerged in English L1 contexts.

17.4 The Expanded Scope of Fluency and Its Relation to Comprehension

> Fluency is both an antecedent to and a consequence of comprehension. Some aspects of fluent, expressive reading depend on a thorough understanding of a text. However, some components of fluency … appear to be prerequisites for reading. (Snow & Sweet, 2003, p. 5).

A second major approach to research on reading fluency, roughly simultaneous with the NRP report, was provided by Fuchs, Fuchs, and their colleagues. Fuchs et al. (2001) demonstrated that oral passage reading rate measures provide one of the strongest predictors of reading comprehension abilities as measured by standardized reading tests. They reviewed a set of studies to show correlations of 0.80 and 0.91 between simple oral passage reading fluency measures and both the reading comprehension test of the Iowa Test of Basic Skills and the reading comprehension subtest of the Stanford Achievement Test. These studies included two large samples of 4th graders and a sample of 6th through 9th-grade reading-disabled students. The procedure that the researchers used to assess oral reading fluency involved participants in reading a simple passage for one minute. These studies also included comprehension measures following the oral reading task. The researchers counted the number of words read correctly and incorrectly and used a score based on words read correctly in one minute (see also Eason et al., 2013).

Variations of the oral passage reading technique, but sometimes without comprehension checks, have also been used as Curriculum-Based Measures (CBM – meant to be used as ongoing diagnostic measures in classes). These diagnostic uses, also sometimes labeled as Dynamic Indicators of Basic Early Literacy Skills (DIBELS), have shown strong correlations with reading comprehension (see also Kim et al., 2010), but they are sometimes used as fluency assessment measures with high-stakes implications. The danger is that CBMs are used by teachers

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and school districts to see how fast students can read without any attempt to assess comprehension. Some researchers have raised concerns that children learn to become "word callers," racing through a text without attending to comprehension (although the word calling phenomenon is not a widespread problem; see Schwanenflugel & Kuhn, 2016). Certainly, teaching students to race through a text orally without appropriate understanding is a serious misuse of a diagnostic tool. However, Fuchs et al. (2001) pointed out that one-minute oral reading checks, when used for ongoing progress measures, provide simple but good diagnostic information for teachers and fit well with students' global levels of reading competence.

Fuchs et al. concluded by stating that oral reading rate is a good predictor of reading comprehension because the process combines elements of out-of-context word reading (word decoding) and reading comprehension abilities, reflecting the two major components of the Simple View of Reading (see Chapter 6). They also provided evidence that oral passage reading fluency predicts reading comprehension better than silent passage reading fluency measures. However, examinations of silent passage reading fluency, along with comprehension checks, suggest that silent reading fluency would be equally good as measures of reading fluency when comprehension questions are used with average and above-average readers (Hiebert & Daniel, 2019).

A third key approach in reading fluency research over the past twenty years involves prosody (lexical stress, phrase and clause grouping, and intonation contours). Early research showed that prosodic shaping of oral passage reading was a good predictor of reading comprehension (see Paige et al., 2014; Schwanenflugel & Kuhn, 2016; Wolters et al., 2022). The challenge, in this case, was the need for a reliable and relatively usable way to rate various prosodic aspects of students' oral reading of a text. However, this challenge has been addressed through fairly simple rating systems that score students with reasonable reliability (Kuhn & Schwanenflugel, 2017; Smith & Paige, 2019). Moreover, prosody ratings of students' oral reading fluency account for additional unique variance with reading comprehension in hierarchical regression analyses. Prosodic fluency also predicts comprehension with older students (7th and 9th grade), showing that fluency measures are not just word reading efficiency limited to 1st through 4th grades (Paige et al., 2012, 2014; Rasinski et al., 2009; Wolters et al., 2022).

A final long-term research perspective focuses on text reading efficiency training involving work over twenty years by Breznitz (e.g., 1987, 2001, 2006). Working mostly with 1st and 2nd-grade poor readers, she found that students do not read at maximal efficiency

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and can actually improve their comprehension by being pushed to increase their reading rate moderately (e.g., 10 percent faster through controlled reading practice). Breznitz (2001), in summarizing her work, argued that accelerating reading rates improved the efficiency of various cognitive processes involved in reading, particularly with respect to working memory (WM) processes.

Breznitz (2006) also showed that as students become increasingly proficient, they are still able to achieve reading comprehension benefits from accelerating their reading rates by 10 percent. University students in both Hebrew and English showed the same effects of accelerated reading, indicating that most good readers do not read at maximal efficiency. Her research argued strongly that reading rate is a part of reading comprehension separate from decoding and attentional comprehension processing. Breznitz (2001, 2006) argued as well that an important aspect of reading ability is based not only on component abilities but also on fine timing mechanisms in the brain to synchronize information for comprehension (see also Perfetti, 2007).

17.5 Key L1 Reading Fluency Research Studies

> Reading fluency at the beginning of the study predicted growth in comprehension 12 weeks later. In addition, comprehension at the beginning of the study predicted growth in fluency 12 weeks later. (Klauda & Guthrie, 2008, p. 318)

Since 2000, a number of key L1 research studies have advanced our understanding of the relationship between fluency and comprehension. Klauda and Guthrie (2008) provided one of the strongest empirical studies of the impact of reading fluency on reading comprehension among 5th-grade students (N = 278). They demonstrated that reading fluency at the word level, the syntactic level, and the passage reading level all contributed independently as predictors of reading comprehension. They also measured inferencing skills and background knowledge as possible mediators of each of the three levels of reading fluency. Finally, they examined the possibility that reading fluency and reading comprehension act in a supportive reciprocal relationship.

In a hierarchical regression, background knowledge was entered first and accounted for 50 percent of the variance shared with reading comprehension. Inferencing was entered second and independently accounted for 8 percent of additional variance shared with comprehension. Word reading speed was entered third and accounted for an additional 10 percent of shared variance with reading. Speed of

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syntactic processing was entered fourth and accounted for an additional 5 percent of shared variance. Passage reading fluency was entered last and was still significant, accounting for an additional 2 percent of shared variance. The five predictors, together, accounted for 75 percent of variance shared with reading comprehension. A hierarchical regression with just the three fluency measures (word and syntactic processing speed and passage reading fluency) accounted for 56 percent of variance shared with comprehension.

Finally, with their longitudinal data, passage fluency predicted comprehension even when entered after a comprehension autoregressor variable from an earlier assessment time. So when an earlier comprehension measure was entered first, fluency was still a significant predictor of time 2 reading comprehension. The reverse was also true. Comprehension was a significant predictor of reading fluency. Overall, this study provided persuasive evidence of strong relationships between fluency measures and reading comprehension.

Tighe and Schatschneider (2014) examined the changes in text reading fluency in 3rd, 7th, and 10th grades (N = 215, 188, and 182, respectively). They also carried out measures of vocabulary, listening, inferencing, nonverbal reasoning, and WM at all three grades. In all, students were given a battery of twenty-one measures. Factor analysis was used to create latent variables for oral fluency (word reading fluency, text reading fluency), for verbal reasoning (or language comprehension: vocabulary, inferencing, and listening), and for WM. At 3rd grade, oral reading fluency was the strongest predictor with language comprehension also a strong predictor. Together, they accounted for 70 percent of the variance shared with reading comprehension, thus mirroring closely the Simple View of Reading. Working memory only accounted for 1 percent of additional shared variance, bringing the total shared variance with reading to 71 percent.

In 7th grade, the language factor became the strongest predictor, but the fluency factor was also a strong contributor. The two composite variables accounted for 63 percent of shared variance with reading. Working memory did not contribute any independent shared variance with reading. In 10th grade, language comprehension was dominant, accounting for 64 percent of the total variance shared with reading. Fluency accounted for an additional 4 percent. Again, WM did not contribute any shared variance with reading. Passage reading fluency, on its own, correlated highly with reading comprehension, between r = 0.80 and r = 0.88 across the three grades. Given the high correlations, even in 10th grade, oral passage reading fluency is most likely an important indirect contributor to reading via language comprehension. It is safe to say that oral passage reading fluency, on its

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own, accounted for a considerable amount of shared variance with reading (and with language comprehension).

A third important study, by Paige et al. (2014), assessed 108 9th grade students on word reading automaticity (words correct per minute), accuracy (percent of words read correctly), appropriate prosody (with a rating system), and vocabulary as predictors of reading comprehension. They first found that accuracy and prosody accounted for 53 percent of the variance shared with reading comprehension. When vocabulary was added, prosody and vocabulary together accounted for 50 percent of the variance shared with reading comprehension and both were significant independent contributors to word-reading automaticity. Reading automaticity, while not an independent predictor on its own, partially mediated the impact of prosody on reading comprehension. Overall, their study provides additional evidence that reading fluency predicts overall reading comprehension skills (see also Kuhn et al., 2010).

Over the past fifteen years, a number of L1 reading fluency studies have shed light on the relationship between reading fluency and reading comprehension. In particular, a number of studies have shown that L1 fluency is not a constrained skill that only predicts reading comprehension up through 4th grade (cf. Paris, 2005). Instead, reading fluency appears to be an important predictor of L1 reading comprehension all the way through to university levels (see also van Bergen et al., 2020; Wolters et al., 2022)

17.6 L2 Perspectives on Reading Fluency

L2 research on reading fluency shows both similarities to L1 fluency and also some intuitively appropriate distinctions, the most important of which involves more limited automaticity and accuracy with word recognition and more limited passage reading fluency (and prosody) with L2 readers. The obvious explanation for this difference is the more limited linguistic knowledge that L2 readers bring to the reading task (including reading comprehension). The more limited language knowledge of L2 readers is reported broadly and is not surprising (e.g., Jeon & Yamashita, 2014; Melby-Lervåg & Lervåg, 2014; Yamashita & Shiotsu, 2017).

Direct evidence of these similarities and differences is reported by Geva and Farnia (2012). They examined the longitudinal development of fluency and reading comprehension among 539 English L1 (N = 149) and English L2 (N = 390) students in 2nd and 5th grades. Students were assessed on word and passage fluency as well as on multiple cognitive and linguistic skills at both grades. Second-grade scores were also used as autoregressors for multiple analyses. In 2nd

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grade, for both L1 and L2 students, the two fluency measures formed a single factor. By 5th grade, word recognition fluency and passage reading fluency formed two separate factors and passage reading fluency results were more closely associated with the linguistic measures.

Measures taken at 5th grade showed that 2nd-grade phonological awareness and vocabulary accounted for a large amount of shared variance with 5th-grade reading (r^2 = .69 for L1 and r^2 = .62 for L2). In addition, 5th-grade passage reading fluency accounted uniquely for 5th-grade reading comprehension even when regressions included 2nd-grade autoregressor variables. For L2 5th graders, additional unique variance in reading was accounted for by 5th-grade syntactic skills and listening comprehension. The developmental patterns in 2nd and 5th grades aligned closely with expectations of the Simple View of Reading, but with the addition of significant unique variance contributed by passage reading fluency at 5th grade.

Jeon (2012) reported on a fluency study with 10th-grade EFL students in Korea (N = 255). She assessed students' fluency with word recognition and passage reading fluency as well as a number of other common predictors of reading comprehension (morphological awareness, vocabulary, syntax, listening comprehension, metacognitive awareness). In a factor analysis, the variables formed two distinct factors, one for fluency and one for comprehension. The fluency factor accounted uniquely for 21 percent of shared variance with reading comprehension. Almost all of this variance was due to passage reading fluency (20.9 percent).

Two additional points are worth noting about Jeon's study. First, among the language knowledge variables, syntactic knowledge was the strongest variable contributing unique variance, pointing to the important role of syntactic knowledge for reading comprehension among L2 students. Second, the L2 students in 10th grade only read the passage orally at a rate of 62.5 words correct per minute. This rate places the students on a par with 2nd-grade L1 students, suggesting a great need for oral passage reading practice among these L2 students.

A third L2 study was carried out by Jiang et al. (2012) with adult Chinese EFL learners (N = 185). Students were given a battery of reading fluency assessment measures as well as a Test of English as a Foreign Language Internet-Based Testing reading section. Five reading fluency measures together accounted for 32 percent of the variance shared with the reading comprehension measure. When passage reading measures were added to regression analyses, the word fluency measures became nonsignificant. In contrast, passage reading fluency accounted for 23 percent of the variance shared with reading comprehension when entered after word fluency measures.

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17.7 L2 Instructional Research with Repeated Reading

> Through our work over the past twenty years with repeated reading for L2 learners … we have concluded that reading fluency is a significant contributor to L2 reading comprehension and that repeated reading has become an effective and time-tested method for boosting L2 reading fluency. (Taguchi et al., 2016, p. 111)

L1 repeated reading activities have been reported for almost forty years. One major finding of the National Reading Panel report (2000) was that repeated reading had been well documented with young L1 readers as an effective way to develop reading fluency skills. In L2 contexts, a small number of studies have examined the effects of training students with repeated reading activities to improve reading rate and fluency. Early studies suggested that repeated reading of five to seven repetitions can significantly improve students' fluency outcomes when carried out over an extended period of time (twenty-two to forty-seven weeks) and also when audio recordings are used to support passage rereading (Gorsuch & Taguchi, 2008; Taguchi & Gorsuch, 2002, 2012; Taguchi et al., 2012). Results of repeated reading studies show that reading rate increases over time, but comprehension improvement is mixed. Given the positive research results among younger L1 students, this line of research exploration should be continued with a number of variations in how L2 instruction is delivered and assessed.

Extensive reading in L2 contexts, in contrast with repeated reading practice, has been explored in many more research studies. Specific studies have provided multiple demonstrations that extended amounts of reading, both cumulatively and over semester- and year-long experimental studies, have improved reading rate, vocabulary knowledge, and reading comprehension. Given the wide array of research on extensive reading, it is covered as its own topic in Chapter 18.

17.8 Implications for Instruction

> Reading fluency, or more importantly, the lack of reading fluency, is a reality in most classrooms…. The reason for this reality is that teachers do not know what to do to help learners improve their reading fluency. (N.J. Anderson, 2014, p. 172)

Fluency development can be supported by a number of instructional practices. These practices include reading rate development, assisted reading, repeated reading, timed reading, paced reading, word recognition exercises, and extensive reading. In some cases, strong

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support exists for specific practices reported in L1 research studies (e.g., assisted reading, repeated reading, amount of reading/extensive reading); in other cases, there is some research support for specific practices (purposeful rereading activities; see Table 17.1). In yet other cases, there is less supporting evidence, but there is an intuitive appeal (timed and paced reading). In L2 contexts, relatively little research directly supports fluency development practices. In fact, there is minimal discussion of L2 fluency instruction beyond 6th grade, even for remedial purposes.

Table 17.1 Sampling of purposes for rereading

Reread text silently:
1. To identify the location of answers to postreading comprehension questions.
2. To fill in a graphic organizer or outline.
3. To summarize.
4. To develop a different position from the author.
5. To find text structure signals.
6. To locate signals for main ideas.
7. To identify the main discourse sections of the text.
8. To synthesize information from the text and another information source (e.g., a lecture, a previously read text).
9. To find points of agreement or disagreement with another information source (e.g., YouTube).
10. To connect to information from a previous text.
11. To write margin notes that serve as functional descriptors of each paragraph.
12. To determine which statements, provided by the teacher, represent main ideas in the text.
13. To decide which statements, provided by the teacher, would be supported by the author.
14. To prepare for a quiz, debate, discussion.
15. To find relevant information for another assignment (e.g., a culminating project).

Rasinski and colleagues (Rasinski, 2010; Rasinski & Cheesman Smith, 2018; Rasinski & Padak, 2013) provide the most comprehensive overall framework for L1 fluency instruction. The activities are primarily intended for elementary grade students, but they can be creatively translated for older L1 and L2 students. Rasinski and colleagues explain many of the better known instructional practices: supported reading, repeated reading, and performance reading (described later in this section). Rasinski also assumes that students are reading

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texts at instructional oral word reading levels (90–95 percent correct oral word reading) or independent oral word reading levels (95–99 percent). Rasinski and colleagues advocate for numerous supported reading options for young readers: (a) students listening or reading silently while a teacher or tutor reads, (b) students reading along with the teacher or tutor, (c) choral reading, (d) paired reading, (e) echo reading, and (f) buddy reading.

With regard to repeated reading, Rasinski (2010) proposes three types of repeated reading fluency practices: (a) oral repeated reading practice of a text with a partner, (b) oral repeated reading practice with a timer, and (c) reading practice with a smartphone or CD. Oral repeated reading involves rereading a short passage until he or she can reach an appropriate criterion (e.g., oral reading at 100 words correct per minute (wpcm) for a 3rd-grade L1 student). The third major type of fluency practice involves performance reading. Students perform their reading for other students or other classes. Performance reading includes (a) student read alouds, (b) reader's theater, (c) "say it like a character," (d) radio reading, and (e) poetry performances (Rasinski, 2010).

Fluency practice in L2 contexts is described by N.J. Anderson (1999, 2009, 2014), Grabe and Stoller (2020), and Nation (2009). All authors recommend that a variety of fluency activities be integrated into L2 reading instruction on a regular basis. They all argue that fluency development is accomplished through a combination of practice with individual rereading, paired rereading, word recognition exercises, timed rate-building practice, and extensive reading.

Apart from specific fluency-development practice with texts, teachers oftentimes underexploit the reading materials in their textbooks for rereading purposes (see Table 17.1). There are many opportunities to ask students to reread, but for new purposes. These purposes allow students to engage in key comprehension skills and increase the number of exposures to new lexical items with texts that they already understand. In this way, students gain additional fluency practice that also supports comprehension skills as well as strategies for learning new information from texts. In contrast, when teachers ask students to reread a text (with no specific purpose stated), students will rarely do it. They may think to themselves, why should I? I've already read the text (see Grabe & Stoller, 2020; Rasinski, 2010).

The fluency instruction practices introduced here focus primarily on the reading of passages. However, research has also explored the impact of reading words for word recognition fluency and reading comprehension over time. Rasinski (2010) recommends that repeated reading of high-frequency words and phrases improves fluency.

