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From the Editor

Dear IJCER Readers,

Welcome to Volume 5, Issue 2 of IJCER

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Hope to meet you in the next issue of IJCER.

Regards,

Dr. Cahit ERDEM
Editor

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Distance Education: Definitions, Generations, Key Concepts and Future Directions

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Distance Education: Definitions, Generations, Key Concepts and Future Directions

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Abstract

Distance Education, nowadays defined more as Open and Distance Learning, dates back to 1800s. Once considered as using non-traditional approaches and delivery methods compared to conventional campus-based education, distance education now has become a mainstream form of education increasing its popularity and use in the 21st century. Distance education has taken various forms and different definitions have been adopted depending on the age it has been developed. Technologies and pedagogies of the age along with the societal circumstances have influenced how distance education is viewed and practiced making way for different generations of distance education. Distinct concepts, pedagogies and practices for distance education have also emerged on the journey distance education has taken since the 19th century. For this reason, this article firstly provides a critical review of the definitions of distance education presenting a new definition reflecting the affordances of the digital age. Moreover, the distance education generations are presented with focus on the factors leading to the forming of these new generations. Concepts such as transactional distance and social presence and trends and practices such as OERs, MOOCs and learning analytics are also addressed. Furthermore, the role of culture in design, delivery and perception of distance education is discussed with focus on the future of distance education.

Keywords: Distance education, Generations, Definitions, Concepts and trends, Culture

Introduction

Open and Distance Learning has gained a new breath with the turn of the 21st century with more and more courses delivered through distance education models worldwide. The impact of the new media, particularly digital connective technologies to deliver courses from a distance has triggered a new interest towards open and distance learning opportunities including the advent of Open Education Resources (OER) and Massive Online Open Courses (MOOCs) that attempt to provide learning access to a wider audience. However, albeit the renewed interest, the history of distance education dates back to 1800s when a Swedish newspaper advertised opportunity to study "Composition through the medium of the Post" (Simonson, Smaldino, & Zvacek, 2015). Similar attempts in the same century to deliver education through distance include that of Isaac Pitman of Britain with shorthand instruction through correspondence (Aydın, 2011). In the 19th century Skerry's College in Edinburgh, University Correspondence College in London and the University of Chicago and Illinois Wesleyan University in the USA are considered among the pioneers in the tertiary level (Simonson et al., 2015). Before these early attempts to deliver education through distance, education was generally viewed as an elite endeavor that primarily male citizens undertook. The school model, which brought the subject area expert (teacher) and students together in terms of space and time, was considered the most effective teaching and learning scheme in the 19th century, and it continues to be the dominant education model today. One of the main reasons for the advent of distance education is to provide equal access to education for citizens of the society who is not among the elite and thus doesn't have the opportunity and the resources to receive on-campus education in an educational institution. Distance education also has given the promise to deliver education to the underrepresented and disadvantaged parts of the society so that a wider audience could access equal access to education. For this reason, distance education is regarded as a more democratic form of education since it aims to reach all and every parts of the society (Gunawardena & McIsaac, 2004). However, distance education practices have been criticized to be of lesser quality and effect compared to campus based education; these criticisms still continue today, although research papers report no significant difference in terms of learning effectiveness and quality between distance and campus-based courses (Ni, 2013; Shanley, Thompson, Leuchner,

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& Zhao, 2004). Yet, some studies even conclude that distance education models are more effective than traditional campus-based education models (Shachar & Neumann, 2003).

Distance education has been engineered and reengineered by the techno-social changes in the society. Besides, the practices, philosophies and cultures of the persons attempting and developing open and distance learning have impacted how it is designed and conducted. Therefore, the philosophical, epistemological and pedagogical roots adopted besides technologies utilized have all shaped the design and delivery of distance education courses. Each generation of distance education has developed in line with the pedagogical underpinnings and technological innovations of its age. It is commonsense to observe the harmony between pedagogy and technology in distance education endeavors in that distance education depends heavily on communications technologies to bridge the geographical and temporal gap between the learners, instructors and the learning resources.

In each generation of distance education, technology and pedagogy have been under the influence of each other. Whereas some experts in distance education has primarily taken pedagogy as the driving force with technology as an aide on the side, others have placed technology in a central role directing the educational experience. Anderson (2003) offers a middle ground in pedagogical and technological determinism battle and suggests that both could be viewed as partners in a dance performance; while technology sets the music and the beat, pedagogy creates the cerography. A Learning Management System that views the world as course and content will require the development of corresponding pedagogies, while rejecting any pedagogy, which is poor in content focus. On the other hand, the technological innovations that can embrace various learning models impact on what pedagogical models can be developed. For instance; the lack of two-way communications technologies will hinder the employment of a pedagogical model that is based on social constructivist pedagogies, which require communication and interaction between learning parties.

This article maps the journey distance education has taken since its first advent in the 19th century focusing on a critical evaluation of the various definitions provided on the road. A new definition that reflects the technological and pedagogical circumstances of the 21st century distance education is also presented. Furthermore, the generations of distance education models are given along with some key trends in concepts, pedagogies and practices.

Distance Education: A Critical Comparison of Definitions

Distance education has had a remarkable effect on the landscape of education since its advent in the 19th century as correspondence study. It has taken various shapes and utilized a wide variety of technologies ranging from postal technologies in 19th century to virtual reality today. Distance education has made into one of the top topics discussed in education in recent years with particular influences stemming from the "open" movement including MOOCs and OER (Simonson et al., 2015). Several definitions have been given as to the nature of what distance education is and what it entails. Earlier definitions depending on distance education models based on print materials in correspondence study, and later the definitions based on the industrial view of distance education have been revised due to advances in technologies which have reshaped the nature of learning materials and how they are produced and delivered, how interaction and communication occurs in distance education. In this part of the article, three definitions each reflecting an era of distance education will be critically reviewed and finally a new definition reflecting the conditions of 21st century will be provided.

In his paper where he states the need for "a clear definition" (p. 1), Keegan (1980) analyzes four definitions and offers "a comprehensive definition" for distance education (p. 6). According to Keegan (1980), the main elements of a definition of distance education are:

- the separation of teacher and learner which distinguishes it from face-to-face (F2F) lecturing
- the influence of an educational organization which distinguishes it from private study
- the use of technical media, usually print, to unite teacher and learner and carry the educational content of the course
- the provision of two-way communication so that the student may benefit from or even initiate dialogue
- the possibility of occasional meetings for both didactic and socialization purposes
- the participation in an industrialized form of education (Keegan, 1980, p. 6).

