Research Insights

English as a Foreign Language Teachers' TPACK

Emerging Research and Opportunities



Mehrak Rahimi and
Shakiba Pourshahbaz

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English as a Foreign Language Teachers' TPACK:

Emerging Research and Opportunities

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Preface

The era of technology has brought with itself new types of competencies, skills, and knowledge. The use of technology for more than half of a century has evolved people's minds and has created new ways of thinking and processing information. As a result, the schools of the 21st century have different students, and thus demand to have different teachers, environment, and equipment.

Undoubtedly, teachers of this century should empower themselves both pedagogically and technologically to be able to teach more efficiently and orchestrate efficient learning. To be able to do that, teachers are required to arm themselves with appropriate knowledge of the subject matter to teach the content based on pedagogical principles and practices using the-state-of-the-art technologies. The knowledge base of teachers of the 21st century is called TPACK (Technological Pedagogical and Content Knowledge)with seven distinct and interrelated components including Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK).While the framework of TPACK is based on certain theoretical underpinnings and empirical studies, extensive research on the model of TPACK has revealed contradictions with respect to the perfect compatibility of its components with the knowledge base of different subject matters.

TPACK of English as a Foreign Language (EFL) teachers can subsume the prototypical model of TPACK if certain additional aspects are taken into account. This would include specification of teaching English as a Foreign Language standards, proficiencies, and competencies; accurate definition of its underlying pedagogical frameworks associated with English Language Teaching (ELT) and Second Language Acquisition; as well as the way English is taught with technology in the domain of Computer Assisted Language Learning (CALL). Although there is extensive research on the way language(s)

should be taught and learned based on teaching/learning principles using the cutting-edge technologies, research on TPACK of EFL teachers is merging and still in need of more scientific support.

As a result, the book 'English as a Foreign Language Teachers' TPACK: Emerging Research and Opportunities' addresses the concept of TPACK and its related concepts in general, and the knowledge base of teaching English as a Foreign language in particular. The book consists of seven chapters with a historical trend of introducing concepts and models in opening chapters and moving to more practical and research-based issues in the closing parts. Therefore, in the first half of the book the historical background of TPACK formation and seminal works of the founders and developers of the model are addressed. Following that, the necessity of defining and specifying EFL TPACK is comprehensively discussed in the second part of the book and some studies done in this arena are reviewed in the closing sections. A summary of each chapter follows.

Chapter One discusses a brief history of Computer Assisted Language Learning (CALL). The chapter begins with defining CALL and its key concepts. A comprehensive but brief account of the history of CALL from the 1950s till the present is presented in the following. The characteristics of each phase of CALL, the corresponding linguistic/psychological frameworks, technologies, activities and merits/demerits are elaborated. CALL research scope and its future perspective are portrayed and possible fields of research are introduced. In the end, a quick and brief guideline is provided on how to use CALL in teaching macro and micro language skills.

Chapter Two discusses the role of teachers in CALL. First the role of teachers in EFL classes along with the timeline of language teaching methodology (from grammar translation method to CLT approach) as well as post-method era is discussed. Then the benefits of using CALL for language teachers is addressed, and the concept of teacher role in CALL is defined and specified. The importance of EFL teachers' cognition in successful ICT integration is discussed in the closing section of the chapter. This is specifically related to discussion about theory of diffusion of innovation and how it can be related to CALL history and integration in language classes.

Chapter Three pinpoints EFL teachers' knowledge base and its components. First, knowledge and its nature in general and teacher knowledge in particular are discussed. The theoretical frameworks of teacher knowledge base in general and the knowledge base of EFL teachers in particular are defined

and elaborated meticulously. In the following, the need to reconceptualizinf EFL teacher's knowledge base, the importance of investigating EFL teachers' knowledge base in CALL-based teaching/learning environments, and the way teachers should be empowered in technology era are addressed.

Chapter Four addresses the theories underlying the construct TPACK. The chapter begins with reviewing the history and then the rationale of teacher knowledge base in the form of a multi-dimensional model taken from published literature. Then it discusses how TPACK framework has developed and evolved in the last decade. Some seminal works are reviewed in this section whose authors have contributed to the development of TPACK model. In continuation, a comprehensive list of the definitions of TPACK and critical issues regarding this framework are discussed. In the closing section, the evolved model of TPACK, namely TPACK in-Action, is introduced in detail.

Chapter Five gives a brief review of literature of TPACK and the variables researchers have focused on during the past decade. The review of literature is divided into four parts: the research done on the emergence of the model and the educationists' works on the theoretical aspects of TPACK; how certain researchers have tried to validate the TPACK model and the contradictions they revealed in the process; the assessment of the model in the context of teaching and the way TPACK can be related to other attributes of teachers and their context of teaching; and finally the measures of TPACK including both subjective and performance measures.

Chapter Six focuses on EFL teachers' TPACK. First, the types of knowledge that are important in pedagogy and how these categories of knowledge and their related frameworks can differentiate models of teacher education are discussed. In the following, some models of teacher education, their characteristics, and their differences and similarities are introduced. Then the rationale of developing EFL TPACK to subsume standard TPACK is discussed and the need to EFL TPACK is addressed. The rationale includes two important characteristics of EFL teachers that can impact the use and adaptation of technology in the process of teaching: computer attitudes and ICT literacy. How these two constructs are important in empowering a teacher to use ICT in instruction, and how they can hinder technology-based teaching and learning are discussed. Some related models and constructs associated with these two attributes are described as well. In the last part, the construct EFL TPACK is comprehensively introduced with respect to seven components of TPACK: CK, PK, PCK, TK, TPK, TPCK, and TPACK. Each component is described in detail and support/evidence from the literature is provided.

Chapter Seven lists studies done on EFL TPACK. As a new and still-evolving construct, some studies done on the understanding of the construct itself and its relationship with other variables are listed. In the closing section of the chapter a few measures of EFL TPACK are introduced. Three samples of measure of TPACK are enclosed in the Appendix for further reference.

As this book gets its strength both from TPACK and ELT theories and practices, it thus can be a helpful guide for EFL teacher educators, EFL teachers, and researchers who are interested in issues related to teacher empowerment and development.

Chapter 1
A Short History of Computer-Assisted Language Learning (CALL)

ABSTRACT

This chapter discusses a brief history of computer-assisted language learning (CALL). First CALL and its key concepts are defined then a comprehensive but brief account of the history of CALL from the 1950s till the present is presented. The characteristics of each phase of CALL, the corresponding linguistic/psychological frameworks, technologies, activities and merits/demerits, and the role of the computer in instruction are elaborated. CALL research scope and its future perspective are portrayed and possible fields of research are introduced. In the end, a quick and brief guideline is provided on how to use CALL in teaching macro and micro language skills.

BACKGROUND

Since the mid of 20th century, the advent of different types of technological devices has revolutionized the way people think, work, and live. Technology and its affordances have affected all areas of science and people's life style; and have had a great role in the way people look at the world and process its components.

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Computers are now an indispensable part of peoples' personal and professional lives and are vastly exploited in general education and many fields of studies. A revolutionary change has thus occurred in the way information is created, saved, transferred, and processed. The huge change technology has caused in the world has led to changes in people and thus inspired studies on the way technology can be integrated into the way children are raised and educated. Computer Assisted Instruction (CAI) as a complimentary component of modern education has emerged and evolved in the following decades.

In language learning, the expression Computer-Assisted Language Learning (CALL), came into existence in early 1950s. Based on the revolutionary and evolutionary movements in the fields of pedagogy and psychology, CALL evolved into a full-fledged discipline of study and as a research field received considerable attention over the past few years. A number of studies have attempted to identify the characteristics of CALL and many theoretical frameworks and hypotheses have developed over the past 60 years. While CALL, as a field of study, was trying to claim its independence from CAI, different labels and terms were in vogue among educationist to refer to the core of computer assisted language learning and teaching.

The Definition of CALL

CALL has been labeled differently and a variety of terms have been used for it by different scholars over time. Some of these terms are summarized in Table 1.

The term CALL, however, seems to be more prevalent among language experts especially after 1980s, although two basic weak points are often highlighted regarding this term: the use of *computer* as the only technology that can be integrated into language instruction and a focus on the *learning*, that seems to ignore the teaching procedure (and thus the teacher role) in

Table 1. CALL Related Acronyms (Beatty, 2003)

CALL	Computer Assisted Language Learning
CAI	Computer Assisted Instruction
ICALL	Intelligent Computer Assisted Language Learning
CELL	Computer Enhanced Language Learning
TELL	Technology Enhanced Language Learning
WELL	Web Enhanced Language Learning

computer-based language classes. The latter consideration, however, raises another issue about the term itself, as one of the educationists' concerns about computer assisted instruction has always been the role of the teacher in technology-based teaching/learning environments and the danger of omitting the teacher from instruction in the modern time.

CALL is as a process of language learning during which learners use computers and, as a result, improve their language proficiency (Beatty, 2003). In this definition, *computer* refers to all types of technologies that lend themselves well into the process of teaching and learning, not necessarily desktop computers. It can be defined as *a research field which explores the use of computational methods and techniques as well as new media for language learning and teaching* (Gamper & Knapp, 2002).

There are certain advantages for using CALL in the process of language teaching and learning (Hubbard, 2009):

- **Learning Efficiency:** Learners are able to pick up language knowledge or skills faster or with less effort;
- **Learning Effectiveness:** Learners retain language knowledge or skills longer, make deeper associations and/or learn more of what they need;
- **Access:** Learners can get materials or experience interactions that would otherwise be difficult or impossible to get or do;
- **Convenience:** Learners can study and practice with equal effectiveness across a wider range of times and places;
- **Motivation:** Learners enjoy the language learning process more and thus engage more fully;
- **Institutional Efficiency:** Learners require less teacher time or fewer or less expensive resources. (p. 2)

CALL can promote language learning and teaching if it is used as a tool to support pedagogical goals of the class and curriculum. CALL utilizes different affordances of technology to promote learning/teaching efficiency including:

- **Technological Devices:** Diverse devices that are used for computer-based instruction such as Personal Digital Assistants (PDA), laptops, tablets, smart phones, Mp3s, Interactive White Boards, etc.
- **Technological Applications:** The applications and/or software packages that can be used in teaching and learning in computer-based learning environments. These software may include different types of educational software such as tutors, edutainment programs,

simulations, etc. or utilities such as word processors, media production, and presentation programs.

- **Technological Environments:** World Wide Web (WWW), its huge databases and affordances such as blogs, wikis, online dictionaries, corpora, concordancers, Learning Management Systems (LMSs), etc.

CALL provides integrated teaching solutions that will (Warschauer & Healey, 1998):

1. Provide realistic, native-speaker models of the language in a variety of media;
2. Offer a language learning curriculum;
3. Do a needs assessment;
4. Determine the best next step for the learner and provide practice with that skill area;
5. Record what the student has done, along with an evaluation, and;
6. Be available at any hour and require no additional pay or benefits. (p. 59)

CALL status depends on three basic factors including research in applied linguistics; changes and developments that take place in languages and language learning; and sociological changes in schools and education (Warschauer, 2004).

The research scope and priorities of applied linguistics are the main factor to consider for defining the scope of CALL. These priorities are defined and specified by the path of theories and practices of language education and SLA. This, on the other hand, is related to the socioeconomic status of the members of the society, changes in the technology policy of a given society, and the attitudes of people towards technology and its benefits for ordinary life as well as professional career.

Based on *technological determinism,* integration of technology into curriculum in general and language teaching in particular in different countries across the globe is inevitable. Based on this postulation, the introduction of any new technology automatically leads to certain social phenomena and *the ability to use it and adapt it, is the critical factor in generating and accessing wealth, power, and knowledge in our time* (Castells, 1998).

Warschauer (2004) believes that the following ten changes in technology have affected or are still affecting CALL and its integration in language classes:

- Phone-based to wireless communication;
- Dial-up Internet connections to permanent, direct online connections;
- The use of personal computers to the use of portable and online devices;
- Narrowband to broadband internet connections;
- Expensive personal computing systems to widely affordable computers and other hardware;
- Internet as an exclusive form of communication/information- mostly limited to people in developed countries- to becoming a mass form of communication accessible to most of the planet;
- Text-based information/communication to audiovisual forms;
- Use of English as the main online language to multilingual Internet use;
- '*Non-native*' to '*digital-native*' users of information technology, and;
- The movement of CALL from the language laboratory to each ordinary classroom. (pp. 3-5)

The History of CALL

The very first generation of CALL came into picture with the development of the mainframe computers and programs designed for those types of computers. The emergence of CALL in 50s was coincidental with the dominancy of one of the giants of psychology, behaviorism, and for almost two decades the activities for machine-based learning were being designed based on mimicry-memorization and rote learning models. Unfortunately, these types of activities are still most common in many software packages.

The history of CALL can be divided into three main stages (Warschauer, 2000), that is, *Structural/Behaviorist CALL, Communicative CALL,* and *Integrative CALL.* Each stage corresponds to certain levels of technology advancement and pedagogical and psychological approaches.

Structural/Behaviorist CALL

Behaviorist CALL emerged as a result of the application of the principles of behaviorism in mainstream education in 1960s to 1970s (Ahmad, Corbett, Rogers, & Sussex, 1985). Based on this view, language teaching/learning was regarded as a type of conditioning and getting students to produce a series of responses in reaction to particular stimuli (i.e., stimulus/response theory). In order to exploit machines in human learning, certain computer language

programs were developed at Stanford University, Dartmouth College, and the University of Essex (Beatty, 2003). The very first computer programs developed in universities and colleges of the US, because the technological tool available at the time was mainframe terminals (Figure 1) that could only be used in the academic centers and universities.

This mode is known as drill-and-practice CALL because it benefits from the underpinnings of behaviorism. The best-known tutorial system of this era was PLATO (Programmed Logic for Automated Teaching Operations). PLATO (Figure 2) consisted mostly of a central computer and terminals that presented drills, translation tests, and grammatical explanations (Ahmad, Corbett, Rogers, & Sussex, 1985).

The computer thus is a teaching tutor that has the role of presenting instructional materials and providing practice opportunities. This tutoring function of the computer is ideal in the behaviorism as it needs a model (teacher or tape) that never gets bored of providing the models. The mode of learning was *normally self-instruction with one student per computer, sometimes gathered together into a computer laboratory parallel to a language laboratory* (Johnson & Johnson, 1999). The pattern of interaction in a behavioristic CALL is depicted in Figure 3 when each student is just allowed, and controlled, to interact with the computer screen for maximum efficiency of the individualized instruction.

Figure 1. A mainframe computer

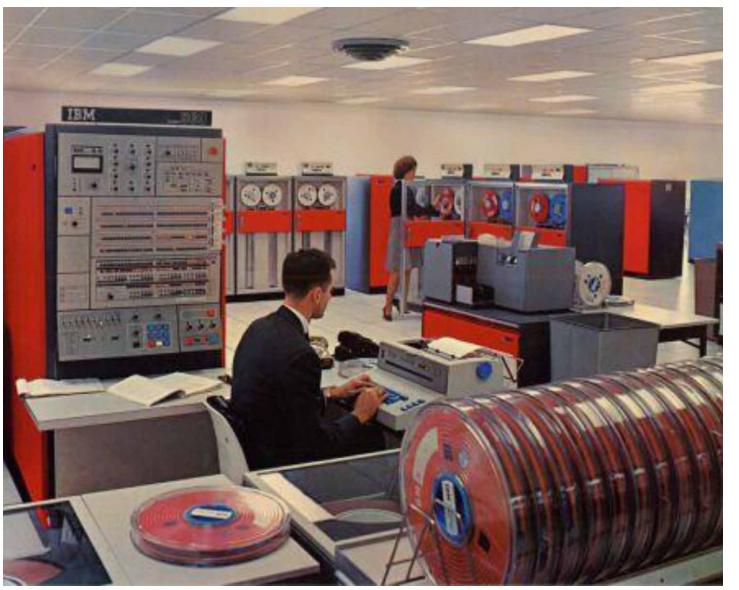


Figure 2. PLATO



Figure 3. Pattern of interaction in Behavioristic CALL



As one of the major premises of behaviorism, students are warranted to go to upper levels of the program, only and if only, they can do the exercises and activities with 10% accuracy. Otherwise, they remain in the same level till the moment they can pass the level without any mistake.

The rationale behind Behaviorist CALL is (Warschauer, 1996):

- Repeated exposure to the same material is beneficial or even essential to learning,
- A computer is ideal for carrying out repeated drills, since the machine does not get bored with presenting the same material and since it can provide immediate non-judgmental feedback, and;
- A computer can present such material on an individualized basis, allowing students to proceed at their own pace and freeing up class time for other activities.

In the late 70s, behaviorist CALL declined as a result of changes in the realm of psychology, linguistics, and technological advancements. In the field of psychology, behaviorism and its theoretical bases were rejected by the emergence of Cognitivism and Constructivism. In linguistics, the Generative Transformational Linguistics put emphasis on inner aspects of language learning and the role of mind and cognition in processing linguistic input. Further, the advent of personal computers (PCs) and their widespread use at home, offices, and educational centers paved the way for the development and use of different software. In this way, the second generation of CALL came into picture.

Communicative CALL

The second generation of CALL, known as Communicative CALL, emerged as a result of the revolution that took place in the realm of language teaching and learning in the 1980s. The application of cognitive and humanistic psychology into ELT led to the proposition of communicative language teaching whose goal was developing language learners' communicative competence. At the same time, personal computers (PCs) came into the market and their use became very popular. The affordances the PCs offered language educationists contributed to the development and fortification of the principles of Communicative CALL and consequently many software packages were designed.

Communicative CALL believes in meaningful use of language for real purposes and:

- Focuses more on using forms rather than on the forms themselves;
- Teaches grammar implicitly rather than explicitly;
- Allows and encourages students to generate original utterances rather than just manipulate prefabricated language;

- Does not judge and evaluate everything the students say nor reward them with congratulatory messages, lights, or bells;
- Avoids telling students they are wrong and is flexible to a variety of student responses;
- Uses the target language exclusively and creates an environment in which using the target language feels natural, both on and off the screen; and
- Will never try to do anything that a book can do just as well (Underwood, 1984).

The underlying psychological framework of Communicative CALL is cognitive psychology and it benefits form the principles of functionalism in language teaching and learning. In this framework, the computer is still the provider of teaching/learning materials and practices and functions as a teaching tutor. Additionally, it helps students to stimulate discussions, writing, and critical thinking activities through computer games (as a stimulator). In this way, the students may spend some time on working with the computer that may inspire them to continue doing language activities in the class without any reference to the computer (Figure 4).

Another function of the computer as a tool is empowering language learners to use or understand language by different types of affordances such as dictionaries or concordancers (Warschauer, 1996).

Figure 4. Pattern of interaction in Communicative CALL



Integrative CALL

The third generation of CALL or Integrative CALL emerged by the advent of two revolutionary technological advancements, that is the multimedia and the Internet in the 90s.

Integrative CALL integrates language skills (listening, speaking, reading, and writing) at the level of the 5th skill by incorporating appropriate technologies into the language learning process. This new approach utilizes the principles of constructivism and sociocultural theory (Stepp-Greany, 2002). Based on these approaches, the central focus of attention of language teaching and learning activities should shift from the teacher to the students while students become more active participants (Newton & Rogers, 2001).

One technological development that had a great role in the conception of this framework of CALL is multimedia. Multimedia technology allows a variety of media (text, graphics, sound, animation, and video) to be accessed on a single machine. It can entail *hypermedia* or the multimedia resources linked together that can be navigated by learners' clicking.

The advantages of using hypermedia in language learning are (Warschauer, 1996):

- The skills can be integrated, so the media makes it natural to combine all four skills in one.
- Providing a more authentic learning environment by combining listening with seeing.
- Students can control their learning by going at their own pace and even on their own individual path.
- It facilitates the progress of focusing on the content with a secondary focus on language forms or learning strategies.

The underlying theory of using multimedia in language instruction is cognitive theory of multimedia learning (Mayer, 2003; 2014). Based on this model, multimedia learning is basically learning from words and pictures. There are three main assumptions about how mind works during multimedia learning (Mayer, 2014):

- **Dual Channel:** Humans possess separate information processing channels for verbal and visual material
- **Limited Capacity:** There is only a limited amount of processing capacity available in the verbal and visual channels.

- **Active Processing:** Learning requires substantial cognitive processing in the verbal and visual channels. (p. 62)

The cognitive theory of multimedia learning is depicted in Figure 5.

The second technological advancement that had a great role in the development of Integrative CALL is World Wide Web (the Web, or simply the Internet) defined as *an international online database that allows the sharing of linked multimedia documents* (Warschauer, 2001). This phase of CALL has developed coincidental with three generations of Web: Web 1.0, Web 2.0, and Web 3.0.

Web 1.0 includes the first generation of websites that lets the users just view the content. The users do not have any role in producing or managing the content of the website. Web 1.0 websites are called *dot com websites*, as they basically are designed for commercial purposes.

The term Web 2.0 was proposed by Tim O'Reilly (2005) for the first time and refers to websites whose contents can be produced by users collaboratively. Web 2.0 affordances are social media (Facebook, Twitter), wikis, podcasts, and blogs. Web 2.0 technologies are called *social software* because they are perceived as being especially connected, allow users to develop web content collaboratively and are open to the public (Alexander, 2006).

Web 3.0, or smart Web, focuses on the way machines can interact with human being. This generation of Web is being developed with advancements in the fields of Artificial Intelligence (AI) and Computer-Human Interface (CHI) (Tasner, 2010). Smart web is the foundation of creating intelligent tutors that can present teaching materials based on individual differences. *Intelligent tutors contain rich, dynamic models of student knowledge that depict the key ideas learners should understand as well as common learner conceptions and misconceptions* (Woolf, 2008).

Three generations of web are shown in Figure 6.

Figure 5. Cognitive Theory of Multimedia Learning (Mayer, 2014)

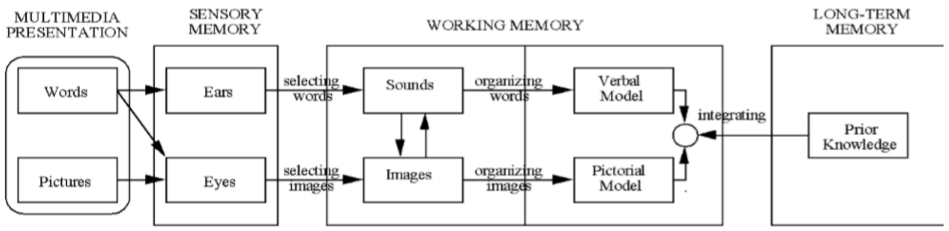
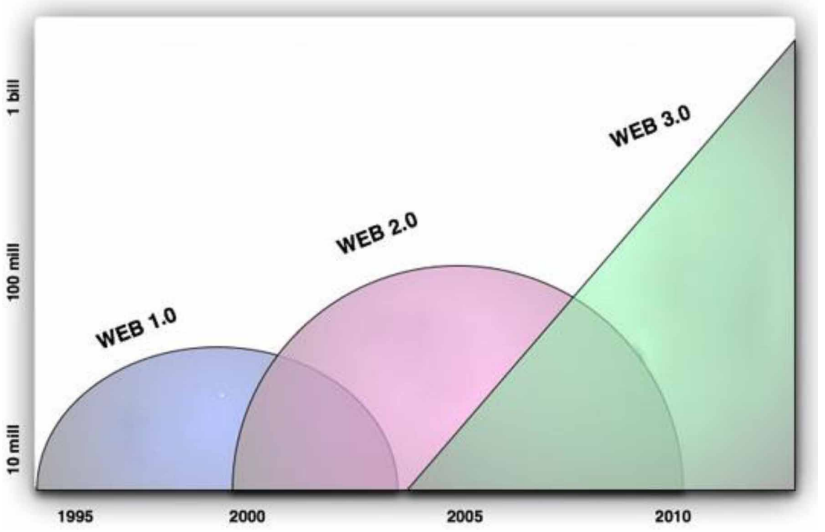


Figure 6. The Changing Intraweb-from 1.0 to 3.0 (Hayes, 2006)



As a result of the fast development of Web-based applications and affordances, CMC tools have become very widespread. Language learners can communicate directly and comfortably with each other whenever and wherever they use these tools. Pattern of interaction in integrative CALL is depicted in Figure 7.

CMC can be *asynchronous* (not simultaneous) through tools such as electronic mail (email),

Or *synchronous* (simultaneous) via Skype or similar applications (Warschauer, 1996). The development of mobile technologies and availability of the web on-the-go have opened up further opportunities for mobile learning and CMC. Mobile learning is the use of any portable learning materials (books, audio/cassettes, audio CDs, portable radio) or portable devices for learning. Three phases of CALL are summarized in Table 2.

CALL Approaches

Bax (2003) has reviewed the history of CALL from another perspective. Based on Bax, Warschaure's three phases of CALL need clarification in a number of areas:

- It is not clear whether the phases show defined historical periods.

Figure 7. Pattern of interaction in Integrative CALL



Table 2. Three phases of CALL (Warschauer, 2000)

Phase	1970s- 1980s: Structural CALL	1980s-1990s: Communicative CALL	21st century: Integrative CALL
Technology	Mainframe	PCs	Multimedia and Interne
English teaching Paradigm	Grammar Translation/ Audio-Lingual	Communicative Language Teaching	Content-based, ESP/EAP
View of Language	Structural (a formal structural system)	Cognitive (a mentally constructed system)	Socio-cognitive (developed in social interaction)
Principal use of Computers	Drill and practice	Communicative exercises	Authentic discourse
Principal objective	Accuracy	Accuracy and fluency	Accuracy, fluency and agency

- The validity of the characterization of the 1980s as part of 'Communicative CALL' needs more support and reference to mainstream communicative language teaching methodology if the term is to be acceptable.
- The underlying principle for identifying a third phase, and then calling it 'integrative', calls for more support- in terms of attitude to language and language teaching (p. 20).

In Bax's classification, there are three approaches of CALL, namely, *Restricted*, *Open*, and *Integrated*. Each approach is analyzed considering certain key dimensions including: type of task, type of student activity, type of feedback, teacher role, teacher attitudes, position in curriculum, position in lesson, and physical position of computer (Table 3).

- **Restricted CALL:** This approach was dominant from 1960s until about 1980s and differs from Warschaure's *Behaviorist CALL* in terms of its historical period and features. This term is more inclusive and flexible and describes the use of CALL in the classroom to be very limited if the above-mentioned dimensions are taken into account.
- **Open CALL:** It has lasted from the late 1980s until today, while some restricted CALL manifestations are still observable and valuable in schools and universities of many countries across the globe. The use of CALL is relatively open in all dimensions including the feedback given to students, to the software types, and to the teacher's role.
- **Integrated CALL (Not Integrative, as in Warschaure's Formulation):** It portrays a situation where idealized and true integration of CALL is taking place in education. This is called the 'normalization' of CALL, when, for instance students can use computers as normally as using a pen in classroom or out of it.

This classification has several advantages over Warschaure's three phases of CALL, including but not limited to:

- This classification thwarts conceptual confusion with behaviorist or communicative approaches to learning or teaching.
- The classification is more precise as a description of what happened in the past and is happening now.
- The framework permits us to define our practice in some detail (Bax, 2003).

CALL and Language Skills

Research shows that educational technology can help language learners develop their language skills (listening, speaking, reading, and writing) (Stinson & Claus, 2000) and can augment communication skills through computer support group interactions (Bourdon, 1999).

Table 3. Restricted, Open and Integrated CALL (Bax, 2003)

	Restricted CALL	Open CALL	Integrated CALL
Type of task	Closed drills Quizzes	Simulations Games CMC	CMC WP e-mail
Type of student activity	Text reconstruction Answering closed questions Minimal interaction with other student	Interacting with the computer Occasional interaction with other student	Frequent interaction with other students Some interaction with computer through the lesson
Type of feedback	Correct/incorrect	Focus of linguistic skills development Open, flexible	Interpreting, evaluating, commenting, stimulating thought
Teacher role	Monitor	Monitor/ facilitator	Facilitator Manager
Teacher attitudes	Exaggerated fear and/or awe	Exaggerated fear and/ or awe	Normal part of Teaching-normalized
Position in curriculum	Not integrated into syllabus-optional extra	Toy Not integrated into syllabus-optional extra Technology precedes syllabus and learner needs	Tool for learning Normalized, integrated into syllabus, adapted to learners' needs Analysis of needs and context precedes decisions about technology
Position in lesson	Whole CALL lesson	Whole CALL lesson	Smaller part of every lesson
Physical position of computer	Separate computer lab	Separate lab-perhaps devoted to languages	In every classroom, on every desk, in every bag

- **Application of CALL in Teaching Reading:** Language skills are often integrated into technology-based learning environments. Reading activities have been designed for computer-based environments since the early days of the development of the field. It is evident that computer programs can help reading development in three ways (Hubbard, 2009):
  - By controlling what the readers see and how long they see it in order to promote reading strategies and automaticity;
  - By providing comprehension and other exercises, and;
  - By presenting glosses and other comprehension aids.

The effects of CALL on the development of reading comprehension have been investigated by many researchers. It is now evident that the use of hypermedia in reading classes can improve students' comprehension and results in higher intrinsic motivation (Becker & Dwyer, 1994). Using audio books can facilitate automatic word recognition, and vocabulary acquisition; and motivate students toward reading (Kim, 2002).

- **Application of CALL in Teaching Writing:** Numerous studies have focused on the effectiveness of CALL on writing ability. Research on writing in CALL has focused on two basic areas of: (a) developing learners' word processing skills and; (b) the use of text-based and graphic organizers to support the writing process.