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Learning high-frequency words develops sight reading skills for the most common words; reading these words in phrases supports comprehension skills. In L2 settings, there is a natural resistance to oral reading practices and assessments because L2 students may experience both reading and pronunciation difficulties. However, this argument, in the absence of research, may indicate the limited state-of-the-art of L2 theorizing on reading instruction rather than any evidence that opposes the oral reading practice. Given the strong evidence for the benefits of fluency training for both L1 and L2 students, a much greater effort needs to be made with respect to L2 students (see also O'Connor et al., 2013).

Building word and passage reading fluency requires an extended commitment in the reading curriculum. One cannot build reading fluency by practicing for a month or two, and only if time permits. It is critical to explain to students why they are working on fluency and to "sell" students on fluency, rate, and recognition activities. Typically, when these activities are done right, students enjoy fluency activities and look forward to them.

Fluency instruction is an important component in the reading curriculum. L2 students in particular need to develop processing automaticity and accuracy at both the word and passage levels. Students also need to build their reading rate and read with appropriate prosodic expression. At the same time, fluency is only one component skill for reading comprehension; fluency instruction needs to be incorporated along with vocabulary and comprehension instruction (as well as extended amounts of reading for comprehension).

Appendix: L1 Reading Rate Development Tables

Rasinski (2010; Rasinski & Cheesman Smith, 2018) lists the following *words correct per minute* (wcpm) for oral reading rates by grade (mid-year average)

Grade 1	35 wcpm
Grade 2	80 wcpm
Grade 3	93 wcpm
Grade 4	112 wcpm
Grade 5	118 wcpm
Grade 6	132 wcpm
Grade 7	158 wcpm
Grade 8	167 wcpm

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Kuhn & Rasinski (2007) suggest the following *end-of-year oral reading rates* for Oral Reading Fluency

Grade 1	30–60 wcpm
Grade 2	70–100 wcpm
Grade 3	80–100 wcpm
Grade 4	100–140 wcpm
Grade 5	110–150 wcpm
Grade 6	120–160 wcpm
Grade 7	130–170 wcpm
Grade 8	140–180 wcpm

Carver (1992) lists the following *standardized words per minute* (silent reading) by grade (mid-year averages)

Grade 2	121 wpm	Grade 8	205 wpm
Grade 3	135 wpm	Grade 9	219 wpm
Grade 4	149 wpm	Grade 10	233 wpm
Grade 5	163 wpm	Grade 11	247 wpm
Grade 6	177 wpm	Grade 12	261 wpm
Grade 7	191 wpm		

(See also Hasbrouck & Tindal, 2006)

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18 *Extensive Reading*

> Individual differences in print exposure … predicted differences in the growth of reading ability, word decoding, spelling, vocabulary, and listening comprehension throughout the elementary grades. (Sparks et al., 2014, p. 189)

Extensive reading (ER) is understood here as an extensive amount of reading. It is not specifically tied only to enjoyable reading or easy reading, although both of these sources of reading are important. Students who are appropriately motivated will read large amounts of academically related material, and do so willingly (e.g., Becker et al., 2010; Miyamoto et al., 2018). The fundamental idea is that a large amount of understandable input (i.e., within students' linguistic competence) via reading will develop students' language and knowledge resources through incidental implicit learning (Seidenberg, 2017; the power of implicit learning for reading development is explained in detail in Chapter 4). ER also develops fluency of processing and lexical quality in an incremental manner.

In first-language (L1) school settings, the essence of ER programs is known under various names including Sustained Silent Reading (SSR), free reading time, independent reading, library time, and, most importantly, Scaffolded Silent Reading (see Reutzel et al., 2010, 2012). The effort to move beyond a loose notion of SSR is taken up by Reutzel and colleagues, who argue persuasively that the teacher in extensive reading programs needs to be an active teacher, observer, and support person for students, especially for those who are struggling. (see also Hiebert, 2009; Hiebert & Reutzel, 2010 for useful applied perspectives on ER.)

ER in second-language (L2) settings, apart from K–12 contexts, is typically carried out in reading classes, reading labs, or at home. A variety of materials can be used for ER with respect to students' interests. Often, L2 ER involves the reading of simplified graded readers that are intended to appeal to older, mature students as well as younger, less proficient readers. The use of graded readers does

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not represent a problem for students 'who will need to read authentic texts.' Most students in L2 academic settings already read a fair amount of difficult (presumably authentic) material, but they seldom have opportunities to develop reading fluency, vocabulary, or comprehension through extended reading practice.

The ability to read extended texts for long periods of time is a hallmark of fluent readers. No other set of reading activities or reading practice can substitute for reading greater amounts of text with reasonable comfort, without needing to stop constantly, and without feeling fatigued or overwhelmed. One of the most interesting puzzles with regard to extensive reading abilities is recognizing how difficult it is to achieve such fluency, yet how many L2 readers eventually are capable of becoming fluent readers. Millions of people learn to read L2 texts fluently for extended periods of time. How do they do it?

The ability to read long texts for extended periods of time is not the same as practicing to read fluently. As we saw in Chapter 17, fluency is concerned with the ability to recognize words automatically and read shorter passages accurately, rapidly, and with reasonable expression. Fluency training will not, by itself, make someone fluent in extended reading because fluency practice does not emphasize meaning processing for extended periods of time. In fact, extensive-reading practice is a strong predictor of subsequent fluency development.

ER has a long L2 history, and it has parallels with L1 "exposure to print" and "amount of reading" (Nation & Waring, 2020; Stanovich, 2000). It has been a source of assertions that many benefits derive from reading extensively. In this chapter, the research evidence for ER is explored, both in L1 and L2 settings. The chapter also explores key issues, stemming from both research and practical experience, for developing ER instruction.

18.1 Research on Extensive Reading

> Research has demonstrated that exposure to print, or the amount of reading a student does, is a unique and powerful contributor to a variety of academic achievement skills, including oral language, basic reading skills, spelling, content/declarative knowledge, and vocabulary skills. (Sparks et al., 2014, p. 190)

18.1.1 An Overview of ER

To set the stage for a review of research on ER (i.e., amount of reading, exposure to print), there is good evidence that practice with extended reading, over a long time frame, leads to important gains

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in reading comprehension. Several leading reading researchers have now strongly argued for the importance of amount of reading for reading comprehension and vocabulary development (e.g., Andrews, 2015; Castles et al., 2018; Dronjic & Bitan, 2016; Kavanaugh, 2019; Miyamoto et al., 2018; Mol & Bus, 2011; Nation, 2013; Oakhill & Cain, 2017; Schwanenflugel & Knapp, 2016; Seidenberg, 2017; Steacy et al., 2017; Van Dyke & Shankweiler, 2013; Verhoeven & Perfetti, 2017a; Willingham, 2017). Going back almost forty years, research studies on ER in both L1 and L2 settings have been strongly associated with reading abilities more generally (R.C. Anderson et al., 1988; Cunningham & O'Donnell, 2012; Elley, 2000; Greaney, 1980; Nation & Waring, 2020; Stanovich, 2000). There is also evidence that ER is more motivating for students than more traditional textbook-oriented reading instruction (Stahl & Heubach, 2005; Yamashita, 2013).

There have also been a large number of qualitative studies that provide important insights into reading and vocabulary growth resulting from extensive reading (e.g., Al-Homoud & Schmitt, 2009; Horst, 2005; Pigada & Schmitt, 2006). Until recently, these studies have not been directly translated into larger-scale controlled experimental research studies (cf. Suk, 2017), indicating a limitation on arguments supporting ER in L2 contexts. However, the most challenging and influential critical analysis of ER appeared in the report of the US National Reading Panel on Reading (NRP, 2000).

18.1.2 A Major Challenge to Extensive Reading Research

The results of the NRP were surprising. No set of true experimental evidence was found in support of ER practices leading to reading comprehension improvement. When the NRP report was published, the analysis of ER, or rather the inability to analyze ER, was disturbing to many reading researchers. The NRP report stated that direct experimental evidence for the efficacy of independent silent reading did not exist. Based on its stringent inclusion criteria, the NRP found only fourteen studies acceptable among the 1,000+ studies identified on this topic. Their conclusion was simple: "Most of the studies, including the best designed and largest ones … reported no appreciable benefit from [extensive] reading" (NRP, 2000, Sec. 3, p. 26).

Although correlational evidence from many excluded studies overwhelmingly supports the idea that ER has a major impact on comprehension, these studies were not true experimental designs. The problem with correlational studies is that other factors may be true causes for results, and it is hard to rule out the idea that students read

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more extensively as a consequence of being better readers (cf. R.C. Anderson et al., 1988; Cipielewski & Stanovich, 1992, both of whom provided autoregressor controls in their studies, but were not randomized studies). Improved research methods over the past two decades (longitudinal studies, hierarchical regression analyses, structural equation modeling) has since provided stronger evidence supporting the impact of extensive reading on reading comprehension and component skills of reading (more so in L1 research studies; see Chapters 10, 17).

18.2 Recent Research on Extensive Reading Effectiveness

> Children who choose to read books in their leisure time have larger vocabularies, better reading comprehension, and better [word recognition] and spelling skills than peers who do not read as frequently. (Mol & Bus, 2011, p. 285)

Over the past twenty years, in both L1 and L2 contexts, research on the role of ER has expanded significantly. This growth provides a response to the earlier NRP critique of ER that strong studies were difficult to find. A primary goal of this chapter is to review the more recent research studies that support the important role of ER for developing reading comprehension, reading fluency, vocabulary knowledge, and general background knowledge.

18.2.1 L1 Studies

The "first" study is actually two related studies, an original study going back to 1997 and a close replication study by an independent group of researchers. In all, the two longitudinal studies devoted over twenty-five years to explore the relationship between amount of reading and reading comprehension. In 1997, Stanovich and Cunningham published the results of a groundbreaking eleven-year study on the effects of exposure to print. They studied twenty-seven students from 1st grade to 11th grade. Initially, in 1st grade, fifty-six children were given a vocabulary test, a nonverbal intelligence test (Raven's Matrices), and three different reading survey/comprehension tests. The students were followed for ten years and were given reading comprehension tests in 3rd and 5th grade. Finally, in 11th grade, twenty-seven remaining children were given a battery of tests: Raven's Matrices, a reading comprehension measure, two vocabulary measures, four cultural knowledge measures, and an exposure-to-print recognition measure.

Using hierarchical regression measures, the researchers first entered the 1st grade reading survey measure, then the 11th grade exposure-to-print recognition measure as the second step in the regression

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analysis. This second step was repeated for several 11th grade measures as separate dependent variables (reading comprehension, vocabulary, and cultural knowledge). After first removing 1st grade reading variance with 11th grade measures, the exposure-to-print variable significantly accounted for independent remaining variance with all measures except for one vocabulary measure. So overall, the more reading experience over years, the better the performance on 11th grade measures, even taking into account early reading skills.

Finally in a reverse analysis, the researchers asked if earlier reading abilities would predict exposure-to-print scores. This switch, as a test to determine if better reading abilities, in turn, led to greater amounts of subsequent reading, amounted to a reciprocal growth analysis. Cunningham and Stanovich found that earlier comprehension measures in 1st, 3rd, and 5th grades all predicted cumulative amount of reading in 10th grade.

A replication study of Cunningham and Stanovich was published by Sparks et al. (2014). Starting with 156 students in 1st grade, and ending with fifty-four students at the end of 10th grade, Sparks et al.'s near replication included similar measures, but also added a few other measures (spelling, cognitive skills, writing and grammar, and IQ). This analysis also assumed that an exposure-to-print measure reflects a cumulative "amount of reading" over the ten years of the study. In fact, the exposure-to-print measure accounted for 16 percent unique shared variance predicting performance on 10th grade reading and an additional 52 percent of unique shared variance on a measure of 10th grade cultural knowledge.

In a further close replication – a hierarchical regression with 1st grade reading entered first – Sparks et al. found that 1st grade reading accounted for 22 percent of shared variance with 10th grade reading, and exposure to print, entered second, accounted for an additional 21 percent of shared variance. This is a very close longitudinal replication of the Cunningham and Stanovich results. This result, and related results, showed that early reading skills strongly predict 10th grade reading, and a cumulative amount of reading accounts for significant additional amounts of shared variance with 10th grade reading.

Finally, Sparks et al. explored which predictors of reading skills would account for a significant amount of shared variance with exposure to print (now as the dependent variable). When 10th grade reading was entered first (accounting for 37 percent of shared variance with 10th grade exposure to print), both 2nd and 3rd grade reading accounted for significant additional shared variance with exposure to print (5 percent and 8 percent, respectively). These results, again a close replication of Cunningham & Stanovich, showed that both current reading ability and early reading ability significantly predicted

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the amount of reading done by students, replicating an argument for reciprocal relations between reading ability and amount of reading (see Sparks et al., 2014 for many additional details).

We have gone into some detail in describing these two studies because they are unique in the research on amount of reading and subsequent and concurrent measures of reading ability. Amount of reading has a powerful impact on later reading abilities, and early reading abilities have a powerful impact on amount of reading done by students.

18.2.2 Motivation Studies and Amount of Reading

In Chapter 10, we reviewed a group of research studies, involving both L1 and L2 students, that demonstrated the extent to which intrinsic motivation strongly predicted amount of reading by students, and amount of reading, in turn, predicted reading comprehension. Studies by Becker et al. (2010, with 704 students from 3rd to 6th grade), Stutz et al. (2016, with 1,053 students from 2nd to 3rd grade), Miyamoto et al. (2018, with 4,619 students from 5th through 7th grade), and Kavanaugh (2019, with 4,067 students in 6th grade) provided consistent findings with students from Germany (in the first three cases) and students from Ireland (in the fourth case) using SEM methodology. Additional studies indicated similar results, but with more variations in the design and outcomes (see McGeown et al., 2016; Miyamoto et al., 2019; Schaffner et al., 2013). The key message is clear that amount of reading strongly predicts reading comprehension abilities when guided by students' intrinsic motivation.

18.2.3 Meta-analyses

Mol and Bus (2011) carried out a meta-analysis assessing the impact of print exposure on reading from infancy through post-secondary studies. Their meta-analysis included ninety-nine studies (N = 7,669) and was divided into three distinct meta-analyses by grade levels: (a) pre-school and kindergarten, (b) 1st through 12th grade, and (c) college and university. For all three meta-analyses, they found moderate correlations between exposure to print and several outcome measures (e.g., oral language skills [vocabulary and listening comprehension], reading comprehension, word recognition, spelling, IQ, and academic achievement [college and university]). Focusing on 1st to 12th grades, the following significant correlations with exposure to print were reported: 0.45 for oral language, 0.36 for reading comprehension, 0.38 for word recognition, and 0.42 for spelling. Focusing on college and university students, the following significant correlations with exposure to print were reported: 0.58 for oral language, 0.41

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for reading comprehension, 0.40 for spelling, and 0.30 for academic achievement. In L2 contexts, Nakanishi (2015) synthesized forty-three independent samples from thirty-four studies (total N = 3,942) and reported two effect sizes between ER and reading comprehension according to different research designs: group contrasts (comparing an extensive reading group and a control group) and pretest/post-test contrasts. The results were d = 0.46 (CI = 0.27–0.65) and d = 0.71 (CI = 0.039–1.04) in each design, respectively. These effect sizes fall mainly in the moderate effects range (Plonsky & Oswald, 2014). Together, these meta-analyses support the impact of extensive reading on L1 and L2 reading even if the effect sizes are not strong.

18.2.4 L2 Studies of Extensive Reading and Reading Comprehension

In an unusual study, Robb and Kano (2013) took advantage of a curriculum change at Kyoto Sangyo University in 2009. The curriculum change required that all incoming first-year university students read in English outside class time for any one of three general course "language study" requirements. In response to this change, Robb and Kano set up an add-on ER component for all of the three courses. They used MReader as an assessment system to ensure that students read five graded readers appropriate for their entering English comprehension abilities (see Robb, 2015; Suk, 2018). Noncompliance involved a 5 percent deduction for their year-end grade in the course. When evaluating the results of this ER intervention, at the end of the 2009–2010 academic year, Robb and Kano compared the 2009 cohort with the 2008 1st year cohort (N= 4,819, combining both years), for whom they had year-end reading and listening comprehension scores in English. Across 127 course sections and five proficiency levels, the 2009 cohort (required to engage in ER) significantly outperformed the 2008 entering class in reading comprehension and listening comprehension at year end. Reading comprehension showed the largest gains for all proficiency levels.

Suk (2017), in a carefully controlled L2 study, investigated the impact of ER on Korean university students enrolled in an English reading course with a modified curriculum. The study involved four classes, two experimental (N = 83) and two control (N = 88). The experimental group combined seventy minutes of intensive reading with thirty minutes of ER in weekly 100-minute classes. The control group was taught through intensive reading – the regular curriculum – for the entire 100 minutes.

Suk assembled 350 graded readers (155 different titles) for the two experimental classes. Experimental- and control-group students were

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required to engage in two hours of homework each week (worth 25 percent of the course grade). For the experimental group, the homework entailed reading graded readers and receiving credit for successfully answering a comprehension quiz using the MReader program (see Robb, 2015). Experimental group students were encouraged to read 200,000 words by the end of the semester.

All students took pre- and post-tests to assess vocabulary, reading comprehension, and reading rate. The vocabulary measure was a 120-word recognition translation test (see Suk, 2021). Drawing on the most frequent words from each of the 155 graded readers, the test provided a very sensitive measure that also was appropriate for the reading level of the control group. The comprehension test was an extensively piloted thirty-two-item, four-passage measure. The rate measure involved the number of words read from the first passage of the comprehension test after one minute. The experimental group performed significantly better than the control group for all three measures: Vocabulary improvement (effect size of $d = 0.70$), comprehension ($d = 0.30$), and rate ($d = 0.39$). The comprehension effect size, while significant, was small. But it is important to note that the control group had more intensive comprehension instruction and additional comprehension homework each week. The vocabulary improvement by the experimental group over the control group was moderate to large and most likely reflects the greater sensitivity of the vocabulary measure used as compared to the Vocabulary Levels Test, a fairly standard measure in other L2 studies.

It should be clear from this review of research that there is considerable evidence for the impact of ER on reading achievement. Many studies not only reported correlational data, but also went further in controlling likely confounding factors. Overall, the research shows that greater amounts of reading, when carried out consistently and appropriately over an extended period of time, will significantly improve students' reading comprehension abilities. One last issue to consider is what other beneficial outcomes are generated, aside from reading comprehension, by having students engage in extensive reading. Section 18.3 briefly explores four of these issues.