One of the strengths of Keegan's definition is that his definition focuses on what distinguishes distance education from traditional F2F education. The separation of the teacher and the learner is a key concept in his

definition. However, the definition doesn't explicitly state what form of separation is present between the learner and the teacher. Is it a physical distance, a pedagogical distance or a time zone distance, or social/cultural distance? Next, the definition focuses on what makes distance education different from private study. The strength of this concept is that it focuses, though implicitly, on some form of a planned education experience. The weakness here is the question of whether one would need the influence of an educational organization to experience a planned learning scheme. One other strength of the definition is the inclusion of technical media to bridge the distance between the learner and the teacher. However, although the definition seems to suggest the use of all technical media, it primarily focuses on print. The problem here is that traditional F2F education depends heavily on print materials as well. This is not a concept that differs distance education from F2F education. What's more, this concept is even weaker in our age since the distance between the learners and the teacher can be bridged via a variety of interactive Information and Communication Technologies (ICT) that allow two/multi-way communication both synchronously and asynchronously.

It is of paramount importance that Keegan's definition places emphasis on the possibility of communication even though it does not explicitly clarify the "two-way communication". The definition seems to suggest communication between the learner and the teacher. However, due to limitless affordances of today's technology it is now possible to have a multiway communication. Not only can a group of learners/teachers engage in simultaneous communication, they also can do it on a multichannel level of communication using a variety of ICT. It is of interest that Keegan mentions the possibility of meetings even though he does not clearly state whether these meetings are F2F or mediated meetings (such as a radio or telephone conference). Finally, Keegan's definition was influenced by the industrial age and the industrial model of Distance Education described by Otto Peters. The theory of Distance Education as an industrial model is an organizational model rather than an educational model, which focuses on producing educational content in masses in a production line and distributed to mass number of learners. Whereas the industrial model brings forward the independence of learners, it sacrifices interaction, which is not cost-effective in an industrial view of instruction (Gunawardena & McIsaac, 2004).

Holmberg's (1989) offers a definition that focuses on the concepts of learner, educational organization and communication:

> Distance education is a concept that covers the learning-teaching activities in the cognitive and/or psycho-motor and affective domains of an individual learner and a supporting organization. It is characterized by non-contiguous communication and can be carried out anywhere and at any time, which makes it attractive to adults with professional and social commitments (Holmberg, 1989 p. 168).

One of the strengths of this definition is that unlike Keegan's definition, it includes the three domains of learning: 1) cognitive (thinking), 2) affective (emotion/feeling), and 3) psychomotor (physical/kinesthetic) (Wilson, 2016). However, like Keegan, this definition incorporates the existence of a supporting organization. Moreover, this definition pinpoints to an individual learner whereas, learning is viewed as a social activity (Bandura, 1971). Therefore, the definition fails to include the learning benefits learners might get from interactions taking place among/with peers and teachers. Another strength of the Holmberg's definition is that is highlights learning as an activity without boundaries of time (any time) and space (anywhere). However, the fact that it characterizes Distance Education by only asynchronous communication is a pitfall. In most forms of distance Education asynchronous communication might be the dominant form of communication even though it doesn't have to be the sole form.

Finally, Gunawardena and McIsaac (2004) provide a broader definition which combine key concepts in three definitions by Rumble (1986), Holmberg (1986) and Keegan (1988).

> Distance education defined the distance learner as one who is physically separated from the teacher (Rumble, 1986) has a planned and guided learning experience (Holmberg, 1986), and participates in a two-way structured form of distance education which is distinct from the traditional form of classroom instruction (Keegan, 1988).

The first dimension of Distance Education within this definition is the physical separation of the learner and the teacher. Secondly, this definition also stresses a planned and guided learning experience, which comprises the second dimension. Besides, Gunawardena and McIsaac do not confine learning experience within the boundaries of an organization. Adopting from Keegan (1988) they also characterize a distinct two-way structured form of education. However, they do not give clear explanations as to the distinctiveness of this two-

way structure of Distance Education. This definition highlights Distance Education as a distinct learning/teaching experience since the learner(s) and the teacher(s) are physically separated. In addition, as in all educational endeavors, guidance and planning are two elements of the structured learning/teaching activity. Distance Education also necessitates some form of mediated communication/interaction between learner(s) and the teacher(s), between learner(s) and the educational resources, and among learners. However, the communication the advancement of ICT, the communication possibilities have evolved to include multichannel and multi-way communication besides two-way communication.

Considering the pitfalls of the earlier definitions and the developments in social and virtual technologies, a revision of definitions is needed. A new definition is provided in the light of the arguments presented in this article:

> Distance education is a form of education which brings together the physically-distant learner(s) and the facilitator(s) of the learning activity around planned and structured learning experiences via various two or multi-way mediated media channels that allow interactions between/among learners, facilitators as well as between learners and educational resources.

This definition focuses on the physical separation of learners and facilitators of the learning activity. The careful use of "facilitator" implies that the learner is in the center of the learning experience taking more responsibility of his/her learning as an independent learner. The separation of learners is what makes distance education a distinct form of education than campus based F2F education, which is also highlighted in this definition. Moreover, distance education entails the planned and structured learning experiences which implies that learning in distance education is not accidental but rather intentional (Moore & Kearsley, 2012). This definition, like the earlier definitions, underscores the use of technologies to mediate the interaction and communication between learners, facilitators and the learning resources. However, what this definition adds is the multi-way communication channels besides two-way communication channels. Multi-way communication refers to an enriched way of communication from two-way communication through recent web-based affordances including video conferences, social media channels and discussion forums.

Distance Education: Generations

The concept of distance education has evolved through generations, correspondence, broadcast, and computer mediated distance education (Anderson & Simpson, 2012). The print technology dominated the first generation of distance education. The proliferation of a fundamental communication system, postal service, made education possible beyond the physical boundaries of university campuses (Caruth & Caruth, 2013). Aiming to bring a sense of social justice and equal opportunities, a variety of organizations adopted the correspondence education (Simonson et al., 2015). First-generation distance education sought to expand the scope of education to include the less fortunate who had limited or no access to educational resources and institutions (Anderson & Simpson, 2012). Due to limited two-way communication affordances inherited in the technology of the time, this first generation of distance education was driven by behaviorist theories of learning. Holmberg's (1983) didactic teaching style called "guided didactic conversation" shaped the landscape of the first generation of distance education. Otto Peters was another influential theorist who shifted the focus toward the organization and delivery of distance education (Peters, 1983). Peters's theory of industrialized education highlighted the division of labor in mass production and delivery of learning materials. Although there were no journals dedicated to distance education, the first generation of distance education witnessed the beginning of distance education research (Anderson & Simpson, 2012).

The second generation of distance education was driven primarily by broadcast technologies of radio and television. Although these broadcast technologies opened new doors for interaction opportunities, interaction between the teacher and the student was kept to a minimum (Anderson & Simpson, 2012). During this phase, the Open University in the United Kingdom (UKOU) was an exemplary distance education institution due to its effective use of television. Enabling access to education was still the driving force in distance education (Anderson & Simpson, 2012). However, there was a considerable increase in scholarly and research work in second generation distance education during which research centers, journals, conferences, and distance education-focused associations developed (Anderson & Simpson, 2012). Distance education providers were moved by the concept of economies of scale and mega distance teaching universities, such as Anadolu University in Turkey and Indira Gandhi National Open University in India, emerged enrolling large numbers of students. In the second-generation distance education learning materials were designed based on one-way

communication facilitated by the instructor. Learning was viewed as an individual activity and was based on cognitive or behavioral theories of learning (Anderson & Simpson, 2012).