Word processing was the first application of educational technology used in writing instruction although it required the mastery of basic keyboard skills (Lehrer, 1995). Teachers' successful experience in assigning students to use Microsoft PowerPoint for oral presentations and guided writing has also been reported (Schcolnik & Kol, 1999).

In the 21st century, the trend of research on the effectiveness of CALL in writing instruction has shifted from individualized writing to collaborative writing. Web 2.0 applications such as blogs and wikis have been the subject of numerous studies on writing.

Blogs by their nature and page structure encourage feedback and represent both a reading and a writing activity. In the best of cases, this kind of online writing stimulates debate, furthers critical analysis, and encourages articulation of ideas and opinions. (Godwin-Jones, 2006, pp. 10-11)

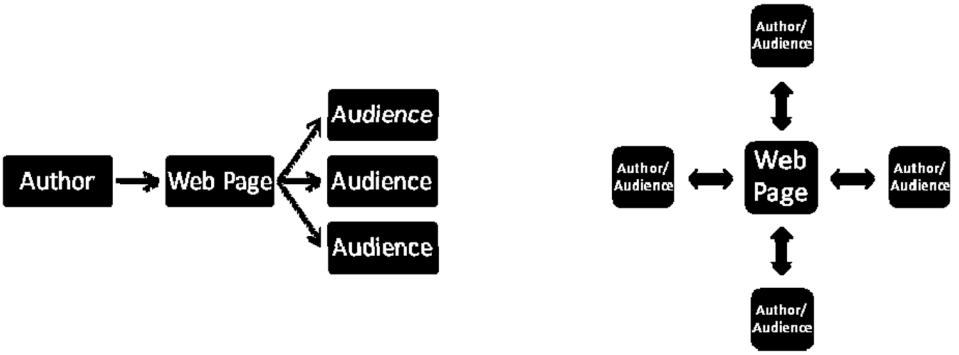
Wikis also have been found to enable students to share their writing with others and let them make changes to the content (Mazlum & Talebzadeh, 2010). The difference between a wiki and a traditional website is shown in Figure 8.

Scholars have specified the advantages of wikis as:

1. A wiki task allows English learners practice writing as a process rather than a product,
2. A wiki-related task leads to creative composition,
3. A wiki is an effective way for interaction and cooperation with a low price,
4. A wiki encourages reading and editing, and;
5. A wiki allows students to participate and learn from public composition processes and products on the internet (Lamb, 2004).

- **Application of CALL in Teaching Speaking:** Literature review shows that traditional approaches of speaking have some weaknesses. First, there is not enough opportunity for students to practice speaking

Figure 8. The difference between a traditional website and a wiki
(Taken from Plourde, 2008)



in formal classes. Second, students are anxious about their mistakes when they talk. Third, there is a lack of technological tools at schools. This forces students to be totally dependent on their books (Liu & Chu, 2010) rather than their communication skill and negotiation of meaning.

Recent studies have revealed that technologies such as video conferencing, online conversation, PowerPoint presentation, electronic dictionaries, and podcasting provide real time communication and appropriate interaction (Meskill & Anthony, 2007; Yamada & Akahori, 2007) and thus can promote genuine communication and oral proficiency. Generally two types of speaking practices exist in a CALL setting:

- Pairs or groups of students speak to each other as they sit in front of a computer and are engaged in a task.
- Individual students use the computer to record their voices, often in the context of pre-determined dialogues.

Two aspects of spoken language competence should be considered when teaching speaking with CALL: (a) the *mechanical aspect* in which students learn to discriminate and produce sounds of a language to have fluent string of sounds (pronunciation) during speaking, and; (b) the *meaningful aspect* which refers to learning to code coherent and grammatical utterances; and link them to fulfill communicative functions (Pennington, 1995).

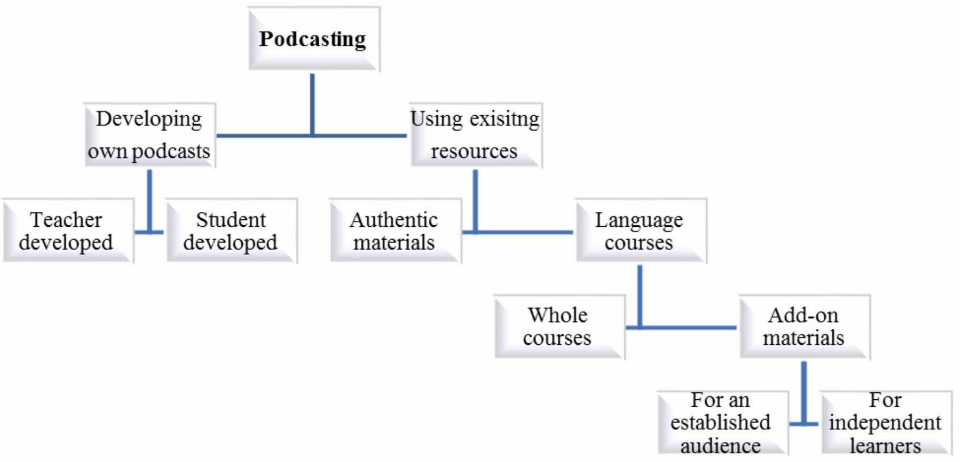
- **Applications of CALL in Teaching Listening:** Many technological affordances such as multimedia, digital storytelling, video conferencing and chatting can provide students with authentic aural input. One of the advantages of using CALL in teaching listening is providing students with comprehensible input and extensive listening for out of classroom times.

One specific technology that can improve listening comprehension and understanding of academic language is podcasting as it provides students with opportunities for mobile learning (m-learning) (Nunan, 1995). Different types of podcasts can be used in language classes (Figure 9).

Some uses of podcasting in education include (Sloan, 2005, slide 12).

- For distance learning;
- To facilitate self-paced learning;
- For remediation of slower learners;
- To allow faculty to offer advanced and/or highly motivated learners extra content;
- For helping students with reading and/or other learning disabilities;
- For multi-lingual education;
- To provide the ability for educators to feature guest speakers from remote locations;

Figure 9. Taxonomy of uses of podcasting for language learning
(Taken from Rosell-Aguilar, 2007)



- To allow guest speakers the ability to present once to many sections and classes;
- To allow educators to escape the tedium of lecturing;
- To offer a richer learning environment;

Many technological tools (such as mobile phones and MP3 players) can be used in the classroom for teaching and practicing listening comprehension and improving students' listening skill using podcasts (Valk, Rashid, & Elder, 2010).

CALL Research Scope

Early CALL research concentrated on the language performance of students who had used CALL programs. A variety of teacher-made programs were tested to assess students' achievement in computer-based environment in comparison to traditional learning context. The result of most of these studies supported the effectiveness of CALL in improving students' language proficiency and achievement in learning English as a first, second, or foreign language.

Later the cognitive paradigm looked at the development of individual processes, strategies, and competencies when students were experiencing CALL software and applications. Different types of measures such as motivational surveys, observations, recordings of keystrokes, and think-aloud protocols were used to collect data. The results of these studies mainly revealed that CALL guarantees more learning motivation and rises language learners' interest while reducing their anxiety and fear of language classes.

The socio-cognitive paradigm emphasized learning through computer networks and focused on the way discourse and discourse communities develop when computer networks were used (Kern & Warschauer, 2000).

While studies on these topics are still in progress, the findings of many of them are in favor of distance and e-learning as well as mobile learning through which language learners use the internet to attend electronic courses or communicate with interlocutors in cyberspace. Table 8 summarizes the implications for research methods of various CALL approaches.

The Future of CALL

In the modern era, the advancement of ICT tools and the development of 3D graphics and educational computer games have modified language teaching

Table 4. Research implications for CALL approaches (Kern & Warschauer, 2000)

	Structural	Cognitive	Socio-Cognitive
Orientation	performances	cognitive processes	social and cognitive processes
Methodology	quantitative: experimental-control comparisons	both quantitative and qualitative	principally qualitative: discourse analysis, analysis of sociocultural context
Principal Kinds of Data	quantities/frequencies of words, errors, structures	think-aloud protocols, questionnaires, computer-recorded data (e.g., keystrokes)	transcriptions of social interactions, ethnographic observations and interviews

methodologies and learning styles (Stefan, 2012). Milgram and Kishno (1994) have defined the concept of Virtuality-Reality continuum in the context of immersive collaborative environments. According to this view Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) emphasize and explore the role of different learning and pedagogical styles in user immersion and interactivity. From an educational point of view, these concepts are in line with collaborative learning (based on Constructivism theory) and in contrast with individualized learning that allows learners to share their experiences and resources with each other (Stefan, 2012). According to Jonassen (1999) *virtual reality may become the default method for representing problems* (p.221). The 3D Virtual Learning Environments (3D VLEs) utilize *simulations to create environments for a learner to participate in simulations where they can explore the observable world and abstract concepts* (Darvasi, 2008, wiki site dedicated to VLEs). Darvasi (2008) further elaborated that:

the freedom and decision-making potential afforded by 3D VLEs encourages learners to take responsibility for their own learning, as they can actively choose paths, objects and define their own learning outcomes.

In agreement with this, Kalay (2004) suggested that:

virtual places afford group learning, of the kind enjoyed by students gathered in a (physical) classroom, lab, or library, where they 'know' they are in a communal space, are aware of the social process of learning, and are affected by the presence and behavior of their fellow students. (p. 196)

3D VLEs are immersive, meaning that they provide a sense of physical manifestation in a 3D learning platform (Dickey, 2003).

VR based learning environments provide an opportunity for learners to be immersed in a simulated, constructed world which may or may not mirror the real-world learning environment. A VR environment might be a totally unique experience *by creating a world in which the physical laws governing gravity, time and material properties no longer hold* (Milgram & Kishino, 1994). VR is defined as *3D computer graphics, real time simulation techniques, and a wide array of input and output devices to create illusions of being in a virtual environment* (Biocca & Delaney, 1995). Figure 10 displays a VR based environment.

Online virtual worlds which date back to the 1970s' computer games are currently playing a fundamental role in education. Based on a study done by Sykes, Oskoz, and Throne (2008) 3D VR environments are classified into three categories: Open Social Virtualities (e.g. Second Life, There, Quest Atlantis, Active Worlds, Teen Second Life); Massively Multiplayer Online Games (MMOGs) (e.g. World of Warcraft, Everquest, Eve Online); and Synthetic Immersive Environments (SIEs) i.e. *visually rendered spaces which combine aspects of open social virtualities with goal-directed gaming models to address specific learning objectives*. Among these three, synthetic immersive environments (SIEs) are suitable for educational purposes in a sense that *learners themselves are at the center of their own learning* (Sykes,

Figure 10. A VR based space



Oskoz, 2008). Second Life is an example of immersive educational environment (Canfield, 2008), that is also collaborative or game-like (Chan, 2008). On the other hand, Edusim is a *3D virtual world like Second Life for the classroom interactive whiteboard or interactive surface* (Edusim home page).

In contrast to VR that disconnects the learner from the real world completely and immerses him/her into an artificial environment, Augmented Reality (AR) is the mixture of real-world and computer-generated objects. It provides learners with an opportunity to experience real-world activities reinforced by virtual objects (Stefan, 2012). AR is integrated in education by utilizing:

virtual objects on the surfaces, using either overhead or back projection. The user can then interact with virtual objects by using traditional tools, such as a pen, which are tracked on the augmented surface using a variety of sensing techniques (Poupyrev, 2001, p. 16).

Today's smart phones offer accessible AR platforms (MAR) such as information browsers that utilize computer-vision techniques and fiducial markers to "augment" real objects. MAR also supports experiential learning paradigms such as content annotation and sharing (e.g. tweets or micro blogging) (Stefan, 2012). Figure 11 displays a collaborative design in an AR environment.

CONCLUSION

This chapter discussed a brief history of Computer Assisted Language Learning (CALL). Starting with the definition of CALL and its key concepts, a comprehensive but brief history of CALL from the 1950s till the present was presented. The characteristics of each phase of CALL, the corresponding frameworks, technologies, activities and merits/demerits were elaborated. Moreover, a quick and brief guideline was provided on how to use CALL in teaching macro and micro language skills. CALL research scope and its future perspective were portrayed and possible fields of research were introduced. In the end, a modern perspective for AR, VR, and MR in educational environments was presented.

The wide use of computer technologies for language learning is an open secret. However, such acceptance does not necessarily lead to a successful story. There are many limitations that can hinder the natural flow of CALL normalization into institutions (Mahdi, 2013). According to research, when a

Figure 11. Collaborative design in AR environment



technology is considered normal, it is no longer considered as an innovation; it becomes invisible, easy to apply, and taken for granted in peoples' everyday lives (Bax, 2003). He goes on to summarize the process of normalization as follows:

CALL will reach this state when computers ... are used every day by language students and teachers as an integral part of every lesson, like a pen or a book. Teachers and students will use them without fear or inhibition, and equally without an exaggerated respect for what they can do. They will not be the center of any lesson, but they will play a part in almost all. They will be completely integrated into all other aspects of classroom life, alongside course books, teachers and notepads. They will go almost unnoticed. (p.23)

Literature in this area has suggested various barriers blocking the path of CALL normalization. Chambers and Bax (2006) were the first to introduce eleven issues in this regard. However, there are other summarized inclusive analyses regarding these issues. A study by Mahdi (2013) has categorized these obstacles into five major branches: (i.e., personal, pedagogical, technical,

institutional, and socio-cultural). As logical as it sounds, technology without human beings is nothing more than a useless tool. It only makes sense to claim that the success or failure of CALL integration relies heavily on the issues related to teachers, learners, administrators, and educational policy makers. With teachers acting as the fundamental basis of educational system, many studies have explored the effects of personal issues related to teachers and students on CALL integration (e.g., Chen, 2008; Egbert, Paulus & Nakamichi, 2002; McCarthy, 1999; Mumtaz, 2000). That being mentioned, investigating the teacher roles in traditional and CALL teaching environments is of supreme necessity since it can provide a lens for language teachers and researchers to analyze the complex ICT enhanced teaching environment.

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Chapter 2
The Role of Teachers in CALL

ABSTRACT

The main aim of this chapter is introducing and discussing the role of teachers in CALL. First the role of teachers in EFL classes along with the timeline of language teaching methodology (from grammar translation method to CLT approach) as well as post-method era are discussed. Then the benefits of using CALL for language teachers is addressed, and the concept of teacher role in CALL is defined and specified. The importance of EFL teachers' cognition in successful ICT integration is discussed in the closing section of the chapter. This is specifically related to discussions about theory of diffusion of innovation and how it can be related to CALL history and integration in language classes.

BACKGROUND

The impact of information technology in today's society has had several important outcomes, the most evident of which is CALL becoming the trend in foreign language teaching all over the world. As a consequence, the tasteless, teacher-centered environment of language classrooms surrounded by a group of passive students has been replaced with modern teaching approaches.

Considering the technological dominancy of the 21st century, CALL is believed to be an inseparable part of the modern language teaching era. What makes CALL a powerful tool to enrich language teaching and learning is its capability to breathe life in language classes, making students motivated and increasing their level of engagement and participation. Several components

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lead to this enjoyable learning process; from convenient use of multimedia to authentic use of language which does not deviate from students' real life.

CALL can combine language classroom environment with the real life outside the class, make foreign language learning much more effective, and provide a rich language input that can enhance students' individual learning. Although the benefits of technology-mediated instruction for all different subject matters are an open secret, exploring the merits of integrating technology into foreign language learning is worth considering.

Multimedia rich environments are superior to traditional ones in the case that they can:

1. Enhance learning in different locations and institutions of diverse quality;
2. Present opportunities to students working at different rates and levels;
3. Provide (tirelessly, without holding up other students) repetition when repetition is warranted to reinforce skills and learning, and;
4. Compensate, in the short term, for high student populations and limited numbers of trained and experienced teachers – in combination with robust teacher development initiatives and improvements in teachers' working conditions (Fitzpatrik, 2004).

Serostanova (2014) elaborated more on this issue mentioning the following merits for using ICT in foreign language instruction:

- **Authentic Context:** That reflects the way the language will be used in real life, thus providing the purpose and motivation for learning;
- **Cultural Understanding:** The possibility to get acquainted with the way of life of the target language community, to visit distant places without leaving home, which makes learning the language part of a cultural experience;
- **Great Amount of Tools:** For teachers and learners (audio and video devices, television and radio broadcasts, synchronous (video and audio conferences, chatting) and asynchronous (e-mail, forum, web logs, message boards), Internet-based communication, which facilitates improving reading, listening, speaking skills and grammar knowledge;
- **Involvement in Collaboration and Cooperation:** Participating in Web-projects and working in a physically-separated team promotes learners' creatively thinking, encourages to solve problems and to make decisions as a team;

- **Removing the Time and Space Limitations:** Which allows students to learn more autonomously at different rates and levels, without interruptions, time pressure and social anxiety, and thereby raises self-esteem and confidence;
- **Immediate Feedback and Error Analysis:** Which can be provided by the computer and teachers as well, and help the learners ward off their misconception at the very first stage. (p.196)

Traditional language learning and CALL differ in several aspects including teaching methods, learning environment, and teacher/student roles in the classroom. Considering the purpose of CALL, it is clear that the effective integration of computers requires a great deal of expertise from teachers and students' part. Hence, teachers who utilize CALL need to master a deeper and more relevant knowledge and experience through CALL education programs. As a matter of fact, scholars suggest that technology education is one of the important aspects of language teacher education programs which can provide teachers with the necessary computer skills and strategies required to help learners learn a foreign language better and easier (Bordbar, 2010). Keeping in mind that CALL possesses completely different efficiency and quality in comparison to traditional language teaching methods; it is obvious that the teacher role is considerably different in using technology to teach and manage instructional activities.

The first important point to consider regarding CALL is that, the language learning environment is so different from the traditional environment, which in parts causes the teacher role to alter dramatically. Regarding this issue, it is claimed that the role of the teacher is of paramount significance in any teaching-learning situation, since the learner roles and the learning environment are greatly influenced by the role teachers adapt in language classrooms. Therefore, teachers must obtain a clear understanding about their role during instruction which can lead to a more effective teaching/learning process. With that being said, it should be mentioned that gaining a comprehensive perspective of teacher's role in language classrooms would not be possible without being familiar with the notion of 'role' to begin with.

The Concept of 'Teacher Role' in Language Classrooms

Teaching is believed to be a highly complex profession due to the multiple challenges rising from the complicated interaction between teacher, students, school, culture, and community (Oktay & Osam, 2013). This complex nature

has been the subject of study for many years. Research in this area has focused not only on the profession's nature, but also on the crucial characteristics of a good teacher (Borg, 2006; Reichel & Arnon, 2009; Timmering, 2009).

Despite the fact that the main characteristics of teachers are quite similar, teachers of different subject matters are claimed to possess distinguishing qualities. For instance, a physics teacher supposedly requires different attributes in comparison to a foreign language teacher (Oktay & Osam, 2013). Research in this regard suggests that this difference is partly due the subject matter's nature; i.e. teaching a foreign language is far more interactive in nature comparing other subjects.

In line with what was motioned, Borg (2006) reports that the difference between teaching a foreign language and other subjects results from the:

dynamic nature of language, the scope and complexity of the content of language teaching, the range of materials, methods and activities available to language teachers, the especially close relationships between language teachers and learners, and issues relating to the status of native and non-native language teachers. (p. 29)

In an earlier study, Hammadou and Bernhardt (1987) have mentioned some distinguishing characteristics of teaching a foreign language:

1. **The Nature of the Subject Matter Itself:** FL teaching is the only subject where effective instruction requires the teacher to use a medium the students do not yet understand;
2. **The Interaction Patterns Necessary to Provide Instruction:** Effective FL instruction requires interaction patterns such as group work which are desirable, but not necessary for effective instruction in other subjects;
3. **The Challenge for Teachers of Increasing Their Knowledge of the Subject:** Language teachers, teach communication, not facts. In other subjects, teachers can increase their subject matter knowledge through books, but it is harder for FL teachers to maintain and increase their knowledge of the FL because doing so requires regular opportunities for them to engage in FL communication;
4. **Isolation:** FL teachers experience more than teachers of other subjects feelings of isolation resulting from the absence of colleagues teaching the same subject;

5. **The Need for Outside Support for Learning the Subject:** For effective instruction, FL teachers must seek ways of providing extracurricular activities through which naturalistic learning environments can be created. Such activities are less of a necessity in other subjects (p.302).

According to what was mentioned, it can be claimed that teaching a foreign language is a *complex process* since it is not as simple as presenting grammatical rules, vocabulary items and practicing the four basic linguistic skills. On the other hand, the biggest challenge for foreign language teachers is creating and maintaining a certain level of motivation for students so that they are able to successfully master the new language. Consequently, the unique quality of foreign language instruction will create a major distinction in roles played by EFL teachers in classroom (Oktay & Osam, 2013).

According to Dörneyi and Murphey (2003), 'role' is a technical term originated from sociology referring to *the shared expectation of how an individual should behave. In other words, roles describe what people are supposed to do* (p.109). Reviewing the literature in the field of ELT suggests that there are several potential roles for a language teacher (e.g., Littlewood, 1981; Richards & Rodgers, 1986; Tudor, 1993; Harmer, 2001). Considering different components of a language teaching methodology, teacher role has been suggested to be an aspect of 'design' component (Richards & Rodgers, 2014). According to Richards and Rodgers (2014), the teacher roles include:

1. The types of function teachers are expected to fulfill,
2. The degree of control the teacher has over how learning takes place,
3. The degree to which is the teacher is responsible for determining the content of what is taught, and
4. The interactional patterns that develop between teachers and learners (p. 24).

Teacher roles in language classes have been evolved significantly alongside the shift in language teaching methodologies. The emergence of technology in the 21st century has certainly influenced the language teaching process and EFL teachers' roles consequently. But before investigating the new teacher roles in the modern world of language teaching, it is crucial to take a brief look at the causes and reasons behind the change without which gaining a comprehensive insight on the subject would be impossible.

Roll the Role: Why?

Despite the abundance of opportunities and chances that come alongside technology-mediated instruction, computers will never make teachers redundant or suppress the need for their instruction. Instead, technological trends in education redefine teachers' roles. As a matter of fact, minimizing educator's role in ICT-integrated classroom is considered to be quite inappropriate by scholars (Ranganath, Rayappa, & Priscilla, 2017). It is of utmost significance to remember that without the appropriate association from educators, technology will control the classroom instead of aiding it and it would be a failure by default.

As Brandl (2002) declared, ICT integration will be efficient only in the presence of educators as 'facilitators' who design, aid, and guide the lesson. With that being said, it makes sense to claim that in order to utilize modern technologies successfully, the ELT educator should embrace new roles and responsibilities (McLaren, Madrid, & Bueno, 2005). As Canado (2010) stated, a foreign language instructor should acquire roles of tutor, counselor, observer, motivator, and facilitator.

Several studies have attempted to investigate causes and necessities related to language educators' role shift alongside the expansion of ICT (Ranganath, Rayappa, & Priscilla, 2017). Firstly, with the proliferation of ICT, it is almost inevitable that certain existing resources such as overhead projectors and chalkboards become obsolete. They are no longer essential in the case that the teacher is presenting information utilizing the same networked resource which is available for all learners; especially if they are not in the same physical location. Secondly, with the help of innovative software, traditional assessment methods will be outdated. For instance, factual information has traditionally been assessed through multiple-choice tests. These tests gave the teachers a skin-deep level of knowledge about students' real achievement upon which they should have based their judgments. However, online tests can easily be utilized in ICT environments in which the teacher can instantly access a wide range of information associated with the learner's score. Thirdly, it is essential for educators to change roles since transferring content knowledge would not suffice the requirements of the 21st century's educational system. Preparing students for meeting the needs of the modern society takes much more than mere content knowledge. Foreign language teachers must equip learners with critical thinking skills, collaborative working practices, and information literacy. The Internet is a convenient resource for both teachers

and learners to access a vast body of information easily, cooperate with one another flexibly, and learn to actually communicate and use their knowledge efficiently (Ranganath, Rayappa, & Priscilla, 2017).

However, there is another side to the coin of this great resource, that is the Internet. The wealth of information available on the Internet is so expanded that it is almost impossible to track inaccuracies and misinformation accessed by learners. This adds another critical new role for language teachers which include identification, qualification, and classification of electronic information resources that are available for language learners (Wheeler, 2000).

Having proposed the significance of developing teacher roles alongside ICT progression, it would be of major value to briefly review EFL teacher's roles in different language teaching methodologies, and how they have changed over time to attain a brighter insight about the causes of this evolution.

EFL Teacher's Roles in Time: From Traditional to Modern Era

Traditional teaching methods have been known to be largely teacher-centered, a situation in which students were used to being spoon-fed discrete vocabulary items and grammatical rules by the ultimate knowledge providers; teachers. This could be the reason that Wilkins (1976) had chosen the term 'synthetic' approach referring to a language teaching method in which: *different parts of the language are taught separately and step by step so that acquisition is a process of gradual accumulation of parts until the whole structure of language has been built up* (p. 2). Nunan (1996) has explained this 'linear' approach by equating it to a 'wall construction' in this way:

The language wall is erected one linguistic "brick" at a time. The easy grammatical bricks are laid at the bottom of the wall, and they provide a foundation for the more difficult ones. The task for the learner is to get the linguistic bricks in the right order: first the word bricks, and then the sentence bricks. If the bricks are not in the correct order, the wall will collapse under its own ungrammaticality. (p. 65)

In this method, the teacher builds up the 'language wall', and also having several important responsibilities in classroom; including providing knowledge, controlling the classroom and students' activities, and evaluating students' learning. The dominance of language teacher as the source of

knowledge, leads to creating receptive and passive learners. Consequently, students lose their motivation and self- confidence to reach their goals if the teachers' assistance is not available.

However, it is only simplistic to believe that learning is only the result of articulate or 'eloquent' teaching. This point is implied by Kumaravadivelu (2006) as he suggests that *teaching, however purposeful, cannot automatically lead to learning for the simple reason that learning is primarily a personal construct controlled by the individual learner* (p. 44). It can be concluded that the collaborative nature of language learning and teaching consists of learning opportunities and the job of a language teacher is creating and maximizing those learning opportunities by involving the learners in the learning process. Hence, teaching is no longer considered to be a process of direct knowledge transmission, but it would be more effective if it is carried out in a cooperative environment.

Considering the amount of time teachers spend with their students and the extent to which they influence students' language learning, it is only worthwhile to briefly review the role of teachers in different language teaching methodologies (the major ones), and how it has evolved through time:

- **Grammar Translation Method:** Based on Allen (1983) and Chastain (1976), the role of the teacher was indicated to be truly traditional. Teacher was the authority, source of knowledge, and in complete control of the classroom. Students would learn what the teacher asked them to.
- **Direct Method:** According to the literature, despite the fact that the teacher is still in charge of directing all the activities in the classroom, the role of students is not as passive as the Grammar Translation Method. The teacher assists students in the process of language learning; more like a partner (Diller, 1978; Paulston, 1971).
- **Situational Language Teaching:** As the name suggest, the teacher's role is creating authentic, real life situations in which students can practice using the target language in a way that it matches their needs outside the classroom. The students will get to know functions of the target language in real life situations. The role of the teacher is deciding about the functions that are appropriate for the students' level and guiding the students on how they should perform these functions accurately and fluently in each situation (Harmer, 1991).

- **Audio-Lingual Method:** The teacher is the director and controller of students' behavior. He/she is like an orchestra leader and his/her role is providing students with an acceptable role model (either him/herself or a tape) to imitate language forms (Paulston, 1971; Finocchiaro, 1974; Brooks, 1960).
- **Silent Way:** Having the role of a technician or an engineer, teachers offer help when necessary. They try to focus on students' perceptions and provide exercises to facilitate language use (Gattegno, 1972; Madesen, 1979). However, the main role of the teacher is summarized into: teach, test, and get out of the way (Richards, & Rodgers, 2014).
- **Suggestopedia:** Supposedly, there is a throwback to the Grammar Translation Method, as the teacher becomes the classroom's authority once again. Suggestopedia scholars suggest that students will learn the target language more effectively when they get the knowledge from someone they can trust fully (Lazanov, 1982; O'Connell, 1982; Racle, 1979).
- **Community Language Learning:** Understanding the threatening nature of learning a foreign language for some students, teachers have the role of counselors helping language learners cope with dilemmas and handle their challenges when it comes to learning the target language (Blair 1982; Curran, 1976).
- **Total Physical Response:** Initiating as a role model who produces nonverbal actions, the responsibility of the teacher in this method is directing students' behavior. In the following stages of the class, when the students are finally ready to speak the target language, there is a role reversal as students in turn will act as a role model and direct their peers' behavior (Asher, 1982).
- **Communicative Language Teaching (CLT):** The teacher has so many new roles to fulfill, the most important of which is creating situations where students are most likely to produce the target language. The teacher is also in charge of managing classroom activities, advising students by answering their questions, facilitating students' learning and also acting as a communicator. The students are no longer passive; they try to make themselves understood, negotiate actively and manage their own learning (Celce-Murcia, 1983; Madsen, 1983; Littlewood, 1981; Brumfit, 1979).