18.3 Further Outcomes Associated with Extensive Reading

18.3.1 Extensive Reading and Vocabulary Growth

> The research seems to suggest that eight to ten reading exposures may give learners a reasonable chance of acquiring an initial receptive knowledge of words. (Schmitt & Schmitt, 2020, p. 144)

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The role of ER and its impact on vocabulary growth has been addressed in several studies in both L1 and L2 contexts (see Elgort et al., 2018; Mohamed, 2018; Nagy et al., 1985; Schmitt & Schmitt, 2020; Webb & Nation, 2017). A thorough treatment of this issue is not possible here (see also Chapters 2, 4, 6, and 11 and especially the discussions of lexical quality). In brief, there is strong evidence that ER supports vocabulary growth through implicit and incidental learning. As words are processed repeatedly to form comprehension networks, they build stronger long-term associational links in memory and create the conceptual space for new words to be learned more quickly over time and multiple exposures (Seidenberg & MacDonald, 2018).

In a recent L2 study in Taiwan, Webb and Chang (2015) carried out a one-year experimental study with university students (N = 82) who read twenty graded readers over the course of two semesters. For each semester, 100 words were quasi-randomly selected as target words to be learned incidentally. Percentage of words gained was determined by words unknown on a pre-test, but subsequently known during post-testing. Experimental students gained significantly more new words from ER than a control group (twenty new words versus six new words). Relative gains in word knowledge from pre- to post-test was 44 percent. Words known at pre-test (fifty words) were subtracted from 100 selected words. The new words learned during the study generated a percent of words learned based on post-test outcomes). As Webb and Chang (2015) note, "The result of the present study suggest that relatively large vocabulary learning gains may occur through reading and listening to multiple (graded reader) texts" (p. 679). Interestingly, the relative frequency of word occurrences did not predict increased learning of new words. The study showed that even with relatively few exposures (1–4), students learned 41 percent of the new unknown words, and this high rate of learning was relatively consistent all the way up to "above 25" occurrences in the ER graded readers.

Overall, however, there is strong evidence that the frequency of occurrence has a strong impact on new word learning across several other studies. In a recent meta-analysis comparing frequency of incidental word exposure and word learning gains across twenty-six studies, Uchihara et al. (2019) reported a correlation of 0.34. In a specific early study Nagy et al. (1985) set the groundwork for modern research on vocabulary learning from reading, showing that 5–10 percent of new words are learned on a single reading of text. Over time, research has demonstrated that 5–15 percent gains in new word learning from reading a text is a reasonable estimation (Nation, 2013;

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Stahl & Nagy, 2006). In L2 contexts, eight to twelve exposures have been commonly proposed as a key number of repetitions required for new word learning (Elgort et al., 2018; Mohamed, 2018; Schmitt & Schmitt, 2020; Webb & Nation, 2017). After almost forty years of research, it is clear that some amount of vocabulary is learned each time a student encounters new words while reading (Nation, 2013; Schmitt & Schmitt, 2020), and that more frequently occurring words, generally, are learned better.

18.3.2 Reading Rate and Fluency

Over the past twenty-five years, several studies have explored gains in reading rate and fluency comparing L2 ER groups with L2 intensive reading groups (who typically engage in close reading of texts, grammar translation, and vocabulary exercises). More recently, research controls on studies have improved considerably, providing stronger evidence that equivalent amounts of time engaged in ER versus intensive reading (control) groups leads to faster reading rates and greater reading fluency with longer texts for the ER groups. Beglar et al. (2012) carried out a one-year longitudinal study in Japan with ninety-seven university students. The reading rates and fluency of experimental groups improved significantly over a control group while comprehension outcomes were equivalent (effect size for greater fluency favored extensive reading, $d = 1.12$). Huffman (2014) carried out a one-semester reading rate study involving sixty-six Japanese first-year university students (thirty-four experimental and thirty-two control). Results showed that experimental students' reading rates after one semester improved significantly over the control group (effect size favoring the experimental group, $d = 1.47$).

The best controlled longitudinal L2 study to date specifically addressing reading rate improvement was carried out by McLean and Roualt (2017) for one academic year. This study involved twenty-three Japanese first-year university students as the experimental group and twenty-seven students as an intensive reading control group. Experimental fidelity was very strong, and the amount of ER done by the experimental group was sufficiently large to provide a strong test of the effectiveness of ER. Results showed that the reading rates of the experimental group were significantly greater than the control group at the end of the year (effect size favoring extensive reading, $d = 1.73$). These results combine to argue strongly that ER significantly improves reading rates and reading fluency over more standard English reading instruction in Japan (see also Beglar & Kite, 2014; Yoshizawa et al., 2018).

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18.3.3 Extensive Reading and Conceptual Knowledge Growth

One of the most likely improvements from ER over an extended period of time is gains in world knowledge and conceptual knowledge in comparison with students who read much less. Over the past thirty-five years, this argument has been validated experimentally multiple times. Stanovich and colleagues have demonstrated that L1 students who read extensively significantly outperform control groups on conceptual knowledge development (e.g., Cunningham & Stanovich, 1997, 1998; Stanovich & Cunningham, 1993).

In the two multi-year longitudinal studies reported earlier in this chapter (Cunningham & Stanovich, 1997; Sparks et al., 2014), both reported a high percent of shared variance between reading comprehension and cultural knowledge for 10th grade students (Cunningham & Stanovich, $r^2 = 49.8$ for the Cultural Knowledge Checklist and $r^2 = 38.8$ for the Multicultural Checklist; Sparks et al.; $r^2 = 51.9$ for a composite of the Cultural Knowledge Checklist and the Multicultural Checklist). As far as we are aware, there are no equivalent L2 studies comparing the relationship between amount of reading and cultural knowledge. However, given the importance of background knowledge as a significant predictor of reading comprehension more generally, it would be an important topic to examine with respect to amount of reading carried out by students (see also Stanovich, 2000; Stanovich & Cunningham, 1993).

18.4 Implications for Instruction

> What is more expensive than the waste of human intellect implied in a library of unread books? And what sort of destruction is more admirable than the book tattered and finally broken beyond all repair by the hands of eager readers? We have been too long without such destruction; the time has come for our school libraries to invite it. (Fader & Shaevitz, 1966, p. 42)

ER, to be reasonably successful, requires a significant effort to motivate students. It also requires many interesting and accessible texts for students. It requires an allotment of time in the curriculum (and time constraints are usually a reason given for not developing an ER program in a reading curriculum). Finally, extensive reading, both in school and at home, requires effective curricular guidelines to give the program appropriate structure, rationale, and goals. (Just assigning the name "extensive reading" to a poorly conceived approach with inadequate time, commitment, resources, and structure is certainly

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not an answer.) Engaging students in ER can be developed by incorporating the recommendations noted in Table 18.1 into a reading curriculum. The most important point is having students read material that they want to engage with and continue reading on their own.

Table 18.1 Engaging students in extensive reading

1. Ensure that plentiful reading materials are in a class library, graded-reader section of the school library, or in a designated reading-lab location.
2. Allot class time for extensive reading, but integrate extensive reading within a larger reading curriculum.
3. Create multiple opportunities for reading (extensive reading, free reading, rereading) in and out of class.
4. Find out what students like to read and why.
5. Read interesting material aloud to the class.
6. Talk about what you read and why the material is interesting to you.
7. Find ways to interest students in reading by, for example, (a) sharing new book acquisitions, book titles, back-cover blurbs, and book topics with the class and (b) having students recommend reading materials to their classmates.
8. Create incentives to start students in their reading.
9. Keep records (of, e.g., which graded readers students have read, number of words read, MReader comprehension scores).
10. Permit students to take reading materials home.

We close this chapter with optimism about the implementation of ER in L2 reading pedagogy. There is now considerable evidence from many sources to demonstrate that reading extensively, when done consistently over a long period of time, leads to better reading comprehension as well as improved abilities in several other language areas. It opens up opportunities for greater amounts of implicit input to support greater lexical quality, additional background knowledge, and better implicit uses of meaning associations and automatic inferencing. At the same time, ER is not all that we need in the reading program. We should support a balanced approach, including both intensive and extensive reading combined with other skill-based instruction (N.J. Anderson, 2014; Nation & Waring, 2020). However, for programs that expect students to develop reasonably advanced academic reading abilities, there is no escaping the simple fact that one learns to read by reading (and by reading a lot).

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PART V
APPLICATIONS OF READING RESEARCH: INSTRUCTION AND ASSESSMENT

This fifth part takes a step back from component skills and extensions of reading development (a) to address curricular and instructional practices that improve reading and (b) to outline assessment practices that impact (and support) student learning (a theme not commonly associated with assessment practices).

Chapter 19 presents a fairly comprehensive view of curricular issues that should guide reading instruction. The view of curriculum development presented here is not meant to be a single blueprint for all reading instruction contexts. Rather, it assumes the development of a needs analysis and a curriculum that gives more emphasis to certain principles depending on students' ages, reading ability levels, and institutional goals. Chapter 19 also outlines four general approaches to reading instruction and emphasizes the importance of engaging students not only in literacy development but also integrating literacy development with coherent content learning.

Chapter 20 provides a fairly simple but expansive overview of reading assessment practices across a range of L1 and L2 reading contexts. It first outlines briefly various general purposes for reading assessment: proficiency assessment, placement and diagnostic assessment, summative classroom-learning assessment, formative classroom-learning assessment, assessment *for* learning, and assessment for research purposes. The chapter then introduces specific reading assessment practices and resources. A major sub-section takes up assessment *for* learning goals and practices as a fairly recent major theme for reading assessment. The chapter (and the book) closes with possible assessment innovations and raises two critical issues that are not commonly addressed in reading assessment overviews: the consequences of assessment and teacher training for reading assessment.

As we close with this final part of the book, one thing has become startlingly clear. The amount of reading, along with the concomitant increase in long-term knowledge about the world, provides the

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impetus for growth of all critical component reading skills as well as the refinement of underlying cognitive skills. Advanced academic-literacy skills are also not possible without acting on this core insight stressed especially in the Preface and in Chapter 18: No matter the context, we only learn to read by reading, and by reading a lot.

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19 *Reading Curriculum and Instruction*

Many instructional implications have been suggested in Chapters 1 to 18. They reflect research results and what we now understand about reading abilities and how they develop. One conclusion to draw from these chapters is that reading comprehension and its development are very complex. Added to this complexity is the variability in instructional possibilities, teacher orientations, and student engagement. One of the major issues facing teachers, teacher trainers, curriculum developers, administrators, and materials writers is how to determine the most efficient and effective instructional approaches for reading improvement that also achieve institutional goals. In this chapter, we offer guidelines to develop coherent approaches to reading instruction by building on the many implications suggested in the first eighteen chapters. With these guidelines, we specifically address second-language (L2) instructional contexts (with an emphasis on 6th grade through university studies). However, we are sure that the curriculum guidelines and instructional ideas apply equally across many if not most first-language (L1) reading instructional contexts as well.

19.1 Research Foundations to Guide Reading Instruction

Overall, the research on L1 and L2 reading suggests that there are a number of important goals for reading instruction. At a minimum, that research suggests that reading comprehension requires L2 skills and knowledge resources (Table 19.1). By extension, it is the goal of curriculum development to translate curriculum principles into a larger coherent instructional approach that achieves learning priorities.

In Chapters 1, and 7 to 10, it becomes clear that students' ages, proficiencies, and social, cultural, and educational backgrounds need to be considered. As a result, the instructional goals from research listed in Table 19.1 apply to readers in differing ways and to differing extents. To take an easy example, more advanced L2 students with a number of years of prior L2 learning experiences will not need letter-sound decoding practice. Conversely, beginning readers will not

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Table 19.1 Reading skills and knowledge resources important for reading curricula

Reading requires the ability to:

1. Decode graphic forms for efficient word recognition.
2. Access the meanings of a large number of words automatically.
3. Draw meaning from phrase- and clause-level grammatical information.
4. Combine clausal-level meanings to build a larger network of meaning relations (how readers comprehend the text–[build main-idea comprehension]).
5. Recognize discourse-level relationships and use this information to build and support comprehension.
6. Use reading strategies with more difficult texts and for a range of academic reading tasks.
7. Set goals for reading and adjust them as needed and monitor comprehension in line with reading goals.
8. Use inferences of various types.
9. Draw on prior knowledge as appropriate.
10. Evaluate, integrate, and synthesize text information to form a situation model of comprehension (an interpretation of the text).
11. Maintain these processes fluently for an extended period of time.
12. Persist in reading and use the text information appropriately in line with reader goals.

have well-developed L2 synthesis and evaluation skills, and explicit instruction in these more advanced skills is inappropriate.

However, each research–driven goal noted here is likely to reflect a need on the part of many students seeking to develop academic L2 reading abilities. The issue then becomes how to build a coherent framework in which all or most of the research findings can be translated into effective, consistent curricular goals and instructional applications in the classroom. Section 19.2 outlines curriculum principles and possible applications for the research-driven goals above. Section 19.3 reviews overall curricular approaches for reading instruction and focuses in particular on content-based approaches as the best way to build coherent and responsive reading curricula and instruction.

19.2 From Research Findings to Curriculum Development Principles

The key argument arising from prior chapters is that a number of reading subskills can be taught successfully, and further, that

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learning these subskills will contribute to students' reading comprehension abilities. How these skills should be taught most effectively is indicated to some extent by the research reviewed in this book. However, research does not typically translate directly into curriculum principles or specific instructional applications; rather, a variety of options emerge that can be used and assessed for learning effectiveness. Often it is the case that multiple instructional options work well together. (We also assume that effective L2 instructional choices build on needs analyses and institutional goals and objectives for teaching and testing.) This section introduces sixteen curriculum-development principles that can inform reading instruction and establish goals for learning (see also Anderson, 2009; Grabe & Stoller, 2019, 2020, 2022). These principles are organized around three themes, as shown in Table 19.2. Note that many of these principles connect back to specific research-driven goals but others provide additional curricular mechanisms for instructional effectiveness.

Table 19.2 Sixteen curriculum principles for reading instruction

Core reading curriculum principles

1. Require student to read a lot and read often.
2. Ask students to read and reread for well-defined purposes.
3. Incorporate deliberate practice into reading curricula.
4. Promote discussion among students around text comprehension.
5. Build student motivation for reading.

Reading-skills development principles

6. Make a strong commitment to vocabulary teaching and learning.
7. Teach (rather than test) main idea comprehension.
8. Raise students' discourse-structure awareness.
9. Train students to become strategic readers.
10. Promote text reading fluency.

Instructional design principles

11. Develop lessons that are structured around prereading, during-reading, and postreading activities.
12. Select and adapt texts based on students' proficiency levels, current and future reading needs, and topic interests.
13. Address students' digital literacy needs.
14. Connect reading to writing to prepare students for academic tasks.
15. Promote assessment for learning to support students' reading development.
16. Integrate content and reading instruction.

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19.3 Core Reading Curriculum Principles

19.3.1 Principle 1: Require Students to Read a Lot and Read Often

To become a good reader requires reading a lot and reading often. There are simply no short cuts, and the amount of reading completed by students may be the single most important factor for both L1 and L2 reading-skills development. This principle, supported by a wide range of reading research, is generally referred to as **exposure to print** or **extensive reading**. Unfortunately, L2 students, even in discrete-skill reading classes, typically read very little. In fact, many reading classes are often more like conversation classes because, rather than focusing on reading-skills development, class activities commonly center around (a) a quick oral review of postreading comprehension questions, (b) vocabulary-building activities, and (c) "personalization" tasks that connect the topic of the assigned reading to students' personal lives, without holding students accountable for what they have read.

In L2 contexts, extensive reading involves *reading more*; it is that simple. Extensive reading is not solely for entertainment purposes, as some assert, because students gain knowledge, confidence, and academic skills by reading content materials that are engaging and that support a shared commitment to content learning and reading-skills development. Students benefit from extensive reading programs because extensive reading (a) increases students' exposure to large amounts of reading, (b) improves reading fluency, (c) builds motivation and confidence to read, and (d) supports vocabulary growth and main-idea comprehension (Nation & Waring, 2020; Robb & Kano, 2013; Suk, 2017; Yamashita, 2013; Yoshizawa et al., 2018; see Chapter 18). Reading extensively on a consistent basis in L2 contexts, in and out of class, is most straightforwardly carried out through a graded-reader program (that requires some level of investment in graded readers). (See also freegradedreaders.com.)

19.3.2 Principle #2: Have Students Read and Reread for Well-Defined Purposes

Purposeful reading and rereading is a second core principle for teaching reading (Britt et al., 2018; van den Broek & Kendeou, 2017). In many L2 classrooms, students are simply assigned to "read" a passage and answer postreading comprehension questions "for the next class meeting." Even well-respected textbooks often direct students to simply complete prereading activities and then "read." Skilled

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readers, however, always read for a purpose. Well-defined purposes for reading influence (a) the ways in which skilled readers approach texts (e.g., reading faster, slower, more carefully, more casually, with pencil or pen in hand), and (b) their expectations of the reading experience. To illustrate, skilled readers might read quickly to search for information, understand the gist of a passage, or decide if a text is worth reading more carefully. In academic contexts, students might also read to evaluate, critique, or use information for other purposes (e.g., to write a summary, prepare for a debate). Readers may also turn to print or digital sources to simply read for general comprehension and enjoyment (Grabe & Stoller, 2020).

Skilled readers often reread important texts a second or third time, also for well-defined purposes. In fact, purposeful rereading is a common strategy used by skilled readers to solve comprehension difficulties, identify important details, determine relationships among ideas (in one or more texts), find evidence of an author's viewpoint, write a summary, review for quizzes, complete a graphic organizer, and so on. Rarely, however, are L2 students directed to reread for well-defined purposes.