Distance education has always been mediated by the use of technology and technology has defined and shaped the distance education landscape. The more affordances newer technologies inherited, the more possibilities and opportunities for distance education delivery have been possible. Next generation of distance education was driven by the two-way communication possibilities such as audio/video conferencing, synchronous and asynchronous computer mediated communication. Increased opportunities for interaction led to the recognition of the importance of interaction in distance education courses in the third generation (Anderson & Simpson, 2012). Likewise, the impact of digital technologies with the extended communication possibilities they provide have anchored the importance attached to interaction. These technologies have caused a shift of focus from organization and didactic teaching to the social construction of knowledge (Anderson & Simpson, 2012), which is in line with the social constructivist as well as connectivist theories of learning.

Recent developments still reflect the main driver for the advent of distance education practices; to bring a sense of social justice and equal opportunities for all. The impact of the "open" movement in education reflected in OER and MOOCs are examples of such new developments which are enhanced by the affordances of the connected technologies. Data mining and learning analytics allow the individualization of learning. Also, ubiquity of mobile technologies fosters anytime, anywhere learning (Anderson & Simpson, 2012). The aforementioned innovations continue to transform the distance education landscape creating create new learning experiences and paradigms.

These developments are also reflected in theoretical foundations and research on distance education. Bozkurt, et al. (2015) carried a comprehensive investigation of research articles published 2009-2013. They found that theories of learning focusing on the impact of community and network, collaboration and cooperation besides higher order skills-based concepts such as critical thinking and problem solving are among the most common theoretical frameworks in distance education research (p. 344). They also report that delivery methods such as blended learning, mobile learning that use multimedia elements like cognitive load theory are emerging trends. Psychological distance (transactional distance theory) and presence (social presence theory) as well as learner dedication (self-regulated learning, self-directed learning, and motivation theory) are important emerging constructs. Their results indicate that no single theory is dominantly representative of distance education practices, which reflects the interdisciplinary nature of the field (Bozkurt, et al., 2015).

Bozkurt, et al. (2015) also highlight a paradigm shift to reflect the "open" trend in distance education. They point out that the generic term defining the field is "distance education" is not the sole descriptor of the field anymore. The term "open and distance learning" has been used more to reflect the shift toward a more social and learner centered view of learning adopting openness for more social equity. Also, in their research, Bozkurt, et al. (2015) conclude that distance education research indicates that the field responses to emerging research topics and "learning" is the major topic in the field. In addition to pedagogical concepts such as interaction and communication in learning communities, learner characteristics, and instructional design (Bozkurt, et al., 2015), distance education research continue to focus on issues of staff development (Feng, Lu, & Yao, 2015; Owusu-Mensah, Anyan, & Denkyi, 2015), universal design and disability accommodation (Barnard-Brak, Paton, & Sulak, 2012; Catalano, 2014; Elias, 2011; Rooij & Zirkle, 2016) and management of distance education institutions (Nworie, 2012; Olivier, 2014).

It is clear that the future of distance education will be directed by learning processes occurring in informal, non-formal as well as formal learning environments. Enhancing the initial goal of distance education, social equity and openness for all, and reflecting the community-based and socially driven approaches to learning, it seems that the field of distance education (or open and distance learning) will be seeing more of OERs and MOOCs.

Key Concepts and Trends in Distance Education

In this part of the article, some of the key concepts and trends in distance education will be discussed. Theories of particular relevance to distance education such as transactional distance, social presence and connectivism; concepts which require an unconventional lens in distance educational practices such as learner and culture; and finally, educational trends that are rooted in distance education paradigms such as OERs, MOOCs and learning analytics will be addressed.

Transactional Distance and Control in Distance Education

The theory of Transactional distance was developed by Moore (1991). Transactional distance views distance not as a geographical distance but as pedagogical distance (Moore & Kearsley, 2012). This distance is determined by the amount of dialogue occurring between the learner and the instructor, and the amount of structure within the design of the course (Gunawardena & McIsaac, 2004). Greater transactional distance occurs when there is more structure and less learner-instructor dialogue. Although transactional distance might seem like an issue for distance education courses, it might be present in a traditional F2F course such as in a big-sized auditorium-style class where there is little, if any, dialogue between the learner and the instructor. The amount of control that the instructor exerts into the course adds to the structure of a course, which increases the transactional distance. There might be other types of distances present in a course such as intellectual (the level of knowledge or prerequisite learning), cultural (language, age, gender, religion etc.), and social distance (support, closeness, affinity) (Gunawardena & McIsaac, 2004).

It might seem relatively easy to improve the amount of dialogue in a F2F course compared to a distance education course. However, the advent of web tools, social network tools in particular, which enable high levels of interactivity, dialogue and connectivity, might serve as useful tools to decrease the transactional distance stemming from the lack of dialogue between the learner and the instructor. Yet, the existence of such connective tools would not in on themselves be sufficient to foster further dialogue between the learner and the instructor unless the required pedagogies of social learning are implemented throughout the course.

As previously stated the amount of control by the instructor adds to the structure of the course thereby increasing the transactional distance. Some form of instructor control might be desirable to keep the learners in track of the learning objectives of a course. However, too much instructor control might put the learner off due to the rigidity and inflexibility of the course, which might prevent the learner from identifying himself/herself with the course. One of the ways to diminish the structure in a course would be when the instructor acts as a guide rather than a source of all knowledge in the course. Also, giving the learner the choice to choose between a set of resources might help the learner to direct his/her own learning according to his/her needs and interests. Similarly, presenting the learner with choices as to what tools to use to represent his/her opinions, identity, creativity and productivity etc. might add to the flexibility of the structure of the course. Finally, involving the learner into decision-making process in course instructional design might be helpful in decreasing transactional distance created by otherwise a rigid structure.

Control in Distance Education

The ultimate goal of adult education is to encourage learners to develop skills that allow them to plan, organize and conduct their own learning experience. In order to better guide learners to develop independence and self-directed learning skills, it is vital to explore the concept of control. According to Garrison and Baynton (1987), control, which is characterized as the opportunity and ability to influence, direct, and determine decisions related to the educational process, is composed of three dimensions; independence, power and support. The dynamic balance between these three components enables the learner to develop and maintain control over the learning process. Independence refers to the learner's freedom to choose the learning objective, learning activities and the methods of evaluation. Independence is associated with the freedom to choose what, when, how and where to learn. Within distance education, independence is a desirable process that should be encouraged in a distance learner. The second component of control, power, refers to the ability or the capacity to take part in and assume responsibility of one's own learning. Power is viewed as a psychological dimension and is associated with and influenced by learner variables of attitude, emotional maturity, cognitive style, self-concept and motivational level. The final element, support refers to resources (courses, learning materials, instructors, media etc.) that the learner needs to carry out the learning process. Support has two dimensions; financial (logistical) and emotional. While financial (logistical) support includes the availability of educational materials, emotional support refers to support that the learner gets from the instructor, peers, friends and family. Emotional support is the human touch in a distance education course. However, a balance of independence and support should be taken into consideration since too much instructor interference in terms of support might be detrimental to control. Support should be designed in a way to enhance greater degrees of control on the part of the learner. The three components are in a dynamic relationship with each other, and throughout the learning process, control can only be achieved when there is balance among these concepts. In an educational program, of the three dimensions, one dimension of control might be weaker the other two, which might diminish learner

control over the learning experience. In this case, the other dimensions must be made stronger to make up for the weaker dimension unless the remaining dimensions are already strong enough to compensate the reduction.