The paradigm shift in the language teaching methodologies majorly relies on Vygotsky's (1978) socio-cultural theory (SCT), emphasizing meaning as the main concern in any teaching environment (Fahim & Haghani, 2012). According to this theory, language learning is a holistic process in which skills and knowledge must be presented in all their complex forms, rather than discrete and isolated concepts (Turuk, 2008). Such integrated learning stems in the dynamic flow of interconnections among learners and teachers in a classroom (Fahim & Haghani, 2012). Several researchers attempted to investigate the implications of SCT for second/foreign language acquisition (e.g. Parks, 2000). Among the different components of SCT and the theories related to it, Activity theory (AT) by Leontiev (1978) has gained a significant popularity in the field of education, especially regarding human-computer interaction (Verenikina, 2010). In agreement with that, studies have been done in order to relate the various aspects of AT to a broad range of educational ICT tools and technologies (e.g., Lim & Hang, 2003; Karasavvidis, 2009; Murphy & Rodriguez-Manzanares, 2008; Scanlon & Issroff, 2005; Demiraslan & Koçak Usluel, 2008). According to AT, human behavior cannot be understood independently of socio-cultural context. Moreover, humans are not simply surrounded by this context; they rather interact with and modify it. They are constantly influencing their environment and create culturally meaningful artifacts. It is this complicated nature of interaction between humans and their social context that is the center of AT (Leontiev, 1978). Based on AT, the interactions made between individuals and their surroundings are mediated through some social objects or tools. These tools can either be physical (artifacts, machines, and instruments) or psychological (language, signs, methods, and procedures). Physical tools are able to manipulate the natural process of adaptation and act as an instrument functioning as a conductor of human activity (Verenikina, 2010).

According to literature, AT can act as a model for the application of ICT in education. In other words, technology is conceptualized as a tool to practice a complex system of goal-oriented activities by teachers and learners in the broad context of school (Murphy & Rodriguez-Manzanares, 2008). The AT model, developed by Engstrom in 2001 (as presented in Figure 2), gives instructors the opportunity to analyze *the whole configuration of events, activities, contents, and interpersonal processes taking place in the context that ICT is used* (Demiraslan & Koçak Usluel, 2008). This framework allows us to examine the interconnections among individuals and socio-cultural elements and also the tensions or barriers that exist in such relationship (Yamagata-Lynch & Haudenschild, 2009). The analysis of tensions enables

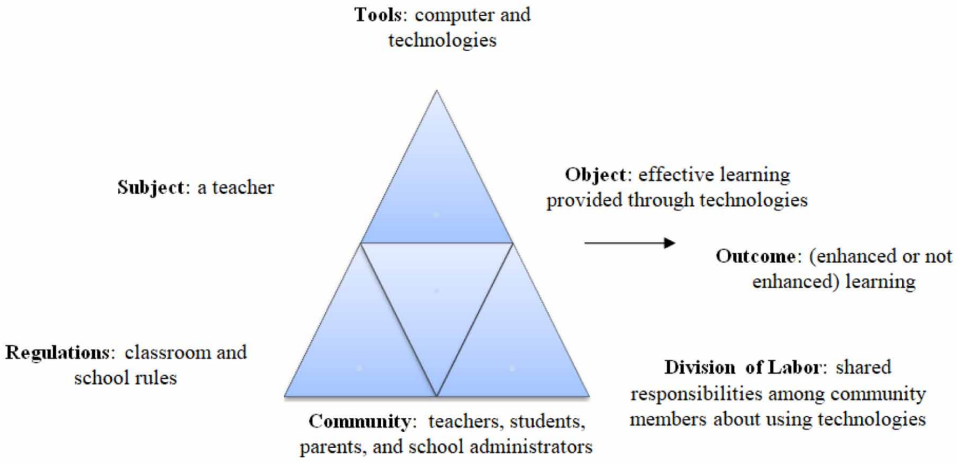
researchers to investigate potential barriers in the process of ICT integration in a school (Zevenbergen & Lerman, 2007). It can be concluded that the new language learning era, which is intertwined with technology, is totally different from the traditional language teaching in nature. Unlike the teacher-centered methods of language teaching, that placed the whole responsibility of instruction on teachers, and turning students to passive agents, *the primary focus of technology-based language education should be the teacher and the instructional process or the student and the learning process* (Garrett, 2009). This requires teachers to embrace new roles in order to integrate the basic language teaching techniques with technology to attain a maximum level of efficient language teaching/learning.

CALL Era: Teacher Roles

As promising as it might seem, technology is not the end in education; it is more like a tool that helps pave the way to more efficient instruction. Technology-mediated education consists of a vast and integrated environment that includes communications among learners, teachers, computers, and network (Vaghela, 2016).

As presented earlier, several aspects of education in general and language teaching in particular have changed dramatically with the advent of different types of technologies; one of the most important of which is the teacher's

Figure 1. Activity system model: A teacher's activity mediated by ICT within a school community (adapted from Engestrom, 2001)



role in the teaching-learning process. Given the fact that teachers play an enormously crucial role as an 'instructor', investigating teachers' new roles created by technology is of paramount significance. There is a focus on the term 'instructor' rather than a teacher in technology-mediated education as Vaghela (2016) points out:

Teacher is not actually teacher but an instructor so Technology Mediated Learning is not based on teaching method but it is based on method of giving instruction. Teacher should keep students updated with current issues. Teacher should give clear instructions with an easy language. Teacher should give answer of each and every question of all the students very clearly and in an understandable method. Teacher should also be prepared about topic and about use of technology instead of an informer. Teacher should be fair and courteous with the fames so that learners never feel fear or shy to ask question and in take part in the classroom. (p.5)

Hence, it is clear that technology mediated education does not imply that there is no longer a place for teachers; it merely means that teachers now have to play multiple new roles (Vaghela, 2016). Literature in this area states that not all traditional teacher roles change alongside technology integration. As a matter of fact, the findings of many studies reveal that teachers maintain some of their previous roles and responsibilities such as information giver, class leader and director, discussion leader, and lecturer (Murchu, 2015).

On the other hand, according to some studies, the teacher's role has changed from knowledge dispenser to a guide and facilitator of learning for students (Aanchal & Goel, 2016). Ely and Plomp (1986) discussed this role shift stating that:

The teacher will be less of an information-giver and more of a learning facilitator. Fewer professional teachers may be required if roles are modified and teacher aides or assistants are used alongside professional teachers. In no way should the teacher be denigrated: he/she is still the primary resource person now serves as more of a manager than as a fountain of knowledge. The more a teacher participates in the planning of instructional delivery, the greater the fidelity to an agreed-upon implementation design. (p.246)

To discuss this claim in more detail, Aanchal and Goel (2016) have proposed four new roles for teachers in technology-mediated classrooms: Teacher as a designer, a facilitator, a classroom manager and a paraprofessional.

Teacher as designer can carefully plan classroom environment that embraces technology-aided student learning. Teacher as a facilitator guides the students in their own learning process instead of giving complete information to the students directly. This becomes of vital importance in learner- centered classes such as communicative language teaching. Teachers need to become more flexible, respond to students' needs irrespective of the preplanned syllabus. This means that educators must utilize a variety of resources and multimedia effectively…. Teacher as a classroom manager means that the teacher is a plan manager, who organizes, directs and controls all the activities in the technology-mediated environment. Paraprofessionals, or educational assistants, are assigned to a teacher in a classroom to assist students with special needs. This encourages and allows the teacher to take ownership of every student in the class. It also provides the teacher and all students an opportunity for extra instruction and support. (p.154)

In another study by McGhee and Kozma (2007), six new roles were proposed for teachers in technology-integrated instruction. These roles that were obtained from case studies include: *instructional designer; trainer; collaborator; team coordinator; advisor; and monitoring and assessment specialist* (p.3).

Instructional designer is a commonly new role for teachers. Much like the 'self- learner' role adopted by students, teachers in this role design, plan, and organize everything in order to effectively use and integrate technology in their classrooms. The instructional designer takes into account all the resources available to meet the variety of needs of his/her students and implements well-designed activities to address those needs.

Trainers give individual instruction to enable skill development. This training is accomplished through modeling the use of technology and helping students see how they might use technology to accomplish doing different activities. Collaborator refers to a variety of activities teachers do with their colleagues collaboratively to improve their teaching. These activities include information sharing, team teaching, and interdisciplinary instructional activities done with the help of coworkers. The focus of team coordinator is on assigning individual students to project or teams to study or do activities. The role of enabling advisor refers to the type of teacher who gives assistance, advice, or suggestions to enable students to make sound decisions and find the information they need to do tasks. The monitoring and assessment specialist refers to the new role where teachers monitor student performance and try to improve that (McGhee & Kozma, 2007).

A 2003 report by the Directorate General of Education and Culture of the European Commission revealed the change in teacher's roles brought by ICT introduction. These eight roles include: facilitator and guide, integrator of media, researcher, designer, orchestrator, collaborator, learner, and evaluator. Teachers who are integrator of media have the knowledge of various modern technological tools and hoe to use them. Teachers also should be able to guide their students to use these ICT tools for making different types of projects and presentations. Researcher teachers have a certain level of literacy to use search engines to obtain the required information for their own use or their students' use. They should also be able to recognize authentic and reliable sources of information from inauthentic and fake ones. Learner teachers constantly empower themselves in their field of study. Orchestrator teachers make a balance between the three components of the new learning environment: technology, learners, and the curriculum. The syllabus and its components including time, teaching materials, and methodology can be carefully revised and adapted by teachers, if they want to fully exploit the potential of ICT in their instruction. Evaluator teachers assess students' ability and design the activities based on the needs of the students.

The Importance of EFL Teachers' Cognition in Successful ICT Integration

Children born in the 21st century are labeled as "next generation" or "digital natives" as they are living in a digital world (Prensky, 2001). Their world is filled up with smart phones, iPods, mp4 players, 3D televisions and videogames (Anderson, 2010). In contrast, "digital immigrants" who are the parents (Prensky, 2001) usually struggle with implementing the innovations that are normalized for their children. Such barriers can also affect the

Table 1.Teacher roles in ICT enriched environments

Directorate General of Education and Culture 2003	Mcghee and Kozma (2007)	Anchal and Goel (2016)
• Designer • Facilitator and guide • Integrator of media • Researcher • Orchestrator • Collaborator • Learner • Evaluator	• Instructional designer • Trainer • Collaborator • Team coordinator • Monitoring and Assessment specialist • Enabling advisor	• Designer • Facilitator • Classroom manager Paraprofessional

teacher-learner interactions in educational settings. Since such innovations provide a great opportunity for learners to interact, communicate and assign meaning to what they have learned, they often feel detached from traditional teaching methodologies (Anderson, 2010; Nallaya, 2010). Students' needs about improving technology literacy are usually taken care of by governments. However, teachers have greater responsibilities in educating students to function properly in this digital world. Teachers often use different types of tools with little difficulty; but they rarely integrate more modern innovations in their teaching process. Hence, educational administrators and policy makers should provide a ground for pre-service teachers to develop their ICT literacy in order to adopt the latest innovations (Davies, Hartshorne, & Ring, 2010). The first important point regarding the implementation of an innovation is changing teachers' perceptions or beliefs about that innovation (Chesney & Benson, 2012).

The concepts of innovation, innovativeness, and diffusion of innovations are widely used today as technologies are considered an integral part of everyday life (Dadura & Lee, 2011). Rogers (2003) in a study defines innovation as *an idea, practice, or object that is perceived as new by an individual or other unit of adoption* (p. 12). According to Parashoes and Messer (2006) innovation is fractious when it redefines procedures, and is encouraging when it assists people in doing things. Diffusion is defined by Rogers (2004) as: *the process through which an innovation, defined as an idea perceived as new, spreads via certain communication channels over time among the members of a social system* (p. 13). According to Lundblad (2003) diffusion of innovations happens when new ideas, products, services, and processes are implemented and/or adopted. Based on literature review in this area, the diffusion of innovation process has been scrutinized for more than 40 years. Among all the different models presented, the Diffusion of Innovations model proposed by Rogers has been most widely accepted and applied to various fields from mathematics to education (Sahin & Thomson, 2006). According to this theory, once individuals come across an innovation their reaction towards that new idea differs because of distinctions in people's tendencies (i.e. innovativeness, behavioral change) (Wilson & Stacy, 2004). Rogers (2003) defines different innovative behaviors into categories named adopters. These consist of five groups: innovators, early adopters, early majority, late majority, and laggards. Figure 2 displays these categories across a bell-shaped curve.

Teachers' ICT use has been under investigation for a long time (Rahimi & Yadollahi, 2011). One reason for this investigation is that the advent of instructional technology creates a full-scale transition; including not only the

Figure 2. Adopter categories based on innovativeness (Taken from Rogers 2003)



way learners learn, but also how teachers teach and school administrators operate (Norum, Grabinder, & Duffield, 1999).

In this respect, many studies have scrutinized the role of teachers' personal characteristics such as teachers' attitudes, age, gender, experience, and ICT literacy in their use of ICT in classroom (e.g., Robinson, 2003; van Braak, Tondeur, & Valcke, 2004; Bebell, Russell, & O'Dwyer, 2004; Rahimi & Pourshahbaz, 2016). Although the availability of technological tools and resources is the first step that determines the success or failure of ICT enhanced teaching, teachers' attitudes and perspectives towards technology is a much more critical factor (Lamy & Hampel, 2007). In agreement with this point, Fernández Carballo-Calero (2001) indicated that:

When we speak of the teacher and of the teacher's role we have to consider his attitude as well, because the teacher's attitude is a basic element within the group of elements which integrate the teaching of a language with multimedia. That is to say, if the teacher does not agree with the system he is using, with the method, with the quality of the software his students are using; if he believes that the software is not the appropriate one for his students to reach their objectives, and in sum, if there is a lack of motivation or an unfavorable attitude on the part of the teacher, this attitude will be directly transmitted to the student and the system will fail. (p.8)

Cuban (1986) analogized teachers to "gate keepers" of instructional technology. Also, according to Smeets and Mooij (2001) teacher is the "key person" in the process of ICT integration. This confirms the fact that although educational administrators might provide all modern technological tools and resources for schools, it would not be fruitful until the point that educators implement technology into the teaching process. In other words, teachers act

as a bridge between administrators' plans and the merits of those plans for learners (Afshari, Bakar, Luan, Abu Samah, & Fooi, 2007). The fundamental position of teachers in the center of curriculum change underscores the fact that successful ICT integration is heavily dependent on teachers' abilities, attitudes, and willingness (Mooij & Smeets, 2001).

Some issues can aid or hinder teachers in the journey of ICT integration. These issues include technical and administrative support, presence or lack of proper training, institutional infrastructures, restraints resulting from teachers' pedagogical and traditional beliefs, and resistance to change (Zhao & Cziko, 2001). The sources of these restraints can be both internal and external (Rogers, 1995). Internal sources of restraints consist of teachers 'attitudes and perception regarding using technology in education. Teachers' attitude towards technology is especially important since it determines the extent of technological acceptance in the teaching process (Pettenati, 2001). Teachers' concerns regarding technology must be considered as a crucial issue as they can influence teachers' behavior (Rakes & Casey, 2000). Fullan (2007) takes the importance of teachers' attitudes even further claiming that, *Educational change depends on what teachers do and think, it's as simple and as complex as that. It would all be so easy if we could legislate changes in thinking.* (p.129)

In addition, the success of educational innovations is believed to be largely dependent on teachers' skill and knowledge in deploying them (Pelgrum, 2001). However, teachers require adequate training programs to enhance their IT literacy since their ICT competence influences the effective implementation of computers in the teaching process (Knezek & Christensen, 2002). Coping with the technological paradigm shift is not an easy task for most teachers, in order to do so, they must update their technical literacy and be familiar with Web technology and CALL applications (Cunningham, Many, Carver, Gunderson, & Mosenthal, 2000). A threshold level of ICT skill and knowledge ensures a variety of positive experiences with computers which can in part increase EFL teachers' confidence (Park & Son, 2009). In order to achieve this aim, teacher development programs can aid educators in dealing with computer-related issues and managing technology-related tasks and activities in the process of teaching (Lee & Son, 2006; Suh, 2004; Oh & French, 2007).

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Chapter 3
EFL Teacher Knowledge Base

ABSTRACT

This chapter aims at pinpointing EFL teachers' knowledge base and its components. First, knowledge and its nature in general and teacher knowledge in particular are discussed. The theoretical frameworks of teacher knowledge base in general and the knowledge base of EFL teachers in particular are defined and elaborated meticulously. This includes the seminal work of Shulman and its three main categories of teacher knowledge—content knowledge, general pedagogical knowledge, and pedagogical content knowledge—and the work of language educationists to define the tripartite model of EFL teacher knowledge base. In the following, the need to re-conceptualize EFL teachers' knowledge base, the importance of investigating EFL teachers' knowledge base in CALL-based teaching/learning environments, and the way teachers should be empowered in technology era are addressed.

BACKGROUND

Teaching is considered by the majority of people as a profession so easy that anyone could do it. This is pointed out by Boyer (1990) when he emphasized the need to redefine teaching since it *is often viewed as a routine function, tacked on, something almost anyone can do* (p. 23).

The demand to redefine the value of teaching is more evident in recent years since imperative about increasing the education quality is strongly related to higher student outcomes. Needless to say, this mean there is an immediate need to redefine the teaching standards. As a matter of fact, research has shown

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that the quality of teaching workforce is a determining factor in students' achievement levels regardless of students' prior background knowledge and family factors (Guerriero, 2014). Being familiar with the definition of 'quality' is considered important since it is a technical terminology used in concepts such as 'quality teachers' and 'quality teaching'. Being used interchangeably, these terms do not actually refer to the same idea (Liddicoat, 2006). According to Liddicoat (2006) these two terms can be defined as:

Quality teachers' refers to issues relevant to teachers' knowledge and practices in language teaching and discussion of quality teachers often assumes that quality teaching is solely dependent on the levels of attainment of individual teachers. 'Quality teaching', however, sees that effective teaching relies on many factors of which the knowledge base of the teacher is only one. (p.1)

Research has revealed several predictors for teacher quality including teachers' certifications, degree, qualification type, class size, years of experience, and knowledge base among which teachers' knowledge base is a less studied factor (Guerriero, 2014). The fact that teacher knowledge base is a contributing factor which can affect the teaching and learning process is widely accepted (Gitomer & Zisk, 2015; Grossman & McDonald, 2008; Darling-Hammond & Bransford, 2007; Woolfolk, Hoy, Davis, & Pape, 2006; Munby, Russell, & Martin, 2001). Reviewing the literature in the field of teacher expertise reveals the implication of teachers' professional knowledge base in carrying out job-related tasks successfully (e.g., Berliner, 2001, 2004; Bromme, 1992). Despite the importance of creating a framework for teachers' knowledge base, there is little consensus among researchers about what exactly an affective teacher has to know (Faez, 2011). Some efforts have been made to conceptualize teachers' knowledge (e.g., Breen, 1991; Johnston & Goettsch, 2000), their attitudes and beliefs (e.g., Almarza, 1996; Crandall, 2000; Peacock, 2001; Mattheoudakis, 2007), and cognition (Borg, 2003; 2006) as they have been hypothesized to influence the teaching process (e.g., Basturkmen, Loewen, & Ellis, 2004; Freeman & Johnson, 2005; Tsui, 2003).

Knowledge and Teacher Knowledge

Conceptualizing teachers' knowledge base is a complicated task since it is interrelated with other key dimensions such as understanding the teaching and learning process, the concept of knowledge, and the way teachers' knowledge is functionalized in the classroom (Guerriero, 2014).

According to Tsui (2003), Ryle (1949), and Polanyi (1966), the conceptions of knowledge can be defined considering five categories of teacher knowledge including: (a) knowing-in-action and reflection-in-action (Schon, 1983); (b) "practical knowledge" (Elbaz, 1983); (c) "personal knowledge" (Clandinin & Connelly, 1987, 1991); (d) "situated knowledge" (Leinhardt, 1988); and (e) "content knowledge" (Shulman, 1987).

The theoretical framework proposed by Shulman (1987) is rather analytical where he considered three main categories for teacher knowledge: (a) content knowledge - CK (or subject matter knowledge); (b) general pedagogical knowledge- GPK, and; (c) pedagogical content knowledge- PCK. Shulman's (1987) model consists of other components such as learner knowledge and its features, contextual factors, and evaluation (Faez, 2011).

These four supporting knowledge areas in Shulman's (1987) framework are:

1. *Curriculum Knowledge, with particular grasp of the materials and programs that serve as "tools of the trade" for teachers;*
2. *Knowledge of learners and their characteristics;*
3. *Knowledge of educational contexts, ranging from the workings of the group or classroom, the governance and financing of school districts, to the character of communities and cultures; and*
4. *Knowledge of educational ends, purposes, and values, and their philosophical and historical grounds (Abdelhafez, 2010, p.49).*

Shulman's (1987) classification has affected the definition of teacher knowledge significantly, as a major part of today's research on this field is dependent on it (König, Lammerding, Nold, Rohde, Strauß, & Tachtsoglou, 2016). The three core elements of teachers' knowledge in his classification are specified as follows:

- **Content Knowledge (CK):** This knowledge which is shaped by the academic disciplines underlying different subject matters is related to the specific subject matter or content area that educators are required to teach (Freeman, 2002). For instance, mathematical CK consists of the following knowledge areas: number, algebra, geometry, and data (Tatto, Schwille, & Senk, 2008) or CK of EFL teachers is basically language proficiency level and command of English.
- **General Pedagogy Knowledge (GPK):** General pedagogy is a scientific term which is affected by cultural approaches (Hopmann & Riquarts, 1995). Unlike CK, GPK is not subject matter related. As

Shulman (1987) pointed out, GPK involves *those broad principles and strategies of classroom management and organization that appear to transcend subject matter* alongside *knowledge about educational contexts, learners and learning, and assessment* (p. 8). Putting GPK into more detail, these broad knowledge areas comprise *knowledge of instructional process* (e.g., teaching methods, classroom management), *student learning* (e.g., individual dispositions of students and their learning processes), and *assessment* (e.g., diagnosing principles and evaluation procedures; König, 2014). (König, Lammerding, Nold, Rohde, Strauß, & Tachtsoglou, 2016, p.2).

- **Pedagogical Content Knowledge (PCK):** This area of knowledge consists of subject specific knowledge with the goal of teaching. According to Shulman (1987), this knowledge functions as a *category most likely to distinguish the understanding of the content specialist from that of the pedagogue* (p. 8).

Although scholars have investigated the knowledge categories proposed by Shulman (Depaepe, Verschaffel, & Kelchtermans, 2013), the way that these three cognitive fields are interrelated remains an open question. According to König et al. (2016) *PCK may be seen as the result of teachers' transforming and applying their CK and GPK to a new subject-specific knowledge category* (p.2). Combining the elements of GPK and subject specific knowledge lets us believe that PCK is a more central knowledge area, while GPK and CK form the foundations of the framework (Grossman & Richert, 1988). Regarding GPK, it must be stated that it has not been the object of many studies though it is considered the most crucial knowledge base in developing teachers' quality (Guerriero, 2014). Reviewing the literature presents some models attempting to determine the features of GPK, considering pedagogical and psychological components. Table 1 presents the elements that some models of GPK have proposed. Needless to say, considering the multiplicity of the models, some components may overlap (Guerriero, 2014).

Shulman's (1987) model of teacher knowledge was adapted and expanded in light of various investigations. For instance, Turner-Bisset (1999) proposed a new analytic framework of teacher knowledge base in the British context through observations and interviews. Her framework is more comprehensive comparing to that of Shulman's (1987), in a sense that she added knowledge of self as a major knowledge area (Abdelhafez, 2010). Hence, her framework comprises nine categories of:

subject matter knowledge, curriculum knowledge, general pedagogical knowledge, knowledge of models of teaching, knowledge of learners, knowledge of self, knowledge of educational contexts, knowledge of educational ends, and pedagogical content knowledge. (Abdelhafez, 2010, p.50)

Another way to conceptualize teacher knowledge is doing it in relation to disciplines required to excel in teaching profession. For instance, Cochran-Smith and Lytle (1999) suggest a framework of teacher knowledge consisting of research-based findings and general approaches together creating eight domains of knowledge base including:

1. *Content or subject matter knowledge;*
2. *Knowledge about the disciplinary foundations of education;*
3. *Human development and learners;*
4. *Classroom organization;*
5. *Pedagogy;*
6. *Assessment;*
7. *The social and cultural contexts of teaching and schooling, and;*
8. *Knowledge of teaching as a profession. (Abdelhafez, 2010, p.48)*

Based on what was presented earlier, it could be deduced that teacher knowledge is described through five attributes: It can be conceptualized

Table 1.Components of GPK (Voss, Kunter & Baumert, 2011; König, Blömeke, Paine, Schmidt, & Hsieh, 2011, cited in Guerriero, 2014)

Pedagogical Components	Psychological Components
•**Knowledge of Classroom Management:** Maximizing the quantity of instructional time, handling classroom events, teaching at a steady pace, maintaining clear direction in lessons. •**Knowledge of Teaching Methods:** Having a command of various teaching methods, knowing when and how to apply each method. •**Knowledge of Classroom Assessment:** Knowledge of different forms and purposes of formative and summative assessments, knowledge of how different frames of reference (e.g., social, individual, criterion based) impact students' motivation. •**Structure:** Structuring of learning objectives and the lesson process, lesson planning and evaluation. •**Adaptivity:** Dealing with heterogeneous learning groups in the classroom.	•**Knowledge of Learning Processes:** Supporting and fostering individual learning progress by having knowledge of various cognitive and motivational learning processes (e.g. learning strategies, impact of prior knowledge, effects and quality characteristics of praise, etc.). •**Knowledge of Individual Student Characteristics:** Having knowledge of the sources of student cognitive, motivational, and emotional heterogeneity.

as a practical, personal, experiential, contextual, and a situational form of knowledge (Abdelhafez, 2010). More specifically defined, teacher knowledge is:

- **Practical:** Since it has a mutual relation with teaching process in different ways, and can form teacher's function in the classroom and at the same time be under the influence of the complicated patterns of interaction in the classroom. According to Munby, Russell, and Martin (2001), teacher knowledge *is based on the personal understandings that teachers have of the practical circumstances in which they work and classroom knowledge that is situated in classroom events* (p.880).
- **Personal:** Because it has sense for the teacher as a person who cannot be separated from his professional self. As Elbaz (1981) declared, teacher knowledge is personal in a sense that teachers try to utilize their knowledge to be able to breathe sense into things in personal meaningful ways. However, Turner-Bisset (1991) emphasizes the personal aspect of teacher knowledge as a form of self-reflection that teachers need to protect their self-image and survive in their profession.
- **Experiential:** As it is shaped through teachers' interrelated and personal experiences with learners and the context. Xu and Liu (2009) support this idea suggesting that *teachers' past experiences, present actions and future plans all constitute the bulk of teacher knowledge*. (p.505)
- **Contextual:** In a sense that it is applied in a specific context and will not make sense otherwise. As Hiebert, Stigler, and Gallimore (2002) pointed out, teacher knowledge *is grounded in the context in which teachers work*. (p.6)
- **Situational:** Since it is constructed through various situations to which it is employed to respond. (Abdelhafez, 2010, pp. 16-17)

Compared to the vast body of research investigating the knowledge of teachers in general (e.g., Grossman, 1990; Hillocks, 1999; Cochran-Smith, Feiman-Nemser, McIntyre, & Demers 2008), little work has been done emphasizing second and foreign language teacher knowledge (Andrews, 1999; 2001; Borg, 2006; 2010; Day 1993; Day & Conklin, 1992; Tsui & Nicholson, 1999; Wright, 2010). It goes without saying that foreign language teaching is much more complex in comparison to other subject matters in the sense that the object of learning – the target language- has to be presented through the same medium of instruction (Faez, 2011). This unity of content and the

medium of instruction in TEFL is evident in communicative foreign language classrooms where no real distinction could be made between the two (König, Lammerding, Nold, Rohde, Strauß, & Tachtsoglou, 2016). In this sense, EFL teachers' knowledge base differs from that of science or mathematics teacher. Hence, it is only rational to claim that the conceptualizations about *'knowledge base'* of language teaching are constituted from a totally different framework. However, it has to be mentioned that in more advanced levels of TEFL, academic disciplines of cultural and literary theories become more emphasized, making TEFL more content based compared to primary basic levels (König, Lammerding, Nold, Rohde, Strauß, & Tachtsoglou, 2016).

Besides the shared content and the medium of instruction in TEFL, there are other distinctive features that make foreign language teaching varied from subject matters like mathematics. As oral communication plays a crucial role in teaching a foreign language (Borg, 2006), EFL curriculum comprises both oral and written competencies, and is majorly dependent on teaching approaches and methodologies that guarantee fluent and accurate oral production (Spada, 2007; Watzke, 2007). While the knowledge base of an EFL teacher with low levels of communicative skills is considered limited, the sheer command of target language will not provide students with effective learning opportunities. The authenticity of tasks chosen for learning, interactions between teacher and learners, and social situations in a foreign language classroom makes TEFL field a distinctive one (König, Lammerding, Nold, Rohde, Strauß, & Tachtsoglou, 2016).

Knowledge Base of EFL Language Teachers

According to research, teaching is a concept intertwined with learning. This implies that the main task of teaching is training students to learn effectively (Fenstermacher, 1986). The definition of language teachers' knowledge base entails several attributes which all effective language teachers are required to possess. EFL teachers' knowledge base refers to understanding, awareness, expertise, and skills (Day, 1993; Freeman & Johnson, 1998; Richards, 1998; Tedick, 2005). Literature in the field of language teachers' knowledge base draws considerably from English Language Teaching (ELT) theories (Ochieng' Ong'ondo, 2017).

Lafayette (1993) attempts to determine the subject matter knowledge needed for EFL teachers by proposing that it encompasses three domains: (a) language proficiency; (b) civilization and culture, and; (c) language analysis

(i.e., knowledge about the language). He emphasizes the role of language proficiency as a vital knowledge area, at the same time not minimizing the importance of cultural awareness for both language learners and teachers. Regarding language analysis knowledge he believes that language teachers should be familiar with applied linguistic issues (e.g., contrastive analysis/ grammar, comprehension of second language acquisition process, fossilization, error correction, and input/output processing), and linguistic structures.