19.3.3 Principle #3: Incorporate Deliberate Practice into Reading Curricula

The role of practice in developing language skills is universally accepted as a requirement for mastering cognitively demanding skills (DeKeyser, 2015; Kellogg, 2018; Lightbown, 2019). However, reading-skills development, because it is driven in large part by incidental and implicit learning, requires more than sets of overt practice exercises. Research over the past thirty-five years – in the psychology subfields of expertise and expert performance (J.R. Anderson, 2020; Ericsson, 2018, Ericsson et al., 2018) – has argued that skill expertise (and skilled reading) requires more than sets of practice activities in a reading coursebook. What reading requires is *deliberate practice* (as well as thousands of hours of reading). As J.R. Anderson (2020) states, "A great deal of deliberate practice is necessary to develop expertise in any field" (p. 305).

Ericsson (2018) and Ericsson and Pool (2016), in their discussions of the development of expertise, depict deliberate practice as purposeful, goal directed, and communicative (Munger & Murray, 2014; Stigler & Miller, 2018). Table 19.3 enumerates key characteristics of deliberate practice.

This principle of deliberate practice is new for many educational specialists because it stems from a concept in cognitive psychology

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Table 19.3 Key characteristics of deliberate practice

1. Well-defined goals for improving select aspects of the target performance; subgoals and more specific subroutines that develop the larger skill.
2. A knowledgeable "coach" (teacher) who can provide feedback to improve skill development.
3. Modification of effort in direct response to coach feedback.
4. Carefully staged and sequenced tasks.
5. Full attention and concentration on the part of the learner.
6. Building on, or modifying, previously acquired skills to improve them.
7. Learner self-monitoring, reflection on achievements, and motivation.
8. Learner understanding of the purposes of practice goals and tasks, and an appreciation for practice as the way to achieve desired outcomes.

centered on the development of advanced skills learning more generally, rather than on reading or language learning more specifically. However, we believe that deliberate practice can help L2 students achieve advanced reading skills (and reading–writing skills; Kellogg, 2018). Reading curricula that integrate elements of deliberate practice, with the teacher taking the "reading coach" role, are likely to witness accelerated learning and improved reading abilities among students (see especially Ericsson & Pool, 2016).

19.3.4 Principle #4: Promote Discussion Among Students About Text Comprehension

Discussion about texts is a common practice in many L2 reading classes. Prior to reading, in-class discussions often center on developing shared background knowledge about ideas to be encountered in the text. Another common use of discussion is to wrap up an instructional unit by extending ideas from a text to more personal connections and interpretations. However, the role of discussion, as advocated here, is different. In line with the concept of deliberate practice (Principle 3), the major focus of discussion in reading courses should be on students achieving text comprehension and content learning from the texts they are reading (and often while they are reading the text).

The concept of discussion is essential for reading-skills improvement and the development of more strategic readers (Beck & Sandora, 2016; Boardman et al., 2017; Fisher & Frey, 2019; Garas-York & Almasi, 2017; Guthrie & Klauda, 2016; Murphy et al., 2009). In-class discussions – as a full class, in student pairs, and/or in small student groups – can focus on ways to (a) identify main ideas, (b) monitor

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comprehension, and (c) build awareness of what strategies other students are using to achieve better comprehension. More specifically, the goal is discussions of *how* students achieved text comprehension, *what strategies* they used and *what purposes* they served, *why* certain text features aided text comprehension (e.g., bolded section headings, end-of-text summary), and *which* vocabulary was key to text comprehension. These discussions need to be guided by the teacher on a consistent basis, as she/he introduces and reinforces sets of specific reading strategies that, in combination, will help students become more strategic readers. Through in-class discussions, teachers can nurture a collaborative classroom environment (Guthrie & Klauda, 2016). The key to effective discussions is to avoid simple teacher-question-and-student-answer sequences (see also Chapter 13).

19.3.5 Principle #5: Build Student Motivation to Read

As shown in Chapter 10, student motivation plays a vital role in reading-skills development and in learning more generally. Research has consistently shown that motivation and positive attitudes toward reading lead to increased reading engagement, as measured by time on task, effort, concentration, and volume of reading (Guthrie & Klauda, 2016; Guthrie & Taboada Barber, 2019). Engaged readers – who read greater amounts – develop automaticity of many of the cognitive processes associated with skilled reading; moreover, they draw on background knowledge for comprehension, rapid inferencing, reading fluency, and vocabulary growth (Guthrie et al., 2013). Students who self-identify as readers and who enjoy reading are more likely to develop into skilled, autonomous readers. Students' sense of self-efficacy, willingness to read, and openness to reading instruction and related activities contribute to their becoming autonomous readers. Motivation for reading can be nurtured in classroom environments that promote CAR (Komiyama, 2009): **C**ompetence with reading skills and content learning, **A**utonomy (when given choices), and **R**elationships (the result of peer collaboration and support).

19.4 Reading-Skills Development Principles

19.4.1 Principle #6: Make a Commitment to Vocabulary Teaching and Learning

Several chapters have argued that vocabulary knowledge is at the heart of the reading process. Vocabulary growth leads to improved reading comprehension and, at the same time, amount of reading

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leads to vocabulary growth (e.g., Ganske, 2019; Stanovich, 2000; Suk, 2017). Students' vocabulary growth benefits from a commitment to reading-skills development in addition to explicit attention to vocabulary building, vocabulary recycling, and vocabulary-learning strategies.

One of the challenges that teachers face is that they cannot possibly teach all the words that students need to know. Thus, introducing students to strategies for independent vocabulary learning is imperative (Nation, 2013; Schmitt & Schmitt, 2020). At the same time, teachers can contribute to students' vocabulary growth by judiciously selecting the lexical items that they teach and recycle (Grabe & Stoller, 2020; Schmitt & Schmitt, 2020; Webb & Nation, 2017). Over time, the best way to learn a large amount of vocabulary is through extensive reading, primarily by incidental word learning through reading. There are other ways to encourage student word learning, and guide students in tasks involving many words (word wall activities, sorting activities, word splash activities, word association maps). Teachers should also recycle vocabulary items over time, give students choices in self-selected word learning, motivate students to collect words that they like and learn about these words, and teach useful word-learning strategies (see Chapter 11).

19.4.2 Principle #7: Teach (Not Test) Main-Idea Comprehension

Teachers, without realizing it, typically devote more time to "testing" reading comprehension than teaching for comprehension (N.J. Anderson, 2014). When structuring a reading lesson mainly (or solely) around a review of postreading comprehension questions, teachers are essentially testing comprehension rather than taking advantage of opportunities to teach students *how* to comprehend texts. Teaching for reading comprehension entails, at a minimum, engaging students in discussions of (a) when, how, and why to preview, predict, and check predictions; (b) how to identify main ideas; and (c) when and for what purposes to reread. Explicit attention to these essential elements of reading, when combined with class discussions about the steps taken to make sense of the texts that students are reading, is key for teaching main idea comprehension (see Chapter 12).

Comprehension tasks and classroom discussions provide valuable opportunities for students to talk – to one another and the whole class – about *how* to understand the texts that they read. A number of instructional tasks, completed as students are reading for comprehension, help students identify main ideas: (a) choose the best

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summarizing statement for each paragraph; (b) identify topic sentences or key sentences in each paragraph if they are present, and then summarize; (c) identify signal words that reveal discourse structure and predict the main ideas; and (d) produce two to five sentence summaries of a paragraph, text section, or text.

Teaching main-idea identification requires tasks carried out in class with students first working on their own, then working in pairs or groups to compare their answers, and then verifying the best main-idea solutions through discussion.

19.4.3 Principle #8: Raise Students' Discourse-Structure Awareness

Chapter 14 offers considerable evidence that good readers recognize the organization of textual information and the signals that provide cues to this organization. In fact, it is well established that reading comprehension depends on a reader's awareness of text structure. Good readers can identify and make use of (a) lexical forms that identify specific organizational patterns such as cause–effect, comparison–contrast, problem–solution; (b) words that signal main ideas, details, topic shifts, and transitions; and (c) headings, subheadings, and paragraphing. Furthermore, good readers recognize how topics are maintained through pronouns and other anaphoric cues. Research has provided evidence for the instructional effectiveness of teaching discourse signals explicitly, using graphic organizers to display organizational patterns, and raising students' discourse structure awareness through reading-strategy training (Beker, Jolles, & van den Broek, 2017; Duke & Martin, 2019; Grabe & Stoller, 2020; Hebert et al., 2016; Jiang, 2012; Meyer & Wijekumar, 2017).

19.4.4 Principle #9: Train Students to Become Strategic Readers

Skilled readers, by definition, are strategic. They know *which* strategies to use – in addition to *when*, *how*, and *why* to use them – to overcome comprehension difficulties and achieve comprehension goals (Grabe & Stoller, 2020; see Chapter 13). Reading curricula that are committed to training strategic readers, rather than simply teaching strategies one at a time, are best positioned to help students develop skilled reading abilities (Almasi & Hart, 2019; Klingner et al., 2015; Taboada Barber, 2016).

Consider the differences between teaching individual reading strategies and training strategic readers. The former is perpetuated

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by textbooks that introduce one reading strategy at a time, often within a decontextualized lesson segment. With this common approach, students might be introduced to previewing (in chapter 1), predicting and checking predictions (in chapter 2), connecting text to background knowledge (in chapter 3), and so forth. With this conventional instructional approach, students are rarely asked to use such strategies while actually reading for comprehension. Nor are they guided in using multiple strategies in combination, which is what skilled readers do.

When training strategic readers, on the other hand, teachers can (a) provide explicit introductions to reading strategies used to achieve text comprehension; (b) incorporate multiple opportunities for deliberate practice in strategy use *while* students are actually reading for comprehension; and (c) give students opportunities to read (or reread) more challenging texts, followed by pair and group discussions about strategies used for improving text comprehension. A curricular commitment to such strategic-reader training practices is likely to result in more skilled and confident readers. When strategic reading is regularly addressed *across* the curriculum, students develop the habits of strategic (and independent) readers.

19.4.5 Principle #10 Promote Reading Fluency

Reading fluency is central to efficient reading abilities. Reading fluency is, in fact, both a contributor to and a product of comprehension (Kuhn et al., 2019). Fluent reading involves automaticity (recognizing words and phrases without effort), rate (reading quickly), accuracy (reading accurately), prosody (reading with appropriate word groupings), and reading with comprehension. A commitment to reading-fluency development is needed at all levels of language instruction (through to advanced levels) and with learners of all ages; such a commitment is accomplished by means of reading fluency activities and plentiful reading opportunities (Principle 1). Making such a commitment recognizes the incremental process that, over time, moves students toward the reading fluency that they need for skilled reading, especially in academic contexts where students are likely to encounter large amounts of reading.

Unlike some common beliefs, fluency is not achieved when L2 students reach a certain number of words per minute (e.g., 200 words per minute). In fact, skilled readers read at different rates, depending on their purposes for reading. Rather than establish a specific reading rate goal, reading curricula need to regularly engage students in reading for different purposes, accompanied by a variety

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of fluency-building activities. Fluency-building activities include (a) rereading a text multiple times, with a goal to read the text within a certain time; (b) reading along with a recording of a text or text excerpt; (c) paired reading aloud; and (d) oral-reading fluency practice through Readers Theater (Grabe & Stoller, 2020; Rasinski et al., 2012; Young & Rasinski, 2018; see also Chapter 17).

19.5 Instructional-Design Principles

19.5.1 Principle #11: Structure Reading Lessons Around a Prereading, During-Reading, and Postreading Framework

Reading lessons, interpreted broadly, are best structured around pre-, during-, and postreading stages that permit students to be exposed to and practice the range of reading subskills and strategies used by skilled readers at different points in the reading process (Grabe & Stoller, 2020; Hedgcock & Ferris, 2018; Klingner et al., 2015). The amount of class time devoted to each stage of the reading lesson is variable, depending on instructional goals, students' reading proficiencies, length of class meetings, and the texts assigned. A single lesson might include all three reading stages, though the text would have to be quite short and/or the class session quite long to do so. Probably more typical would be a span of multiple class sessions during which the teacher could incorporate pre-, during-, and postreading activities.

Each stage of the reading lesson provides opportunities to introduce and have students practice stage- and text-appropriate reading strategies. During each stage, the teacher has the opportunity to guide, model, and set students up for success. Of the three stages, it is the during-reading stage that is most often neglected in published textbook materials. Adapting textbook materials to incorporate during-reading strategies (and authentic purposes for reading) can truly enhance a reading curriculum.

19.5.2 Principle #12: Select and Adapt Texts to Support Students' Comprehension Development

What teachers ask students to read, and how teachers use those reading materials, can greatly influence students' progress in reading-skills development (in addition to students' motivation for reading). In ideal circumstances, text selection is guided by identifying print and digital reading materials that (a) complement students' L2 proficiency levels, ages, maturity levels, and interests and (b) can be read with

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scaffolded instruction or independently. Yet in most settings, textbooks are selected by others for teacher use. In such cases, teachers can build upon those textbooks to promote reading improvement. For example, if the mandated textbook does not include any fluency-development activities, teachers can design them around textbook reading passages and add them to their lessons.

Similarly, if the textbook does not explicitly address strategic-reader training, teachers can adjust their lessons to do so. If text-structure awareness is missing, teachers can provide a discourse-structure activity with each major reading. If a textbook chapter (or unit) includes only one reading passage on a particular topic, teachers can locate related readings (print and digital) to build students' content knowledge and permit more cognitively challenging tasks, such as syntheses. With supplementary readings, topic-related vocabulary is recycled and content learning is likely to be more successful, thereby simulating academic contexts where students commonly read related texts to build their content knowledge. Even teachers with little extra time to modify their reading lessons can augment their textbooks in small but principled ways to more fully promote reading-skills development (Stoller et al., 2013).

In addition to integrating easy and appropriately challenging texts into instruction, students benefit from reading texts of different types, including print and digital texts, narrative and expository texts, prose and nonprose, texts with different types of discourse organization (e.g., description, comparison–contrast, problem–solution, chronology), and nonlinear texts (e.g., charts, diagrams, figures).

19.5.3 Principle #13: Promote Students' Digital-Literacy Skills

In today's world, most language students seem to spend much more time on their electronic devices than with print texts (Kervin et al., 2018). Yet the skills (and comfort levels) that students have developed using their digital devices for (mainly) social purposes do not consistently transform themselves into the reading comprehension skills and strategies that they need for more academic digital texts and tasks (Dobler, 2015; Zawilinski et al., 2019; see Chapter 16). Digital texts and tasks should become an increasingly important part of reading comprehension instruction (Cobb, 2017). To prepare students for the digital-literacy demands inherent in reading-to-learn contexts, language teachers should address digital tasks that have implications for academic success (Dobler & Eagleton, 2015), such as those listed in Table 19.4.

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Table 19.4 Digital tasks supporting reading comprehension

Teachers support students in:
1. navigating the convoluted pathways inherent in online information searches;
2. locating academically relevant online information;
3. reading online sources critically;
4. determining the relative importance of information;
5. judging the accuracy, reliability, and bias of online sources;
6. determining authorship;
7. making effective connections within and across online texts;
8. using online information responsibly for written assignments.

19.5.4 Principle #14: Connect Reading to Writing to Prepare Students for Academic Tasks

In academic settings, tasks that require the integration of reading and writing are commonplace. In fact, the ability to integrate reading and writing is critical for academic success (Grabe & Zhang, 2013; Hirvela, 2016). Using textual resources to complete academic writing tasks is challenging for students and requires a lot of practice. When making a curricular commitment to reading–writing integration, students can be guided in numerous tasks, including summarizing, synthesizing information from multiple sources, and responding critically to textual input. Students can also practice taking notes while reading and using notes for authentic purposes (e.g., writing a paper).

Grabe and Zhang (2013) recommend initiating reading–writing integration early in language-program curricula and providing opportunities for a lot of iterative practice. At the point when students are reading informational texts, reading curricula can connect reading and writing by focusing explicit attention on reading comprehension with the texts that students will use in read-to-write tasks. Reading–writing integration creates natural opportunities for reinforcing the importance of being responsible for text information (rather than relying on personal opinions) and introducing the expectations of different read-to-write tasks.

19.5.5 Principle #15: Promote Assessment for Learning

In our discussion of Principle #7 (Section 19.4.2), we state that the teaching, rather than the testing, of main-idea comprehension should be central to what we do in our reading classes. Nonetheless, in reading curricula, there is an important place for assessment, which, for practical purposes, can be divided into two basic types: assessments

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of learning (i.e., proficiency and achievement) and assessments *for* learning, the latter used for guiding and supporting student learning (Wiliam & Leahy, 2015). Assessments *for* learning – also referred to as learning-oriented assessment (Turner & Purpura, 2016) – measure students' day-to-day (or weekly) improvements; results are used to provide forward-looking feedback (Carless, 2007). Both assessments *of* and *for* learning are important indicators of the effectiveness of a reading curriculum.

The major difference between assessments *of* and *for* learning centers on how indicators of student performance are used. In assessments *of* learning, teachers gather evidence, from formal and informal measures of student performance, to decide how well students seem to be learning and how well the curriculum is working. Assessment *for* learning, on the other hand, is a concept that all teachers should embrace as part of their ongoing efforts to improve students' learning. Assessment *for* learning focuses on students' performance "at the moment" (see Chapter 20). In the context of classes focused on reading-skills development, this form of assessment should result in forward-looking teacher feedback that (a) leads to classroom discussions and student self-reflection to improve learning outcomes, (b) facilitates teacher–student and student–student interactions centered on ways to improve reading performance, and (c) results in active student engagement with feedback to improve their reading abilities. This approach to assessment also ties in with the concept of deliberate practice (Principle 3, Section 19.3.3) (See also Chapter 20).

19.5.6 Principle 16: Integrate Reading and Content Learning

Any careful consideration of academic reading development has to take into consideration the very large set of component skills outlined in various chapters in this book. While not every component skill and knowledge base can receive equal amounts of attention, one approach to building a coherent and effective reading curriculum is to combine an emphasis on content learning with reading-skills development, often labeled generally in L2 settings as content-based instruction (or more commonly in Europe, Content and Language Integrated Learning [CLIL]). It has become increasingly clear that the development of reading abilities requires not only reading component skills but also relevant content knowledge. The content knowledge, or background knowledge of a subject, activates a large network of information that supports implicit knowledge activation and reading

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processes, including fluency and comprehension (Hirsch, Jr., 2018; O'Reilly, Wang, & Sabatini, 2019; Petschur et al., 2020; see also Chapter 4).