On condition that we can achieve a good balance among these three dynamic concepts composing learner control over the learning experience, any individual can learn within distance education. When individuals are provided with the freedom to diagnose their own learning needs and formulate their own learning goals (independence), when the individuals possess the needed intellectual ability, study skills and motivation (power), and when educational materials as well as emotional encouragement is available to individuals (support), and when all these conditions are met in concert with each other, each learner will successfully achieve a distance education course. However, individual differences and/or contextual requirements/restrictions might cause one dimension to fall short compared to other dimensions causing learner control to be reduced. Then, the educational institution and/or the instructors, aware of the shortcomings, should take informed action to increase the reduced learner control to enable effective learning experiences on the part of the learner.

Social Presence in Distance Education

Gunawardena (1995) and Gunawardena & Zittle, (1997) provide a solid theoretical framework for Social Presence (SP). However, Tu & McIsaac (2002) further elaborates on the SP concept, expands it to include further dimensions. They also give practical guidelines that can be easily translated and implemented into online learning environments. According to Gunawardena (1995) and Gunawardena & Zittle (1997), SP is defined as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships..." (Short et al., 1976 p. 65 cited in Gunawardena, 1995). Two concepts are associated with SP; intimacy and immediacy. Intimacy depends on factors such as physical distance, eye contact, smiling, and personal topics of conversation. Immediacy is a measure of the psychological distance that an individual puts between himself/herself and others. Verbal, as well as non-verbal cues such as physical proximity, formality of dress and facial expression, etc. are indicative of immediacy. Both intimacy and immediacy enhance SP.

SP is dependent upon the qualities of both the medium and the communicators. Computer mediated communication (CMC) is considered to be low in non-verbal and social cues. However, Equilibrium Theory holds that the lack of one form of communication cue might be compensated through the utility of other forms of cues. What it means is that that a communicator tends to adopt other forms of communication relay non-verbal messages (Gunawardena, 1995). Therefore, a communicator in a CMC environment will use verbal replacements such as "I agree", and non-verbal cues such as emoticons to convey his/her message better. In a f2f environment, teacher immediacy behaviors include both verbal and nonverbal actions such as gesturing, smiling, using humor, vocal variety, personalizing examples, addressing students by name, questioning, praising, initiating discussion, encouraging feedback and avoiding tense body positions. Although some of these elements may not be available in CMC (e.g. vocal variety), other elements might be replicated in CMC such as addressing the students by name etc.

SP has been identified as a potentially key component for learning and teaching effectiveness in both F2F and distance education courses. In a CMC environment, participants create SP through a variety of strategies such as constructing communities and reflecting their identities in these communities in addition to supplementing online communication with further verbal and non-verbal cues. The development of SP and a sense of an online community becomes key to promoting collaborative learning and knowledge building. SP projected by both the instructors and learners in the online community will impact on the perception of the social and human qualities of the medium. Interactivity, collaboration, and reflectivity concepts might not be naturally inherent within the medium, however, these concepts can be manipulated by design elements, moderator/participant roles, and participation and involvement patters (Gunawardena & Zittle, 1997).

Tu & McIsaac (2002) redefine SP as "the degree of feeling, perception, and reaction to another intellectual entity in the CMC environment" (p. 146). They further expand on the concepts of intimacy and immediacy to include the dimensions of social context, online communication and interactivity. Social context, such as task orientation and recipients/social relationships is constructed from the CMC users' characteristics and their perception of the CMC environment. According to Tu & McIsaac (2002), social context cues that have a positive influence on SP are:

- familiarity with recipients,
- informal relationships,
- better trust relationships,

- personally informative relationships,
- positive psychological attitude toward to technology, and
- more-private locations

In an online environment, participants need some digital literacies such as typing, reading, and writing. Tu & McIsaac (2002) recommend that the conversations should start with light/casual topics. They highlight that training students to use the medium comfortably contributes to the success of collaborative learning. Interactivity includes the activities in which CMC users engage and the communication styles they use. According to Tu & McIsaac (2002), interactivity issues that have positive impact in SP are:

- timely response to CMC messages,
- use of stylistic communication styles,
- casual conversations, communication strategies,
- appropriate message length,
- planning, creativity, intellectual, decision-making, and social tasks, and
- appropriate communication group size.

Connectivism: A new learning theory for Distance Education?

Connectivism is a learning theory that incorporates the principles of chaos, network, complexity and self-organization theories into our understanding of how people learn in the Digital Age. According to Siemens (2005), the three broad learning theories of Behaviorism, Cognitivism and Constructivism were developed at a time when technology wasn't prevalent in our learning experiences at such scales. Current developments in technology and social software are significantly altering how learners access information and knowledge, and how they construct dialogue with their peers and instructors (Siemens, 2008). The rapid development of technology and exponential growth in the use of the web tools plus mobile developments make new and different educational structures, organizations, and settings a possibility (Kop & Hill, 2008). For these reasons, Siemens argue that we need a new learning theory that addresses the impact of technology on traditional thinking and learning models (Siemens, 2005). According to Constructivism;

> Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing. (Siemens, 2005, p. 7)

How does Connectivism Differ?

What makes Connectivism distinct from other learning theories is that, unlike earlier theories of learning which view learning as a process occurring "inside" an individual, Connectivism posits that learning can happen outside of an individual. Connectivism views not only individuals but also organizations as learning organisms. The theory also pinpoints "learning stored and manipulated by technology" (Siemens, 2005, p. 5). He also suggests that knowledge does not only reside in the mind of an individual but it is also distributed across a network (Siemens, 2006). Therefore, learning is not viewed "as schematic formation structures", but learning is viewed as "the act of recognizing patterns shaped by complex networks" (Siemens, 2006, p. 10). According to Siemens (2006), the networked act of learning exists on two levels:

1. *Internally as neural networks* (where knowledge is distributed across our brain, not held in its entirety in one location)
2. *Externally as networks we actively form* (each node represents an element of specialization and the aggregate represent our ability to be aware of, learn, and adapt to the world around). (p. 10)

Even though Constructivism and Connectivism both highlight the complexity and chaotic nature of learning, Connectivism encourages the individual to create new networks or recognize the existing networks of knowledge that will help him/her to learn. While Constructivism views learning as meaning making process, Connectivism values not only meaning-making activities but also recognizing patterns of existing meanings and forming connections within communities of practice. Previous theories focus on how learning takes place but not on what is learnt. However, in an age when the learners are exposed to exponential growth of knowledge,

Connectivism values "the ability to evaluate the worthiness of learning something as a meta-skill that is applied before learning itself begins" (Siemens, 2005, p. 2).