Day (1993) proposed a framework for language teachers' knowledge base, inspired from Lafayette (1993) and Day and Conklin's (1992) work. His framework which was designed especially for English as a Second/Foreign Language (ESL and EFL) teachers in Canada, consists of four categories: (1) content knowledge (knowledge of the subject matter i.e. English language); (2) pedagogic knowledge (knowledge of practices of teaching); (3) pedagogic content knowledge (knowledge of teaching strategies for teaching the subject matter), and; (4) support knowledge (knowledge of fields/disciplines which can affect language teaching such as linguistics, psycholinguistics, and sociolinguistics).

Freeman and Johnson (1998) make a great contribution in conceptualizing EFL teachers' knowledge base by proposing a theoretical framework which treats language teaching as an "activity" consisting of three interrelated areas: (1) the teacher-learner; (2) the social context, and; (3) the pedagogical process. However, Tarone and Allwright (2005) criticize this framework due to a lack of attention to English as a specific subject matter which is majorly distinctive compared to other fields. They point out their idea stating that *teachers of different subject areas must learn different things and may have to learn those things in different ways* (p.7). In response to Tarone and Allwright's (2005) critique, Freeman and Johnson (2005) have mentioned that considering language teaching as a far distinctive subject matter compared to other subjects is at the heart of their framework. As a matter of fact, they have focused on the crucial role of contextual factors in foreign language teaching in their original proposal when they posed this question about EFL teachers' knowledge base: *who teaches what to whom, where?* (Freeman & Johnson, 1998, p. 405).

Richards (1998) defined teaching as a set of particular practices and competencies, the application and evaluation of which can assure high quality teaching. In his proposal about what domains shape language teachers' knowledge base, he identified six knowledge categories including: theories of language teaching, subject matter knowledge, teaching skills, communication skills, pedagogical reasoning and decision making; and contextual knowledge.

However, Richards (1998) acknowledges the fact that there is not much consensus regarding the knowledge base of language teachers stating that this field *draws on a variety of disciplinary sources, including linguistics, psycholinguistics, and education* (p.1). The specifications of language teachers' knowledge domains as pointed out by Richards (1998) are presented as follows:

Theories of Language Teaching: Mitchell and Myles (2004) define theory as an: *abstract set of claims about the units that are significant within the phenomenon understudy, the relationships that exist between them and the processes that bring about change* (p.6). A theory is an effort to reach a reasonable and research-based set of generalizations in order to explain a phenomenon (Macaro, 2003). Hence, it is clear that:

theory tends to be concerned with general issues rather than specific issues about a phenomenon. Therefore individual cases that are not consistent with these general issues are mostly ignored (Ochieng' Ong'ondo, 2017, p.29).

According to Richards (1998; 2001), English Language Teacher Education (ELTE) programs always rely on some sort of theories whether explicitly stated or not. Regarding this issue, he declares that:

At the core of SLTE is a theory of teaching that provides the theoretical basis for the program as well as the justification for both the approach to teaching as well as the instructional practices students are expected to develop in the program. Teachers also teach within the context of beliefs that shape their planning and interactive decisions. Theories of teaching are therefore central to how we understand the nature and importance of classroom practices… (1998, p.2)

- **Teaching Skills:** It would be the fundamental and core competency of a successful English teacher. Shulman (1987) refers to this knowledge domain as related to several teaching aspects. It involves presenting language; organizing and facilitating interactive and communicative opportunities for students, ensuring students' comprehension; creating reasonable balance between fluency and accuracy; apprehension of students' errors; and appropriate treatment to errors (Kyriacou, 1991; Richards, 1998; Shulman, 1987).
- **Subject Matter Knowledge:** This knowledge simply means *what* of teaching- knowledge of the specific subject matter which in the case of ELT is the English language (Ochieng' Ong'ondo, 2017). In other

words, this knowledge comprises theories, concepts, and disciplinary knowledge serving as the theoretical basis of foreign language teaching (Richards, 1998). According to Kumaravadivelu (2006) this knowledge could include basic aspects of linguistics such as syntax, morphology, phonetics and phonology, and language acquisition, and in some context it could refer to advanced knowledge of four skills of English (e.g. Hinkel, 2006). Subject matter knowledge is regarded as a considerably important knowledge base for language teachers; as Shulman (1987) argues *teaching begins with a teacher's understanding of what is to be learned and how it is to be taught*. He further explained that *in the face of student diversity, the teacher must have a flexible and multi-faceted comprehension, adequate to impart alternative explanations of the same concepts and principles* (p.9).

- **Pedagogical Reasoning Skills (PRS) and Decision Making:** These are the underlying cognitive abilities that are required for foreign language teachers (Shulman, 1987; Shavelson & Stern, 1981). Shulman (1987) defined PRS as:

the capacity of a teacher to transform the content knowledge he possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented to the students. (p.15)

He further stated how comprehension of teaching process alone would not suffice. Teachers must be aware of the contextual factors and be able to apply their knowledge base for making judgments and taking necessary actions. Moreover, Richards (1998) indicated that developing pedagogical reasoning skills is extremely crucial for language teachers as it helps them to:

- Relate theories of language, teaching and learning to language teaching in actual situations.
- Analyze pedagogical problems and develop alternative strategies for teaching.
- Recognize the kind of decision making employed in teaching and to utilize decision making effectively in one's own teaching (p.15).
- Learn to think about the subject matter from the learners' perspective.
- Acquire a deeper understanding of the subject matter.
- Learn how to present subject matter in appropriate ways.
- Learn how to integrate language learning with broader curricular goals (p.97-98).

Johnson (1999) agrees with Richards (1998) on the necessity of PRS for language teachers arguing that *reasoning teaching lies at the core of both learning to teach and understanding teaching* (p.1). She goes even further supporting PRS by posing some practical questions that will help language teachers in learning PRS. These questions are:

- Who am I as a teacher?
- Who are my students? How do they experience my teaching?
- What do I know about my teaching context?
- What do I know about the subject matter content that I teach?
- Why do I teach the way I do?
- What are the consequences of my teaching practices for my students?
- How do I make sense of theoretical knowledge?
- Who is my professional community?
- What sort of change do I see as fit for my own teaching? (p.139)

Contextual Knowledge: Awareness about the context in which language learning takes place plays is a crucial role in efficient teaching process. This domain of knowledge involves being familiar with the specific educational context, i.e., the school setting, knowing about students' background including families, strengths, weaknesses and particular interests (Grossman, 1988; Lampert, 1984). Kumaravadivelu (2006) emphasizes the importance of context in language teaching when he points out: *it is impossible to insulate classroom life from the dynamics of political, educational, and social institutions…* (p. 44). Borg (2003) defines contextual factors as:

the social, psychological and environmental realities of the school and the classroom parents, principals' requirements, society, curriculum mandates, classroom and school layout, school policies, colleagues, standardized tests, and the availability of resources. (p. 94)

Richards (1998) adds several institutional contextual factors to Borg's (2003) list as:

- Type of school, (e.g. state, or private, tertiary),
- Administrative practices, (e.g. time management, teacher's duties, workload),
- School culture (e.g. established beliefs and practices),
- School program (e.g. reception class, pullout class, transitional class),

- Level of class (e.g. elementary, intermediate, advanced),
- Teaching resources (e.g. syllabus, textbooks and other resources), and
- Testing factors (e.g. role of school and national tests) (p.12).

Communication Skills: High communication skill can aid language teachers to achieve their interpersonal goals during authentic encounters. These include: (1) ordering, requesting, and giving rule; (2) questioning; (3) giving instruction; (4) repeating and reporting what has been said; (5) warning and giving advice; (6) giving reasons and explaining, and; (7) giving and refusing permission (Richards, 2001; Owen & Hargie, 1986).

In addition to knowledge base frameworks, there have also been attempts to determine standards for language teaching which can aid scholars in the field to develop effective teacher education programs (Guntermann, 1993). An example of these attempts is the development of several standards for effective foreign language teaching by National Council for Accreditation of Teacher Education (NCATE) (2008). These six standards include: (1) language, linguistics, comparisons; (2) cultures, literatures, cross-disciplinary concepts; (3) language acquisition theories and instructional practices; (4) integration of standards into curriculum and instruction; (5) assessment of language and cultures, and; (6) professionalism (cited in Faez, 2011, p.33). However, there has been little or no research done in order to validate the efficacy of these standards. As Donato (2009) asserts, these standards identify the scope of knowledge domains that are necessary for efficient foreign language teachers, but they do not demonstrate any specific direction on how teachers could achieve their goals. In agreement with what was mentioned, Richards (2008) attested to the fact that the standards framework *reflects a reductionist approach in which learning is reduced to the mastery of discrete skills that can easily be taught and assessed* (p. 172). Table 2 presents a summary of knowledge frameworks discussed in this chapter.

Having presented these theoretical frameworks, it is noteworthy to mention that conceptualizing EFL teachers' knowledge base has moved from "discrete" skills and competencies, drawing on socio-cultural theories (Lantolf, 2000; 2009; Johnson, 2006; 2009). It focuses on the role of context suggesting that learning is a "situated activity" within specific contexts (Lave & Wegner, 1991). As Johnson (2009) discussed the way an individual learns, what he/she learns, and the way he/she will use the learnt material, is majorly related to his previous experiences, social contexts in which learning take place, his

Table 2. Foreign language teacher knowledge base frameworks

	Shulman (1987)	**Lafayett (1993)**	**Day (1993)**	**Richards (1998)**	**Freeman & Johnson (1998)**	**NCATE Standards (2008)**
	Subject Matter Knowledge	Language Proficiency	Content Knowledge	Subject Matter Knowledge	The Teacher Learner	Language, Linguistics, Comparisons
	Pedagogical Content Knowledge	Civilization and Culture	Pedagogic Knowledge	Theories of Language Teaching	The Social Context	Cultures, literatures, Cross Disciplinary Concepts
Knowledge bases	Curricular Knowledge	Language Analysis (i.e., knowledge about the language)	Pedagogic Content Knowledge	Teaching Skills	The Pedagogical Process	Language Acquisition Theories and Instructional Practices
			Support Knowledge	Communication Skills and Language Proficiency		Integration of Standards Into Curriculum and Instruction
				Pedagogical Reasoning and Decision Making		Assessment of Language and Cultures
				Contextual Knowledge		Professionalism

needs and wants, and what is expected from him to do with that knowledge in the society. Hence, it can be deduced that the modern needs of the society calls for a comprehensive reform in the educational system which will affect the ELTE programs significantly.

In line with these propositions, Richards (2008) suggests that EFL teacher knowledge base frameworks should be modified, putting the "nature" of language teaching process at the center. He further argues that:

From this perspective, learning takes place in a context and evolves through interaction and participation of the participants in that context. Teacher learning is not viewed as translating knowledge and theories into practice but as constructing new knowledge and theory through participating in specific social contexts and engaging in particular types of activities and processes. (p. 164)

Reconceptualizing EFL Teachers' Knowledge Base

In recent years, there has been a growing debate between two parties arguing about the role of Second Language Acquisition (SLA) in language teacher education (Jourdenais, 2009). One party claims that the knowledge of SLA and applied linguistics is vital for an effective EFL teacher (Freeman 1989; 2004), while the other party holds a completely different stand (Tarone & Allwright, 2005).

The debate originates from a conflict between academic knowledge and practical knowledge and the question that which knowledge base should act as the core of EFL teacher knowledge domains (Zhu, 2013). Ever since professional reform occurred, there has been an instant need to develop a systematic and new knowledge base for language teacher education programs. Simply put, given the central role of language teachers' knowledge base in curriculum design and EFL educational reform, reconceptualizing EFL teachers' knowledge frameworks are considered essential (Zhu, 2013). According to Zhu (2013), there are three main reasons for revising EFL teachers' knowledge base:

- **The Need of Professional Movement:** Despite the fact that teaching was listed as a separate and legitimate college major at the end of 19th century, there have been many doubts and critiques on its quality (Zhu, 2013). Thus, the new movement of Teacher Education Reform gained major support as several reports were presented to enhance the quality of teaching as a profession (Shulman, 1987).
- **The Need of Bridging the Big Gap between Theory and Practice:** Regardless of the fundamental role of applied linguistics as a source for EFL teachers' knowledge base, it turned out to be a great waste after some teaching methodologies became unpopular (Richards, 2011; Jourdenais, 2009). Therefore it is reasonable to claim that *It is necessary to bridge theory and practice in teacher education and the first step is to undertake a new knowledge base* (Zhu, 2013).
- **The Need of Education Globalization:** A report of Transforming Teacher Education informed stated that *all systems of teacher preparation have to rethink their core assumptions and processes in the new global context* (Kumaravadivelu, 2011). The core assumptions in the traditional EFL teachers' knowledge frameworks assumed that an effective teacher education program must help teachers *comprehend*

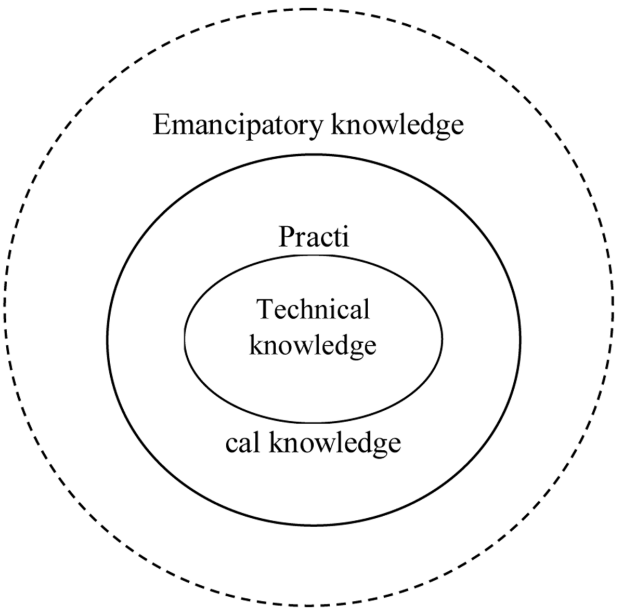
and eventually master the content knowledge (Kumaravadivelu, 2011). However, this is not the case in global context. Teachers must keep up with the expectations of the society and be able:

to play the role of reflective practitioner, who deeply think about the principles, practices, practices and processes of classroom instruction and bring to their task a considerable degree of creativity, artistry, and context sensitivity. (Kumaravadivelu, 2011)

Having these points mentioned, it is clear that re-conceptualizing EFL teachers' knowledge base is of utmost significance (Zhu, 2013).

In an attempt to propose a framework for EFL teachers' knowledge base that integrates theory and practice, Zhao (2009) presents a hierarchical categorizing method as shown in Figure 1. This figure presents EFL teacher knowledge base through a multilayer circle. In the act of teaching, educators must apply some or even all of these knowledge domains. There have been studies trying to investigate this method. For instance, Wang and Han (2005) point out the importance of maintaining a harmony between technical knowledge and practical knowledge. However, despite the fact that this method attempts to

Figure 1. EFL teaches' knowledge base (Zhao, 2009)



combine theory and practice, it has not been explored clearly by researchers and consequently, language teachers might find these abstract concepts hard to apply and digest (Zhu, 2013).

Fortunately, Tsui (2003) integrates the traditional and modern knowledge base methods. Although she classifies elements of EFL teachers' knowledge base separately, she asserts that *the delineation of teacher knowledge as consisting of separate domains is more analytical than real* (p. 247). She comes up with three features of relations among teacher knowledge bases, including *the integration of knowledge, in relation with specific context and situated possibility, theorizing (theorizing practical knowledge), and practicalizing (practicalizing theoretical knowledge)* (Tsui, 2003, pp. 246-257).

Moreover, in distinguishing novice and expert language teachers she finds that *the transformation of formal knowledge to personal practical knowledge through personal interpretation of formal knowledge in the teachers' own specific contexts of work* and *making explicit the tacit knowledge* (p. 265), are two critical attributes. To sum up, it is essential to reconceptualize EFL teachers' knowledge base through scientific investigations. It is vital that these investigations be based on teachers' need primarily, that is teachers can try to establish a proper revised knowledge base framework through self-reflective techniques (Zhu, 2013).

The Importance of Investigating EFL Teachers' Knowledge Base in CALL Era

Since technology is omnipresent in today's modern world, it is almost impossible for an ICT illiterate teacher to process teaching activities and tasks without resorting to technology. Hence, all teachers including EFL teachers are dealing with the urge to master ICT tools and technologies (Mishra, Koehler, & Kereluik, 2009). In agreement with this, Prensky (2006) stated that EFL teachers should be "digitalized" in order to keep up with the 21st century's modern students. In a technology enhanced language classroom, teachers must rethink *analogies, illustrations, examples, explanations and demonstrations* in order to make learning more accessible and convenient for students (Shulman, 1986). In other words teachers must revise their schemata and merge technology knowledge with their content and pedagogical knowledge. Nevertheless, technology should not be force-fed to teachers. Before integrating technology into the teaching process, some important

factors must be taken into account including teachers' present knowledge, students' needs, societal expectation and monetary and human resources (Liu, Liu, Yu, Li, & Wen, 2014).

Despite all the merits that come along with technology, it should be considered that every change needs some level of preparation. A radical jump from traditional chalk and board to smart boards for instance might be too overwhelming instead of effective for teachers (Liu, Liu, Yu, Li, & Wen, 2014). It is just like a 15-year old trying to learn a second language, if immersed in the target language environment completely, is more likely to choke rather than make considerable progress (Krashen, 1988). If teachers want to effectively integrate smart boards into their teaching for example, they *need to learn how to use an array of web resources, how to integrate digital technology with the subject he or she is teaching and how to plan his or her curriculum digitally* (Liu, Liu, Yu, Li, & Wen, 2014).

Considering what was presented, suffice it to say that teaching EFL for communicative purposes could not be achieved in a nonnative context without resorting to technology to create simulated environments for authentic learning (Liu, Liu, Yu, Li, & Wen, 2014). An EFL teachers' professional knowledge consists of two major categories: knowledge and practice. Cochran-Smith and Lytle (1999) classify three conceptions regarding the interrelations of EFL teachers' knowledge bases; namely knowledge-for-practice, knowledge-in-practice and knowledge-of-practice.

According to literature the first concept, knowledge-for-practice, is what distinguishes language teachers as different professionals compared to other fields. This knowledge involves *knowledge of subject matter, of the standards and content of the various professions, and of research-based strategies for effective teaching and classroom organization* and also technology knowledge for language teachers (Cochran-Smith & Lytle, 1999).

The second concept, knowledge-in-practice, which is acquired through experience and reflection is related to the dynamic nature of teaching in schools (Liu, Liu, Yu, Li, & Wen, 2014). According to Cochran-Smith and Lytle (1999), this knowledge is implicit and intangible which is only shaped through teachers' background knowledge and in collaboration with experienced teachers.

The third concept, knowledge-of-practice, is formed through a connection between formal knowledge and practical knowledge. Kennedy (1991) indicated that this knowledge help teachers practice teaching in the broad context of

society. To help teachers develop ICT knowledge in the form of knowledge-of-practice, teachers should be encouraged to reflect on their present teaching, identify problems, figure out solutions in regard of technology and generate new teaching concepts supported by technology (Liu, Liu, Yu, Li, & Wen, 2014). Administrative resources such as school district and school principals play an essential role in achieving this purpose. Research in this area validated this point claiming that school leadership is the crucial factor to guarantee the effectiveness of school reform (Leithwood, Day, Sammons, Harris, & Hopkins, 2006). Thus, the interactive integration of both bottom-up and top-down will gradually turn "digital immigrants" (Greenhow & Robelia, 2009) to be ICT native like language teachers whose knowledge of technology is normalized in a way that it is impossible to separate it from subject matter and pedagogical knowledge (Liu, Liu, Yu, Li, & Wen, 2014).

CONCLUSION

According to what was presented in this chapter, it is clear that the everyday process of teaching is very complex, and hence, it will only become more complicated while enriched with technological tools and affordances. Keeping the multi-layered teacher's knowledge base, it is only logical to claim that scrutinizing the framework for teachers' technological literacy will provide a lens for educators to implement innovations in their teaching process more effectively. The next chapter aims at exploring the academic framework for teachers' ICT knowledge, TPACK.

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Chapter 4
Technological Pedagogical Content Knowledge (TPACK): The Theory

ABSTRACT

This chapter addresses the theories underlying the construct TPACK. The chapter begins with reviewing the history and then the rationale of teacher knowledge base in the form of a multi-dimensional model taken from published literature. It also discusses how TPACK framework has developed and evolved in the last decade. Some seminal works whose authors have contributed greatly to the development of TPACK model are reviewed. Based on the theoretical frameworks and the findings of the empirical studies, a comprehensive list of the definitions of TPACK and critical issues regarding this framework are discussed. The chapter comes to its end by introducing the evolved model of TPACK, TPACK in-Action, in detail.

BACKGROUND

It is common sense between educators that teaching is a complicated profession that requires several types of specialized knowledge. This means that in order to make the most of this ill-structured discipline, teachers must be able to employ complex knowledge structures across multiple contexts (Mishra, Spiro, & Feltovich, 1996; Spiro & Jehng, 1990). In other words, teachers are under the constant pressure of empowering themselves technologically

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and pedagogically. Given the dynamic nature of the teaching environment, educators need to be flexible to evolve their understanding and develop their knowledge from well-organized and integrated domains (Glaser, 1984; Putnam & Borko, 2000; Shulman, 1986; 1987). These domains involve knowledge of the subject matter, students' learning, and most importantly, knowledge of technology. In the field of language learning, the word technology applies to both old (analog) and new (digital) technologies (Koehler & Mishra, 2009).

As technological determinist beliefs push educators to adapt themselves to technology, it is seen that ICT use is demanded by different groups outside of school; and teachers are expected to embrace this change accordingly. With this force upon change in the educational system, of course come some unintended consequences for the teachers; some good, some actually not so desirable (Pedersen, 2001). That is to say, despite the widespread integration of technological tools and software in peoples' everyday lives, using technology in education and language instruction has not always been successful.

This problem is created due to the lack of normal integration of technology in education that can have many reasons according to empirical findings. It is proposed that different personal, technical, pedagogical, socio-cultural, and institutional issues act as barriers in normalization of ICT in education (Mahdi, 2013). As a matter of fact, it is believed that the mission of integrating ICT into classrooms cannot be a truly positive and effective experience if the executers, in this case language teachers, do not possess the required knowledge and skills of using technology. Lack of teachers' skills and abilities in incorporating technology into the classroom is known to be one of the most important barriers to successful technology integration in the teaching process (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012). Recognizing the challenges of teachers in the route of ICT integration is a great step in finding a solution.

The first challenge is related to the characteristics of technological affordances. The traditional and modern pedagogical technologies have distinctive features which are characterized by three attributes: specificity, stability, and transparency (Koehler & Mishra, 2009). The function of traditional technologies is specified (a chalkboard is used for writing while a microscope is used to view objects), stable (chalkboards, microscopes, and pencils have not altered significantly over time), and transparent (the function of a pencil or a microscope is simple as it is directly related to their inner workings) (Simon, 1969).

Modern technologies on the other hand are adaptable (they can be used in many different ways), changeable (rapidly modified over time), and obscure (the functions and inner workings are hidden and not easily accessible for users) (Papert, 1980; Turkle, 1995). By their very nature, digital technologies introduce new challenges to teachers who are striving to utilize more technology in the teaching process (Koehler & Mishra, 2009). Understanding the challenges that teachers face in the path of technological integration is vital for comprehending the need of developing teachers' technological knowledge base.

Another obstacle that might complicate teaching with technology is the fact that technologies are not unbiased or neutral. In fact different technological tools and resources are characterized by exclusive affordances, constraints, and potentials (Bromley, 1998; Bruce, 1993; Koehler & Mishra, 2008). For instance, using e-mail has some potentials and constraints; it provides asynchronous communication and effortless storage of exchanges, however in the case of instant and synchronous communication, it has to accept defeat in the battle with phone calls and video calls. E-mail cannot provide the subtleties of tone, mood, body language, and intentions as face-to-face communications can. Being familiar with the distinct affordance and constraints of educational technologies can aid teachers in their professional development program (Koehler & Mishra, 2009).

Last but not least in the list of challenges that technology integration brings, are social and contextual factors. Despite the administration demands that impel teachers to include technology in their teaching routine, they are not as supportive as expected. Considering the fact that teachers often have inadequate knowledge base and skills when it comes to technology, adopting new methods of teaching with technology can be a huge struggle for them (Koehler & Mishra, 2009). Obviously the lack of knowledge to use technology creates a huge burden for teachers to integrate technology in the process of teaching (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012). In this condition, integrating technology into the teaching process seems unlikely unless it is consistent with teachers' existing pedagogical beliefs (Ertmer, 2005).

Facing the mentioned challenges, it is clear that technology integration is not a simple task for most teachers. That is to say that there is no '*one best way'* to do this job. In order for this idea to make more sense to teachers, an approach is required that treats teaching as a body of teachers' knowledge and its application in the classroom. Accepting the idea that teaching with technology is a complicated and ill-structured venture, teachers must find

new ways of comprehension in order to overcome the complexities of this process (Koehler & Mishra, 2009).

Nowadays, with the change in the approaches related to technology integration, this knowledge can be either technological knowledge (teachers' ability to use technology in general) or techno-pedagogical knowledge (teachers' ability to use technology in their instruction, in a way that it is effective by using proper class management techniques as one example) (Hew & Brush, 2007). This new knowledge base is associated with a scientific term in education called Technological Pedagogical Content Knowledge (TPACK). According to Yurdakul, et al. (2012), TPACK is a framework to describe teacher's knowledge and skills to integrate technology. It is one of the new frameworks that consider both teachers' technological and techno-pedagogical knowledge as being equally important and valid conceptions. Teacher knowledge as regarded by TPACK framework is not simply the ability to use technology; it is a complex interaction of three layers of knowledge within the TPACK framework: technology, pedagogy and content (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012).

The Development of TPACK Framework

TPACK is not a simple framework and this is due to the complicated nature of teaching profession to begin with. Knowing about technology and how to use it in everyday activities is just one part of the story; knowing how to integrate this knowledge into instruction using proper pedagogical skills and classroom management abilities is a whole different world. With that being said, it only makes sense to state that there are different conceptualizations for TPACK framework, each emphasizing some of the aspects of this knowledge as the core, and some other as supporting components. As discussed in the previous chapter, teachers' knowledge base has mostly focused on content knowledge (Shulman, 1986). However, according to literature review, research on TPACK can be divided into three main categories: (1) definition and measurement of TPACK; (2) effects of professional development on TPACK, and; (3) evolution of the TPACK model (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012).

The first phase of TPACK research was officially initiated when Koehler, Mishra, Yahya, and Yadav (2004) defined the TPACK framework in a qualitative study. This study has been suggested by researchers to be the first attempt to create a deep understanding of the complex interrelationships

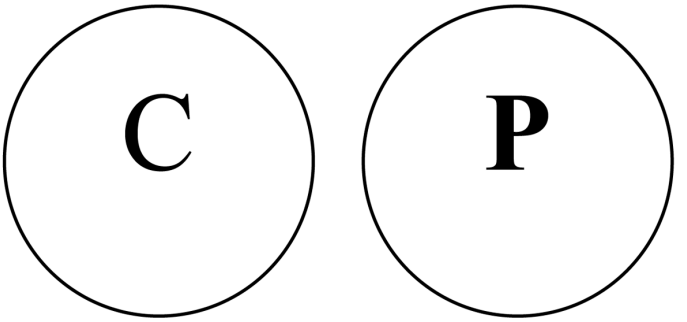
between content, pedagogy and technology knowledge and the contexts in which they occur (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012).

Following this phase, most research on TPACK focused on the important role of TPACK in professional development for pre-service and in-service teachers (Koehler & Mishra, 2005). Considering the second phase of TPACK research, a number of experimental studies have attempted to investigate whether teachers' professional development can influence their TPACK development level. Not surprisingly, it was found by most of these studies that teachers' professional development has a positive influence on developing teachers' level of TPACK (Doering, Veletsianos, Scharber, & Miller, 2009; Graham, Burgoyne, Cantrell, Smith, St. Clair, & Harris, 2009; Jang, 2010). The most comprehensive study in this regard was carried out by Wilson and Wright (2010). The participants of their study were two social studies' teachers and the research was conducted over a two-year period covering pre-service to in-service stage.

In terms of the third phase of TPACK research, several studies have tried to develop an integrated model of TPACK considering each dimension separately and also the relationship among the dimensions. Eventually teacher education programs evolved to emphasize pedagogy that is independent of subject matter as the primary knowledge bases for teachers (Ball & McDiarmid, 1990). Since then, different theoretical frameworks of teacher education programs based on 'content knowledge (C)' and 'pedagogical knowledge (P)' as separate domains. The two components of teacher knowledge could be presented as two independent circles (Figure 1) (Mishra & Koehler, 2006).

Shulman (1987) advanced his theory about teacher knowledge and addressed the dichotomy of content knowledge and pedagogical knowledge

Figure 1. Domains of teacher knowledge; content knowledge and pedagogical knowledge (Mishra & Koehler, 2006).