Sustained content and reading instruction, if developed appropriately, is especially suited for more advanced reading-to-learn contexts and reading in disciplinary contexts, but works well from about 5th grade onwards. The integration of content and reading instruction provides many natural opportunities for (a) extended reading, (b) motivational learning experiences, (c) strategic responses to more complex tasks, (d) greater choices in reading materials, and (e) opportunities for much student discussion around text meaning. The combination of content and reading development also brings along opportunities for project-based learning, the regular recycling of important skills, the rereading of many text resources, and more realistic needs to interpret, integrate, and evaluate information from multiple texts. These types of activities capture what students should be trying to do with information resources for academic purposes (Grabe & Stoller, 2019, 2020; Guthrie & Klauda, 2016; Stoller & Grabe, 2017).

19.6 Overarching Frameworks for Reading Instruction

The sixteen reading curriculum principles just introduced do not impose an overarching framework for student learning. A number of curricular frameworks are available to teachers and administrators; four are noted here and two are developed further. One option is to adopt a **discrete reading-skills building approach** (e.g., Jeffries, 2011; Jeffries & Mikulecky, 2014). Skills-building texts typically do not have extended reading material. Rather, they have sets of shorter texts on a range of topics and they provide numerous skills exercises throughout the book (e.g., twenty short passages for identifying the main idea, twenty shorter fluency practice texts, twenty texts for practicing select reading strategies). This curricular approach is a somewhat limited foundation for a coherent reading curriculum (although it can provide useful focused reading-skills practice with repeated practice opportunities within a larger curriculum).

A second approach involves a central focus on **extensive reading** (see Chapter 18). This approach has serious limitations as a sole approach to reading development. While the need for extensive reading is now widely viewed as critical, most researchers and practitioners also view the role of explicit, focused reading instruction as an important accelerator of major skills development and key language knowledge resources.

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A third approach centers reading instruction around a **commercial textbook series** (or major L2 reading textbook) that is devoted to reading instruction and incorporates many of the component skills along with a large number of shorter readings. A number of textbook series from major L2 publishers adopt either a topical or thematic approach; they provide effective reading comprehension practice and skills development. Textbook chapters typically are organized in a pre-, during-, and postreading design. Chapters (or units) may have a longer text and a related shorter text. They typically include comprehension questions, vocabulary activities, and some extended or wrap-up tasks. They may highlight a specific reading strategy and a practice activity, or they might offer a fluency building activity.

A fourth approach involves integrating reading and content learning goals into **content and reading instruction** (CRI, a variation on Content Based Instruction more generally). CRI itself is carried out in numerous ways. At beginning and intermediate levels, the content is limited, but follows a coherent sequence. A greater emphasis is placed on developing vocabulary, grammar, simple strategy learning, and some fluency work. The content focus is typically on culture learning, major landmarks or regions of a country, educational issues and challenges, biographies and historical narratives, controversial issues in modern societies, and so on (Koda & Yamashita, 2019). At more advanced L2 levels, context can vary considerably, texts tend to be longer, and culminating tasks may involve multiple text syntheses (see Stoller & Grabe, 2017; see Chapters 13 and 15).

The first two reading curricula approaches noted here have their limitations. A pure reading skills approach, typically implemented with a skills-practice textbook without extended reading material, does not generate coherent conceptual learning that can engage students, build intrinsic motivation or flow experiences, or provide a sense of learner autonomy through student choices. Conversely, a pure extensive reading program does not allow for instructional guidance or support with a range of crucial academic skills. The rest of this section focuses on the benefits of the reading textbook series and CRI approaches.

19.6.1 Reading Textbook Series

The use of a reading textbook series (or a more-advanced textbook) is the most common instructional approach for L2 students almost everywhere. Effective textbook series provide clear instructional frameworks as well as teacher guidance and support. Good textbook

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series have a range of useful pre-, during-, and postreading activities. They include interesting texts and sometimes cluster multiple texts in thematic units. They introduce reading strategies, vocabulary learning and practice, discourse and morphology awareness activities, and extension tasks that integrate language skills.

In most cases, a good textbook series is a reasonable compromise in L2 settings with limited institutional support in terms of resources, teacher training, curricular goals, and expectations and motivations for learning to read. It also allows for a fairly coherent sequence of courses when students must take multiple courses on reading skills development. However, the goal of this chapter is to explore, imagine, and understand what a truly effective long-term reading curriculum might look like, one that incorporates the full range of curricular principles for reading instruction discussed earlier. In such a context, textbook series reveal a number of limitations.

Most textbook series, of necessity, do not incorporate a full range of reading skills, tasks, and strategy practice that are important for improving reading. There are, after all, limits to what a textbook series can provide and still be economical, usable with a wide range of teachers, manageable in terms of slotting into a larger curricular space, and realistic in its goals. Nonetheless, the argument of this chapter is that reading instruction can and should be more than a curriculum that is driven by a textbook. Many textbooks do not build content learning into reading instruction in a coherent or motivating way.

Most textbook series have sets of readings organized thematically. The texts within a theme may provide a coherent set of more complex linked information, but they do not commonly lead to a major culminating project, and the connections from one major theme to the next often are not strongly linked. Most textbook series do not provide many choices for student reading on a theme or topic and do not ask students to explore and discover additional thematic resources. Most textbook series do not pay serious attention to the consistent development of reading strategies of various types that would require repeated applications across the reading texts in the series. They do not encourage discussions of the main ideas of texts while students read the text in class, limiting the development of strategy instruction and metacognitive awareness. They often do not incorporate fluency practice or encourage extensive reading as part of the planned instruction.

The point here is not to denigrate reading textbook series. Textbook series have a vital role to play in contexts (a) with more

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limited academic reading goals, (b) with limited L2 resources, (c) where teachers do not have strong training in reading instruction, and (d) in which teachers have heavy teaching loads and/or large classes. There are many reasons for the adoption of this curricular option, and quite a lot of learning can develop from reading textbook series when used well. However, a major concern with textbook adoptions is that they are often presented as the best "answer" for teaching reading rather than as a resource that can be built upon by well-informed and well-compensated teachers. At the same time, textbook series *can* be used in ways to support more complex learning goals and integrate the full range of reading skills, tasks, and strategy instruction outlined in this chapter (and in the implications-for-instruction sections throughout this book). In this regard, textbook series have the potential to form a strong foundation for CRI.

19.6.2 Content and Reading Instruction

In this final section, we offer curricular guidelines specifically for CRI. In Chapter 13, we introduced Transactional Strategies Instruction, Collaborative Strategic Reading, Promoting Adolescents' Comprehension of Text (PACT), Concept-Oriented Reading Instruction (CORI), and the Integrated Communication Skills approach (Yamashita & Koda, 2019). In this chapter, we introduce a Six Ts approach for L2 contexts (Stoller & Grabe, 2017), and we close with some comments on challenges when implementing CRI.

We begin by taking a step back to the more general notion of content-based language instruction (CBI) to review briefly the range of content and language instruction options generally discussed. CBI has been translated into practice in many L2 contexts to accommodate (a) the needs of different student groups, (b) the priorities and language policies of diverse teaching settings, (c) teacher preparedness to address students' language- and content-learning needs, (d) available resources, and (e) expected final-performance outcomes (Brinton & Snow, 2017b). Some content-based models (e.g., immersion and partial immersion) focus more on content learning, while others (e.g., topical, theme-based, and sustained content models) place a greater emphasis on language learning.

Other content-based models make a more balanced commitment to language and content learning through different forms of "sheltered" instruction in which teachers strive to make content comprehensible to L2 students and, at the same time, support students' language learning; these models include CLIL and various linked and

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adjunct models. (For an overview of these content-based models, see Brinton & Snow, 2017a; Dalton-Puffer, 2017; Dalton-Puffer & Smit, 2013.)

Despite the variations that exists among models of CBI, what models share is a commitment to facilitating students' grasp of subject matter (content) and developing students' language abilities. In content-based instructional contexts, it is assumed that (a) the learning of content contributes to the learning of language, (b) language mastery gives learners easier access to content, and (c) learning language in classroom environments with coherent content motivates students. Research has shown that content-based approaches increase student motivation, student engagement in more cognitively demanding lessons, and student preparedness for more authentic uses of the L2. (See Fitzsimmons-Doolan, Grabe, & Stoller, 2017, for a review of research support for CBI.)

It is our contention that content-based approaches to language and content learning, when adapted specifically to reading development, provide the conditions appropriate for the promotion of both reading comprehension and reading to learn through CRI. To achieve CRI goals necessitates, first and foremost, that language teachers hold students accountable for content learned from the reading passages that they are assigned to read. CRI also requires deliberate practice as an integral part of course objectives. Further, CRI emphasizes the importance of content knowledge as a foundation for reading skills development (Hirsch, Jr., 2018; Petschur et al., 2020). Finally, CRI supports reading to learn; CRI in academic settings is best achieved with challenging (but not frustrating) texts, often challenging (but achievable) tasks, and domain-specific subject-matter knowledge (see also Kellogg, 2018). More specifically, CRI can engage students in all of the sixteen principles addressed in this chapter in a coherent overall approach. CRI goals are described in nine major points.

1. *CRI can easily accommodate the explicit instruction needed for both content and reading development.*

When students are motivated to learn interesting content, they are open to improving their language skills to gain access to that information. Teachers can provide explicit attention to the skills and strategies needed for both content and reading development. With regard to reading, specifically, Table 19.5 outlines key activities that teachers should address explicitly while students are reading texts:

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Table 19.5 Goals for explicit instruction

1. Teach for main-idea comprehension.
2. Engage students in group and class discussions around ways to identify main ideas.
3. Instruct students in making inferences with more challenging texts.
4. Ask students to read and reread for meaningful and varying purposes.
5. Introduce strategies for learning new vocabulary and new meanings of already familiar vocabulary.
6. Introduce students to and provide meaningful practice opportunities with reading strategies in the context of reading for comprehension.
7. Raise students' discourse-structure awareness.
8. Focus on grammatical structures that are needed for comprehension.
9. Link textual information to students' background knowledge.
10. Provide instruction in the skills needed to synthesize information from multiple texts and different parts of a lengthy text (e.g., note taking, underlining, marginal annotations, purposeful rereading, summarizing).

2. *CRI with reading-to-learn aims lends itself to teaching for main-idea comprehension rather than testing for comprehension.*

In settings where students are held accountable for the content of what they are reading, teaching for main idea comprehension (rather than testing it) is not only beneficial but also appropriate (even if it is also more challenging). In fact, teaching for main-idea comprehension should be at the core of reading instruction (N. J. Anderson, 2009) and there is certainly a place for it in content-based curricula with reading-to-learn goals. Main-idea comprehension abilities can be developed in line with suggestions in Chapter 12. During class and group discussions, students can be guided to note connections across parts of the text, between two or more texts, or between the text and their own background knowledge (Almasi & Hart, 2019; Fisher & Frey, 2019). Class conversations centered on main-idea comprehension may start with postreading comprehension questions, but they should also be followed by requests for further elaboration, during which students can pose and answer *why*, *where*, and *how* questions.

Full-class discussions about text content are essential for promoting reading-to-learn outcomes. Asking students to summarize (orally and in writing) what they have read, or some segment of a longer text, also provides students (individually, in pairs, and/or in groups) with helpful practice in identifying main ideas, articulating these ideas clearly (orally or in writing), and establishing links across main ideas and supporting details.

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3. *CRI units are most effectively designed around sustained content or well-defined themes, connected topics, and coherent sets of related textual materials.*

CRI can counter the lack of coherence that often exists in traditional L2 reading curricula, where we see lessons that are structured around the exploration of shallow themes (if there are themes at all), disconnected topics, weakly related texts, and the superficial consideration of content (Hirsch, Jr., 2018; Stoller & Grabe, 2017). In those traditional settings, it is difficult to promote reading to learn. Coherent content-based curricula, on the other hand, facilitate a more in-depth exploration of content. They permit meaningful connections across themes, topics, and texts, which allow for a progression of well-sequenced text-responsible tasks. These tasks begin with motivating initiating activities and culminate with synthesis tasks that provide opportunities for students to display mastery of content and improved language abilities.

4. *CRI supports the reading of abundant conceptually linked content resources.*

In content-based classrooms, L2 students can be asked to read a lot, which is easier to do (and more motivating) when readings are conceptually linked. While reading related texts, key vocabulary is recycled, important concepts become easier to understand as they are encountered multiple times (in subsequent texts), and reading to learn becomes possible. In such content-based classes, students reread (usually without complaint) as they explore linkages across sets of conceptually linked texts. When there is sufficient content (presented in multiple, related texts), students can engage in tasks (scaffolded early on and then completed more independently later on) that involve comparisons, rankings, information gaps, information transfer, summaries, syntheses, analyses, and later meaningful extensions. While engaged in such tasks, students often find the need to reread purposefully, and teachers can highlight the value of these types of rereading purposes for academic reading development (see Chapter 1 for purposes for reading; Chapter 17 for different purposes for rereading).

In CRI, because many L2 textbooks do not include sufficient numbers of conceptually linked texts, it becomes the responsibility of teachers (and curriculum developers) to find additional texts that are instructionally appropriate in terms of students' proficiency levels and ages, plausible linkages, cross-cultural appropriacy, length, and so forth. Students can participate in nominating texts for selection as well (adding a degree of autonomy and engagement).

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5. *CRI leads to tasks that support content learning, reading skills, and strategy instruction.*

Tasks are the basic units of instruction in most language classes. In content-based classes with reading-to-learn aims, such tasks can address the following goals:

1. consolidating content knowledge;
2. reinforcing language skills, language structures, and study skills;
3. recycling vocabulary;
4. providing practice with relevant learning and skill-specific strategies (e.g., establishing a purpose for reading, predicting, checking predictions, connecting text information to background knowledge, rereading); and
5. engaging students in cooperative learning during which they collaborate with classmates to work through complex texts, synthesize information from multiple texts, talk about what they have learned and how the content connects to their prior knowledge, and report what strategies they used to achieve their learning.

Major tasks – within and across topics and texts in a thematic unit – can be designed with higher levels of complexity as students move from one thematic unit to the next and as teachers work toward realizing curricular goals. Equally valuable are the culminating tasks (or project outcomes, see Stoller, 2006; Stoller & Myers, 2020) that require students to synthesize content from various text sources and display what they have learned. Such tasks help students develop the academic skills, strategies, critical thinking abilities, and reading-to-write abilities (Grabe & Zhang, 2013) that they will need in future academic endeavors. Meaningful culminating activities serve other important purposes as well. They provide students with a sense of successful completion and pride. They also provide a sense of closure, thereby preparing students psychologically to move on to the next instructional unit.

6. *CRI classes lend themselves naturally to a pre-, during-, and postreading framework and the strategies that are appropriate at each stage.*

Content-based lessons, from a reading-to-learn perspective, can be structured around pre-, during-, and postreading stages. In this way, students are exposed to and able to practice the range of reading subskills and strategies used by successful readers at different points in the reading process (Hedgcock & Ferris, 2018). Each stage of the reading lesson (see Grabe & Stoller, 2020, p. 184) provides

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opportunities to introduce and have students practice stage- and text-appropriate reading strategies. Of the three stages, it is the during-reading stage that is most often neglected in published textbook materials. Teachers can adapt their textbook materials to incorporate during-reading strategies (and authentic purposes for reading) into their lessons (see Wolf & Stoller, 2018) to enhance students' reading training and model the reading habits used by skilled readers while they read to learn.

7. *CRI classrooms provide natural forums for strategic-reader training.*

Helping L2 readers become more strategic can be easily accommodated in a content-based framework where students are reading for understanding or reading to learn. An emphasis on training strategic readers, rather than teaching individual strategies, is the ideal. Content-based classrooms can be guided by what we know about the strategies used by skilled readers. For example, we know that good readers read for well-defined purposes and they typically employ multiple strategies to achieve their reading comprehension goals. When good readers' default strategies – used without much conscious attention – do not lead to successful comprehension (which might happen when good readers encounter a challenging text, a new genre, and/or new content), a more conscious problem-solving mode of attention is activated. At this point, good readers draw upon a larger set of strategies, which they use in different combinations, to achieve their comprehension goals. In such circumstances, the reader may, for instance, decide to reread the text (or parts of it), reconsider initial predictions, reexamine discourse markers, and/or try to unravel a complex sentence (see Chapter 12, Appendix for a more complete list of reading strategies).

In content-based classes with reading-to-learn aims, teachers can introduce new strategies (in useful combinations) when students are engaged in reading for comprehension (rather than in decontextualized lessons). Students can practice using the strategies when the strategies serve the purpose of helping them achieve their comprehension goals. As an integral part of strategic-reader training, teachers should facilitate pair, group, and whole-class discussions of *how*, *when*, and *why* strategies are/were used to achieve reading comprehension goals.

Teachers can also reinforce comprehension monitoring, entailing a combination of reading strategies. Comprehension monitoring involves much more than the recognition of main ideas and the identification and untangling of difficulties experienced while reading (see Chapter 12). Teachers can support reading comprehension development (and monitoring) by modeling these strategies, discussing them,

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guiding students in using them, and leading students in discussions about *when* the students used the strategies, *what* purpose(s) they served, and *how* they helped.

8. *CRI with a reading-to-learn focus is enhanced by the assignment of different types of informational texts.*

While compiling a coherent set of texts for content-based units, teachers can work toward incorporating informational texts of different types (including digital texts) as a way to build students' discourse-structure awareness. Teachers can assign print and digital texts as well as texts with diverse rhetorical structures (cause–effect, chronology, comparison–contrast, description, problem–solution, process). In English for Specific Purposes settings, assigning discipline-specific genres, and guiding students in reading them, is critical for students' future academic success (N.J. Anderson, 2015). When texts of different types are assigned, the opportunity to teach students how to recognize discourse organization and the signals that provide cues to that organization (e.g., words that signal rhetorical patterns or topic shifts, transition phrases, headings and subheadings, paragraphing) becomes feasible. The use of discourse-specific graphic organizers, which clearly reflect text-specific organizational patterns at paragraph, section, and full-text levels, is an effective way to raise students' discourse awareness and promote reading comprehension (Jiang, 2012; Jiang & Grabe, 2007, 2009).