How does Connectivism Relate to Distance Education?

The media that distance education models are heavily dependent on have evolved considerably especially in the 21st century defined as the Digital Age. Many distance education models have incorporated technological tools that encourage further interaction between learner-learner, learner-teacher and learner-resource. In line with this development, Connectivist learning paradigm uniquely envisions enriched, connected and networked learning that incorporates the impact of technology. The enriched media has the capacity to transform the teacher-learner relationship. The teacher, now a facilitator of learning, guides the learner in developing meta-skills for creating/recognizing specialized information sets, and the connections (Siemens, 2005). Learners creating their own learning paths and personal learning networks develop their ability to see connections between fields, ideas, and concepts as a core skill. Connectivism centers the learner in the learning experience but acknowledges learning "as a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual" (Siemens, 2005, p. 7). Therefore, the theory puts special emphasis on continual learning, decision-making as a learning process and capacity-to-know. It seems that Connectivism has been influencing the instructional design of distance education courses. The concept of MOOCs is a good example of connectivist impact on how courses are delivered at a distance. Another indication of the impact is the attrition of teacher/content centered Learning Management Systems. More and more distance education courses, as well as traditional courses, are adopting various social network tools to connect learners, facilitators and resources (what connectivism calls "specialized nodes").

Massive Open Online Courses

Massive Open Online Courses (MOOCs) have proved to be one of the most controversial topics in education throughout human history. While some view MOOCs as "a major revolution in education", others view them as "just another example of the overblown hyperbole often surrounding technology" (Bates, 2014, p. 154). Two types of MOOCs; xMOOCs and cMOOCs have emerged in the process. Bates (2014) provides a comprehensive comparison of philosophy and practice between xMOOCs and cMOOCs.

xMOOCs rely heavily on behavioristic and cognitivist theories of learning and depend mainly on the transmission of information utilizing various media to deliver content. Assessment is generally automated through multiple-choice tests marked by computers. There is almost no or very little direct contact between an individual learner and the facilitators of the course. In this sense, xMOOCs seem to reflect the first generation of distance education courses, correspondence study in which the learners were responsible for studying the available resources with very limited or no interaction with the instructor, and Otto Peter's industrialized education in which high quality content is produced for masses. The differences are the delivery medium and the quality and quantity learning resources available for the learners. Although learners also have chances to interact with each other, there is no feedback or guidance on their discussions and the quality of the discussion depends on the expertise of learners. Also, the automated evaluation system inherent in xMOOCs resemble pen and paper tests learners in a massive scale distance education course take. Bates (2014) provides a list of the qualities of a typical xMOOC.

- specially designed platform software
- video lectures
- computer-marked assignments
- peer assessment (wide variations in expertise between the different members of a group and different levels of participation cause problems in peer assessment strategies)
- supporting materials
- a shared comment/discussion space
- no or very light discussion moderation
- badges or certificates (for completion of the course)
- learning analytics

The educational underpinnings of cMOOCs, in comparison, are rooted in different philosophies in that cMOOCs are grounded in Connectivist and Social Constructivist theories of learning. cMOOCs are dependent upon community based approaches to learning with comparatively self-directing learners in constant interaction

with other learners and facilitators across a network built around various platform including social media. cMOOCs primarily focus on co-construction of knowledge and collaborative meaning making. In this sense, knowledge sharing platforms such as discussion forums or special interest groups on social media play an important role. There is a loosely-set curriculum, if any, and participants learn from the contributions of others, from the meta-level knowledge generated through the community, and from self-reflection on their own contributions (Bates, 2014). Bates (2014) also identifies four key design practices in cMOOCs:

- use of social media (courses are loosely supported by a range of 'connected' tools and media)
- participant-driven content (content is decided upon and contributed by the participants themselves)
- distributed communication (communication is a self-organising network with many sub-components)
- assessment (participants decide for themselves whether what they have learned is appropriate to them)

Open Educational Resources

The idea that sparked the advent of Open Educational Resources (OER) movement is the idea that the world's knowledge is a public good and that technology in general and the Worldwide Web in particular provide an opportunity for everyone to share, use, and reuse it (Smith & Casserly, 2010). In other words, OER movement was also driven by the social responsibility which aims to provide equitable and universals access to knowledge and web platforms particularly serves as distribution platforms. This driving force behind the OER movement has encouraged multiple initiatives around the globe to provide access to a wide range of educational resources including lecture materials as well as educational materials.

Two official definitions are available for OER; one from UNESCO and one from OECD. UNESCO's previous definition (UNESCO, 2002, p. 24) was refined to include not only digitized but also other forms of resources as OER.

> teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. (UNESCO, 2012, p. 1)

> digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research. (OECD, 2007, p. 10)

Both definitions highlight the "openness", the "digital" formats, and "reusability/adaptation" or resources. What do we mean by openness? Nti (2015) provides a somewhat comprehensive concept of what open means in OER. The paper distinguishes 4 levels of openness in OER:

- Level 1: Access and Accessibility. Access refers to free availability of the resources as well as the provision of required technical infrastructure. An educational resource might not be considered accessible if it is distributed on a web platform for users with no access to the internet. Accessibility refers to the design of products, devices, services, or environments for people with disabilities. The fact that an educational resource is out there on the web doesn't ensure its accessibility for disabled people unless it comes with some form of assistive technology. Also language barriers might undermine the accessibility of a resource. Most OER are in English, which might pose accessibility issues for non-speakers of the language. Cultural, economic and social factor might also pose accessibility issues.

- Level 2: Right and capability to use: OER resources come with the rights for the users to use them for their learning/teaching or researching purposes. However, the user's capability to use a certain tool on which OER is presented determines is usability.

- Level 3: The provisions that allow for users to be able to modify, reuse, and repurpose content. This level deals with the copyright licenses such as creative commons. While some OER come with the licenses that enable the users to modify, reuse, and repurpose the resource, others might not allow modification or repurposing.

- Level 4: Redistribution of resources. This level is the highest level which enables users to redistribute the resource they have modified or repurposed. Redistribution is also associated closely with copyright licenses.

Finally, The OER review by The William and Flora Hewlett Foundation provides a comprehensive list for OER:

1. Learning Content: Full courses, courseware, content modules, learning objects, collections and journals.
2. Tools: Software to support the development, use, re-use and delivery of learning content including searching and organization of content, content and learning management systems, content development tools, and online learning communities.
3. Implementation Resources: Intellectual property licenses to promote open publishing of materials, design principles of best practice, and localization of content (The William and Flora Hewlett Foundation, n.d.)