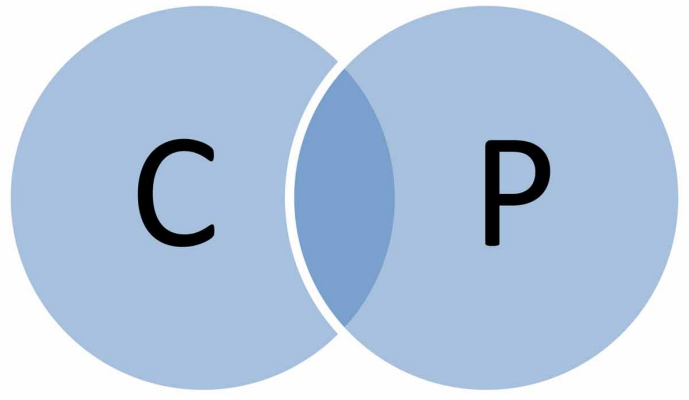
by introducing the notion of pedagogical content knowledge (PCK). As the name suggests, PCK is created as an intersection of subject matter (content) and pedagogy. It goes beyond the previous approach which was the isolation of these two domains. In agreement with these lines of research, he argued that the individual knowledge of content and pedagogy though essential, are not sufficient for an effective teaching process (Shulman, 1986). He focused on the necessity of PCK indicating that:

Pedagogical content knowledge is of special interest because it identifies the distinctive bodies of knowledge for teaching. It represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and Technological Pedagogical Content Knowledge adapted to the diverse interests and abilities of learners, and presented for instruction. (p. 8)

The interplay between content and pedagogy is portrayed in Figure 2. As observed in this figure, the two circles of Figure 1 are connected with the formation of PCK (Shulman, 1986).

The TPACK framework builds on Shulman's (1987; 1986) explanations of PCK to determine the complex relationships between content and pedagogy and how content is presented, adapted, and prepared for effective instruction. The conceptualization of TPACK framework has developed significantly

Figure 2. The two domains of content knowledge and pedagogical knowledge which are joined by PCK

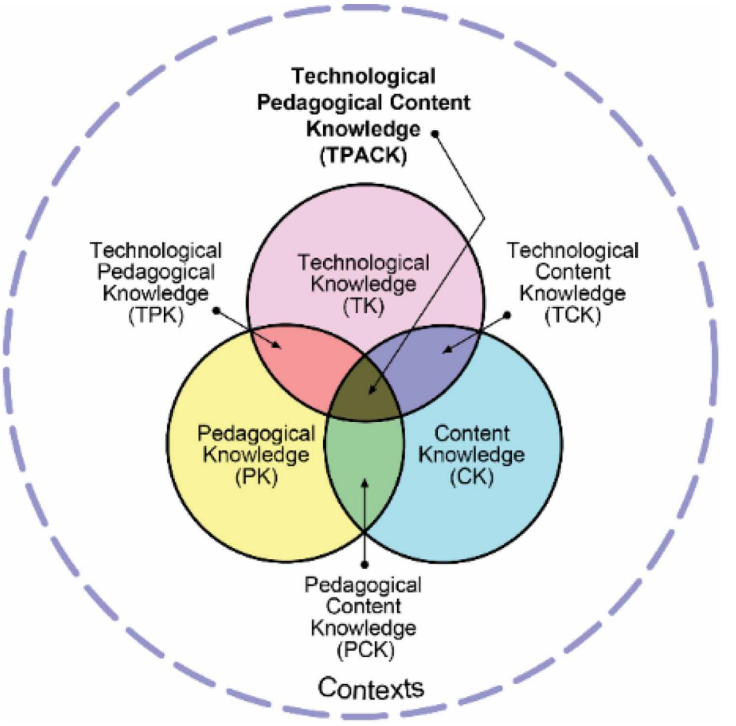


over time and through various series of publications (e.g. Mishra & Koehler 2006; Koehler & Mishra, 2008).

This model (Figure 3), consists of three main components of teachers' knowledge: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). As can be observed in Figure 3, there are other components in TPACK framework which are created as an interaction among the three domains of teacher knowledge within the framework of TPACK. These components include: TCK (Technological Content Knowledge), PCK (Pedagogical Content Knowledge), TPK (Technological Pedagogical Knowledge), and TPACK (Technological Pedagogical Content Knowledge). These components are considered equally important to the framework (Koehler & Mishra, 2009; Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012).

- **Content Knowledge (CK):** It is teachers' knowledge of the subject matter to be taught including knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as

Figure 3. The TPACK framework and its knowledge categories (Koehler & Mishra, 2009)



well as established practices and approaches toward developing such knowledge. The nature of this knowledge differs significantly among different fields (Koehler & Mishra, 2009). The damages made in the case that teachers lack a required amount of content knowledge are not always recoverable. Giving incorrect information to students might cause them to develop misconceptions about the subject matter (National Research Council, 2000; Pfundt, & Duit, 2000).

- **Pedagogical Knowledge (PK):** It is a deep and generic form of knowledge which involves comprehending teaching processes and methodologies. This area of knowledge involves using classroom management techniques and understanding lesson planning, student assessment and how different students learn. A pedagogically literate teacher is aware of students' cognitive processes such as the development of mind habits, motivation, and positive or negative dispositions about learning. With that being mentioned, in order to build an appropriate pedagogical knowledge base, teachers need to be familiar with developmental, cognitive, and social theories of learning (Koehler & Mishra, 2009).
- **Technological Knowledge (TK):** This knowledge is greatly dynamic in nature, more than the other fundamental knowledge domains in the TPACK framework. As defined by Mishra and Koehler (2006). TK comprises *skills to operate technologies such as installing or removing devices/software programs, or creating and archiving documents* and *abilities to learn and adapt to new technology* (pp.1027-1028). Schmidt et al. (2009) add to this definition suggesting that TK also encompasses the ability:

to solve technical problems, to learn technology easily, to keep up with important technology, to play around with technology, to know a lot of technologies, to have technical skills and to have opportunities to work with different technologies. (p.145)

The definition of TK used in the TPACK framework is similar to that of Fluency of Information Technology (FITness), as presented by the Committee of Information Technology Literacy of the National Research Council (NRC, 1999). FITness notion claims to go beyond the traditional conceptualizations of ICT literacy, to the convenient application of technology into work and everyday life, to recognize situations in which technology can facilitate or hinder a function, and to adapt with technological developments constantly.

Therefore, FITness is a much deeper knowledge base compared to the traditional ICT literacy and it encompasses information processing, communication, and problem-solving skills. This form of knowledge does not consider an "end state" and is rather developmental, evolving, and open-ended (Koehler & Mishra, 2009).

- **Pedagogical Content Knowledge (PCK):** As defined by Shulman (1986) PCK is the knowledge of:

…. the most regularly taught topics in one's subject, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations and demonstrations … including an understanding of what makes the learning of specific concepts easy or difficult: the concepts and preconceptions that students of different ages and backgrounds bring with them to the learning. (p. 9)

Consistent to Shulman's (1986) concept of PCK, this flexible knowledge is formed as the teacher interprets the subject matter, seeks various ways to present it, and adapts and modifies the instructional material to match students' background knowledge. PCK creates links among curriculum, pedagogy, and evaluation (Koehler & Mishra, 2009).

- **Technological Content Knowledge (TCK):** According to research there is a deep and historical relationship between technology and content. The advent of technology has had major influence on the fields of science, physics, history, medicine, and archeology. The impact of technology on the mentioned fields has led to fundamental and permanent changes. Recognizing the effects that technological tools and resources bring to practices of a particular discipline is crucial for developing ethnological affordances for educational purposes.

Although the choice of some ICT tools might aid or hinder representing particular content areas, it can provide the opportunity for flexible navigation among and across disciplines. Hence, mastering TPK equals comprehending the manner in which content and technology are influenced and restrained by each other. Teachers must be able to choose, understand, and effectively utilize technologies that best suit the demands of the specific subject matter to be taught (Koehler & Mishra, 2009).

- **Technological Pedagogical Knowledge (TPK):** According to Koehler and Mishra (2009) TPK is defined as:

An understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies. To build TPK, a deeper understanding of the constraints and affordances of technologies and the disciplinary contexts within which they function is needed. (p. 65)

TPK becomes extremely vital considering the fact that most popular software programs such as Microsoft Office Suite (Word, PowerPoint, Excel, Entourage, and MSN Messenger) are usually designed for business environments and not primarily for educational purposes. Other types of technologies such as podcasts and web-based technologies are usually known to be in the entertainment, communication, and social networking territory. Teachers must be able to ignore these fixed classifications (Duncker, 1945) and restructure the functions of ICT tools to meet their classroom needs. Thus, this knowledge does not view the use of ICT for its own sake, but for improving students' learning and understanding (Koehler & Mishra, 2009).

- **Technological Pedagogical Content Knowledge (TPACK):** This knowledge goes beyond the three *'basic'* elements of TPACK framework (content, pedagogy, and technology); it is rather an understanding created as an interaction among these layers of knowledge *by simultaneously integrating knowledge of technology, pedagogy and content* (Koehler & Mishra, p.66). As declared by Koehler and Mishra (2009) TPACK:

Is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones. (p.66)

The importance of integrating the separate bodies of teacher knowledge into the unified TPACK framework is visible in situations where the introduction of a new technology pushes teachers to keep the equilibrium among the knowledge bases. This confirms the difficult nature of teaching with technology, and the need for teachers to develop their technological knowledge alongside other required knowledge domains constantly (Koehler & Mishra, 2009). Table 1 contains a short summary of the definitions and examples for each of these seven dimensions synthesized from literature review (Cox & Graham, 2009; Koehler & Mishra, 2009; Mishra & Koehler, 2006 cited in Chai, Koh & Tsai, 2013).

Table 1. Definition and examples of TPACK dimensions

TPACK Constructs	Definition	Example
TK	Knowledge about how to use ICT hardware and software and associated peripherals	Knowledge about how to use Web 2.0 tools (e.g., Wiki, Blogs, Facebook)
PK	Knowledge about the students' learning, instructional methods, different educational theories, and learning assessment to teach a subject matter without references towards content	Knowledge about how to use problem-based learning (PBL) in teaching
CK	Knowledge of the subject matter without consideration about teaching the subject matter	Knowledge about Science or Mathematics subjects
PCK	Knowledge of representing content knowledge and adopting pedagogical strategies to make the specific content/ topic more understandable for the learners	Knowledge of using analogies to teach electricity (see Shulman, 1986)
TPK	Knowledge of the existence and specifications of various technologies to enable teaching approaches without reference towards subject matter	The notion of Web quest, KBC, using ICT as cognitive tools, computer-supported collaborative learning
TCK	Knowledge about how to use technology to represent/research and create the content in different ways without consideration about teaching	Knowledge about online dictionary, SPSS, subject specific ICT tools e.g. Geometer's Sketchpad, topic specific simulation
TPACK	Knowledge of using various technologies to teach and/represent and / facilitate knowledge creation of specific subject content	Knowledge about how to use Wiki as an communication tool to enhance collaborative learning in social science

Issues With the TPACK Framework

Despite the fact that the TPACK framework has made significant contributions to the field of educational technology, *a number of theoretical concerns have continued to be raised in the literature* (Jordan, 2014).

The first issue lies with the ambiguous definitions of the seven TPACK components (Chai, Koh, & Tsai, 2010.; Graham, 2011; Jordan, 2014). In her doctoral study, Cox (2008) declared that there were at least 89 definitions of TPACK framework and its categories by 2008. For instance, in an attempt to define PCK, Priest (2007) proposed two different ways. In the first approach, he focused on the concept linguistically and viewed PCK as consisting of content knowledge as a compound noun, and pedagogical knowledge as its adjective. Thus, he defined PCK as a form of subject matter that is in agreement with pedagogical purposes. In the second perspective however, he believed that PCK is a form of teachers' decision-making skills that can be affected by different subject matters and educational contexts.

So and Kim (2009) also proposed a definition for the TPACK framework which included only five constructs. These were: 1) CK; *knowing about what to teach;* 2) PK; *knowing about how to teach in general;* 3) TK; *knowing about various technical tools and their capabilities;* 4) PCK; *knowing about how to teach particular subject matter content,* and; 5) TPCAK; *knowing about how to represent subject matter with technology in pedagogically sound ways.*

In addition to inconsistent definitions, the other challenge with the TPACK components is defining boundaries between them (Jordan, 2014). In line with this, Graham (2011) argues that:

many researchers who have made serious attempts at measuring TPACK constructs have been challenged by the difficulty the model presents in distinguishing boundaries between the constructs in the model (p. 1957).

For instance, the boundaries between TCK and TPK constructs are viewed as *fuzzy indicating in their view a weakness in accurate knowledge categorization or discrimination* (Angeli & Valanides, 2009).

According to researchers, another main issue with the TPACK framework is related to the operation of these seven elements (Dinh, 2015). Regarding this dilemma, Archambault and Crippen (2009) stated that *these domains seem[ed] confounded and … difficult to separate …* (p.74). However, Cox and Graham (2009) represented a whole different perspective emphasizing TPK and TCK's independence from CK and TK elements respectively. They

elaborated that TPK that is *knowledge of the general activities that a teacher can engage using emerging technologies [should be] …independent of a specific content or topic-CK*, and also TCK that:

refers to a knowledge of the topic-specific representations in a given content domain that utilize emerging technologies [should be] …independent of knowledge about their use in a pedagogical context-PK. (p. 64)

So far it can be concluded from the above discussion that teachers' knowledge to integrate technology is complicated in nature and is affected by multiple factors (Dinh, 2015). In order to address this issue, several studies have tried to develop an integrated model of TPACK considering each dimension separately and also the relationship among the dimensions. However, the number of studies with the focus of TPACK as a unified and consistent body are very limited (Archambault & Crippen, 2009).

Despite the fact that TPACK is the basis of technological knowledge framework, early conceptualizations of TPACK framework focused on seven distinct components of technology knowledge (TK, PK, CK, TPK, TCK, PCK, and TPACK) (Shahin, 2011; Shmidt, Baran, Thompson, Koehler, Mishra, & Shin, 2009). In agreement with the following studies, Brantley-Dias and Ertmer (2013) stated that *TPACK should … become embedded within other aspects of teachers' knowledge, i.e., CK, PK and PACK* (p. 117). They thus suggested that TPACK should be conceptualized as *concentric, rather than intersecting circles*. This lack of attention to investigate the main component TPACK as a whole leads to the development of a more comprehensive framework of TPACK considering all these separate parts along with the main component. It might be safe to say that the study that has been carried out in 2012 by Yurdakul and associates has been successful in developing a consistent and comprehensive framework (TPACK-deep scale, Figure 4) as it includes technology integration in classrooms based on different competencies and components in the teaching-learning process.

Figure 4 (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012) shows the new TPACK framework consisting of four sub-components of design, exertion, ethics and proficiency. Design factor refers to teacher's ability to create and develop curriculum plans, and combining proper technological tools and resources to enhance the teaching and learning situation. Exertion refers to the ability to implement the design plans in the teaching and learning situation and also using appropriate technologies to assess and evaluate students learning. Ethics factor focuses on the ability to consider copy right issues and

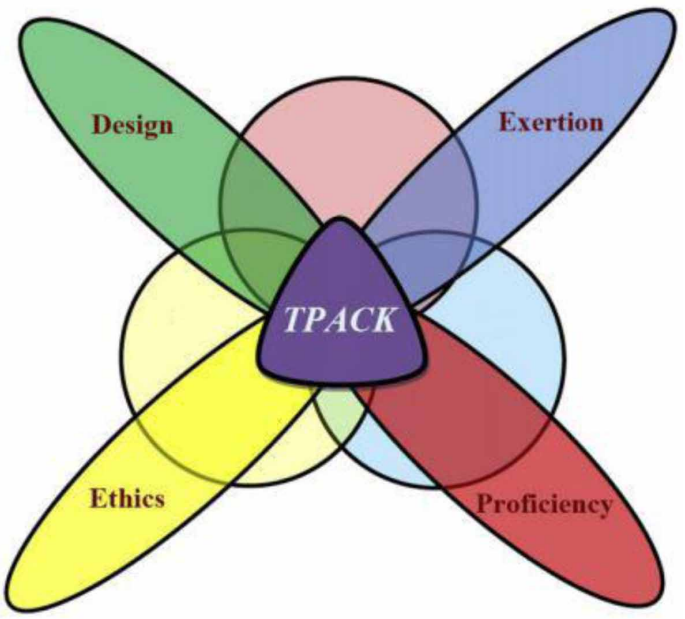
show ethical behavior as a professional in online educational environments and also when using technological tools and resources. Last but not least is the proficiency factor which refers to teachers' leadership ability to integrate technology into the teaching process in the most effective way (ISTE, 2000; 2008; Niess, Ronau, Shafer, Driskell, Harper, & Johnston, 2009).

TPACK in Action: Is It Important?

In sum, these studies make a great contribution to understanding of the ways TPACK construct is developed within educational contexts. However, regardless of the fact that the focus of most TPACK approaches revolves around the technology component, more attention is needed to investigate the design and implementation of CALL-based teacher education courses in order to maximize the successful ICT integration (Tai, 2013).

In agreement with previous lines, Kereluik et al. (2012) stated that: *there has been a significant effort in developing coherence at multiple levels, multiple instructors and graduate students, multiple methods of delivery, including face to face, online, and hybrid* (p. 4719). Literature emphasized

Figure 4. The framework and factors of TPACK-deep scale (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012)



the roles of power of experience (Dewey, 1938) and knowledge of practice (Schon, 1983) in shaping a deeper and more efficient TPACK for teachers. The deduction is that the implemented TPACK programs helped teachers gain a more comprehensive understanding of technology since they provided opportunities to learn TPACK by using it, instead of learning about TPACK (Kereluik, Mishra, Hagerman, Wolf, DeSchryver, Fisser, & Spicer, 2012).

Hence, ICT-based teacher education programs should be situated in authentic contexts in order to function efficiently (Slaouti & Motteram, 2006; Hampel & Stickler, 2005; Chapelle & Hegelheimer, 2004; Thompson, Bull, & Willis, 1998; Duffield, 1997) and present more than mere technology knowledge for teachers (Kessler & Plakans, 2008; Levy & Stockwell, 2006; Hegelheimer, 2006; Peters, 2006; Hubbard, 2004; Chisholm & Beckett, 2003; Bennet & Marsh, 2002; Levy, 1997).

In line with the above discussion, Levy (1997) suggested a more holistic view towards teachers rather than focusing on whether or not teachers are educated to be technology experts. Thus, as Chapelle (2003) declared *the way that students will learn to do applied linguistics with technology is by learning applied linguistics through technology* (p. 31), teachers must learn to utilize technology through first hand experiences. Slaouti and Motteram (2006) confirm the importance of authentic and novel experiences for online teaching environments when they suggest that *teachers need to learn about online learning through online learning* (p. 89).

Fig and Jaipal (2012) developed a new TPACK framework to address the necessity of experience for teachers' computer education courses named *'TPACK-in- Practice'* model. In an attempt to distinguish itself from traditional technology-based TPACK framework, this model views technology as a stream flowing and influencing teachers' content and pedagogical knowledge (Tai, 2013). This is in line with previous research in the field of teacher education that suggested active learning and collective participation alongside content can comprise an effective professional development program for teachers (Desimone, 2009).

That is to say, in an ICT-based language classroom, content should still play the fundamental role while proper technological affordances should be adopted through sound pedagogical decisions (Tai, 2013). In addition, this model focuses on the role of reflective practices in developing teachers' TPACK in ICT-based educational courses as they can enhance teachers' awareness about the teaching process and trigger positive outcomes (Liou, 2001; Kullman, 1998; Ho & Richards, 1993). *Reflection in action* (during learning), and *Reflection on action* (after learning) are considered to be

crucial factors in helping teachers build a bridge between theory and practice (Schon, 1983; 1987). Hence, the TPACK-in-Action model consists of five elements: (1) Modeling; (2) Analyzing; (3) Demonstrating; (4) Application; and (5) Reflection (Figure 5) (Tai & Chuang, 2012).

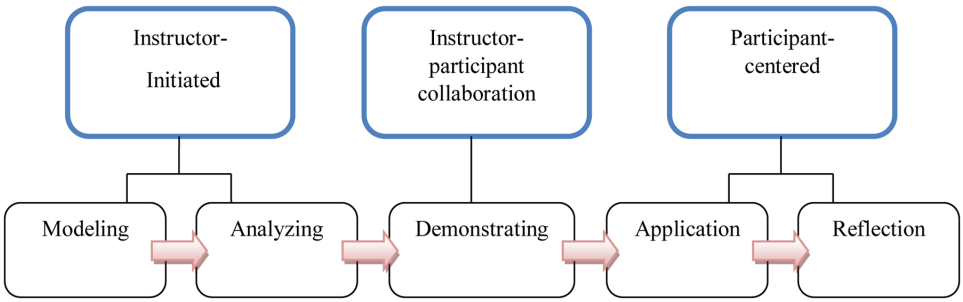
As can be observed in the above Figure 5., instructors and learners both take responsibility for ICT integration in the process of teaching. As Lawless and Pellegrino (2007) proposed:

A design-based approach affords teachers the opportunity to learn how to use specific technologies situated in the context of their curricular needs. As a result, teachers take more ownership of the resources, have higher confidence in integrating the unit as a teaching tool, and are more likely to believe that the curriculum resources will have a positive impact on student achievement. (p. 594)

The five steps of TPACK in Action model are briefly discussed in the following section:

- **Modeling:** This would be the first step to situate teachers in the CALL context in line with what was mentioned previously by Chapelle (2003) that *the way that students will learn to do applied linguistics with technology is by learning applied linguistics through technology* (p. 31). In this step, a CALL function is modeled by the workshop instructor in order to provide an opportunity for language teachers to experience and witness an authentic CALL utilization in action (Kessler & Plakans, 2008; Hughes, 2005). Modeling can be helpful for teachers in the sense why they can see the direct relevance of CALL usage in the teaching context while they can also witness the challenges and

Figure 5. TPACK in Action model (adapted from Tai, 2013)



benefits associated to it; and *thereby contributing to greater confidence in their instructional ability* (Ross, Hogaboam-Gray, & Hannay, 1999).

- **Analyzing:** This step enables teachers to make connections between the modeled CALL activity and making decisions related to why and how certain technological and pedagogical resources are selected to meet particular goals (Tai, 2013). This element is related to a notion proposed by Chapelle and Hegelheimer's (2004) when they indicated that knowing how to utilize technology is not sufficient for language teachers; they should also be aware of the reasons that they are doing so. Hence, analyzing step within the TPACK framework is essential for observing connections, affordances, and constraints among content, pedagogy, and technology and how these relationships can lead to successful ICT implementation (Tai, 2013).
- **Demonstrating:** During this step, teachers gain a more comprehensive understanding about the navigation of each technological tool or resource, through clear, step-by-step instructions. They not only learn about specific properties of the ICT tools used in the modeled activity in great detail, they are required to develop activities and tasks, individually and collaboratively using those devices. This provides a great environment for teachers to demonstrate their comprehension and skills, and grasp their function in relation to a specific content and context, which can eventually enhance their self-confidence (Hoven, 2007; Hughes, 2005).
- **Application:** In this stage, it is time for teachers to put their knowledge into an actual lesson plan, and attempt to teach materials from textbooks using the learned technological tools in a group. The group work stimulates learning among teachers as they strive to not only focus on the three knowledge domains (content, pedagogy, and technology), but the interrelations among them (Kamhi-Stein, 2000). They are provided with peer feedback after completing the lesson plans. One or two groups of teachers might voluntarily teach their lesson plan which itself acts as a model for colleagues. This final presentation brings teacher a step closer in gaining a realistic perspective about technology integration (Tai, 2013).
- **Reflection:** Last but certainly not least in TPACK in Action model is the reflection stage. Teachers are provided with a model based on which they should reflect on the learning steps that occurred in the program. The significance of reflection is secret to none as Kullman (1998) noted that *reflection […] will lead to a greater awareness among student*

teachers of what constitutes appropriate pedagogic practice and will lay the foundation for development (pp. 471 -472). The reflections in the TPACK in Action model are carried out individually (through an online questionnaire), or collaboratively (through online communities). Either way, these reflections are shared among teachers to give them a chance to benefit from peers' comprehension and perspectives (Kamhi-Stein, 2000).

TPACK in Action model supports practical and experiential ICT-based programs and tries to identify language teachers' technological competence in light of particular content and educational context. It provides opportunities for language to teachers to witness contextualized technology use in action, participate in hand-on-activities, create lesson plans, and teach collaboratively using technology. As a result, in agreement with the complexity of teachers' technology knowledge, this model goes beyond considering domains of content, pedagogy and technology as separate components, but rather as an integrated unit (Tai, 2013).

CONCLUSION

This chapter presented different academic models and frameworks for teachers' Technological and Pedagogical Content Knowledge (TPACK). The different elements of each framework were elaborated in detail. Given the important role of educators for preparing learners to adopt technological affordances more effectively, there has been a great interest among scholars in this field to explore the TPACK construct and factors influencing it. The following chapter presents research agenda of TPACK framework from traditional to modern era and some theoretical and empirical studies would be reviewed and discussed briefly.

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Chapter 5
Technological Pedagogical Content Knowledge (TPACK): Research Agenda

ABSTRACT

This chapter gives a brief review of literature of TPACK and the variables researchers have focused on during the past decade. The review of literature is divided into four parts: the research done on the emergence of the model and the educationists' works on the theoretical aspects of TPACK; how certain researchers have tried to validate the TPACK model and the contradictions they revealed in the process; the assessment of the model in the context of teaching and the way TPACK can be related to other attributes of teachers and their context of teaching; and finally the measures of TPACK including both subjective and performance measures.

BACKGROUND

Since the advent of the conceptual model of TPACK several studies have been done to scrutinize the validity of the model, discovering teachers' perceptions of the model, assessing the construct, and probing into possible ways to integrate the model into teacher education programs to empower teachers accordingly. In this chapter, a quick review of the studies done with respect to the above mentioned aspects would be done and their findings would be discussed briefly.

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The Emergence of the Model

One of the early models of TPACK was proposed by Pierson (2001) who based on a survey discussed the integration of technology into pedagogical expertise. She investigated how teachers at various levels of technology use and teaching ability used technology in instruction; and how technology use was related to general teaching practice. Based on the empirical data and the literature available at the time, she suggested that another component, technological knowledge, should be added to the knowledge base of teachers. According to her findings,

this knowledge would include not only basic technology competency but also an understanding of the unique characteristics of particular types of technologies that would lead themselves to particular aspects of the teaching and learning process. (p. 427)

In another study, Angeli and Valanides (2005) discussed the evolution of an instructional systems design (ISD) model based on an expanded view of Shulman's concept of pedagogical content knowledge (PCK). The proposed ISD model was suggested to be useful in educational technology courses, elementary teacher education method courses, and teacher professional development courses to develop information and communication technology (ICT)-related PCK. The findings of the study revealed that the evolved model was effective in developing some aspects of ICT-related PCK.

In a series of studies, Kohler and associates (Kohler & Mishra, 2005) presented Technological Pedagogical Content Knowledge (TPACK) as a framework for the integration of technology within teaching. In this model, that is the most frequently referred to in the recent literature on TPACK (See Chapter 4), three main bodies of knowledge – technological knowledge, content knowledge, and pedagogical knowledge – shape the design of the theoretical framework. The characteristics of these three bodies of knowledge, along with the bodies of knowledge that emerge from the interactions between and among them (7 types of competencies) are discussed in the published works. They argue that knowing how to integrate technology emerges from an understanding both of the three main bodies of knowledge and their interactions. TPACK framework is argued to have significant implications for teachers and teacher educators. Therefore, TPACK is *a conceptualization of the knowledge base teachers need to effectively teach with technology* (Voogt, Fisser, ParejaRoblin, Tondeur, & van Braak, 2012).

The Validation of the Model

While TPACK framework was still developing, certain researchers scrutinized the validity of the model by utilizing certain qualitative and quantitative research methods.

In one of these studies, Archambault and Barnett (2010) examined the nature of technological pedagogical content knowledge (TPACK) through the use of a factor analysis. The used a survey with 24 items designed to measure each of the areas described by the TPACK framework to measure the responses of 596 teachers from across the United States. Data analysis suggested that while the framework was helpful from an organizational standpoint, it was difficult to separate out each of the domains, calling into question their existence in practice. Three major factors became evident, but rather than being comprised of pedagogy, content, and technology, the only clear domain that distinguished itself was that of technology. Examining the validity of the TPACK model, it was suggested that measuring each of the domains of the framework is complicated, potentially due to the notion that they are not separate.

In their study, Angeli and Valanides (2009) investigated the theoretical framework of TPACK proposed by Kohler. They first raised several issues regarding the epistemology of technological pedagogical content knowledge (TPCK) for the purpose of clarifying the construct. They concluded that TPCK was a unique body of knowledge constructed from the interaction of its individual contributing knowledge bases. They introduced ICT–TPCK as a strand of TPCK described as the ways knowledge about tools and their affordances, pedagogy, content, learners, and context were synthesized into an understanding of the way teachers can teacher more effectively with technology and students can learn better in this situation. One model for the development and another for the assessment of ICT–TPCK were then discussed. Three forms of assessment (expert assessment, peer assessment, and self-assessment) were proposed for assessing teachers' competencies to teach with technology. The study also reported the empirical findings of a study that was under taken to investigate the impact of the proposed models on student learning. The results indicated that ICT–TPCK competency significantly improved over the course of a semester, supporting the theoretical models.