9. *CRI, with reading-to-learn goals, motivates students through engaging content that has been mastered in an L2.*

With sustained content and the opportunity to read to learn in their L2, students are more likely to become interested and involved in their own learning. Such classes provide students with opportunities to select some of their own reading materials, chances to work with their classmates to unravel complex texts, and the satisfaction that comes from realizing that they have mastered content in an L2 (Komiyama, 2009). In effect, students learn a level of content knowledge that they can recognize and take pride in.

19.7 Building a CRI Curriculum

In Chapter 13, we reviewed two multipurpose, multistrategy CRI approaches developed in L1 reading contexts: PACT and CORI. Both of these approaches were used for research studies. In L2 contexts, CLIL approaches for L2 learning have been developed and

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implemented across a number of European countries for over twenty years in 3rd through 11th grades, but not specifically for reading development (see Snow & Brinton, 2017a; Dalton-Puffer, 2017). In an EFL context, Koda and Yamashita (2019) have developed an approach designed for L2 students who have university language-study requirements, an Integrated Communication approach that combines content and reading development. In an EAP context, Stoller and Grabe (2017) have developed and implemented a CRI approach for pre-university L2 students since the early 1990s: a Six Ts approach. We outline some features of the Six Ts approach as one example of CRI in L2 settings.

The Six Ts approach builds the curriculum on *Themes*, *Topics*, *Texts*, and *Tasks*, supported further by *Threads* and *Transitions*. Themes identify overarching content areas, and topics are subordinate content units that are closely linked together and that provide a coherent set of content information for student to learn and work with. Coherent sets of texts (i.e., reading passages) are key to CRI and must be a top priority at the outset. Text materials that provide the core input for themes and topics need to be interesting, extended in length, sufficiently complex, serious in content presentation, coherent, and instructionally useable (not an easy combination).

Threads represent additional concepts that can be used to link content across themes and topics, adding to the overall coherence of the curriculum. They make connections that provide opportunities to recall/revisit some aspect of a prior thematic unit. Transitions represent explicit linkages from one task to the next, one text to the next, and one topic to the next. They signal to students that instructional activities are coherently linked, and each new activity builds on previous activities. Good teachers usually do this already and the notion of transitions simply formalizes a further way to build curricular coherence. Finally, tasks are at the heart of day-to-day lessons and learning activities. Tasks are how we teach reading skills, main idea comprehension, reading strategies, metalinguistic awareness, and advanced EAP skills of summarization, synthesis, and critical evaluation of text information.

Overall, the Six Ts framework provides a flexible curricular model for (a) integrating reading and content learning, (b) reading multiple text resources, (c) building coherence in the reading curriculum, (d) introducing and practicing reading strategies continually throughout the curriculum, (e) engaging students in tasks, texts, and concepts that promote positive motivation for reading and learning, and (f) encouraging and promoting extensive reading for additional information. A thematic curricular framework can create the context for including

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almost all of the crucial reading skills components that have been emphasized throughout this book, and do so in a coherent manner in line with academic skills development (see Stoller & Grabe, 2017).

19.8 The Challenge of CRI Implementation

The overall goal of this chapter has been to highlight the many ways that the implications for instruction running through the entire book can be integrated and practiced consistently and realistically in a content-based reading curriculum. Having presented a positive set of argument for content-based reading instruction, we need to add a few cautionary remarks (see also Yamashita & Koda, 2019).

CRI is not an easy option to implement (and that is a limitation). It requires a significant commitment to reading resources, teacher training and development, instructional time, time for instructional preparation, institutional willingness to innovate, and skills in developing integrated curricula. In particular, teachers sometimes take years to develop a comfort level with these innovative approaches to reading development, and they need to be compensated for development time. As a result, CRI is not for everyone, but when done well over an extended period of time, it works very well. In such settings, students learn to read for academic purposes in ways that no other curricular option can provide. It can also be challenging for teachers who are not comfortable with changing their teaching styles or adapting to new instructional practices.

CRI has the potential to integrate many types of reading skills, language skills, and learning tasks on a consistent basis. However, no curriculum can commit equal time to *all* skills on a consistent basis (with extensive recycling of skills practice). Thus, needs analysis has to be conducted to determine which reading skills and academic abilities require the highest priority, the most attention, and the most consistent practice. Many reading skills and abilities require a long time-frame for learning if they are to support reading effectively (e.g., strategic reading, vocabulary development, fluency training, extensive reading), and they cannot be switched on and off in the space of a semester and still provide a productive outcome. Any well-conceived curriculum will need to take this fact into account.

Finally, CRI should not overfocus on the content information and lose sight of the reading skills development goals. Too often teachers focus so intently on interesting content that they forget to provide the common, but important, language learning practice that L2 students need. At many points in a content-based curriculum, it should look just like other learning instruction. Students simply need to practice

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learning and using vocabulary, working with difficult complex sentences, and using language to explain basic ideas and information. Perhaps the best way to view content-based reading instruction, at least initially for teachers, is to see it as providing the means for combining language skills practice, academic tasks, effective strategies, and motivating ideas.

19.9 Closing Thoughts

We close with a few simple recommendations for reading-curriculum innovation for researchers, administrators, and curriculum developers. First, start small, considering perhaps two to three changes at most. Second, support teachers interested in piloting idea for new innovations. Third, give teachers time to discuss the potential of new innovations and time to get comfortable with new ideas. Fourth, bring in consultants who can review plans and provide additional input. Fifth, work with teachers to create detailed action plans for implementing innovations. Sixth, have plans for how to assess outcomes of piloted innovations and develop revisions. Seventh, provide encouragement to teachers throughout the development process.

Curriculum innovation involves a lot of time and effort. Teachers need to be compensated in some way for this additional planning and instructional development; the need to recognize teacher time and effort is sometimes lost in the excitement of new ideas. Innovations are critical for keeping teaching and learning fresh and interesting. But curriculum innovations often do not work as well as hoped for the first and second times around. Curriculum assessment provides one way to build a strong path to better teaching and learning. Another pathway is teacher professional development that is research-based and also grounded in demonstrable reading improvement.

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20 *Reading Assessment*

An understanding of the principles and uses of assessment is essential for *all* teachers, and in particular for teachers of reading. (Snow et al., 2005, p. 179)

Reading assessment has great power to inform researchers, teachers, administrators, and policymakers. Assessment practices can significantly benefit learning environments or they can inflict great harm. Reading assessment, therefore, needs to be treated with great care, attention, and respect. Teachers, especially, have a responsibility to understand the uses and the impacts of reading assessment and be mindful of the consequences of assessment.

Reading assessments are used for many purposes, but all appropriate uses of assessment begin from an understanding of the reading construct, an awareness of the development of reading abilities, and an effort to represent the construct in assessment tasks. Chapters 1 to 6 of this book, in effect, represent a reasonable interpretation of the construct of reading ability. Chapters 8 to 18 describe key aspects of the reading development process. The complexity of both the reading construct and reading development over time reveals the challenges of reading assessment.

Reading assessment can be intimidating and sometimes overwhelming for many teachers and administrators; thus, a first goal of the chapter is to present a straightforward framework that categorizes the many uses and purposes for assessment. A fairly simple yet thorough framework should allow readers to sort through their own assessment experiences in a way that gives interpretive force to the framework. In Section 20.2, the chapter then outlines and describes a number of major options, though not a comprehensive set, under each category in the assessment framework. These assessment options are equally applicable in both first-language (L1) and second-language (L2) contexts, though important L2 tests and assessment practices are noted where relevant. Section 20.3 considers a number of reading-assessment innovations and challenges. Section 20.4 addresses a

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set of further issues for reading assessment. The chapter closes with implications for instruction.

20.1 Goals for Reading Assessment

Reading assessments are meant to provide feedback on the skills, processes, and knowledge resources that represent reading abilities (Chapters 1 to 6), though it is important to note that different assessment practices may assume different theories of reading and reading development. Assessment in general can be categorized in a number of ways, and all assessment frameworks serve important purposes. Commonly, assessment has been categorized in terms of (a) norm-reference and criterion-reference testing, (b) formative and summative assessment, (c) formal and informal (or alternative) assessment, and (d) proficiency, achievement, placement, and diagnostic assessments. For the purposes of this book, reading assessment is organized and described in terms of five basic assessment purposes (see Table 20.1).

There is an inevitable overlap among specific test uses across these categories, but these categories, nonetheless, serve as a useful framework for organizing reading assessment.

Table 20.1 Five purposes for reading assessment

1. Reading proficiency assessment
2. Assessment *of* classroom learning
3. Assessment *for* learning
4. Placement and diagnostic assessment
5. Assessment for research purposes

20.1.1 Reading Proficiency Assessment

Assessment of reading proficiency is important as a way to understand students' overall reading abilities (based on some assumed construct of reading) and determine if students are appropriately prepared for further learning and educational advancement. Commonly, this type of assessment is referred to as **standardized testing**, although local groups and researchers also develop proficiency tests of different types. In most respects, **proficiency assessment** represents high-stakes testing because decisions are often made about students' future educational goals and opportunities. Alternatively, this type of assessment may lead to special education or reading disability

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designations – labels that, once applied, are hard to remove from a student's record. Reading proficiency assessment is also sometimes used for student placement, policy decisions, curriculum changes, and program, teacher, or institutional evaluations.

20.1.2 Assessment of Classroom Learning

Assessment of reading improvement in classroom settings involves the measurement of reading skills and knowledge gained from reading over an extended period of time; it is commonly referred to as **summative** (or **achievement testing**). Sometimes, proficiency assessments are used to measure student progress from year to year (as in a final exam), but such reading assessment does not capture ongoing student gains made in reading skills in the classroom. Year-end testing actually measures growth in proficiency from year to year rather than measure gains in reading abilities based on what was taught in class. Much more commonly, assessment of classroom learning uses tasks that reflect the material taught in class and the skills practiced. Typically, the teacher, teacher groups, or curriculum groups (or textbook materials writers) develop these tests, and they are responsible for deciding what represents a measure of success, as well as what steps to take as a result of assessment outcomes.

Teachers have multiple opportunities to assess student learning in a semester as **formative assessment** using common techniques (e.g., summarization tasks, end of unit tests, quizzes of various types, post-reading comprehension questions), but some classroom assessment alternatives are less obvious. **Informal and alternative assessment** options are central for effective assessment of learning (e.g., student observations, self-reporting measures, progress charts, engagement and group work, group outcomes assessment, interviews), and they usually provide converging evidence over time for appropriate summative assessment at the end of the semester or school year.

20.1.3 Assessment for Learning

Assessment for learning has been gaining considerable attention in both L1 and L2 education in the past twenty years (Leung et al., 2018; Wiliam, 2011, 2018a, 2018b. This form of assessment is intended to support and promote student learning, in this case, the improvement of reading abilities. There are two general types of assessment for learning. The first involves the use of recognizable classroom assessment activities to provide helpful feedback for learning (e.g., reading comprehension questions); the second involves specific assessment-for-learning practices to support students directly in their day-to-day

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learning (e.g., have students work in groups to find the best response to a comprehension task). Keeping a record of task outcomes is not the learning goal; instead, the goal of both types of assessment for learning is to provide immediate feedback and help students engage in more effective learning.

At first glance, this approach appears to overlap with assessment of classroom learning, but this is true only with respect to many of the reading tasks performed, not to the follow-up feedback and interaction between the teacher and students. Furthermore, assessment for learning engages students in their own learning and uses indicators of non-understanding or weak performances to carry out on-going remediation and fine tuning of instruction. Several L2 researchers have explored ways to develop assessment for learning, but none to the same degree (connecting theoretical frameworks to assessment for learning) that Wiliam and his colleagues have (see Wiliam, 2018a, 2018b).

20.1.4 Placement and Diagnostic Assessment

Most discussions of L2 reading assessment practices do not focus on placement and diagnostic assessments. This gap in coverage is most likely due to the very specific, and somewhat limited, nature of these two types of assessment practices. Goals for placement assessment include assigning students to the right course level and also providing some broad diagnostic information about student learning needs. Often, proficiency assessments are used for initial placements when students enter a new school or a new program. Many intensive language programs have their own placement tests to insure that initial placement is reasonable, in line with program goals.

Diagnostic assessments are intended to identify specific strengths and weaknesses of students. Most commonly, diagnostic assessments explore specific component skills in some depth to probe these sources of reading weakness. They tend to go into more detailed measures of component reading skills and propose ways to address student needs to help improve reading comprehension. Diagnostic assessments also can be used in research studies to assemble detailed profiles of students' abilities and offer multiple measures of students' skill levels (see Alderson et al., 2015, 2016).

20.1.5 Assessment for Research Purposes

Assessment for research purposes is not generally addressed in assessment chapters such as this one, but it is a topic that is very important for reading research results as well as their implications for reading

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instruction. Research studies sometimes use standardized assessment instruments to measure student levels or student instructional outcomes. In other studies, however, researchers develop their own reading assessment measures for a variety of reasons. Regardless of reason, researcher-developed measures need to conform to expected requirements for any appropriate and fair assessment practice (e.g., McKay & Plonsky, 2021; Révész & Brunfaut, 2021). Given that students are likely to perform somewhat differently even across different standardized measures (Cutting & Scarborough, 2006; Keenan et al., 2008), it is important to ensure that tests are developed and used appropriately as well as emphasize the value of multiple measures in any research context.

The five broad areas for assessment just described suggest that reading assessment practices (much like all educational assessment) cover a wide range of purposes and uses. In Section 20.2, a range of assessment tasks and practices are described. Most if not all of the activities introduced are equally applicable to L1 and L2 contexts, though not necessarily with the same assessment tools and resources. (For more comprehensive coverage of L2 reading assessment, see Alderson, 2000; Alderson et al., 2015; Weir & Chan, 2019.)

20.2 Reading Assessment Practices and Resources

> Any single technique for assessment will necessarily be limited in the picture it can provide.... We should always be aware that the techniques we use will be imperfect, and therefore we should always seek to use multiple methods and techniques, and we should be modest in the claims we make. (Alderson, 2000, p. 270)

As noted earlier, we link reading proficiency assessment with standardized testing and assessment of learning primarily with classroom-based measures. There is certainly overlap between standardized and classroom settings, and some of these are noted, but this simplification eliminates the need to note details of crossover at all points.

20.2.1 Standardized L2 Reading Assessment

What all standardized reading tests have in common is an effort to reflect the construct of reading comprehension abilities in one form or another (Grabe & Jiang, 2014). Standardized assessment makes a serious effort to capture crucial aspects of the component abilities of comprehension. Drawing on these assumptions for standardized test construction, and considering the component abilities of reading outlined in this book, standardized reading assessment should seek to

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translate aspects of the reading construct listed in Table 20.2 into an effective reading test (appropriate for a given proficiency level).

Table 20.2 Major component abilities for reading comprehension

1. Fluency and reading speed	8. Main idea comprehension
2. Automaticity and rapid word recognition	9. Recall of relevant details
3. Search processes	10. Inferences about text information
4. Vocabulary knowledge	11. Strategic processing abilities
5. Morphological knowledge	12. Summarization abilities
6. Syntactic knowledge	13. Synthesis skills
7. Text structure awareness and discourse organization	14. Evaluation and critical reading

Among the challenges to consider for reading assessment is how such an array of component abilities can best be captured within the operational constraints of standardized testing, what new assessment tasks might be developed, and what component abilities (e.g., grammar) might best be assessed indirectly. While it is possible to outline the many component abilities of reading comprehension (as we do in Table 20.2), it is less straightforward to capture all of these abilities in reading assessment tasks. Standardized assessment practices are far more constrained by concerns of validity, reliability, time, cost, useability, and consequence than classroom assessment practices. These concerns limit the types of reading assessment tasks that can be used. Moreover, the context for standardized assessment precludes any strong assumption of a match to authentic reading in the "real world." When students read a text as part of a standardized assessment, they know that they are reading for an assessment purpose. Nonetheless, more realistic texts, tasks, and contexts are helpful as long as they do not pretend to be authentic "real-world" reading tasks.

A further complication for standardized reading assessment is that different tasks and task types are appropriate at different proficiency levels. How reading assessment tasks and task types should change with growing L2 proficiency is an area that has not been intensively investigated (although it is logically assumed, and appropriately so, in many standardized multilevel assessment batteries). Commonly, assessment practices tend to focus on specific target populations within a more restricted proficiency range, and tasks may not be valid for populations at much lower or higher proficiencies. Having a theory of reading development, as one of the validity supports for assessment practices, might provide a more complete understanding

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of L2 reading abilities, their expected patterns of growth, and rationales for using different types of assessment tasks at differing proficiency levels.

Unlike past standardized L2 reading assessment, which had not been overly concerned with an evidence-based construct of reading abilities tied to the group of students being assessed, a number of major standardized assessments have now been developed from an initial set of claims about the nature of L2 reading ability with a set of tasks that measure the relevant component skills. We note five standardized exams are now used as one criterion for university entrance across multiple countries: IELTS, TOEFL iBT, Cambridge Proficiency in English Examinations, Pearson Test of English (PTE) – Academic, and Duolingo English Test (DET).

The development of the IELTS represents one example of a standardized test built from construct assumptions and the gathering of appropriate evidence (Bax, 2013; Moore et al., 2015; Weir & Chan, 2019). Similarly, efforts to redesign the TOEFL as TOEFL iBT required the development of an appropriate L2 reading construct (among other language skills) as well as evidence to support assessment tasks that would measure this construct (see Chapelle et al., 2008). A third L2 standardized assessment, built from claims about reading abilities, is the suite of Cambridge Proficiency in English Examinations (Weir & Milanovich, 2003; Weir et al., 2013). These three L2 reading assessments strongly document arguments for an L2 reading construct, the importance of specific components of reading ability, the types of tasks that can assess these component abilities, and the creation of overall tests that generate evidence for the claims made (thus building a validity argument for the appropriateness of the test).

Two more recent large-scale standardized assessments with measurement of L2 reading ability include the PTE – Academic, and the DET. (For DET, see also section below on assessment innovations.) Concurrent validity for both of these tests involves successful benchmarking with the CEFR framework and concurrent validity by comparison with more established large-scale measures such as TOEFL iBT and IELTS. Each of the two newer tests also provides construct validity arguments (e.g., Zheng & De Jong, 2011, for PTE, and LaFlair & Settles, 2020, for DET).