Learning Analytics

Data mining tools within an online course help to track learner behaviors by recording variables such as number of posts, time spent on the platform, number of clicks, engagement and involvement patterns as well as resilience and retention of concepts (Johnson, et al., 2013). Learning analytics (LA), in this sense, is defined as "the analysis and representation of data about learners in order to improve learning" (Clow, 2013, p. 683). According to the 2013 Horizon Report, LA has positive implications for administrators, policy makers, instructors, designer and learners alike to improve the educational experience.

Administrators and policy makes can make use of LA to target at-risk students, assess the quality of their programs and see if their retention improvement interventions are working. LA can also help the administrators and policy makers to locate areas for improvement and make better informed decisions as to the allocation of resources. All of these outcomes might lead to development of well-informed policies and effective pedagogies which can be assessed continuously in terms of efficiency and effectiveness through LA. LA also has the potential to allow instructors identify strengths and weaknesses of the learners since instructors can track learners' online learning behaviors and preferences, which will provide instructors with further insights into what learners are experiencing. Relying on LA data, instructors can make calculated adjustments and suggestions to motivate learners, locate areas for improvement. LA also enables the development of adaptive learning environments that respond to a student's progress in real-time. The design of learning software might be reshaped to enhance learner engagement and involvement within an online course. Early warning or encouragement systems might help learners to see how they are doing and enable them to take timely an informed action. All in all, by allowing the aggregation of large amounts of data on learner behavior, LA helps to tailor learning to learners' personal needs and interests. LA also has the potential to foster personalized learning environments that adapt to the learning behaviors of students.

Learner in Distance Education

Learner engagement and drop-out rates have been important issues for distance education and several studies attempted to discover factors that inhibit or enhance learner engagement and reduce drop-out rates in distance education courses (Grau-Valldosera & Minguillón, 2014; Fozdar, Kumar, & Kannan, 2006; Yates, Brindley-Richards, & Thistoll, 2014). Yates et al. (2014) identify "enablers" and barriers to learner engagement in distance education courses through distance education staff perspectives. Student-focused approaches and high-quality course and resource design were among the enablers according to the staff taking part in the study. Yates et al. (2014) underscore the importance of catering for individual learner needs and providing social support to increase learner engagement. They also found out that learner-teacher and learner-learner interactions were key determinants in making the students feel part of a learning community and to create a sense of belonging, which contribute to learner engagement. According to the staff course, resources and course design were important enablers in student engagement. On the other hand, poor quality course materials were among the barriers detrimental to learner engagement. Another barrier was negative attitudes toward learners. Resistance to change was also identified as a further barrier that negatively affected learner engagement because some staff were reluctant to change or improve the quality of their instructional resources and techniques. Yates et al. (2014) also identify four student-related enablers that help course completion; correct course and program choice, monitoring, use of support services, and involvement in a learning community. Their study emphasizes the importance of guiding learners into the appropriate courses as well as amount of study and resources. Careful monitoring of learner progress was an important aspect of encouraging engagement as well. The need for students to be supported academically and availability of various resources are also determinants in learner engagement. The final enabler for learner engagement was involvement in a learning community, which highlight the importance of creating learning communities of staff and learners. The first leaner-related barrier

was students lacking necessary skills. Learners who were unprepared for the independent learning in terms of motivation, intellectual skills such as writing skills affected learner engagement negatively. Also learners' social and family commitments were barriers to their engagement within the course. Finally, lack of F2F contact was identified as a student-related barrier to engagement. The lack of F2F contact was reported as a barrier to establishing relationships with students to encourage engagement and connection with the institution.

A number of studies also investigated learner attitudes toward distance education (Lenka & Kant, 2012; Simon, Burton, Lockhart, & O'Donnell, 2014; Smidt, Bunk, McGrory, Li, & Gatenby, 2014). Although these studies do not report gender as a determinant in learner attitudes toward distance education, Lenka and Kant conclude that biographical factors such as locality, stream, and caste play a vital role to develop positive attitude towards distance education. Smidt et al. (2014) underscore the importance of providing clear structure and guidance in terms of course expectations and responsibilities for positive learner attitudes. They also report that it's also important to offer well-designed and creative tasks such as audiovisual content for multiple learning styles. Interaction with both other learners and instructor is also emphasized as a contributing factor for positive attitudes (Farooq, Al Asmari, & Javid, 2012; Simon et al., 2014).

Culture in Distance Education

Culture has a central but neglected role in design, perception and effectiveness of the learning experience. With the widespread use of connective digital technologies, it has now become possible to connect with individuals from diverse cultural orientations enabling learning communities to form that foster intercultural communication (Saykili, 2018). In his paper where he proposes new directions for research into culture in online learning, Goodfellow (2008) argues against the essentialist approaches to in Distance Education instructional design, particularly that of online learning. While it is commonsense to assume that people brought up in different cultural and socio-linguistic backgrounds will develop their own perceptions and assumptions for learning contexts, in terms of instructional design of a multi-cultural distance education course, a reductionist approach that is rooted in stereotypical national or ethnic cultural differences is also problematic for a number of reasons (Goodfellow, 2008). Goodfellow posits that culture is mainly associated with nationality, which poses a problem for distance education since it confines communication in distance education courses as communication between people of different nationalities. The conceptualization of culture as a national trait also enforces the view of "the suitability of materials or interfaces designed by people of one nationality for use by those of another" (p. 553). However, the drivers of change in distance education reinforce the problems associated with a 'single cultural identity' view. The growth of widening participation, which necessitates the consideration of increasing diversity of learners, their community, and educational and professional backgrounds, is a concern for the new learning ecologies of the digital age. Also, the spread of internet community, networked socializing and informal learning communities are beginning to influence educational development through the incorporation of web2.0 technologies into course design.

The increasing multinational nature of distance education courses requires the reconsideration of prevalent western approaches to distance, particularly online, education. The problem with instructional design is single cultural identity being imposed on culturally diverse learners, and the key to this problem is seen as providing culturally appropriate instruction. However, the issue here is the question of how to cater for an audience of culturally diverse backgrounds. A reductionist approach that is rooted in stereotypical national or ethnic cultural differences is also problematic since it doesn't encompass the new cultural and social identities formed in virtual learning communities that are rooted in a combination of contemporary cybercultures of the internet and the systems of cultural relations inherited from conventional settings. Today, it is not only the national or ethnic characteristics that form the basis for one's cultural identity, but also the virtual communities of practice shape the individual cultural identities. Thus, the question lies in how to make sense of the new cultural/social identities in virtual platforms and how to reflect these identities in course design.