Cox and Graham (2009) investigated the relationship between TPACK and PCK and proposed certain problems with the framework. Discussing the fact that TPACK is *teacher's knowledge of how to coordinate subject- or*

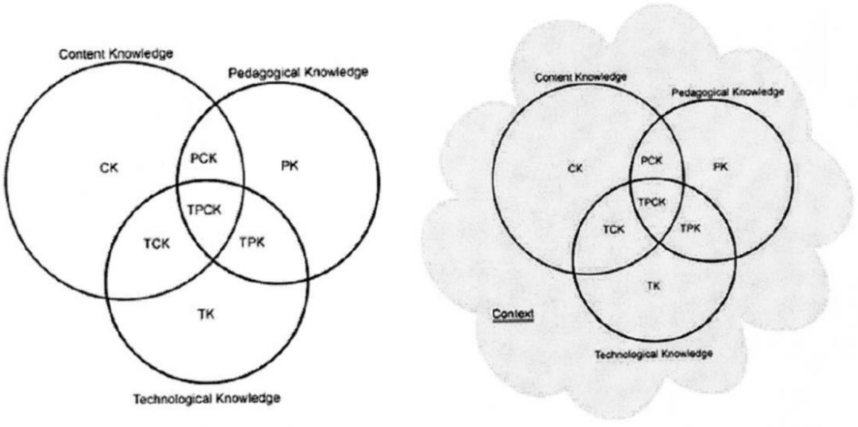
topic-specific activities with topic-specific representations using emerging technologies to facilitate student learning (p. 64), they concluded that there is no need for a separate conceptual model of TPACK as these competencies would be integrated in PCK.

In another conceptual study, Graham (2011) investigated the TPACK framework as it is increasingly in use by educational technology researchers around the world. He believed that TPACK framework is appropriately designed; however, considerable theoretical work is required if TPACK research aims at strengthening the field of educational technology. Using Whetten's (1989) criteria for theory building as a lens for examining the TPACK framework, he reported specific weaknesses of the model that needs theoretical development. His findings underscored the use of research findings to constructively build common definitions and understandings of the TPACK constructs and the boundaries between them.

Doering et al. (2009) used the TPACK framework to investigate the relationship between theoretical aspects of the model and the way it can be applied in a teacher training program. In-service teachers who went through the TPACK-based program experienced considerable improvement within the TPACK knowledge domains and expressed positive and encouraging comments regarding their knowledge domains portrayed within the TPACK framework. However, based on the findings of the study, certain limitations were reported to exist for TPACK framework that urges a modification of the model. They suggested that knowledge use in the model can be represented by differing size circles (Figure 1). The diagrams show a teacher who encompasses a content dominated knowledge base, while context can be viewed as a variable that engulfs the whole figure as it influences the way teachers' knowledge is applied and used in the classroom.

In a recent study, Koh, Chai, and Tay (2014) considered TPACK framework as a base for investigating the application and validation of the framework in certain teaching contexts. They described TPACK-in-Action, as a framework to visualize the interplay between TPACK and four contextual factors (Physical/Technological, Cultural/Institutional, Interpersonal, and Intrapersonal) that influence teachers' design of ICT lessons. The framework was used to analyze the lesson design discussions of 24 school teachers. The findings showed that when intrapersonal factors such as beliefs of teaching and students were articulated and its pedagogical implications considered, it facilitated TPACK. They suggested that for ICT innovation to be successful, the composition of design teams should be carefully considered.

Figure 1. An updated view of TPACK (Doering, Veletsianos, Scharber, & Miller, 2009, p. 337)



The findings of studies on the validation of TPAC show that three views on TPCK have developed over time:

T(PCK) as extended PCK (Niess 2005; Cox & Graham 2009); TPCK as a unique and distinct body of knowledge (Angeli & Valanides 2009); and TP(A)CK as the interplay between three domains of knowledge and their intersections and in a specific context (Koehler & Mishra 2005; 2008; Voogt, 2012).

TPACK IN THE CONTEXT

Prior to the Development of TPACK Framework

A few studies have been done on the construct technological pedagogical knowledge of the teachers, prior the introduction of the TPACK framework. The theoretical basis of these studies was Shulman's model of teacher knowledge base.

In a pioneering study, Keating and Evans (2001) examined interviews and survey data of a small group of pre-service teachers to look at the disconnect between using technology with confidence for personal use and using technology as an educator and *get a sense of how teaching with technology fits into [their] student teachers' evolving pedagogical content knowledge* (p. 1672). The study suggested possible sources for this disconnect, and offered

an alternative conception of technology in education that was defined as technological pedagogical content knowledge (TPCK). This concept extends beyond computer proficiency to understanding the effect technology may have on student's conceptions of the subject matter, as well as the inevitable challenges that accompany technology, and the judicious use of technology when new forms of representation are most appropriate.

In another study, Margerum-Leys and Marx (2002) first investigated the construct of teacher knowledge of educational technology through the lens of three components of Shulman's model of teachers' knowledge-content knowledge, pedagogical knowledge, and pedagogical content knowledge. Then they investigated the ways in which teacher knowledge is acquired, shared, and used by student teachers and their mentors in the context of teaching. The result of the study based on Shulman's model, offered that the teacher knowledge of educational technology developed within a particular setting. It was also found that employing Shulman's model revealed a set of knowledge derived from and applicable to practice with educational technology. This knowledge could be considered a Pedagogical Content Knowledge of technology, corresponding to Shulman's identification of a particular understanding by teachers. Within the context of the mentor/student teacher pairs, both knowledge acquired in and brought to the setting was shared in a multi-year cycle from student teacher to mentor to subsequent student teacher.

In a following study, Niess (2005) investigated the development of pre-service teachers' pedagogical content knowledge (PCK) with respect to integrating technology in instruction. Four components of PCK were adapted to describe technology-enhanced PCK (TPCK). The study examined the TPCK of student teachers in a multi-dimensional science and mathematics teacher preparation program that integrated teaching and learning with technology throughout the program. Five cases described the difficulties and successes of student teachers teaching with technology in molding their TPCK. Student teachers' view of the integration of technology and the nature of the discipline were identified as an important aspect of the development of TPCK.

Stoilescu (2015) explored the Technological Pedagogical Content Knowledge (TPACK) for three experienced mathematics secondary teachers. By using a multiple case study, teachers' attitudes, skills, and approaches toward the use of Information and Communications Technology (ICT) in classrooms were described. By being aware of the three main facets of TPACK (technological, pedagogical, and mathematical aspects), the relative importance of each component and their intersections were scrutinized. Although from the same school, the teachers were found to have very different

conducts of showing their integration of ICT in mathematical pedagogy and therefore, their TPACK was different. Teachers demonstrated various strategies and different paces of adopting ICT. It was noticed that the teachers integrated technology for the following main reasons: (a) help them describe the concepts to students; (b) motivate students to learn mathematics; (c) give students opportunities to experiment with mathematical concepts and skills; (d) assess, evaluate, and provide feedback to student's work, and; (e) help them communicate mathematical solutions.

Measuring TPACK

After defining and consolidating the TPACK framework, one basic issue researchers had TPACK was measuring the construct of TPACK and its seven interrelated components.

In a pioneering study, the developers of the framework, Mishra and Koehler (2005) designed a quantitative survey instrument to measure TPACK through assessing perceptions of six component including: (a) time and effort; (b) learning and enjoyment; (c) group functioning; (d) perceptions of online leaning, and; (e) thinking about TPACK.

In another effort to develop a self-assertion subjective measure, Schmidt, et al. (2009) developed Survey of Pre-service Teachers' Knowledge of Teaching and Technology, for pre-service teachers who were preparing to become elementary (PK–6) or early childhood education teachers (PK–3). They developed and validated an instrument based on TPACK framework and related knowledge domains that are included in it. The TPACK instrument included 47 items that clustered in 7 subscales. The scale and its components showed high indices of reliability. Many studies have used the scale ever since. Some have reported certain reliability and validly issues.

In a recent study, Yurdakul et al., (2012) developed and validated the TPACK scale based on TPACK-in Action model. The scale has four sub-scales including Design (10 items), Exertion (12 items), Ethics (6 items), and Proficiency (5 items). The questionnaire anchors on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The validity study of the TPACK scale form also included the calculation of the discrimination validity (Yurdakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012). As a result of this calculation, it was revealed that each of the items found in the scale significantly discriminated the individuals belonging to the lower and higher groups. The Cronbach alpha coefficient for the scale as a whole was reported to be .95.

In addition to subjective measures of TPACK, a few studies have tried to develop performance-based TPACK measures.

Underlying the development of the performance-based measures is the idea that the products of student work are evidence of pre service teachers' instructional design and planning process (Abbit, 2011).

Harris, Grandgenett, and Hofer (2010), for instance, developed a TPACK-Based Technology Integration Assessment Rubric that reflects key TPACK concepts. The instrument's inter-rater reliability coefficient (.857) was computed using both Intraclass Correlation and a score agreement (84.1%) procedure. Internal consistency (using Cronbach's Alpha) was .911. Test-retest reliability (score agreement) was 87.0%. Five TPACK experts also confirmed the instrument's construct and face validities.

Some researchers have also used qualitative measures of TPACK or have triangulated the findings of qualitative studies by qualitative data gained by interviews or observations. Hofer et al. (2011) believes that:

The challenges inherent in assessing teachers' knowledge accurately via self-reports-in particular, that of inexperienced teachers-are well-documented. Unfortunately, measured gains in teachers' self-assessed knowledge over time reflect their increased confidence regarding a particular professional development topic more than their actual increased knowledge in practice (Lawless & Pellegrino 2007; Schrader & Lawless 2004). Self-report data should therefore be triangulated carefully with external assessments of teachers' TPACK knowledge. (p. 4353)

Burgoyne, and Borup (2010), used three instructional scenarios that were randomly selected and unique to the content area and grade level to investigate teachers' planning and decision making. They asked the participants to describe two instructional strategies: one instructional strategy that used technology and one strategy that did not use technology. They then developed a coding scheme that included the domains of TK, TPK, and TPACK. The also identified additional category codes and themes within each of these three domains to further classify responses within the domains from the TPACK framework.

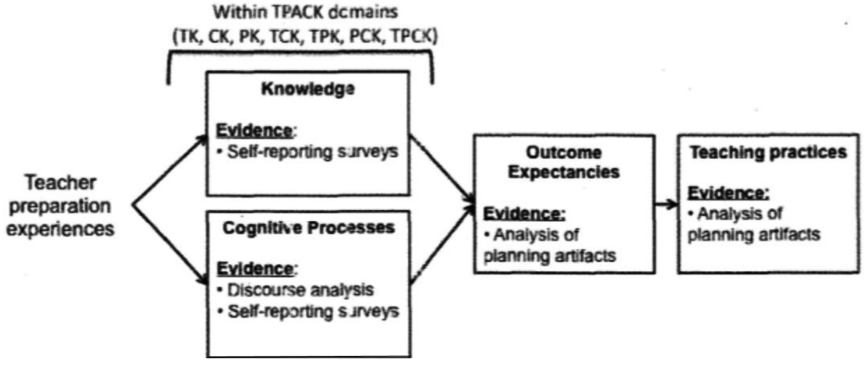
In another study, Stoilescu and McDougall's (2010) used ethnographic techniques to study mathematics teachers' technology integration. Similarly, Jaipal and Figg (2010) gathered qualitative data by multiple case study of two groups of pre-service teachers and triangulated data sources and types by combining multiple individual interviews with each participant, multiple instructional observations and debriefings, responses to both structured and open-ended survey items, and analysis of lesson plans to determine the teachers' knowledge to plan and implement technology in instruction.

In a seminal work, Hofer et al., (2011) developed and validated a TPACK-based observation rubric that can be used to assess observed evidence of TPACK during classroom instruction. Seven TPACK experts confirmed the rubric's construct and face validity. The instrument's interrater reliability coefficient (.802) was computed using both Intraclass Correlation and a percent score agreement (90.8%) procedure. Internal consistency (Cronbach's Alpha) was .914. Test-retest reliability (score agreement) was 93.9%. The rubric is available online at http://activitytypes.wm.edu/Assessments.

Abbit (2011), however, believes that *both quantitative and qualitative measures provide unique insights into various facets of preparing pre-service teachers to integrate technology* (p. 296). This idea is depicted in Figure 2.

Looking through these instruments shows that measuring the construct TPACK is still open to further question and maybe there is a need for different subject matters to develop their own measures considering the differences that exist among the disciplines.

Figure 2. TPACK-based evaluation of teacher preparation experience existing methods and instruments (Abbit, 2011)



CONCLUSION

This chapter covered the studies done on TPACK framework, its different measuring instruments and models. According to literature review, the TPACK construct is a highly complex concept that is still open to further investigation. Having explored the TPACK construct in the field of education in general, it would be insightful to present a TPACK platform for EFL teachers. This is aimed at in the following chapter, in which EFL teachers' TPACK is scrutinized.

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Chapter 6
EFL TPACK:
The Theory

ABSTRACT

This chapter focuses on EFL teachers' TPACK. First, the types of knowledge that are important in pedagogy and how these categories of knowledge and their related frameworks can differentiate models of teacher education are discussed. In the following, some models of teacher education, their characteristics, and their differences and similarities are introduced. Then the rationale of developing EFL TPACK to subsume standard TPACK is discussed and the need to EFL TPACK is addressed. The rationale includes two important characteristics of EFL teachers that can impact the use and adaptation of technology in the process of teaching: computer attitudes and ICT literacy. How these two constructs are important in empowering a teacher to use ICT in instruction and how they can hinder technology-based teaching and learning are discussed. Some related models and constructs associated with these two attributes are described as well. In the last part, the construct EFL TPACK is comprehensively introduced and each component is described in detail and support/evidence from the literature is provided.

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BACKGROUND

The instruction of EFL by a nonnative English-speaking teacher, who is also a language learner and does not speak English as naturally and idiomatically as natives do, leads to scarcity of exposure to authentic learning environments. Due to this limitation, effective communication (mainly in the process of listening and speaking) in EFL is only possible with the aid of technological tools and resources. This makes TPACK a major part of EFL teachers' professional development (Li, Liu, Liu, Yu, Li, & Wen, 2014).

With the variety of unbounded Internet resources available for learners in today's digital world, to use or not to use technology is no longer considered an important question for EFL teachers (Harris & Hofer, 2010); rather, it is the issue of teachers' competency in ICT integration that is worth discussing. That is to say that the effectiveness of language teaching and learning is decided by successful technology integration, especially in a non-English speaking environment (Chapelle, 2009).

According to research, utilizing technology with high TPACK levels for the purpose of EFL instruction can help solve the problems of big size classes. Having sufficient ICT competency, EFL teachers can easily individualize students' learning using e-portfolios and also facilitate communication between teacher-students and among students. In short, knowledge of technology plays an inevitably crucial role in EFL teaching, without which effective communication is actually impossible (Lui, Liu, Yu, Li, & Wen, 2014).

Different Types of Knowledge

Different terms have been used to address knowledge of teachers such as input, knowledge, skill, and competency (Rahimi, 2008). Knowledge, however, is the most frequently used technical word in teacher education domain to define the underlying constructs of teaching and/or its related competencies and behavior.

Knowledge can be simply defined as the information, skills, and understanding that one has gained through learning or experience or the body of information possessed by a person or, by extension, by a group of persons or a culture (Reber, 1995). Defining knowledge, how it is going to be transferred, and how it is implemented in certain areas of human domains of activity such as teaching and learning, however, is certainly related to philosophical, epistemological, ontological, and psychological arenas of a

community. For instance, based on philosophical beliefs of positivism, the value of knowledge is in its objectivity and a single piece of reality exists in the world around us that is worth knowing. Generally the emphasis of knowledge transfer in this framework is on what can be observed outside the entity of a human being or what is called *behavior*. The internal aspect of people, their mind and the way it can be used in internalizing knowledge is totally neglected. Knowledge, skill, or competence is then defined as desired behaviors (habits) and the knowledge is transferred through mechanisms of habit formation through instruction.

On the other hand, based on interpretive and humanistic philosophy, subjective information is worth attention and multiple realities exist in the world around us. Constructivist psychology emphasizes the way people use their construction system to interpret the world and what exists in it. People's personal experiences with the world shape their knowledge and thus lots of realities can be defined and internalized considering the number of people who live on the planet. In this framework, people and their experiences have a great role in shaping the knowledge and then transferring it to other people. In this way, the context of living and working and the people around get special attention in defining what knowledge is. In this sense, knowledge *is a cultural system, rather than a universal recognition of sensible practice* (Geertz, 1983, as cited in Toole, 2011).

Considering teaching/learning issues, certain types of knowledge are documented to have greater role in academia. The ones that seem to be related to knowledge base of learning and teaching are:

- Tacit and/or explicit;
- Individual and/or collective, and;
- Declarative and/or procedural.

Tacit vs. Explicit Knowledge

Tacit knowledge does not require and is not associated with remembering or awareness and *may unconsciously influence our perceptions, thoughts, and actions* (Schacter, 1996). This is the *knowledge which individuals use to perform effectively but which they may find hard to articulate* (Sternberg & Grigorenko, 2001). This is the knowledge that is created, written down or codified. Explicit knowledge, on the other hand, requires remembering and activation of the background knowledge. It is memory-based and is the type of information that is organized and stored in the brain.

Considering teaching, tacit knowledge is the knowledge of teacher educators and/or experienced teachers that cannot be transferred very easily. Tacit knowledge can be transferred into explicit knowledge through the use of appropriate language (Shim & Roth, 2008).

Individual vs. Collective Knowledge

Individual knowledge refers to what individuals keep and retain as knowledge individually and independent of the community they belong to. Collective knowledge, though, needs the support of the context and social group. Therefore,

knowledge retention can occur via one human brain, where one person simply remembers what they have learnt, or on a collective level, where collective mechanisms act to retain knowledge so that individuals and groups may access the knowledge as they need in a workplace environment. (Toole, 2011)

Individual knowledge of teaching may consist of each teacher's individual understanding of the profession and the way instruction should be carried out. However, collective knowledge embodies the body of knowledge of the community of the teachers and is shared and used among them.

Declarative vs. Procedural Knowledge

Declarative knowledge is often defined as the type of knowledge that defines the essence of something and what the phenomenon is. This is a conscious knowledge that is not yet automatic. On the other hand, procedural knowledge, is the knowledge of how to do things, most often the automatic unconscious skills of carrying out a task.

Considering the differences that exist in underlying theories and accordingly types of knowledge, certain models of teachers' knowledge base has been proposed. The distinction between declarative and procedural knowledge in instruction is well identified bellow:

Declarative knowledge is knowledge about teaching- knowledge of subject areas and the 'theory' of education; procedural knowledge is knowledge of how to teach- knowledge of instructional routines to be used in the classroom. (MacDonald, Badger, & White, 2001)

Considering different types of knowledge that is required for teaching, and based on changes in psychological and sociological views, different types of programs are designed to educate teachers.

The knowledge base of teachers that is specified in each model, is under the influence of many factors that would be discussed below in more detail.

Models of EFL Teacher Education

Defining the type of knowledge language teachers need, and the way this knowledge should be presented to pre-service and in-service language teachers has been a matter of contradiction and confusion in the history of language teaching. Like any movement, the development and evolution of certain models did not happen irrespective of the movements in the fields of psychology, pedagogy, technology and science. The inflection point of EFL teacher education took place around 70s when the views to human, learning, and teaching started to change under the influence of cognitivist, constructivism, and humanism.

A retrospective view to the ups and downs of EFL teacher education development reveals that the central point of discussions on EFL knowledge base is the dichotomy of declarative/procedural knowledge and the way the objectives, content, and outcome of teacher education programs should be specified (Lightbown, 1985; Richards & Nunan, 1990; MacDonald, Badger, & White, 2001). In this regard two basic models of teacher education are proposed: teacher development and teacher training. These two models are commonly referred to as the traditional and modern teacher education respectively and can be specified by certain features.

The traditional model of teacher education focuses on theories of teaching and emphasizes the declarative knowledge of teaching and what teachers should now in order to become key agents of education. In this regard, learning about teaching becomes very important and knowledge is transmitted from teacher educator to student teachers through traditional techniques of teaching including lectures. There is limited reference to the locale of teaching and the contextual realities that prospective teachers will face in their teaching context in the near future (individual knowledge). Limited cooperation with schools and in-service teachers is also observed. As a result, what happens in universities and teacher training centers mostly proceeds without the involvement of schools, teachers, and students.

In modern teacher education models, however, the emphasis is on in-service teacher's professionalism and expertise (collective/tacit knowledge). It is assumed that teachers learn how to teach, if they actually do lots of teachings. Therefore, instead of major focus on theories of teaching that are transmitted to their heads from a single source-teacher educators-, the teachers construct knowledge themselves through meaningful and real teaching practices. This type of teacher education needs a close cooperation between schools and universities and thus pre-service teachers become a member of the community of in-service teachers. Ur (1997) has summarized the distinction between these two models as can be seen in Table 1.

In a more detailed comparison, Freeman (2001) compares and contrasts teacher training and teacher development considering 'what, how, and to what effect' (Table 2).

Ur (1997), however, believes that neither of these models can satisfy teacher professionalism single-handedly and a combination of the knowledge bases of the two models is required.

In this sense, the optimal model of teacher learning is the one that can combine all types of knowledge in a single program (tacit/explicit, individual/collective, and declarative/procedural) (Figure 1).

The most important, central source (the inner circle) is the teacher's reflection on their own experience, whether as learner, as trainee on teaching practice or as professional teacher. But to learn only from oneself is limited: One needs

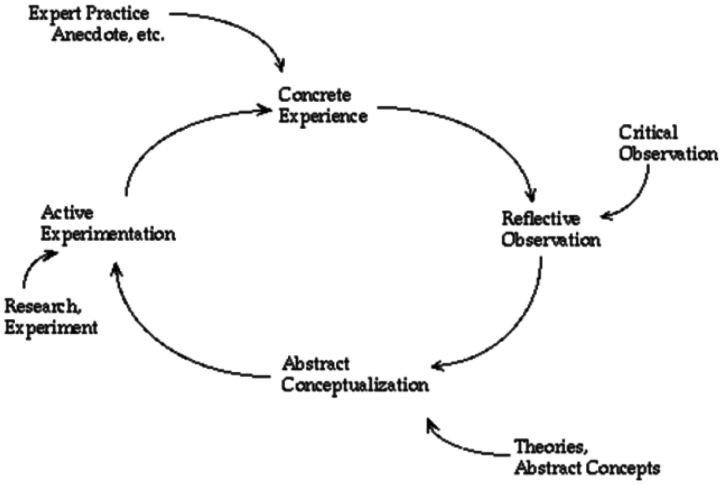
Table 1. Teacher training and development (Ur, 1997)

TRAINING	DEVELOPMENT
Imposed from "above"	Initiated by "self"
Pre-determined course structure	Structure determined through process
Not based on personal experience	Based on personal experience
Externally determined syllabus	Syllabus determined by participants
External evaluation	Self-evaluation
Input from "experts"	Input from participants
Unthinking acceptance of information	Personal construction of knowledge
Cognitive, cerebral	Cognitive and affective, "whole person"
Isolated	Collaborative
Stresses professional skills	Stresses personal development
Disempowers individual teacher	Empowers individual teacher

Table 2. Teacher training and teacher education (Freeman, 2001)

	'what' content	*'how' process*	*'to what effect' Impact/outcome*
Teacher Training	• defined externally • usually determined beforehand • providing access to knowledge base	• transmitting knowledge and skills • organizing access to new content	• externally assessed • bounded • often drawing on publicly demonstrated evidence
in common	• external process of presentation/articulation triggers • internal process of incorporation		• use leads to usefulness
Teacher Develop-ment	• usually generated through experience • determined by/in relation to participants	• sense making, using articulated experience to construct new understandings	• self-assessed • open-ended • often using self-reported evidence

Figure 1. Optimal teacher learning (Ur, 1997)



also to take advantage of the enormous amount of professional knowledge and expertise "out there." waiting to be tapped. …. Such knowledge, however, cannot be taken on board simply through reading or hearing about it. In order to function as real knowledge and not just as inert items of information, you need to process it through your own experience, reflection, conceptualization, and experimentation and to construct your own understanding of it. This means, of course, that not all external input will necessarily be accepted, and that that which is accepted may be extensively adapted. The teacher's processing will "filter out" those aspects which do not seem to be appropriate

or comprehensible, and finally absorb the knowledge in the form which fits in with their own thought and action and which they can "own." (UR, 1997)

Knowledge Base of EFL Teachers

Based on Shulman's model of teacher knowledge base each teacher should own different types of knowledge including but not limited to (1987):

- Content knowledge
- General pedagogical knowledge, with special reference to those broad principles strategies of classroom management and organization that appear to transcend subject matter
- Curriculum knowledge, with particular grasp of the materials and programs that serve as "tools of the trade" for teachers
- Pedagogical content knowledge, that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding
- Knowledge of learners and their characteristics
- Knowledge of educational contexts, ranging from the workings of the groups or classroom, the governance and financing of school districts, to the character of communities and cultures,
- Knowledge of educational ends, purpose, and values, and their philosophical and historical grounds

Based on the guidelines of general education, language experts have proposed a tripartite model of knowledge base for EFL teachers' professional empowerment (Rahimi, 2008):

- **Knowledge of Language:** Content knowledge, knowledge of the subject matter, English language.
- **Knowledge of Science of Teaching and Pedagogy:** Pedagogical knowledge, knowledge of generic teaching strategies, beliefs, and practices; along with support knowledge, the knowledge of the various disciplines that would enrich teachers' approach to the teaching and learning of English.

- **Knowledge/Competency of Teaching in Reality:** Pedagogical content knowledge, the specialized knowledge of how to represent content knowledge in the classroom and how students come to understand the subject matter in the context of real teaching; the students' problems and ways to overcome those problems by considering all variables related to their learning (teaching materials, assessment procedures, parents, etc.).

However, these types of knowledge, cannot fulfill the needs of teachers of the 21st century nor the needs of their students. Therefore, certain changes are inevitable to take place to reorganize the content of EFL teacher's knowledge base. Expectedly, the component that is required to be added to this knowledge base is technology. A brief review of the history of language teaching shows that language teachers have always been pioneers of incorporating the cutting-edge technologies in their classes. This movement started from the Direct Method, where the use of audio-visual aids entered language classes for the first time. Simple wall charts and posters, realia, and pictures were amongst the primary audio-visual aids that language teachers started to use.

Later, by the advent of the Audio Lingual Method, the state-of-the-art technology of the 50s, that is cassettes and tape recorders and later language labs, became quite prevalent in teaching and learning languages. In the following decades, in 60s and 70s, a group of innovative methods were designed that utilized revolutionary techniques of teaching under the influence of theoretical shift from behaviorism to cognitivism and humanism. As a result, different types of audio-visual aids and modern technologies were in vogue in language classes. Yet, the invention of computers and PCs opened great doors of opportunity for language teachers to use modern technologies in instruction. Using technology is so much interwoven in language classes that a single discipline of study, CALL, has emerged and developed along with advancements of technology in the past decades.

In spite of the great role technology plays in teaching and learning languages, technology knowledge has not been a part of its teacher knowledge base. Based on the framework of TPACK and the urgent necessity of integrating knowledge of technology into language curriculum, some language educationists have focused on the type of TPACK language teachers need to teach more efficiently and effectively.

EFL TPACK

The Rationale

Teaching English as a foreign language takes place when language learners learn English in a nonnative English-speaking country. In this situation, English is usually taught by nonnative English language speakers who are not expected to be as fluent and accurate as native English speakers as they themselves have been EFL learners.

The EFL setting is usually contrasted with English as a second language (ESL) where the official language of the community is English and English plays an important role in education, business, and government (like India, Malaysia, and Hong Kong) (Rahimi, 2009).

Due to lack of exposure to real and authentic language input in EFL environments, EFL teaching strongly depends on technological devices especially in teaching listening and speaking (Liu, Liu, Yu, Li, & Wen, 2014). The literature on CALL is extensive and full of theories and practices of using technology in language classes. However, the use of technology in language classes is not as easy as it may seem. There are certain barriers to implementing technology in EFL classes that have their roots in students and teachers' characteristics or personalities.

With respect to teachers, two debilitative factors are widely mentioned in the literature: teachers' attitudes and IT Literacy. As a matter of fact, these two factors have been reported to have reciprocal effect on each other, that is, those who have more positive attitudes towards technology empower themselves more technologically and those who have less favorable attitudes towards the benefits of technology in education, do not seem to be interested in promoting their technological competencies and skills.

It is quite evident that attitude towards computers is an important factor in using computers for both general purposes and learning and teaching goals. Although the construct is of vital importance, no particular definition or the one that all could agree upon is available (Liaw, 2002).

One of the most common definitions of attitude was proposed by Fishbein and Ajzen's under the influence of Theory of Reasoned Action (TRA). In this framework attitude is defined as *a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object* (Fishbein & Ajzen's, p. 6). There are three main components in the model:

- **Attitude (A):** Positive and negative feelings of doing something.
- **Subjective Norm (SN):** *The person's belief about whether significant others feel that he or she should perform the target behavior* (Hale, Householder, & Greene, 2003).
- **Behavioral Intention (BI):** A function of both attitude towards performing the behavior and one's subjective norm.

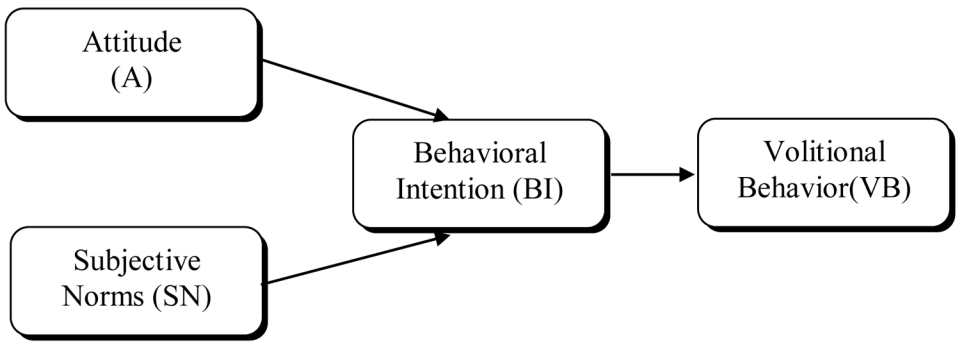
The way these components function and have reciprocal effect on each other can be seen in Figure 2.