It is important to examine the types of tasks developed for standardized reading tests and consider how these major tests (a) incorporate and reflect the reading construct and (b) engage L2 learners in fair and appropriate assessment tasks. Given that the primary purpose of assessment tasks is to collect information to make inferences about students' reading abilities, different reading tasks should help provide

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information about many component reading abilities as well as reading comprehension more generally. Reading assessment tasks come in many recognizable forms (as well as a few less common forms) in standardized assessments. Table 20.3 list types of task options used in standardized reading assessments.

Table 20.3 Standardized reading assessment task options

1. C-tests (retain initial letters of words removed)
2. Choosing from a "heading bank" for identified paragraphs
3. Choosing right word for a text gap
4. Classification into groups
5. Cloze
6. Cloze elide (remove extra word)
7. Dichotomous items (T/F/not stated, Y/N)
8. Finding mistakes and fixing them
9. Free recall
10. Gap filling formats (rational cloze formats)
11. Information transfer (graphs, tables, flowcharts, outlines, maps)
12. Integrated multitask reading assessments
13. Matching (and multiple matching) techniques
14. Multiple choice
15. Sentence completion
16. Short answer
17. Skimming
18. Summary (1 sentence, 2 sentences, 5–6 sentences)
19. Text gap
20. Text segment ordering
21. Project performance evaluation

Many of these task types are widely used in standardized tests. We comment selectively on a number of these task types, and identify other types that are less common but that do appear in standardized assessments. Cloze assessments with random nth word deletions (e.g., every sixth word or every seventh word) are not automatically valid assessments of reading abilities, particularly when students are expected to write in the missing words. Such tests become production measures and are not appropriate for L2 reading assessment. Much more useful options are gap filling measures (rational cloze formats) that purposefully target specific words (e.g., prepositions, verbs) rather than delete, for example, every seventh word.

C-tests are variants of cloze formats, but rather than deleting whole words, the initial letter or syllable of a targeted word remains, and students use this clue, along with the sentence context, to determine the missing words. This option is less of a production task. Cloze elide, in which "extra" words are meant to be struck out, have the advantage of not requiring any production. In both cases, however, it may not be easy to make persuasive construct validity arguments for these formats.

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Text segment ordering and text gap item types involve the moving around of whole sentences or paragraphs, or the selection of the right space in the text to supply a sentence or paragraph. Text gap formats can be tricky when multiple gaps are created and a list of sentences or paragraphs is provided to insert in the correct spaces. These formats amount to a type of multiple matching task type. Choosing from a heading bank to label identified paragraphs is a similar type of task. The strength of these types of tasks is that they call on knowledge of discourse signals and discourse structuring to be answered successfully. They require several comprehension skills for appropriate task completion.

Free recall formats, a common format in researcher-developed L2 reading measures (Jeon & Yamashita 2022), simply ask test takers to recall ideas (or make a list of ideas) they remember from a text just read. These responses are matched up against a list established by the test maker. Summary formats can be straightforward though somewhat difficult to score. Alternative summary formats can include, for example, choosing the best from among three summary options for shorter texts.

Some task types in Table 20.3 are more innovative. Information transfer tasks, especially visual representations of text information, have powerful construct validity support. However, they can be difficult to score and can have high item interdependence. Project performance evaluation is a newer task format that evaluates test takers as they read texts and then perform in groups to carry out a larger project. It is an interesting option, but is problematic on several validity grounds (giving individual scores based on group interactions and a holistic task). Skimming tasks are well known to teachers but are not as common when used as standardized reading assessment tasks. Certainly, the most innovative task type is an integrated multitask scenario. For example, the Global Integrated Scenario-based Assessment (GISA) includes multiple assessment tasks, texts, and item types organized around an integrated set of content material and a stated purpose for engaging test-takers in the reading assessment. While designed for L1 assessments, it is relevant for L2 contexts as well. This approach is much like an integrated performance-based task (such as an architecture licensure exam) (see Kendeou, 2020; O'Reilly et al., 2014, O'Reilly, Sabatini, & Wang, 2019; Sabatini & O'Reilly, 2013).

In closing this discussion of standardized assessment, it is important to emphasize that all formats need to go through a careful validation process that includes a theoretical justification, a feasibility study (does the task work the way that it is supposed to), a piloting study for reliability and item performance, and a fairness review. While individual teachers are seldom called upon to create standardized

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tests, programs are sometimes expected to generate end-of-year types of standardized assessments. It is important that medium- and high-stakes tests be constructed and used carefully and in the fairest possible way.

20.2.2 Classroom-Based Assessment Practices

> A first concern for classroom teachers is collecting and using reading assessment information…to shape instruction and learning…. A robust classroom assessment program continually provides detailed information about students' current competencies and next steps. (Afflerbach, 2007, p. 268)

Classroom assessment allows for a much wider range of tasks and student observations. Testing formats in classroom contexts can include all of the assessment formats identified for standardized assessment (Table 20.3). Classroom reading assessments can also make use of informal reading inventories or miscue analysis (a student reads aloud one-on-one with an evaluator who notes errors on a record sheet and then determines what progress the student has made or what instructional support is needed).

A number of other informal assessment, or alternative assessment, types are also commonly used in classroom contexts. Almost any language task that is a useful teaching task can be used as an assessment task. What might be lost in the way of relatively weak validity or consistency for any given reading task or measurement in the classroom setting is, in principle, countered by the continual nature of assessment practices of all types in a classroom context. Several types of informal assessment options are available to teachers, including the following:

1. Observations.
2. Self-reporting measures.
3. Progress charts.
4. Performance inventories.
5. Participation and engagement records.
6. Portfolios.

Each general type of informal assessment can be carried out by means of several specific tasks and in different formats. Regardless of informal assessment formats used, teachers and administrators have a responsibility to focus on appropriate tasks and interpretations of task outcomes so that students are not evaluated unfairly. Table 20.4 identifies a large number of informal assessment options that can be used in on-going classroom reading skills assessment. The items in Table 20.4 are grouped according to the six major informal-assessment types noted above.

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Table 20.4 Informal assessment formats

Observations
1. Have students read aloud in class and evaluate their reading.
2. Keep a record of student responses to questions in class after a reading.
3. Keep notes on student participation in class discussions on a reading.
4. Observe what reading material is read during free reading or Scaffolded Silent Reading (ScSR).
5. Observe how much time students spend on task during free reading or ScSR.
6. Have student do paired readings and observe.
7. Observe students reading with an audio device or listen to an audio-recorded reading.

Self-reporting measures
8. Have students list strategies they have used while reading.
9. Have students list words they want to know better after reading and why.
10. Have student keep diaries or reading journals.
11. Have students write simple book reports.
12. Have students recommend books.
13. Ask students about their reasons for choosing certain answers in reading tasks and activities.
14. Ask students about their reading progress.
15. Ask students about their goals for reading with various texts and tasks.

Progress charts
16. Keep charts of student readings.
17. Keep charts of student reading rate growth.
18. Record how far a student reads on an extended reading task.

Performance inventories
19. Have a student read and then have a discussion on the text (1-on-1).
20. Have a student read aloud for the teacher/tester who makes notes, uses a checklist or notes miscues on the text (1-on-1).

Have students do think-alouds while reading (1-on-1).
21. Have students enact a scene/episode/event from a text.
22. Use participation and engagement records.
23. Note the uses of texts in a multistep project and discuss in groups.
24. Have students fill out simple questionnaires of interests and engagement levels in various tasks.

Portfolios
25. Create student portfolios of reading activities or progress indicators.

Many of the assessment options noted in Table 20.4 are fairly simple and straightforward for teachers to use as means to gather important information about students' reading abilities. Key issues include the need for multiple assessment types for any decisions about student abilities or student progress. Informal formats should

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be operationalized in ways to be more objective than occasional after-the-fact judgments or overall subjective assessment. Informal assessment can be made more objective when a teacher knows that assessment information will be used for grading, ranking, placement, or advancement. Observations can be carried out on a regular schedule with certain tasks and activities. They can be recorded consistently at the conclusion of specific tasks, during teacher breaks, or at the end of the day. Portfolios and projects can be constructed with clear goals in mind and assessed according to a pre-established set of grading criteria. The goal is not to formalize informal assessment, but to remember to evaluate a wider range of student performances, thereby making informal assessment more effective and fairer for students.

When using various (and multiple) student performances to inform assessment, teachers should decide on a grading or commenting plan *before* evaluating students. Assessments involving students reading in class, participating in discussions, contributing to a project, reporting on a book they read, or performing in a scripted project (e.g., a readers-theatre reading, a news report) should include multiple assessment points (e.g., note completion of multiple steps in a performance or project). Reviews of student reading records, reading and fluency charts, and reading portfolios should include notes on students' activities at multiple points in the school semester. Otherwise, it is often the case that the most recent one or two reviews dominate the assessment.

Self-assessment by students is an important component of informal assessment and there are multiple options that teachers can explore. Self-assessments can require students to (a) chart their progress on various skills, (b) note what they are reading and why, (c) explain their goals for reading and their reading choices, (d) list reading strategies that they use or want to use, and (e) assess their own evolving reading portfolios according to a few simple criteria. Through self-assessment, students develop greater self-awareness that feeds into assessment for learning when their self-assessments are reviewed, discussed, and reflected on. In fact, informal assessment practices, when objectivized in some way so that students participate in the assessment, can promote assessment for learning on a fairly continual basis.

20.2.3 Assessment for Learning Practices

> Feedback is only successful if students use it to improve their performance. (Wiliam, 2016, p. 10)

Assessment for learning is an alternative and somewhat innovative way to think about the goals of assessment and operationalize the notion that assessment should be used to promote learning (rather

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than to check learning). As such, assessment for learning involves more of a philosophy toward teaching and student learning than a separate set of assessment practices; it is not specific to reading although it can easily be adopted for reading contexts. In effect, the crucial goals of assessment for learning involve teaching procedures that use assessment information as major opportunities for teacher feedback and student learning, and for the development of more effective skills over time. The key, in this case, is not to provide answers, but to help students work through misunderstandings that are apparent from their performance, help them develop effective learning strategies, and encourage their self-awareness and motivation to improve.

Assessment for learning is an approach that is well suited to reading instruction. In its simplest form, the teacher provides feedback on student performance (e.g., on reading-related activities) on a regular basis and engages students in improving their learning based on teacher feedback. Teachers can respond to student indicators of noncomprehension and observations of students' weak performance. In many cases, the techniques used can be associated with straightforward comprehension instruction (comprehension questions, vocabulary learning tasks, strategy training), although the specific goal is to provide feedback to students and elicit appropriate student responses (rather than provide correct answers). (See Black & Wiliam, 1998, 2009; Wiliam, 2011, 2016, 2018a; Wiliam & Leahy, 2015, for additional perspectives on assessment for learning.) The seventeen-example assessment-for-learning ideas and techniques itemized in Table 20.5 apply to any learning and assessment context, but it should be evident that these techniques are ideally suited to reading tasks and reading comprehension development.

These seventeen examples of engaging in assessment for learning represent only a subset of what teachers and students can do together to enhance learning goals through ongoing assessment feedback (see Wiliam, 2011; 2016, 2018a, 2018b; Wiliam & Leahy, 2015). The key idea is that teachers carry out ongoing observations of student performances to decide how best to provide effective feedback.

In addition, many, if not most, of the informal assessment practices noted in Table 20.4 (as well as standardized assessment types, Table 20.3) create opportunities for teachers to engage students and groups of students with feedback. When implementing assessment for learning, the first step is to establish signaling mechanisms that allow students to signal difficulties that they are having to the teacher. Second, feedback from teachers should (a) address skills needed to improve learning, (b) encourage greater student awareness of what successful

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Table 20.5 Assessment for *learning techniques (adapted from Wiliam, 2018b; Wiliam & Leahy, 2015)*

1. Teachers ask students to generate good questions about reading texts, which could then be included on a test of some sort. Students learn how to formulate good questions about the texts they read, and their questions then appear on quizzes and comprehension checks.
2. Teachers move from more traditional question and answer sequences about reading passages to questions that initiate a discussion with and among students about their understanding of the text.
3. Teachers withhold grades on student work until students respond to comments on their assignments (e.g., multiple text syntheses, filled in graphic organizers). In many cases, teachers do not provide grades at all, only comments.
4. Teachers wait for five seconds after asking a question, without answering the question when students are silent, or without switching to a strong student for the answer.
5. Teachers deal with wrong answers or performance difficulties in ways that engage students in finding good answers and achieving task success.
6. Teachers provide feedback to build student self-efficacy for learning.
7. Teachers have students write out answers to questions or tasks before being called on to give answers.
8. Teachers discourage student hand-raising to answer questions; instead, they create impartial ways to call on students (i.e., a plan to randomly call on different students).
9. Teachers provide comments that ask students to make decisions and work toward achieving their learning goals.
10. Teachers engage students in "why" questions and "why" follow-up questions to generate discussions about an answer.
11. Students learn to engage in self-assessment by monitoring their comprehension and their levels of success in carrying out during-reading and post-reading activities.
12. Students work in groups to answer questions and are given time to work out answers together.
13. Students assess the work of other students, usually through constructive comments rather than with a simplistic (and fairly meaningless) "very good."
14. Students select a peer to answer a question, for example, by drawing a student's name from a hat.
15. Students learn to monitor their noncomprehension of a text or task and signal for assistance when they have difficulty.
16. Students redo their answers on a reading task or a quiz, often with peer support.
17. Students use "traffic-light" discs (green on one side, red on the other) to silently signal to the teacher that they are doing well or having trouble when working on their own or in groups.

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outcomes would look like, and (c) provide opportunities to help students become more successful. Because carrying out assessment for learning on a consistent basis can be challenging for teachers, Wiliam and Leahy (2015) offer a number of guidelines for implementing these practices. Certainly, teachers need to experiment with various ways to provide effective feedback in order to build effective practices.

Whichever assessment for learning techniques are chosen, they should be used on a regular basis so that students know what to expect, how to respond, and how to use feedback from the teacher. Students also need to be encouraged to see assessment for learning practices in a positive light. This need for a positive learning cycle around brief, consistent, and informative assessments means that teachers must not use these assessment procedures primarily to sort or grade students. Both teacher and students need to be sold on the positive power of assessment for learning practices in the classroom (Black & Wiliam, 2009; Wiliam, 2011, 2016, 2018b). To carry out assessment for learning effectively, teachers need a significant amount of training and students need consistent support and reinforcement.

In L2 contexts, assessment for learning has been receiving increasing attention in the United Kingdom, Australia, New Zealand, and Hong Kong (Leung et al., 2018). In some cases, these applications involve many similar ideas and approaches to those already outlined. In other cases, the concept of assessment for learning, and the larger notion of formative assessment, focus on student self-assessment of learning and have been adapted into standardized assessment schemes for overall student performance. Examples of these efforts, and related discussion, are provided by Davison and Leung (2009), Leung et al. (2018), and Poehner (2009). One distinction emphasized by Wiliam (2018a) over the past fifteen years is the central idea that teacher feedback is not the goal; instead, student use of teacher feedback to improve learning is the goal. This goal also links assessment for learning with the goals of deliberate practice to build greater expertise (e.g., get a good coach). The goal is not what the teacher does, but what the student does that demonstrates learning. L2 researchers exploring assessment for learning appear to have been more focused on the support for learning provided by the teacher and less on the demonstrated student improvements in goal-directed learning outcomes.

Returning briefly to the connection between assessment for learning and deliberate practice, how does the role of the effective coach work in skills development? It might be useful for assessment researchers to study the behaviors of effective coaches. Why do learners develop trust that a coach will improve the learner's performance? What counts as a performance measure (or a task) that a coach can use to

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improve a learner's performance? What does a learner do with the feedback from the coach? And how do performance tasks translate into language learning tasks that promote effective subsequent learner performance (see Ericsson, 2018; Ericsson & Pool, 2016)?

20.2.4 Placement and Diagnostic Assessment Practices

Most of the assessment formats identified in this chapter provide the foundation for specific types of placement and diagnostic assessment. The key difference for placement and diagnostic purposes is that these latter types of assessments are usually more locally driven: Classes, programs, and institutes have specific needs for placement and for diagnosis of students' strengths and weaknesses. It is true that standardized tests are commonly used or adapted for placement purposes (e.g., Gray Oral Reading Test or Test of Word Reading Efficiency for young L1 students; TOEFL or IELTS variants for older L2 students), but programs and institutions often require additional assessment information and give follow-up assessments (often developed in-house) of crucial language skills, including reading skills. For reading, these skills might include comprehension of academic material, discourse awareness for reading difficult texts, and writing from text resources. At more basic levels of L2 reading ability, students can be assessed and placed according to vocabulary knowledge, spelling skills, oral passage reading, grammar knowledge, and main-idea summary statements.

Diagnostic assessments can be used for placement purposes, although the goals for placement and diagnosis are distinct. Diagnostic assessments should typically include a battery of skills at a given ability level that may cause difficulties or (alternatively) should already be well learned by students. If some students need specific instructional support to address weaknesses, diagnostic assessments lead to a plan for individualized work, either to address the weaknesses of select students, or to provide more generalized instruction for the whole class. Diagnostic assessments can provide more detailed information on various component skills (e.g., vocabulary knowledge, reading fluency, complex syntactic structure knowledge, inferences with more challenging texts, ability to summarize main ideas) (see Alderson et al., 2015)

One further specific use of diagnostic information is the role it can play within a classroom-based assessment-for-learning approach. Teachers can use diagnostic assessment to identify likely sources of difficulty for specific students or groups of students at the outset of instruction. (Other difficulties for students may arise during the course of instruction.) Diagnostic information would allow teachers to anticipate some student difficulties, give careful thought to ways to

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provide effective feedback at the outset of teaching, and identify ways for students to show that they are learning from teacher feedback. If student learning crucially depends on how students use teacher feedback, teachers can look carefully at subsequent student performance to assess improved learning outcomes. In a very concrete way, teachers can also use the diagnostic assessments themselves to show students some of the skills that they need to work on (and how to work on them) to improve reading comprehension.