Recent research into culture in distance education handle the problem of designing and implementing courses for non-western cultures. These research are mainly grounded in Hofstede's characterizations of national culture (Hofstede, 2001). Hofstede categorizes cultures as 'individualistic' cultures (focused on self-interest) and 'collectivistic' cultures, (centered on the interests of family and the wider community); or between 'high-context 'cultures (using the entire social context of an interaction: physical location, status of participants, body language etc. to interpret its meaning), and 'low-context' cultures (focusing on the direct content of messages, seeking specific information and/or expecting particular responses). The essentialist conceptions of culture, such as that of Hofstede, tend to view culture as a manifestation of individual behavior and disposition. In distance education, this translates into instructional design as the need to tailor the design of learning environment to suit

individual cultural differences. The problem with this view is that this perspective will not be helpful in managing unpredictable configurations of heterogeneous and dispersed individuals. It might be considered beneficial to focus on the collective national characteristics where large groups of mono-culture individuals are working together. However, when we are dealing with multi-cultural learning ecology, where the interaction is cross-cultural, the collective national characteristics won't be exhibited. Citing from Scollon & Scollon (2001), Goodfellow (2008) underscore that it is not the cultures but the individuals that talk to each other. For these reasons, the view of culture primarily as an issue of birth or upbringing is problematic in a multi-cultural learning ecology influenced by the contemporary cybercultures of the internet in the face of the new cultural and social identities in virtual communities. Therefore, it becomes of paramount importance for instructional designer to consider not only the engrained cultural dispositions and conceptions, but also the manifestations of individual and collective behavior which reflect the emergence of new systems of values and ways of communicating about learning (Goodfellow, 2008).

Distance Education: The Future

Technological innovations hand in hand with the pedagogical underpinnings have been shaping and reshaping how distance education is structured and delivered. New technologies along with the social conditions help advancement of appropriate pedagogical models. The cognitive-behaviorist pedagogical models which have given direction to distance learning practices in the first generation of distance education were developed at a time when two or multiple way communication possibilities were scarce and much of the learning/teaching activities were dependent on the print-based technologies. Although cognitive-behaviorist models are still in effect today, social-constructivist models were developed in the age of web 2.0 technologies that allow two and multiple ways of communication and interaction. Still, connectivist pedagogy took hold in a time when technology has begun to enter the social domain seamlessly and technology impact on learning has reached a peak such that previous learning models have started to fall behind, thus giving way to new generations of distance education.

Some experts predict that future models will be shaped by technological innovations such as web 3.0, semantic web, mobile devices, augmented and virtual reality (Hendler, 2009). Even though the technological innovations play a vital role in shaping the future of distance education, it is doubtful that they will trigger a paradigm shift similar to the previous technological innovations since it doesn't seem that the nature of communication will change. On the other hand, data mining and learning analytics along with the communities of learning which is rooted in the network of learners and resources will help the construction of 'collective mind' which will guide the distance education models and pedagogies.

Conclusion

Distinct technologies and pedagogies guide distance education definitions and generations. Even though one single pedagogical model alone fails to answer all the questions associated with how learning occurs, these pedagogies together support and supplement each other. As the new technological innovations emerge, new areas of learning, new practices and thus trends on distance education emerge. Distinct learning experiences and processes necessitates the use of appropriate learning activities and contexts. Distance education experts, therefore, need to formulate the most effective mix of technology and pedagogy. The primary actors of all distance education generations are learners, instructors and resources; thus, the formulation of any effective distance learning experience must consider how the relationship of these actors are constructed depending on the pedagogy employed and technologies available. Whether the primary actors in a distance education undertaking are placed in a central or non-central role, for an effective learning experience all learning models including behaviourist, cognitivist, constructivist and connectivist pedagogies each have a vital role to play. Culture also has a central role impacting the effectiveness of a given distance education practice and pedagogy.

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English for Academic Purposes Needs of Research Assistants: A Qualitative Needs Analysis in a Nursing Department

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English For Academic Purposes Needs of Research Assistants: A Qualitative Needs Analysis in a Nursing Department

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Abstract

The present study aimed to fill a gap in the literature by documenting the EAP needs of the research assistants of Nursing in a public Turkish university. The study was of a qualitative nature and data was collected by means of an open-ended questionnaire, whose questions were based on Hutchinson & Waters's (1987) framework to identify the target needs of language learners. The participants of the study were 8 research assistants working for the Nursing department of a public university in Turkey, who volunteered to participate in the study. For the analysis of data, the statements of the participants were coded according to their themes and topics. The findings of the study revealed that the participants were in need of improving their academic speaking and writing skills within the context of Nursing in order to perform better in writing research articles and giving presentations in international conferences.

Key words: English for Academic Purposes, Needs Analysis, English for Nursing

Introduction

Following the Oil Crisis in 1980's, Teaching English as a Second / Foreign Language has shifted its aim towards meeting the individual, institutional or contextual needs of language learners, which is nowadays referred to as English for Specific Purposes (ESP). According to Dudley – Evans (1998), ESP aims to cover explicit learning needs utilizing discipline-specific methodology and activities with a special focus on the grammar, lexis, register, study skills, discourse and genre of the discipline at hand. In this respect, the language needs of the academic community have necessitated the treatment of English language with particular respect to academic needs, which resulted in the emergence of the term English for Academic Purposes (EAP). EAP is a specific area within the domain of ESP and it is defined by Flowerdew & Peacock and Jordan in Hyland (2006) as the teaching of English in order to aid the learner in researching or studying in English. According to Hyland (2006), EAP has two subbranches, English for General Academic Purposes (EGAP), which refers to the activities, forms and skills that could be necessary for all academic fields of study, and English for Specific Academic Purposes (ESAP), which deals with the language and skills that are related to a particular field of study, focusing on the field-specific areas. As seen in the definitions, the concept of EAP covers most of the needs related to the English language within academic contexts, from generic skills to specialization areas. Considering also the status of English as an academic lingua franca (Mauranen, 2012), it comes out naturally that those who are involved in the academia by being a learner, teacher or researcher within an academic field of study are in need of a sufficient command of English language regarding both EGAP and ESAP and this necessitates the formal identification of their language learning needs.

A well-documented way to identify the needs of language learners within any context is the analysis of the target needs, which attempts to discover the context in which the language to be learned is/will be used by the learners (Hutchinson & Waters, 1987). In more comprehensive terms, target needs analysis is concerned with the identification of the roles to be adopted by the language learner in the target community and the knowledge and skills required to perform this role. In this respect, the requirements of language use, the actualization of communicative events and the identification of the genres functionally in use in the target context are integral endeavours within the context of target needs analysis (Hyland, 2006). To put it succinctly, the analysis of the target needs involves finding out what the learners will do with the language.