Based on Fishbein and Ajzen, predicting the behavior, attitudes, and norms totally depends on the individual and the situation of performance, and therefore attitudes and norms can have certain effects on people's behavioral intention (Mokhtari, 2013).

Generalizing the definition of attitudes to computer-based learning, computer attitude can be defined as a user's general evaluation or reaction of like or dislike toward technology and particular technology-related activities. In can then be assumed that in the context of CAI a key user's (student or teacher) level of attitudes toward technology determines the degree he/she intends to use computer in learning a certain subject matter such as a foreign language (Kao & Tsai, 2009). The construct attitudes has three components (Liaw, 2002):

- Cognitive,
- Affective, and
- Behavioral

Figure 2. TRA (Hale et al., 2003)



The cognitive component involves beliefs or perceptions about the objects or situations related to the attitude. The affective component expresses the feelings that arise about the cognitive element and the appraisal (good or bad) of these feelings. Finally, the evaluation of the affect is translated into a behavioral component that gives utterance to the attitude and certain attitudes tend to prompt learners to adopt particular learning behaviors. (Vandewaetere & Desmet, 2009)

Based on what has been mentioned, it is predictable to suggest that negative attitude is associated with more knowledge and use of technology by both teachers and students.

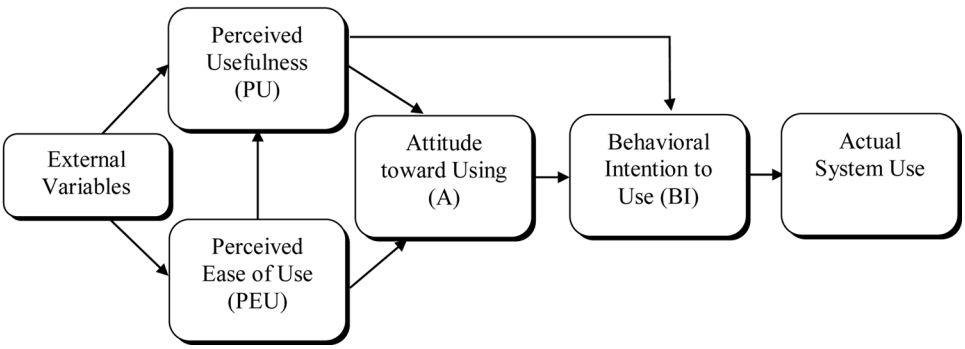
Some more practical models or frameworks have tried to define the role of attitudes in the way people behave, take actions, or carry out performance in handling different types of jobs. One of these models is Technology Acceptance Model (TAM) (Figure 3).

TAM is a quite valid and reliable model as it has received strong theoretical and empirical support in the literature and has been cited a lot during the last decade (Rahimi & Yadollahi, 2015).

TAM is a model for predicting and explaining behavioral intention and actual behavior of an individual's computer use. Based on TAM, an individual's computer use is mostly influenced by their behavioral intention and there is a causal relationship among TAM components including perceived usefulness, perceived ease of use, attitude toward using technology and actual behavior intention.

The perceived usefulness is *the degree to which a person believes that using a particular system would enhance his or her job performance*, and

Figure 3. TAM (Davis, Bagozzi, & Warshaw, 1989)



perceived ease of use is *the degree to which a person believes that using a particular system would be free of effort* (Davis, 1989). In the same vein, 'ease of use' identifies attitudes and subsequently the degree of acceptance of technology.

Perceived usefulness and perceived ease of use are as considered to be two significant mediators mediating the effects of external variables (e.g. training, system characteristics, and development process) on intention to use technology.

Perceived ease of use affects perceived usefulness as with everything equal, the easier the technology is, the more useful it can be (Venkatesh & Davis, 2000). The underlying assumptions of TAM are:

1. Technology use is voluntary (Davis, 1989);
2. By considering enough time and knowledge about certain behavioral activity, an individual's preference to fulfill the behavioral intention will be directly similar to the way they behave (Ajzen & Fishbein, 1980); and
3. When an individual intends to do something, he/she will be free to do it without any limitation such as limited ability, time constraints, environmental or organizational limits, or unconscious habits (Bagozzi, 1992).

TAM has been used in many fields of study including business, economy, and recently education. TAM particularly has been used in studying the attitudes of students and teachers towards technology in educational settings.

In line with the above-mentioned models, attitudes have been found to be one of the key factors that contribute to accept innovations. Based on theory of Diffusion of Innovation (DOI), the success of an innovation in the educational setting depends on the nature of innovation and the targeted adopters. The key agent of change in education is teachers and thus one of the important characteristics of them, that is attitudes, can have a certain role in integrating technology into the classroom.

The way attitudes can have a great role in the normalization of technology in CALL is reflected in the following (Bax, 2003):

1. **Early Adopters:** A few teachers and schools adopt the technology out of curiosity.
2. **Ignorance/Skepticism:** However, most people are skeptical, or ignorant of its existence.

3. **Try Once:** People try it out but reject it because of early problems. They can't see its value-it doesn't appear to add anything of 'relative advantage' (Rogers, 1995).
4. **Try Again:** Someone tells them it really works. They try again. They see it does in fact have relative advantage.
5. **Fear/Awe:** More people start to use it, but still there is: (a) fear, alternating with; (b) exaggerated expectations.
6. **Normalizing:** Gradually it is seen as something normal.
7. **Normalization:** The technology is so integrated into our lives that it becomes invisible-'normalized'. (p. 24)

As it was seen, knowledge is one of the key assumptions of the propositions related to attitudes towards technology. Therefore empowering teachers with respect to technology and its values in education can guarantee its efficient and constant use during instruction. Follow-up studies done on computer attitudes show that besides computer attitude, external variables such as subjective norms, facilitating conditions, and technological complexity directly or indirectly affect technology acceptance (Teo, 2010). All these variables can be handled through appropriate instruction and enriching one's competence and knowledge base. This knowledge can be interpreted as IT literacy or:

the knowledge of computers and computer experience influence teachers' attitudes toward computers and the use of computers in the classroom. Teachers with computer skills or more computer experience have more favorable attitudes and exhibit lower levels of anxiety toward computers. (Hardy, 1999)

Therefore, for language teachers to be able to implement new technologies in language education appropriately and efficiently, certain level of computer literacy is required. In order to be able to take over the responsibility of educating students who are digital native, teachers must empower themselves for their classes. Being a computer-literate teacher is reported to be as one of the key factors that help teachers to teach efficiently and effectively in the digital era (Konan, 2010) and to guarantee occupational and personal success (Shapka & Ferrari, 2003).

In a general sense, computer literacy as *the basic knowledge, skills, and attitudes needed by all citizens to be able to deal with computer technology in their daily life* (Tsai, 2002). It is more specifically defined as *using digital technology, communications tools, and/or networks to access, manage,*

integrate, evaluate, and create information in order to function in a knowledge society (ETS, 2007) whose components are defined as:

- **Access:** Knowing about and knowing how to collect and/or retrieve information.
- **Manage:** Applying an existing organizational or classification scheme.
- **Integrate:** Interpreting and representing information. It involves summarizing, comparing and contrasting.
- **Evaluate:** Making judgments about the quality, relevance, usefulness, or efficiency of information.
- **Create:** Generating information by adapting, applying, designing, inventing, or authoring information.

Selber (2004) lists three main perspectives of the concept of ICT literacy, consisting of functional, critical and rhetorical elements, which is denoted as *the conceptual landscape of a computer multi-literacies program* (Selber, 2004) (Table 3).

In a more pedagogical sense, IT literacy can be interpreted as *technology knowledge base* of a teacher that has other interrelated components within the TPACK model including:

- **Technological Knowledge (TK):** It refers to *skills to operate technologies such as installing or removing devices/software programs, or creating and archiving documents* and *abilities to learn and adapt to new technology* (pp.1027-1028) or the ability *to solve technical problems, to learn technology easily, to keep up with important technology, to play around with technology, to know a lot of technologies, to have technical skills and to have opportunities to work with different technologies.* (Schmidt, Baran, Thompson, Koehler, Mishra, & Shin, 2009).

Table 3. Perspectives on digital literacy (Selber, 2004)

Objective	Subject Position	Metaphor	Category
Effective employment	Teachers as users of technology	Computers as tools	**Functional Literacy**
Informed critique	Teachers as questioner of technology	Computers as cultural artifacts	**Critical Literacy**
Reflective praxis	Teachers as producers of technology	Computers a hypertextual media	**Rhetorical Literacy**

This aspect of technology knowledge is what is in common among all people, regardless of their profession, or for what reason(s) they use technology. This construct itself can have many dynamic components as by the passage of time, the construct TK or ICT literacy should be updated, otherwise the person would be lagging behind the benefits of using technology in their life or profession.

Research on this component basically focuses on developing different types of measures to help people assess their IT literacy.

- **Technological Content Knowledge (TCK):** This is the knowledge of using technology in teaching a single content knowledge or subject matter. Teachers should be able to appropriately choose and effectively use different types of technologies for the betterment of the teaching of their subject matter (Koehler & Mishra, 2009). Example of this is knowing how to use a spreadsheet provides an example of how to analyze a set of data for patterns or knowing how to use Fraction Bars to show a proportional relationship in mathematics or the way mobile dictionaries can be used to search collocations of certain words or how concordancers are helpful in finding the most frequent words of English language in teaching English.
- **Technological Pedagogical Knowledge (TPK):** This is the way the teaching procedure is changed as a result of integrating appropriate technology into instruction. For instance, the way a chemistry teacher uses simulation software programs in teaching an experiment or when multimedia is integrated into the teaching of listening comprehension in listening instruction.
- **Technological Pedagogical Content Knowledge (TPACK):** This is the integration of all types of literacies that determine a teacher's ability to be able to work with a certain type of technology, being able to use it in her or his subject matter, integrate it into his/her teaching, and ultimately manage the technology-based teaching and learning environment effectively.

Due to the importance of IT literacy in professional life of a teacher many studies have probed into the importance of ICT literacy in instruction and the factors that can have certain effect on this type of knowledge.

Olaoluwakotansibe (2009) examined the gender disparities that exist in the use of Information and Communication Technology among Nigerian in-service teachers using a self-designed ICT Literacy Scale (ILS). The

findings revealed that gender is a determining factor of in-service teachers' overall ICT literacy level, as well as their skill levels in different ICT-oriented tasks. It was further found that a significant relationship between gender, in-service teachers' ICT literacy level and their monthly income exists; while a relationship between gender, ICT literacy level and subject discipline was significantly established among in-service teachers.

Yadollahi (2011) explored the relationship among teachers' computer literacy, anxiety, and use of ICT in teaching language skills and found that ICT use had a positive and significant correlation with computer literacy while it was inversely related to computer anxiety among Iranian language teachers.

Hatlevik and Arnseth (2012) investigated the relationship between teachers' experiences with ICT-supportive school leaders, perceived usefulness of computers, perceived learning outcomes for students and teachers' use of computers in their teaching. The correlation analysis revealed that teachers with higher levels of ICT-supportive leaders reported higher levels of perceived usefulness of computers, perceived learning outcomes for students and more frequent use of computers in comparison to who had lower levels of ICT-supportive leaders. Regression analysis indicated that two factors, ICT-supportive school leaders and perceived learning outcomes for students using computers, explained 25% of the variation in perceived usefulness of computers. Finally, these two factors, ICT-supportive school leaders and perceived learning outcomes for students using computers, explained 5% of the variation in how frequently teachers were using computers for reading and writing.

Alazam, Bakar, Hamzah, and Asmiran (2012) determined the levels of ICT skills and ICT usage among technical and vocational teachers in Malaysia. The data were gathered by quantitative techniques and assessed teachers' ICT skills, ICT use and their demographic factors. The results showed that teachers' ICT skills were at moderate levels, and that a vast majority of teachers who participated in this study were moderate users of ICT for instruction. There were significant differences of teachers' ICT skills based on gender, age, years of teaching experience, and type of ICT training. Also, there were significant correlations between ICT skills and ICT integration in classroom. Teachers' demographic factors (age, gender, teaching experience, except level of education) did not influence ICT integration in classroom.

In another study, Shariatmadari and Aghajani (2015) investigated the relationship between teachers' ICT literacy and the academic achievement of their students in Iran. The findings of the study indicated that there was a significant correlation between teachers' ICT literacy, and students' academic

achievement. Furthermore, it was found that the use of computer and management files, jobs and ICT predicted academic achievement positively.

Shariatmadari and Mazandarani (2016) investigated teachers' knowledge and use of ICT along with their attitudes towards the integration of ICT in English language classrooms. The findings revealed that most of the teachers had positive attitudes towards ICT; but no significant relationship between EFL teachers' knowledge and use of, and attitudes towards computer was reported.

The findings of many other studies suggest that technology knowledge of teachers can be related to different factors including but not limited to gender, age, teaching experience, computer anxiety, subject matter, degree and type of specialty, and context of teaching.

The Construct

Combining knowledge base of EFL teachers with the TPACK model presented in previous chapters, and considering the rationale for developing a comprehensive (technology) knowledge base for language teachers, the TPACK model can be modified and specified more meticulously for EFL profession. Similar to the standard TPACK, there are seven components for EFL TPACK: CK, PK, PCK, TK, TPK, TPCK, and TPACK. In the following, each component of EFL TPACK will be explained and exemplified in more detail.

Conant Knowledge (CK)

This is the knowledge of the subject matter without consideration of teaching and/or learning the subject matter. For someone who wants to become a language teacher, certain requirements are considered when language knowledge is concerned. These requirements are specifically defined under the term *language proficiency*.

Language proficiency is identifiable by the knowledge of the system of language including the knowledge of macro skills (listening, speaking, reading, and writing) and micro skills (vocabulary, grammar, and pronunciation). The way this knowledge is assessed however depends on the view towards language.

Based on recent models of language teaching, the goal of language teaching and learning is communication and both teachers and students should be

negotiators of meaning in language classes. In this framework, language learning results from the following processes that take place in the class (Richards & Rodgers, 2014):

- Interaction between the learner and users of the language
- Collaborative creation of meaning
- Creating meaningful and purposeful interaction through language
- Negotiation of meaning as the learner and his or her interlocutors arrive at understanding
- Learning through attending to the feedback learners get when they use the language
- Paying attention to the language one hears (the input) and trying to incorporate new forms into one's developing communicative competence
- Trying out and experimenting with different ways of saying things
- Learning as social mediation between the learner and another during which socially acquired knowledge becomes internal to the learner
- Learning facilitated through scaffolding by an expert or fellow learner
- Learning through collaboration dialogue centering on structured cooperative tasks (p. 91)

This orientation leads to a recognition that linguistic accuracy is only one component of proficiency and to an emphasis on communication as opposed to the memorization of linguistic forms for discrete-point test items (Chastain, 1989).

Language proficiency of language teachers, therefore, should *encompass everything that 'normal' language users might be expected to be able to do in the context of both formal and informal communication as well as a range of specialist skills* (Elder, 2014). These special language skills include a command of subject specific/metalinguistic terminology and the discourse competence required for effective classroom delivery of subject content.

Effective classroom delivery also necessitates a good command of linguistic features such as using directives in establishing classroom procedures and learning tasks. Further, a range of questioning techniques is necessary if the teacher is to be able to monitor learner understanding. The teacher should also be able to use rhetorical signaling devices and simplification strategies to communicate specialist areas of knowledge and explain them to learners (Viete, 1998; Elder, 1994). Bachman and Palmer (1996) identify six interrelated areas

of language knowledge that could be considered in developing a language proficiency tests:

- Organizational knowledge pertaining to the way in which texts are structured;
- Grammatical knowledge including knowledge of vocabulary, syntax and phonology/graphology;
- Textual knowledge, which includes knowledge of cohesion and knowledge of rhetorical or conversational organization;
- Pragmatic knowledge, related to the communicative goals of the language user and the context in which the language is being used;
- Functional knowledge including an understanding of ideational, manipulative, heuristic and imaginative functions, as well as socio-linguistic knowledge (p. 68).

These propositions can be interpreted within the framework of communicative language teaching from two perspectives: (1) the goal of 'expanding communicative competence' for all language learners, including the teachers themselves, and; (2) the role of teachers in the framework of communicative language teaching to help learners develop their communicative competence.

It is well-known that the goal of teaching English has shifted from linguistic norms to meaningful communication. In this process the ultimate goal of each language learner is communicative competence with four distinctive, yet, interrelated components: linguistic competence, discourse competence, sociolinguistic competence, and strategic competence. As a result, a teacher himself/herself should promote his/her competency in the following:

- **Linguistic (Grammatical) Competence:** It is in line with Chomsky's theory of competence as he suggests that:

Linguistic theory is concerned primarily with an idea of speaker-listener in a completely homogenous speech community, who knows its language perfectly and is unaffected by such grammatically irrelevant conditions as memory limitation, distractions, shifts of attention and interests, and errors (random of characteristics) in applying his knowledge of the language in actual performance. (p. 4)

- **Linguistic Competence:** Signifies whether (and to what degree) something is formally possible (Hymes, 1972) and thus it includes the knowledge of grammar, words, and phonology of a given language.
- **Discourse Competence**: *Refers to the interpretation of individual message elements in terms of their interconnectedness and of how meaning is represented in relationship to the entire discourse or text* (Richards & Rogers, 2014).
- **Strategic Competence:** *Refers to the coping strategies that communicators employ to initiate, terminate, maintain, repair, and redirect communication.*
- **Sociolinguistic Competence**: *Refers to an understanding of the social context in which communication takes place, including relationships, the shared information of the participants, and the communicative purpose for their interaction.*

These competences are also related to what Hymes (1972) calls the knowledge and ability for language use with respect to:

- Whether (and to what degree) something is formally possible.
- Whether (and to what degree) something is feasible in virtue of the means of implementation available.
- Whether (and to what degree) something is appropriate (adequate, happy, successful) in relation to a context in which it is used and evaluated.
- Whether (and to what degree) something is in fact done, actually performed, and what its doing entails (p. 281).

This competence and proficiency would absolutely help a language teacher to take the role of a communicative language teacher successfully as:

The teacher has two main roles: the first role is to facilitate the communication process between all participants in the classroom, and between these participants and the various activities and texts. The second role is to act as an independent participant within the learning-teaching group. The latter role is closely related to the objectives of the first role and arises from it. These roles imply a set of secondary roles for the teacher: first, as an organizer of resources and as resource himself, second as a guide within the classroom procedures and activities. (Breen & Candlin, 1980)

Moreover, the language proficiency that a teacher needs should enable him/her to act as a needs analyst, counselor and group process manager in teaching language communicatively (Richards & Rodgers, 2014).

In sum, the content knowledge of a language teacher is not just interpretable by linguistic knowledge and knowledge of language but the way a language teacher can act as a successful communicator in the process of language teaching.

Pedagogical Knowledge

This is commonly referred to as the knowledge about the students' learning, instructional methods, different educational theories, and learning assessment to teach a subject matter without any references towards content.

It is thus the knowledge of generic teaching strategies, beliefs, and practices along with support knowledge, the knowledge of the various disciplines that would enrich teachers' approach to the teaching and learning of any subject matter (e.g. educational psychology), such as knowledge of using metacognitive strategies to enhance learning.

Pedagogical Content Knowledge

It is the knowledge of representing content knowledge and adopting pedagogical strategies to make the specific content/topic more understandable for the learners. In the domain of language teaching, it is the specialized knowledge of language teaching and learning; how to represent English as a foreign language in the classroom and how language learners come to understand English in the context of real teaching; discovering the students' problems and ways to overcome those problems by considering all variables related to their language learning (teaching materials, assessment procedures, parents, etc.), such as knowledge of conducting group activities to improve students' learning.

This knowledge, as being conclusive of the three previous components, is much related to defining and measuring the credential of good language teachers. Some educationists have a general view towards an effective language teacher that embodies a list of premises coming from their experience and common sense.

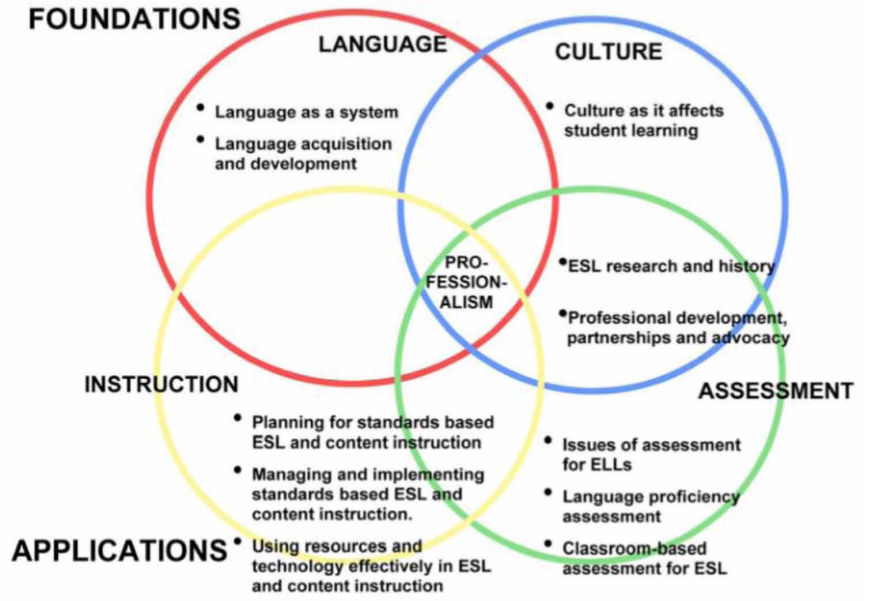
Allen (1980), for instance, proposes a nine-item list of characteristics of good ESL teachers including a degree in TESL (Teaching English as a Second Language), the love of English language, critical thinking, the persistent urge to upgrade oneself, self-subordination, readiness to go extra mile, cultural adaptability, professional citizenship, and a feeling of excitement about one's work.

In the same vein, Brown (2001) suggests a 30-item list of such qualities with four main components including technical knowledge, pedagogical knowledge, interpersonal skills, and personal qualities.

These movements have urged the official organizations to legitimize certain standards for language teachers. These professional standards *define what teachers should be able to do and what they should know* (Sachs, 2005). The standards are used in defining effective teaching and are essential in evaluating one's process of teaching (Smith, 2005).

Here TESOL/NCATE P-12 ESL Teacher Education Program Standards (TESOL, 2008) are listed to see how all language teacher knowledge base components discussed so far can be integrated in five main domain standards: language, culture, assessment, instruction, and professionalism (Figure 3).

Figure 4. TESOL P-12 ESL Teacher Education Program Standard (2008)



Domain 1: Language

Standard 1: Language as a System

Candidates demonstrate understanding of language as a system, including phonology, morphology, syntax and semantics, support ESOL students as they acquire English in order to communicate with native speakers of English.

Standard 2: Language Acquisition and Development

Candidates understand and apply theories and research, of language acquisition and development to support their ESOL students' learning.

Domain 2: Culture

Standard 3: Culture as it Affects Student Learning

Candidates know, understand, and use in their instruction, major theories and research related to the nature and role of culture, and how cultural groups and individual cultural identities affect language learning and school achievement.

Domain 3: Planning, Implementing, and Managing Instruction

Standard 4: Planning for Standards-Based ESL and Content Instruction

Candidates know, understand, and apply concepts, research, best practices, and evidenced-based strategies to plan classroom instruction in a supportive learning environment for ESOL students. Candidates plan for multilevel classrooms with learners from diverse backgrounds using standards-based ESL and content curriculum.

Standard 5: Managing and Implementing Standards-Based ESL and Content Instruction

Candidates know, manage, and implement a variety of standards-based teaching strategies and techniques for developing and integrating English listening,

speaking, reading, and writing. Candidates support ESOL students' access to the core curriculum by teaching language through academic content.

Standard 6: Using Resources and Technology Effectively in ESL and Content Instruction

Candidates are familiar with a wide range of standards-based materials, resources, and technologies, and choose, adapt, and use them in effective ESL and content teaching.

Domain 4: Assessment

Standard 7: Issues of Assessment for English Language Learners

Candidates understand various issues of assessment as they affect ESOL student learning. Some examples include cultural and linguistic bias; testing in two languages; political, social, and psychological factors; special education testing, and assessing giftedness; the importance of standards; the difference between formative and summative assessment, and the difference between language proficiency and other types of assessment (e.g., standardized achievement tests), Candidates will also understand issues around accountability. This includes the implications of norm-referenced assessment as opposed to alternative assessments and issues of accommodations in formal testing situations.

Standard 8: Language Proficiency Assessment

Candidates can use and interpret a variety of standards-based language proficiency instruments, usually norm-referenced, to meet district, state and federal guidelines, and to inform their instruction. They also understand their uses for identification, placement, and demonstration of language growth of English learners.

Standard 9: Classroom-Based Assessment for ESL

Candidates know, and can use a variety of standards-based, on-going, formative and summative, performance-based assessment tools and techniques to inform instruction in the classroom.

Domain 5: Professionalism

Standard 10: ESL Research and History

Candidates demonstrate knowledge of history, research, public policy and current practice in the field of ESL teaching and apply this knowledge to improve teaching and learning.

Standard 11: Professional Development, Partnerships and Advocacy

Candidates take advantage of professional growth opportunities and demonstrate the ability to build partnerships with colleagues and students' families, serve as community resources, and advocate for ESOL students.

In many pre-service and in-service programs the type of knowledge of this component, however, focuses on theories and the type of knowledge language teachers should know about teaching theories and beliefs, and language education pedagogy. Types of courses range from those that target methodological and pedagogical knowledge (teaching methodology, theories of teaching language skills, testing and evaluation, etc.), to supplying knowledge about language(s) (linguistics courses), and supporting knowledge of other disciplines (sociolinguistics, and neurolinguistics courses) (Rahimi, 2008).

Technological Knowledge

This is the knowledge about how to use ICT hardware and software and associated peripherals. It is also called ICT literacy, IT literacy, and computer knowledge. This includes the type of knowledge of technology that generally a person has to be able to live in the third millennium to fulfill their personal, social, and professional needs. What is required of a language teacher is to have basic knowledge working with technology devices (printers, scanners, digital

cameras), applications and software (data management, media production) and environment (world wide web).

Technological Content Knowledge

Knowledge about how to use technology to represent/research and create the content in different ways without consideration about teaching. Therefore, it is the way technology can be used in English such as available software, databases, and devices.

Technological Pedagogical Knowledge

This is the knowledge of the existence and specifications of various technologies to enable teaching approaches without reference towards any subject matter. It includes all technology affordances for education that can be studied to be later adapted for being used in teaching a subject matter. Table 4 gives a general overview of the affordances and limitations of various technological resources widely in use today in education (Haddad & Draxler, 2002).

Technology-supported-pedagogy may be classified into three categories in which technology functions as: (a) replacement; (b) amplification, and; (c) transformation (Hughes, 2005). Technology as replacement involves using technology as a different means to teach the same instructional goal and/or materials. Technology as amplification *involves the use of technology to accomplish tasks more efficiently and effectively without altering the task* (Pea, 1985, as cited in Hew & Brush, 2007). Use of technology as transformation provides learners and teachers with innovative educational opportunities (Hughes, 2005) by affecting cognitive processes and doing different types of problem solving activities.

Teachers are required to be able to use technology in their teaching in three distinct parts of the class: preparation, presentation, and doing assignments (Hew & Brush, 2007). In preparation phase, teachers may use technology to prepare their lesson plans, search/prepare related sources and content for teaching or prepare homework/assignments, tests, and task sheets. They may use word processors or the Internet to prepare the required materials. In presentation phase, the teachers may use different types of technologies to present the material in teaching such as PowerPoint slide shows. After the presentation, the teachers may provide students with tasks/assignments and asks students to use related technologies to do the assignments. This may

Table 4. Affordances and limitations of modalities (Haddad & Draxler, 2002)

Mode	Instrument	Affordances	Limitations
Text	Books/magazines	• portable • durable • can present complex information • sequential structure guides learner • little eyestrain • Moderate cost of development	• Difficult to modify (as in localiztio, updating, etc.) • Required literacy plus higher-order thinking skills • Content is difficult to extract for use in other resources • High per-unit cost of publication
	Web page	• Dynamic and easy modified • Hyperlinks enable non-sequential navigation • Low cost of development and very low publishing costs • Support interactivity (e.g., navigation, user-entered information, etc.) • Can support assessment	• Non-sequential structure may obscure critical information or cause confusion • Reading may cause fatigue • Required OC, electricity, connection • Potential additional system requirements (e.g. Java, plugins)
Images	Printed photos, maps, and schematic drawing	• Concrete, specific, detailed information • Appropriate for learners with 'visual intelligence' • Engaging and motivating for many learners • Affordances similar to printed photos • Easily copied, charred, and used • Low costs for reproduction and publishing • Can be data-based or Web-served for delivery to handheld computers and other • 'anytime, anywhere' devices	• Low information value relative to text • Resistant to reuse by learners • 'visual literacy' skills required for best use • High cost reproduction • Limitations similar to printed photos • Require PC and electricity, possibly an Internet connection
Audio	Radio	• Can present contemporary and topical information easily • Highly accessible and potentially engaging format (no literacy skills required) • Widespread adoption in developing countries • Moderate production costs • Highly scalable • Low-cost hardware	• Information is not durable; learners can't 'review' a broadcast • Poor presentation of complex concepts • No visual component (e.g. schematics, maps, photos) • Synchronous form requires system-wide coordination (e.g. announcements, class schedules, etc.)

continued on following page

Table 4. Continued

Mode	Instrument	Affordances	Limitations
	Digital audio (Web- and CD-based)	• Can present contemporary and topical information easily (Web) • Information is durable (e.g. it can be reviewed many times) • Medium is durable • Moderate production costs • Low reproduction costs; easily scaled • Easily catalogued and reused (by developers and users) • Can be indexed or catalogued to enable non-sequential access	• Requires robust PC and/or high-speed Internet connection • High storage "overhead" (in terms of hard drive capacity) • May not support presentation of complex concepts
Video	Analog	• Highly accessible and potentially engaging format (no literacy skills required) • Sequential structure guides learner • Concrete, specific, detailed information • appropriate for learners with 'visual intelligence' • Engaging and motivating for many learners • Moderate hardware costs	• High production costs; moderate reproduction costs • Complex information may be difficult to present effectively • Information may prove difficult for some learners to analyze/synthesize
	Broadcast	• Same as analog video • Can present contemporary or topical information easily	Same as analog video; however, costs may be higher
	Digital (Web- and CD-based)	• Same as analog video • Can present contemporary or topical information easily • Easily catalogued and reused (by developers and users) • Can be indexed or catalogued to enable non-sequential access • NOTE: "moderate hardware costs" is not applicable	• Same as analog video • Requires robust PC and/or high-speed Internet connection • High storage "overhead" (in terms of hard drive capacity)
Simulations	Interactive (Web- and CD based)	• Active-learning characteristics engage learners via several parts to reinforce concepts • Quantitative elements are supported (and reinforce conceptual learning) • Engaging and motivating for many learners • Can support assessment	• Requires robust PC and/or high-speed Internet connection • Potential additional system requirements (e.g. Java, plug-ins)

include tutorials, drill/practice software, educational websites, and/or online/offline computer tests.