20.2.5 Research-Based Assessment Practices

Reading research makes use of a range of assessment tools. In many cases, studies use already existing standardized tests or create adapted versions of those tests. In other cases, researchers create their own tests using testing formats already identified in this chapter. In yet other cases, researchers use measures developed for specific research questions, and sometimes the researchers use uncommon assessment formats. For example, asking test takers to read sentences with alternating CaPiTaL and lower case letters is not a typical reading assessment technique, but it does measure the impact of visual form on sentences processing, and indicates different levels of visual processing interference for L2 students from different L1s. In other cases, students may simply read a sequence of numbers and then recall the numbers in the same order (as a working memory [WM] measure). On the face of it, this task would not seem to be a reading measure, but WM is usually a moderate predictor of reading abilities. Similarly, oral passage reading tasks are not generally used for L2 assessment purposes, but they are useful to examine reading fluency in the right contexts. Most common assessment measures that have been developed by researchers can be categorized under one or more of the six general options listed in Table 20.6.

Table 20.6 Types of reading assessments commonly used for research purposes

1. Time measures and response-time measures.
2. Priming measures (speed and preference decisions based on co-occurring associations).
3. Frequency of occurrence measures (including category-level coding with qualitative data; e.g., number of strategies used).
4. Specific reading skills and knowledge measures (including recall measures of various types).
5. Self-reporting measures (checklists, diaries, interviews, questionnaires).
6. Performance measures using information from texts.

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Reading research uses all of these common types of measures as well as a few that are unique and innovative. Regardless of measures used, they all involve assessment of student abilities. As student assessment measures, they need to be validated under the various criteria for a validity argument (construct validity, reliability, usability, fairness, and consequences).

20.3 Issues and Innovations for L2 Reading Assessment

> Feedback studies focusing on comprehension are particularly rare.... Feedback is useful only if it relates to the goals of learning and moves the learner toward the goal. (Alderson et al., 2015, p. 15)

Specific assessment plans and item types for L2 reading, that might better capture reading abilities, are discussed in Section 20.3.1. Within the area of reading for academic purposes, there is a need for different types of reading measures that do not currently fit easily within common assessment instruments. While almost everyone would agree that test takers need to be given a variety of task types reflecting different skills, the issue is what might count as tasks that capture new but important information on reading comprehension (e.g., through multitask performance, GISA, described earlier, for L1). Adding different types of assessment tasks to the standard repertoire also complicates validity concerns for reading-assessment measures. These are interesting challenges to address: any new task that is given credibility as a valid assessment task must add further knowledge about a test taker's reading abilities. In Section 20.3.2, five further options for new reading assessment methods are introduced (new ideas for reading assessment).

20.3.1 New Perspectives on L2 Reading Assessment

Content and Language Assessment for Learning. Koda and Yamashita (2018, 2019) have proposed an assessment-for-learning approach for L2 reading development in English as a foreign language contexts. More specifically, the target ability to cultivate in this approach is combined reading and content learning (comprehending reading materials and learning new information/knowledge by integrating the text content with prior knowledge/experience). This assessment approach is a counterpart to the integrated content and language instruction discussed in Chapters 13 and 19. Among several features of this approach, assessment-driven learning is relevant to our discussion here. This feature is developed by a tight connection between assessment (formative and summative) and classroom instruction.

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The assessment framework (including specific assessment criteria) is shared with students at the start of the course, and the teacher uses the framework consistently at all levels of classroom activities and assessment (e.g., teacher-created worksheets, pair work, group work, unit-level assessment, summative assessment) so that students clearly understand the skills to develop and make every effort towards mastery of the target skills.

Koda and Yamashita (2018) identified four key elements for successful assessment-driven instruction to support content and language learning: concrete, explicit, consistent, and iterative instruction. *Concrete* descriptions of the focal skills for instruction should be made *explicit* to students and used *consistently* and *iteratively* throughout class activities and at various levels of assessments. Although this approach might be challenging for teachers at first, especially when they are not used to the practice of assessment for learning, it is possible to design L2 instruction to cultivate reading and content learning skills in various contexts (see Koda, 2019; Koda & Yamashita, 2019, for specific classroom practices).

Evaluation of Academic Vocabulary. Multiple innovative ways to assess vocabulary knowledge have recently been explored. For the past twenty years, vocabulary assessment and instruction have been rather static. But new conceptualizations of vocabulary knowledge and instruction in both L1 and L2 contexts raise new possibilities for vocabulary assessment. In L1 contexts, Crosson et al. (2019) and McKeown et al. (2018) have developed an assessment of vocabulary depth, the Evaluation of Academic Vocabulary (EAV). Their goals have been to develop a measure of vocabulary depth that is sensitive to vocabulary gains during and after vocabulary instruction.

EAV was designed specifically to determine if vocabulary instruction with an experimental group improves depth of vocabulary learning, over time, significantly more than a control group. Rather than ask test takers to select the best meaning choice for each tested word, the researchers created four sentence frames with a gap for a given word. Words are provided above the four sentences; for each sentence, participants had to decide if a given word fits appropriately in the gap. The sentence frames are either appropriate or not appropriate (somewhat similar to one of the new Duolingo assessment formats, DET). In their study, ninety-nine words were assessed with 396 sentence frames. The test provided a strong indicator of significant lexical-quality vocabulary gain after a one-year experiment over a control group (Crosson et al., 2019).

Computer Adaptive Test of Size and Strength (CATSS). A very different vocabulary-depth assessment format, the CATSS was described

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by Aviad-Levitsky et al. (2019) for L2 academically oriented students. In this innovative measure of vocabulary depth, words were assessed for participant responses to four vocabulary knowledge traits: recall of word form, recall of word meaning, recognition of word form, and recognition of word meaning through a computer adaptive test format. The test used a corpus of word families from the first fourteen bands of the British National Corpus (BNC) and the Corpus of Contemporary American English (COCA) word lists. University students (*N*=453) participated in the study; they formed three English proficiency levels based on an English academic proficiency test. The CATSS strongly differentiated students across the three proficiency levels, and each of the four test item types strongly contributed to differentiating the three proficiency levels. The CATSS test itself was highly reliable with Cronbach's alpha between 0.94 and 0.99 for the four different item types.

Duolingo English Test (DET). The DET is also an innovative computer adaptive test of English proficiency with two vocabulary comprehension item-types (out of seven proficiency assessment item-types for the entire test; see LaFlair, 2020; LaFlair & Settles, 2020; Settles et al., 2020). One item-type is a paragraph with vocabulary assessed as a C-test (from twelve to fifteen words to be completed in a paragraph). The second item-type comprises a list of words and pseudowords. Students are asked to select only the real words (up to eighteen words on a screen). These two measures, together, correlated highly with the TOEFL iBT reading subsection. These measures suggest interesting ways to assess students' reading comprehension with two vocabulary item-types. One open issue is the extent to which an innovative and psychometrically sound assessment such as DET might be limited because it does not directly reflect surface validity; that is, it does not use item-types that reflect Target Language Use (Bachman & Palmer, 2010). But are real language tasks necessary? That is a question for future assessment research.

Diagnosing reading and writing in a second or foreign language (DIALUKI). Alderson et al. (2015) provides a number of diagnostic item types for L2 reading assessments as part of their L2 DIALUKI assessment project. The DIALUKI project assumes that specific language skills provide strong predictors of reading subskills based on extensive reading research. They developed a set of diagnostic measures of what many reading researchers consider the most important reading component skills to identify strengths and weaknesses of second and foreign language reading abilities. These skills and associated item-types include both vocabulary and grammar knowledge, word reading fluency, text segmentation skill (in both L1 and L2),

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and word recognition skills. Among key findings for the diagnosis of strengths and weaknesses is the dominance of L2 language component skills over and above L1 reading skills, higher-level L2 skills, cognitive skills, motivation, and sociocultural factors as measures of L2 reading comprehension. Especially important was vocabulary knowledge (Alderson et al., 2016). They also found, similar to other findings, that vocabulary measures and grammar measures are most likely to provide better assessments when combined as part of a single language comprehension component factor (see also Chapter 2; see also the Lexical Quality Hypothesis, Chapter 11).

20.3.2 Additional Ideas for L2 Reading Assessment

A number of additional approaches to reading and component-skills assessment could be explored in interesting ways that have not yet been developed. In vocabulary contexts, test takers could be asked to carry out sorting or classification tasks with large groups of words according to specified category labels; or they could be asked to take words from a list to fill in a relevant diagram. Phraseological knowledge may be a very important predictor of reading comprehension (Kremmel et al., 2017). It would seem that a number of vocabulary assessment formats could be specifically developed for phraseological units. For example, students could be asked to fill in sentence gaps with a given phraseological unit if that phraseological unit is appropriate in the gap.

Assessing reading fluency is another issue that deserves more attention. Reading fluency can be measured at various linguistic levels (word, sentence, or passage). Fluency assessment information should offer useful diagnostic and classroom-based measures of L2 students' reading abilities. Various tasks are possible such as oral reading for one minute, or silent reading on a computer, much as is done for L1 assessments. Timed readings with simple follow-up comprehension questions could have multiple assessment uses. Such measures would ultimately place less emphasis on task authenticity and direct measurement of reading comprehension and more emphasis on prior extensive reading practice.

Assessment of discourse structure is another option that can be explored further. With respect to text factors, we need to know how reading assessment difficulty can vary by text choice (genre, length, complexity, vocabulary, organization). Will literary texts versus general narrative texts versus informational texts versus persuasive texts generate very different assessment outcomes? Discourse structure knowledge might also be assessed effectively through various types of discourse awareness tasks (see Chapter 14) and especially through the

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use of extended graphic organizers (Jiang, 2012). The use of graphic organizers is currently employed in some tests to a limited extent (Schmitt et al., 2011), but it should be investigated further.

We have suggested a number of areas associated with new reading assessments, some already established, and some involving potential for innovation. Ultimately, any innovative reading assessment idea must connect back to a coherent and plausible construct statement; it needs to provide additional information that better assesses the reading abilities relevant to a given group of students, in a specific situation, and at a subset of appropriate proficiency levels. But with reasonable controls set up at the outset, the potential development of new reading assessment options can be an interesting challenge for an assessment specialist.

20.4 Further Issues for Reading Assessment

Several additional issues could be discussed, but we focus on two that are particularly important for the appropriate uses of assessments in reading contexts. The first is the recognition – on the parts of assessors, teachers, and administrators – of the consequences of assessment. The second is the importance of teacher training for effective and appropriate reading assessment.

20.4.1 Consequences of Assessment

All assessments have consequences. In a classroom setting, students may feel that they did not perform well. Teachers may be disappointed in a specific performance by a student (or an entire class) and let it show even if grades are not involved. Informal assessments may inadvertently be made based on one or two salient experiences rather than a fair accumulation of evidence over time and across tasks. Teachers and administrators may use grades, tests, and evaluation reports to make decisions about students that should require additional input. Summative achievement tests certainly have consequences, as do standardized tests. Even in assessment for learning contexts, a steady diet of difficulties and poor performances can take a toll on both students and teachers. The point is that assessment, no matter the context, is a serious business and must be handled with care, purpose, and expertise.

Most importantly, teachers cannot opt out of the consequences of assessment. Even when teachers state that they do not believe in standardized assessment or grading, they are generating consequences of assessment. They sometimes leave assessment to others who may be less informed about their students, their progress, and their needs.

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When teachers do not take assessment seriously as their responsibility, they give up their ability to advocate for students in assessment contexts or support fair assessment practices. Teachers need to develop expertise in assessment practices of all types if they are to ensure fair uses of assessment and appropriate consequences of assessments. Only when many teachers have true assessment expertise will their views be heard by administrators and policy consultants.

All of us engage in assessment all the time, both in our daily lives and in the classroom. We assess the value of most daily activities we engage in and most purchases we make. We assess our friends, our work, our leisure activities, and the food we eat. We assess students' homework, their group work, their responses to pre-, during-, and postreading activities, and their levels of engagement in extensive reading in class. Assessments also provide information for continuous learning. It should not be surprising, then, that assessments are essential to learning institutions, teachers, and students. Honest, fair, and appropriate assessments are needed by students if they are to learn most effectively. Taking this view of assessment also highlights the consequences of assessment. It is everyone's responsibility to ensure that these consequences are not harmful or unfair.

20.4.2 Teacher Training for Reading Assessment

> Given the widespread use of language assessments for decision-making across a number of social domains (education, immigration and citizenship, professional certification), it has become vital to raise awareness and knowledge of good practice in language assessment for a wide range of stakeholder groups. (Kremmel & Harding, 2020, p. 100)

This discussion of assessment consequences inevitably places a responsibility on teachers to develop some level of expertise in assessment practices and uses of resulting outcomes. One obvious way to promote teacher expertise in assessment is to modify teacher development programs so that a greater emphasis is placed on assessment skills. However, assessment training needs to update itself to engage teachers much in the way that teachers have a responsibility to engage students in their own learning. Until recently, surprisingly little research has been conducted on how teachers develop assessment expertise, or how they can develop this expertise. In L2 contexts, this challenge has led to a movement towards Language Assessment Literacy (LAL), a recent topic in L2 assessment journals and other publications. Recognizing that more traditional courses on language assessment do not seem to produce active and engaged teachers with strong literacy assessment skills, new perspectives on training and

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supporting teachers in their assessment roles are needed (see Fulcher, 2012; Kremmel & Harding, 2020; Levi & Inbar-Lourie, 2020).

The movement towards LAL strives to find new ways to raise awareness, understanding, and active knowledge about effective literacy assessment goals and practices for differing groups of stakeholders. Some of these goals can be developed by (1) asking teachers to produce their own assessment formats and explain them, (2) having teachers review actual assessment instruments, discussing their strengths and weaknesses, (3) having teachers take the tests themselves and then reviewing/critiquing test effectiveness and test fairness, and (4) examining and exploring the rationales and justifications for new assessment formats to serve standardized, classroom-based, and diagnostic purposes.

At the same time, there are a number of ways in which teachers can help themselves. When assessments are recognized as essential aspects of learning, teachers can explore specific aspects of assessment practices that appeal to them. It is not difficult for teachers to develop expertise in informal assessment practices and learn to use them appropriately through action-research projects. Teachers may also want to explore assessment for learning practices as a process of continual supportive feedback for student learning. Teachers may want to learn about specific standardized assessments, perhaps in study groups, as a way to understand technical specifications, construct validity arguments, and consequences of test uses. Well-informed teacher voices that can challenge or complement expert consultants will go a long way to fair and appropriate assessment practices. Teacher engagement in assessment issues also suggests that researchers and teacher trainers need to know more about how teachers can develop assessment expertise. Assessment is far too important in the lives of students to leave matters of fairness and consequences to others.

20.5 Implications for Teachers and Instruction

In this final chapter, we shift the implications section from a set of useful recommendations for instruction to a wider view of the intersections among teaching, learning, and assessment. Our earlier comments on the consequences of assessment for student learning have both policy and instructional dimensions, but not entirely easy recommendations. Our goal here is to consider how assessment in classroom contexts can make a difference in student learning. To start off, when teachers (a) recognize the potential of assessment for student learning (rather than focus on mandated high-stakes testing) and (b) take responsibility for appropriate assessment practices, many

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implications for instruction emerge. The most central of these implications is that appropriate and effective assessment practices should lead to better student learning. The most obvious example of this is a consistent and on-going effort to provide assessment for learning.

Many teachers might imagine assessment for learning as a series of pop quizzes or weekly quizzes intended to measure learning progress. However, assessment for learning is not focused mainly on quizzes, graded homework, and tests. Rather, the key is the continual process of collecting data from students through informal types of assessment and observations of students' performances, and then acting quickly to provide feedback that can enhance learning. Doing this well, and remembering to do this continually, is not an easy process for teachers to incorporate in their teaching routines if they are not socialized into this practice. So a major implication for instruction and student learning involves teachers becoming adept and comfortable in collecting continuous information on student learning and then acting on this information to enhance learning. In this way, assessment becomes a major component of instruction itself. But what counts as collecting continuous information from students on their learning (or lack of learning)? And how does a teacher translate that information into actions that support student learning?

Perhaps a good way to bring this implication to life is to draw on insights from the study of expertise combined with the goals of performance teachers or coaches. If we take a piano teacher as an example, that teacher may have forty minutes a week with a learner. A good teacher, in a short space of time, has to show/teach the learner what she or he (the learner) has to do to make progress within the week. The rest of the week, the learner uses that teacher feedback to make the expected improvement. The tie-in with expertise is the central role of deliberate practice that a learner engages in to make improvements week over week (see Ericsson, 2018; Ericsson & Pool, 2016). This connection between what the teacher needs to do and what the learner needs to do is the critical space in which assessment (and self-assessment) supports and develops student learning (see Stigler & Miller, 2018).

This performance/coaching context for teaching and learning (and assessment) does not provide simple answers to the challenge of using assessment to improve student learning, especially in whole classroom contexts. The field of expertise research provides a virtually untapped knowledge domain not only for assessment for learning, but also for any level of school-based assessment intended to improve student learning (see Ericsson, 2018; Kalyuga & Sweller, 2018; Stigler & Miller, 2018)

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Until such wider explorations add new insights, the perspectives outlined by Wiliam (2018a) and the recommendations by Wiliam (2018b) and Wiliam and Leahy (2015) offer a number of important suggestions for incorporating assessment for learning into ongoing teacher practices (Table 20.5). Importantly, teachers need to develop ways to provide timely and useful feedback as well as help students understand that they are expected to make improvements based on teacher feedback.

On a small scale, a teacher or group of teachers can engage in action research projects to explore assessment-for-learning options and their impacts on student learning, perhaps even as preliminary steps before long-term commitments (see Grabe & Stoller, 2020). Projects might include ways to teach students self-assessment of reading task performance; or teachers can provide students with specific ways to indicate, through some signaling mechanism, that they do not understand or are having difficulties. Teachers can engage students in nonthreatening discussions during which students identify sources of comprehension difficulty and strategies for addressing these difficulties while they are reading a given text.

Student projects may also involve periodic opportunities for assessments that can be a resource for further classroom instruction. The point of assessment for learning is not that common assessment formats are inappropriate (e.g., quizzes, comprehension questions, unit tests), but that assessment formats should be means for teacher feedback and for students to address difficulties and improve subsequent performance. This process is much like what a coach provides for musicians or athletes, who then expect to improve their performance through self-assessment.

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