Teachers should also be aware of different types of instruction that can be held using technology as well. Knowledge of the type of instruction would help teachers design their courses more effectively. Two basic types of instruction are specified for teaching with technology: e-learning and blended learning. *E-learning is a computer based educational tool or system that enables you to learn anywhere and at any time* (Epignosis LLC, 2014, p. 3). There are certain plethora for e-learning that needs certain degrees of familiarity if teachers are going to use them in instruction. These may include Learning Management Systems (LMS), websites, collaborative systems, social media, etc. Conventionally, if all learning takes place in a virtual learning environment and students and the teacher never meet, the course is called e-learning. If a part of the course is held in a face to face manner and a part of teaching and learning materials is extended to the virtual environment, the course is blended.

Blended instruction is defined as (Lim, Morris, & Kupritz, 2011, p. 28):

1. A learning method with more than one delivery mode is being used to optimize learning outcomes and reduced cost associated with program delivery,
2. Any mix of instructor-led training methods with technology-based learning, and
3. The mix of traditional and interactive-rich forms of classroom training with any of the innovative technologies such as multimedia, CD-ROM, video streaming, virtual classroom, email/conference calls, and online animation/video streaming technology.

Technological Pedagogical Content Knowledge

Knowledge of using various technologies to teach, present, and facilitate knowledge creation of specific subject content. This is the ultimate knowledge of a language teacher to be able to teach language efficiently, based on pedagogical norms, using appropriate technology, and combining them with their knowledge of teaching English appropriately (considering the theories and practices of applied linguistics).

Table 5. The EFL TPACK Components (Adapted from Rahimi & Pourshahbaz, 2017)

EFL TPACK Constructs	Definition	Example
CK	Knowledge of the subject matter without consideration about teaching the subject matter	English language proficiency
PK	Knowledge about the students' learning, instructional methods, different educational theories, and learning assessment to teach a subject matter without references towards content	Knowledge of generic teaching strategies, beliefs, and practices along with support knowledge, the knowledge of the various disciplines that would enrich teachers' approach to the teaching and learning of English (e.g. educational psychology, second language acquisition), such as knowledge of using metacognitive strategies to enhance learning
PCK	Knowledge of representing content knowledge and adopting pedagogical strategies to teach English	The specialized knowledge of language teaching and learning; how to represent English as a foreign language in the classroom and how language learners come to understand English in the context of real teaching; discovering the students' problems and ways to overcome those problems by considering all variables related to their language learning (teaching materials, assessment procedures, parents, etc.), such as knowledge of conducting group activities to improve students' learning
TK	Knowledge about how to use ICT hardware and software and associated peripherals	IT literacy, knowledge of technology in general, knowing about basic computer applications (software), devices (printers, scanners, digital cameras), and environment (www)
TPK	Knowledge of the existence and specifications of various technologies to enable teaching approaches without reference towards subject matter	IT integration literacy, the ability to use technologies to teach and interact with students
TCK	Knowledge about how to use technology to represent/research and create the content in different ways without consideration about teaching	Knowledge of CALL at the level of technology use and content preparation
TPACK	Knowledge of using various technologies to teach, represent, and facilitate knowledge creation of specific subject content	Knowledge of CALL teaching/learning: using multimedia software/games as a tool to enrich teaching language macro skills (listening, speaking, reading, writing) and components (grammar, vocabulary, pronunciation); class management and assessing students' learning; presenting content via appropriate language teaching strategies by using proper technological tools intermingled with appropriate language teaching methodology/ instructional materials

For a language teacher, the basic knowledge of TPACK involves the knowledge of different types of CALL, their underlying theoretical frameworks, the required technology, and types of activities. This also means to be able to integrate this knowledge into teaching macro (listening, speaking, reading, and writing) and micro skills (vocabulary, pronunciation, grammar) using appropriate teaching methodology. This means being aware and able of teaching appropriately and taking the role of a CLT teacher, while appropriate class management and assessing techniques are brought into the instruction. A summary of the EFL TPACK is presented in Table 5.

By going through the EFL TPACK model presented above, it is clear that when ICT use is accompanied by appropriate knowledge base on teachers' side, it can help EFL teachers to enhance all aspects of their teaching; from materials development to classroom management to appropriately diagnose language learners' learning problems and solving those problems professionally. In this way, ICT integration would be a truly wise choice for every EFL classroom paving the way of creating a more authentic and native-like language teaching and learning environment for both EFL teachers and learners.

CONCLUSION

EFL teachers' TPACK framework, its categories and models were investigated in this chapter. This was done with the perspective of different language teaching/learning approaches, assessment techniques, knowledge domains, technological affordances, and their merits/demerits. Needless to say, similar to TPACK construct for educators in general, EFL teachers' TPACK is complicated and requires detailed elaboration. The research carried on this area is covered in the following chapter.

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Chapter 7
EFL TPACK:
Research Agenda

ABSTRACT

This chapter lists studies done on EFL TPACK in the last decade. The empirical studies on the prototypical model of TPACK seem to boom in the second decade of the twenty-first century, specifically from 2012. As a new and still-evolving construct, some studies have focused on teachers' (both in-service and pre-service) understanding of the construct itself and its relationship with other variables (e.g., demographic, psychological, technological). Another group of studies have emphasized the importance of the way TPACK should be operationally defined. A few measures of EFL TPACK have thus been developed by some researchers. They are discussed in the current chapter and their samples are provided in the Appendix of the book for further reference.

BACKGROUND

Research suggests that integrating ICT into education has become significantly important for European and Western countries in the last decade. In the same vein, the expansion of technological infrastructures has made ICT one of the most important issues addressed in educational systems of developing countries. One reason for this movement is to prepare the labor force of a world in which technology is being normalized. As a result, the mainstream education needs technologically literate teachers to handle classes of digital

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natives and direct them in the right path of using technology for their academic and professional goals. Having said this fact, teacher professional development is now considered a highly important resource in the field of language teaching to help EFL teachers develop their knowledge base to catch up the needs of today's modern world (Avalos, 2011; Kleinsasser, 2013). Professional development programs in the area of CALL are one example (Hong, 2010). In the following the body of research done on EFL TPACK is briefly reviewed.

All around the world, short term pre-service and in-service courses have been prevalent ways enabling educators to develop their professional capacities. Needless to say, these programs cannot be very fruitful without a comprehensive needs analysis. A wise step to do so would be investigating the needs of EFL teachers regarding ICT literacy. It would be useful to gain comprehensive insights about EFL teachers' current level of TPACK, and find out accurate facts about their strong and weak points considering different dimensions of TPACK knowledge base. In this way, the program would be certainly more effective and lots of time, money and resources would be saved.

EFL-TPACK

Xiaobin, Wei, Huiwen and Lijun (2012) investigated practical application status of Educology of Foreign Languages among English teachers involved in National English Teachers Training Project in China. The results showed that the participants knew a little about TPACK, while nearly 80% of the subject said that they knew nothing about TPACK. The teachers were also found to have low capabilities towards using technology in language instruction.

Fauzan Ansyari (2012) developed and evaluated a professional development program for technology integration in English language teaching setting in an Indonesian higher education. The study mainly explored the impact of such program on English lecturers' TPACK development. To gather data TPACK survey, TAC survey, technology integration assessment rubric, interview, and logbook were used. The findings suggested that all participants had positive experiences with the professional development programs. The weaknesses of the programs were viewed on limited time, technology exploration, and students' active engagement. TPACK was also enhanced after the professional development program. The findings from lesson plan assessment demonstrated

that the professional development program had a sound impact based on the overall result of the lecturers' lesson plan designs in all components of TPACK, except in CK.

Rahmany, Sadeghi, and Chegini (2014) examined the effect of technology integration in general and normalization of CALL in particular on Iranian teachers' technological, pedagogical, and content knowledge (TPACK). Teachers' main opportunities and challenges with normalization of CALL were also scrutinized. To reach these goals, 16 teachers taught a course with the goal to integrate computer technology in instruction. The TPACK questionnaire was administered among the participants before and after the course and a semi-structured interview was held after the course. Observations of the classes were carried out to gain a complementary understanding of the process of CALL normalization and how teachers dealt with their new roles. The results revealed that technology-related knowledge domains developed significantly and that Iranian educational society is highly sensitive to instructional technology and its use in education.

Liu et al. (2014) investigated the technological pedagogical content knowledge (TPACK) of English as foreign language (EFL) teachers. They focused on how technology was connected with EFL teachers' professional knowledge and the importance of TPACK in EFL teaching. They also discussed four points concerning EFL teachers' challenge in developing TPACK including the integration of technology into teachers' present knowledge system, the relationship between new and old knowledge, teachers' willingness to accept new technology and teachers' weaker position in using new technology. They also justified the existence and development of the construct EFL TPACK as a connection of two sources of knowledge, i.e. the formal knowledge and skills provided and supported by schools and teaching community and the practical knowledge in using technology.

In another study, Tseng (2014) assessed EFL students' perceptions of their teachers' TPACK through a validated student-based TPACK instrument in Taiwan. The results of the survey showed that the teachers were thought to be more proficient in the three individual domains of core knowledge than in the intersections between them. In particular, the students perceived that their teachers demonstrated content knowledge more adequately than their integrated TPACK.

Wu and Wang (2015) investigated the TPACK of in-service EFL teachers at elementary schools in Taiwan. Also, the possible needs of these EFL teachers for their future professional development were examined. The quantitative data were gathered by a questionnaire to assess the EFL teachers' performance on

the seven TPACK construct components and their synthesized TPACK was grasped by interviews and observations. The Revised Bloom's Taxonomy and the pedagogic framework for computer-assisted language learning were used to analyze the qualitative data. The results indicated that the EFL teachers needed more technology knowledge to further develop their TPACK, and that the EFL teachers' TPACK focused much on motivating students, rather than on using technology for creating opportunities for students to use English language meaningfully and authentically

Liu and Kleinssaser (2015) did a mixed study and gathered both quantitative and qualitative data on how EFL vocational high school teachers perceived CALL knowledge and competencies in a yearlong technology-enriched professional development program. The teachers' developing TPACK and perceived computer self-efficacy were examined from their use of technology while participating in online EFL instruction. Data analysis revealed that the participants' TPACK and self-efficacy of using computer technology, their application and infusion of technology in English instruction, and factors that facilitated or hampered their (technology) professional developed.

Akcay, Mancilla, and Polat (2015) investigated EFL teachers' perceptions of their Technological Pedagogical Content Knowledge (TPACK). The data was collected from 54 EFL pre-service or/and in-service teachers using a TPACK survey to identify if and how teachers interact with technology in their classrooms. The preliminary results revealed no statistically significant difference between those who were active EFL in-service teachers and those who continued in pre-service education programs regarding the seven technology acceptance measures.

Kwangsawad (2016) determined EFL pre-service Thai teachers' TPACK trough a wide range of approaches including self-report, lesson plan assessment and classroom observations. This was done to examine EFL pre-service teachers' ability to apply and foster the interplay between content, pedagogy and technology in their classrooms. The results of self-reported data (as measured by TPACK survey), lesson plan assessment and classroom observations showed high scores for all domains.

Rubadeau (2016) investigated English language teacher educators' cognitions and practices related to pedagogical technology integration at a South Korean university. Data collected over twenty weeks and included four rounds of semi-structured interviews and two sets of classroom observations for each of participants as well as interviews with program administrators, written reflections, field notes, photographs, and document review. The results revealed that the focal participants displayed high levels of TPACK

and used Web 2.0 applications extensively to facilitate interactions in their roles as teacher educators. It was also found that UTAUT (Unified Theory of Acceptance and Use of Technology) factors guided teacher educators' (TE) decisions and use behavior to varying degrees, but that the mediating factor of age did not relate to TEs' decisions in the manner predicted by the UTAUT.

Ersanli (2016) explored the effectiveness of a five-week workshop and training sessions on Technological Pedagogical Content Knowledge (TPACK) of pre-service English language teachers in Turkey. The data were gathered through the TPACK Scale developed by Solak and Çakır (2014) and journal entries of pre-service English language teachers before and after the procedure. The results indicated a statistically significant improvement in TPACK scores of both male and female pre-service English language teachers. The journal entries clearly indicated an increase in several possible applications or websites that can be used in the classroom with more effective and to the point objectives. The pre-service English language teachers also displayed better performance in manufacturing and tailoring language learning/teaching materials with specific goals.

Cahyono, Kurnianti, and Mutiaraningrum (2016) examined how Indonesian EFL teachers' TPACK-oriented teaching practice course improved as a result of improving the quality of their EFL instructional designs and teaching practices. The teachers attended 16-session course in which they were introduced to TPACK framework and were assigned to make instructional designs based on TPACK framework. Moreover, they were asked to teach their colleagues (peer teachers) using the TPACK-oriented instructional designs. At the end of the course the teachers were given a questionnaire asking the benefit of the TPACK-oriented teaching practice course in improving the quality of their EFL instructional designs and their EFL teaching practices. The result of the study showed that the teachers benefited a lot from the TPACK-oriented teaching practice course and they have successfully prepared instructional designs and performed the teaching practices by applying TPACK framework.

Rahimi and Pourshahbaz (2016) investigated Iranian EFL teachers' Technological Pedagogical Content Knowledge (TPACK). The result of the study showed that Iranian EFL teachers have a roughly high level of TPACK in general. Their knowledge on four components of the scale was also assessed. The result also revealed that EFL teachers' had higher level of knowledge on design (competencies in designing teaching to enrich the teaching process with the help of their technological and pedagogical knowledge about the content to be taught before the teaching process of the content) and exertion (competencies in using technology for the execution of the teaching process

and for the measurement and evaluation of the effectiveness of the process) in comparison to ethics (competencies in ethics regarding teaching profession and ethical issues such as privacy, accuracy, property and accessibility) and proficiency (leadership ability to integrate technology into content and pedagogy by becoming experts in the teaching profession, to put forward suggestions for solving problems related to the subject area, the teaching process and technology, and to choose the most appropriate one among these suggested solutions).

Rahimi and Pourshahbaz (2017) investigated the role of Technological and Pedagogical Content Knowledge of language teachers in their use of Information and Communication Technologies (ICTs) in language classes. The level of participants' TPACK was assessed by TPACK-deep scale with four dimensions including design, exertion, ethics, and performance. The use of different types of technological affordances in teaching English as a foreign language was also measured by ICT-use rating scale. The results of correlation revealed significant and positive correlations between ICT use in language classes and EFL TPACK in general and its four components including design, exertion, ethics, and performance. Further, the result of multiple regressions revealed that EFL TPACK is a significant predictor of ICT use and can predict more than 26% of its variance.

Turgut (2017) addressed the issue of the longitudinal process to see if PTs' perceived development of TPACK skills followed an increasing linear pattern through years as planned in four-year-long language teacher education programs. Based on TPACK survey with open-ended questions, results of the study indicated a nonlinear pattern of TPACK development over time.

Lailiyah and Cahyono (2017) investigated Indonesian EFL teachers' self-efficacy towards technology integration and their use of technology in EFL teaching. Data were collected by using a questionnaire and interview protocols. Analysis of the data showed that there is a relationship between the EFL teachers' self-efficacy and their use of technology in EFL teaching.

Thooptong (2017) examined the implementation and evaluation a professional development program for technology integration based on communicative language teaching (CLT) among Thai in-service EFL teachers. The study focused on evaluating in-service EFL teachers' knowledge and skills in CLT and technology integration in CLT and their experiences with participating in the program. The results showed that the post-test scores of the in-service teachers' knowledge in CLT and technology integration in CLT were significantly higher than the pre-test scores. However, their skills

in CLT and technology integration in CLT were at the low level. Almost all participants reported having positive experiences with the program.

Measure of EFL-TPACK

A number of instruments have been developed to assess TPACK. The differences of these instruments lie in different TPACK frameworks that have been developed to this date. The TPACK survey developed and validated by Schmidt et al. (2009) is a widely used instrument to assess TPACK. This scale assesses TPACK in terms of the seven distinct components of TPACK: TK, CK, PK, TCK, PCK, TPK and TPACK.

The 24 item TPACK survey developed by Archambault and Crippen (2009) is another example. The survey, like the previous one, examines TPACK by the seven components of TPACK based on the prototypical model. What these two instruments have in common is that they have been built on the commonly used TPACK framework (Koehler & Mishra, 2008; Mishra & Koehler, 2006). The TPACK scale developed and validated by Yurdakul et al., (2012) however is a little different from these two. The scale has been built on the TPACK framework developed by Yurdakul et al., (2012) and consists of four sub-scales including Design (10 items), Exertion (12 items), Ethics (6 items), and Proficiency (5 items).

Some instruments have been specifically developed to measure language teachers' TPACK. The first one is an EFL-TPACK questionnaire that investigates EFL students' perceptions of their teachers' TPACK (Tseng, 2014). In the process of developing the scale, the TPACK prototypical model with seven components was put into test (TK, CK, PK, PCK, TCK, TPK, and TPACK). The result showed that EFL teachers' TPACK consists of five factors, three of which were found to be TK, TPK, and PCK and two of which were the combination of PK and CK; and TCK and TPACK respectively.

Baserab, Kopchac, and Ozdend (2016) also developed and validated a self-assessment survey that examines TPACK of EFL teachers. The TPACK-EFL survey, as it is called by the authors, aims to provide an assessment tool for pre-service foreign language teachers and addresses subject-specific pedagogies and technologies. The result of data analysis revealed a seven-factor structure for TPACK including TK, CK, PK, PCK, TCK, TPK, and TPACK.

In another study, Hsu (2016) explored the psychometric property of measure of EFL teachers' TPACK. The research instrument was the TPACK-EFL and the exploratory factor analysis (EFA) with extraction method of Maximum

Likelihood and the rotation method of Promax with Kaiser Normalization, was performed to extracted factors with factor loading above .50. Seven constructs (Technological Knowledge, Pedagogical Knowledge, Content Knowledge, Technological Pedagogical Knowledge, Technological Content Knowledge, Pedagogical Content Knowledge and Technological Pedagogical Content Knowledge) were retrieved. Afterwards, the Confirmatory Factor Analysis (CFA) was undertaken to examine the convergent and discriminant validity of selected factors. Results showed that the constructs met the necessary requirement and the items had convergent validity.

What is vitally important to mention here is that these scales showed that EFL TPACK has the same factor structure as the general scale, verifying the seven-component model of TPACK (Shahin, 2011; Shmidt, Baran, Thompson, Koehler, Mishra, & Shin, 2009). However, what distinguishes these scales from the original version is the way items are loaded on the extracted factors. This means that the general model as a whole is valid to be used across subject matters; however, context specific studies are required to explain the details of the construct TPACK.

CONCLUSION

This chapter presented studies done in TPACK field. Some scales and instruments were introduced for measuring the TPACK construct alongside their validation models.

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Appendix

1. TPACK-DEEP SCALE (YURDAKUL, ODABASI, KILICER, COKLAR, BIRINCI, & KURT, 2012)

1. I can update an instructional material (paper based, electronic or multimedia materials, and etc.) based on the needs (students, environment, duration, and etc.) by using technology.
2. I can use technology to determine students' needs to a content area in the pre-teaching process.
3. I can use technology to develop activities based on students 'needs to enrich the teaching the teaching and learning process.
4. I can plan the teaching and learning process according to available technological resources.
5. I can conduct a needs analysis for Technologies to be used in the teaching and learning process to increase the quality of teaching.
6. I can optimize the duration of the lesson by using technologies (educational software, virtual labs, and etc.
7. I can develop appropriate assessment tools by using technology.
8. I can combine appropriate methods, techniques and technologies by evaluating their attributes in order to present the content effectively.
9. I can use technology to appropriately design materials to the needs for and effective teaching and learning process.
10. I can organize the educational environment in an appropriate way to use technology.
11. I can implement effective classroom management in the teaching and learning process in which technology is used.
12. I can assess whether students have the appropriate content knowledge by using technology.
13. I can apply instructional approaches and methods appropriate to individual differences with the help of technology.

14. I can use technology for implementing educational activities such as homework, projects, and etc.
15. I can use technology for evaluating students' achievement in related content areas.
16. I can use technology for evaluating students' achievement in related content areas.
17. I can be an appropriate model for the students in following codes of ethics for the use of technology in my teaching.
18. I can guide students in the process of designing technology based products (presentations, games, films, and etc.
19. I can use innovative technologies (Facebook, blogs, twitter, podcasting, and etc.) to support the teaching and learning process.
20. I can use technology to update my knowledge and skills in the area that I will teach.
21. I can update my technological knowledge for the teaching process.
22. I can use technology to keep my content knowledge updated.
23. I can provide each student equal access to technology.
24. I can behave ethically in acquiring and using special/private information –which will be used in teaching a subject area –via technology (audio records, video records, documents, and etc.).
25. I can use technology in every phase of the teaching and learning process by considering the copyright issues (e.g. license).
26. I can follow the teaching profession's codes of ethics in online educational environments (WebCT, Moodle, etc.).
27. I can provide guidance to students by leading them to valid and reliable digital sources.
28. I can behave ethically regarding the appropriate use of technology in educational environments.
29. I can troubleshoot problems that could be encountered with online educational environments (WebCT, Moodle, etc.).
30. I can troubleshoot any kind of problem that may occur while using technology in any phase of the teaching and learning process.
31. I can use technology to find solutions to problems (structuring, updating and relating the content to real life, etc.).
32. I can become a leader in spreading the use of technological innovations in my future teaching community.
33. I can cooperate with other disciplines regarding the use of technology to solve problems encountered in the process of presenting content.

2. TPACK-EFL

Constructs Items

Technological Knowledge (TK)

1. I can use basic technological terms (e.g. operating system, wireless connection, virtual memory, etc.) appropriately.
2. I can adjust computer settings such as installing software and establishing an Internet connection.
3. I can use computer peripherals such as a printer, a headphone, and a scanner.
4. I can troubleshoot common computer problems (e.g. printer problems, Internet connection problems, etc.) independently.
5. I can use digital classroom equipment such as projectors and smart boards.
6. I can use Office programs (i.e. Word, PowerPoint, etc.) with a high level of proficiency.
7. I can create multimedia (e.g. video, web pages, etc.) using text, pictures, sound, video, and animation.
8. I can use collaboration tools (wiki, edmodo, 3D virtual environments, etc.) in accordance with my objectives.
9. I can learn software that helps me complete a variety of tasks more efficiently.

Content Knowledge (CK)

10. I can express my ideas and feelings by speaking in English.
11. I can express my ideas and feelings by writing in English.
12. I can read texts written in English with the correct pronunciation.
13. I can understand texts written in English.
14. I can understand the speech of a native English speaker easily.

Pedagogical Knowledge (PK)

15. I can use teaching methods and techniques that are appropriate for a learning environment.

16. I can design a learning experience that is appropriate for the level of students.
17. I can support students' learning in accordance with their physical, mental, emotional, social, and cultural differences.
18. I can collaborate with school stakeholders (students, parents, teachers, etc.) to support students' learning.
19. I can reflect the experiences that I gain from professional development programs to my teaching process.
20. I can support students' out-of-class work to facilitate their self-regulated learning.

Pedagogical Content Knowledge (PCK)

21. I can manage a classroom learning environment.
22. I can evaluate students' learning processes.
23. I can use appropriate teaching methods and techniques to support students in developing their language skills.
24. I can prepare curricular activities that develop students' language skills.
25. I can adapt a lesson plan in accordance with students' language skill levels.

Technological Content Knowledge (TCK)

26. I can take advantage of multimedia (e.g. video, slideshow, etc.) to express my ideas about various topics in English.
27. I can benefit from using technology (e.g. web conferencing and discussion forums) to contribute at a distance to multilingual communities.
28. I can use collaboration tools to work collaboratively with foreign persons (e.g. Second Life, wiki, etc.).

Technological Pedagogical Knowledge (TPK)

29. I can meet students' individualized needs by using information technologies.
30. I can lead students to use information technologies legally, ethically, safely, and with respect to copyrights.
31. I can support students as they use technology such as virtual discussion platforms to develop their higher order thinking abilities.

32. I can manage the classroom learning environment while using technology in the class.
33. I can decide when technology would benefit my teaching of specific English curricular standards.
34. I can design learning materials by using technology that supports students' language learning.
35. I can use multimedia such as videos and websites to support students' language learning.

Technological Pedagogical Content Knowledge (TPACK)

36. I can use collaboration tools (e.g. wiki, 3D virtual environments, etc.) to support students' language learning.
37. I can support students as they use technology to support their development of language skills in an independent manner.
38. I can use Web 2.0 tools (animation tools, digital story tools, etc.) to develop students' language skills.
39. I can support my professional development by using technological tools and resources to continuously improve the language teaching process.

3. MEASURE OF EFL STUDENTS ON THE TPACK OF THEIR TEACHERS (TSENG, 2014)

Technological Knowledge

1. My teacher knows about basic computer hardware (e.g. RAM, network cable, and projector).
2. My teacher knows about basic computer software (e.g. media players, word processing programs, and web page browsers).
3. My teacher knows how to solve technical problems associated with hardware (e.g. setting up printers, using webcams, and changing hard drives).
4. My teacher knows how to deal with technical problems related to software (e.g. installing drivers, setting up Internet connection, and sharing files in the cloud).
5. My teacher keeps up with important new technologies (e.g. e-books, Facebook, and white board).

Pedagogical Knowledge

1. My teacher uses a variety of teaching strategies in class (e.g. explanation, raising questions, and group work).
2. My teacher uses different evaluation methods and techniques (e.g. quiz, report, and role-playing).
3. My teacher understands students' learning difficulties.
4. My teacher adjusts the ways he/she teaches according to student performance and feedback.
5. My teacher knows how to manage his/her class (e.g. drawing up clear class rules, creating friendly atmosphere in class, and developing a good relationship between students and the teacher).

Content Knowledge

1. My teacher has sufficient knowledge of English grammar.
2. My teacher has good pronunciation.
3. My teacher teaches class naturally in English.
4. My teacher creates materials that can enhance my learning.
5. My teacher answers students' questions about English.

Technological Pedagogical Knowledge

1. My teacher uses technologies to motivate me to learn.
2. My teacher uses technologies to explain clearly.
3. My teacher uses technologies to interact more with us.
4. My teacher uses technologies to facilitate teaching activities.
5. My teacher uses technologies appropriate for his/her teaching.

Technological Content Knowledge

1. My teacher uses digitalized teaching materials with which I can learn vocabulary better.
2. My teacher uses digitalized teaching materials with which I can learn grammar better.
3. My teacher uses digitalized teaching materials with which I can read better.

4. My teacher uses digitalized teaching materials with which I can speak better.
5. My teacher uses digitalized teaching materials with which I can understand the target culture better.

Pedagogical Content Knowledge

1. My teacher conducts lectures in which I can understand English better.
2. My teacher conducts quizzes in which I can practice English more.
3. My teacher conducts games in which I can practice English more.
4. My teacher conducts group activities in which I can use English more.
5. My teacher conducts discussion activities in which I can use English more.

Technological Pedagogical Content Knowledge

1. My teacher represents content with appropriate strategies via the use of various technologies.
2. My teacher provides us with the opportunity to practice English with appropriate strategies via the use of various technologies.
3. My teacher provides us with the opportunity to use English with appropriate strategies via the use of various technologies.
4. The way my teacher teaches English with the computer is engaging.
5. The way my teacher teaches English with the computer is of help to English with the computer is of help to.

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Related Readings

To continue IGI Global's long-standing tradition of advancing innovation through emerging research, please find below a compiled list of recommended IGI Global book chapters and journal articles in the areas of online learning, asynchronous learning experiences, and technological pedagogical content knowledge. These related readings will provide additional information and guidance to further enrich your knowledge and assist you with your own research.

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