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Even though language needs analysis studies regarding the EAP needs of research assistants seem to be rather scarce within the Turkish context, EAP appears to be one of the problematic aspects of being a research assistant in Turkey. For instance, in their quantitative study with 350 research assistants, Bakioğlu and Yaman (2004) conclude that a large part of their sample believes that incompetence in English is among the major problems in professional development. Similarly, in a mixed method study, Poyraz (2013) reveals research assistants' beliefs that professional perfection requires competence in a foreign language. She also adds that foreign language skills appear to be among the barriers to publishing research studies. Related to the problematic nature of foreign language competence for research assistants in Turkey, Doğan (2013) discovers that 64 out of a sample of 150 academic people regard themselves to be insufficient in English language. Çinemre (2014) confirms Doğan's (2013) findings in a more field-specific quantitative study with 171 research assistants of theology in Turkey, in which many participants state that they feel insufficient in terms of English language skills. In a qualitative study conducted by Örücü and Şimşek (2011), the results of content analysis disclose that academic people encounter foreign language related problems in their professional lives. Considering the findings of these studies, it can be said that multiple studies within the Turkish context point at the need to have an adequate command of English language, reporting it as a problem and a barrier in the professional lives of research assistants.

As seen in the relevant literature, having a good command of EGAP and ESAP is a requirement for those who work within the academia and the Target Needs Analysis framework proposed by Hutchinson & Waters (1987) appears to be a functional way of identifying the language-related target needs of academic staff, among whom are research assistants. However, the literature appears to indicate a gap with respect to the formal documentation of the target needs of research assistants as academic staff. In this respect, the present study aims to reveal the target needs of the research assistants working at the Nursing department of a public university in Turkey.

The Context

Within the Turkish context, research assistants are required to pass several English exams for various reasons, which makes the command of English a legal necessity in addition to research purposes. Briefly, they need English for the following reasons:

Master's / Doctoral Studies

The candidates to enrol in Master's or Doctoral studies are required to document that they have obtained minimum score set by a related institution, which means without passing the national or university-specific English exams, the candidates cannot apply for the graduate programmes (i.e. Hacettepe University, 2013; İstanbul University, 2012).

Research / Publication Purposes

As research assistants in any field, those who work in the field of Medical Sciences are expected to carry out research studies and publish their work in academic journals or present them in academic conferences. Naturally, this brings the need to possess a certain command of EAP, especially for the international journals or conferences. Moreover, the fact that not all research studies in the field of Medical Sciences are translated into Turkish makes it a natural requirement for research assistants to keep up with the current developments in the field. Lastly, in the applications of research assistants for tenure-track positions, publications are converted to *academic points* according to their types and most Turkish universities have standard prerequisites for 'minimum academic points' in job applications.

Academic Promotion

Although it is a rather extended need for research assistants, passing either the foreign language exam organized by the university that is applied to or one of the national foreign language exams organized by the Student Selection and Placement Centre (ÖSYM) is a prerequisite for the applicants who want to become faculty members (Higher Education Council, 1982). Academic Promotion for research assistants in Turkey is also

closely linked to the 'academic points' mentioned in the previous subsection since the demonstration of foreign language knowledge is among the requirements of promotion.

Purpose of the Study

As seen in the literature and documents, English is both a professional and a legal requirement for research assistants in Turkey, which naturally encompasses the research assistants of Nursing departments, too. In addition, the literature written in Turkey shows that this requirement is one of the problematic areas in the professional lives of research assistants. For this reason, it comes out as a necessity to identify the specific academic language needs of those who hold academic positions. In this regard, this study intends to reveal the subjective accounts of the participants as to the reasons why they need to learn English / improve their English skills as well as, how, where, when and with whom they believe they are going to use English. Furthermore, the study aims to disclose the specific content areas that the participants feel they should learn.

Method

Since the present study attempted to reveal the subjective accounts of research assistants in terms of EAP needs within a rather local context, a qualitative methodology was preferred. According to Dörnyei (2007), qualitative research designs are used in order to understand natural contexts, subjective opinions and personal feelings within a typically small group of participants. To this end, the qualitative researcher begins the research process by collecting data by means of observations, interviews, documents or audio-visual materials and then, the data is grouped into categories, themes and patterns for the purpose of making sense of the meaning that a group of participants hold with respect to a problem (Creswell, 2014). Since the study aimed at revealing the subjective perceptions of the participants within the context of a Nursing department regarding their EAP needs, a qualitative research design was considered suitable for the purposes of the study.

To meet the aims of the study, the following research question was formulated:

1. What are the target EAP needs of the participants?

The study took place in the Nursing Department of a public university in Turkey. The participants of the study were 8 research assistants working for the aforementioned department, who volunteered to participate in the study. 1 of the participants was male and 7 of them were female. 7 of the participants continued their Master's studies while 1 participant had a doctoral degree at the time the study was conducted. All of the participants had National Foreign Language Exam (YDS) scores from different years, for this reason, the most recent scores of theirs were asked within the context of the study. According to the self-reports of the participants, 3 of them had YDS scores between 80-89, 2 of them had scores between 70-79 and 2 participants had YDS scores between 60-69. 1 participant had a YDS score between 50-59. 6 of the participants had attended an English course provided within the framework of Teaching Staff Training Program (ÖYP) for 6 months, each month having 120 hours of teaching for Listening, Speaking, Reading and Writing Skills along with Grammar teaching. 2 participants had not attended any language course during their research assistantship.

The qualitative data for the study was collected through an open-ended questionnaire. According to Hutchinson and Waters (1987), the term 'Target Needs', which is the basis of the research question in this study, refers to the necessities, lacks and wants of language learners as in what they need to know, what kind of knowledge they lack and what they want to know in order to function effectively in their target situation. In this respect, the Target Situation Analysis framework of Hutchinson and Waters (1987, p. 59), which aims at identifying the target needs of learners, was used as the basis of the questionnaire. On this basis, the following questions were asked to the participants:

1. Why do you think you need to learn / improve your English?
2. How do you think you use / will be using English (Writing, reading, academic, informal, etc.)?
3. Which academic field is your main focus in using English?
4. With whom do you use / will you be using English (native/non-native speakers, experts, colleagues, etc.)?
5. Where do you think you use / will be using English (office, hotel, meetings, abroad, etc.)?
6. When / How often do you use / will you be using English?

For the trustworthiness of qualitative data, Lincoln and Guba (1985) propose four standards as credibility, confirmability, transferability and dependability, which can be respectively achieved by means of a prolonged engagement of the researcher with the participants of the research, presentation of raw data for confirmation, provision of a thick description for sufficient contextual information and confirming the stability of findings over time and across researchers. In this respect, the credibility of the data was believed to be sufficient by the researcher since the engagement of the researcher with the participants had been prolonged due to working for the same institution, which would give the participants enough confidence to allow the researcher to study the context. To increase confirmability, extracts from the raw data were presented so that the findings could be compared to the raw data. Moreover, a thick description in the form of a detailed contextual account of legal and academic status of research assistants in relation to foreign language learning were provided in the initial section of the study to increase the transferability of the results to other contexts. The thick description was backed by research studies from different contexts (i.e. research assistants of theology) in order to assist in transferability. Lastly, the dependability of the data across researchers was confirmed by asking a researcher to categorize 30% of the coded quotations. The calculation of the Cohen's Kappa Coefficient for Intercoder Reliability suggested excellent agreement between two coders ($K = .91$, $p < .001$). Taking these into account, the data collected within the context of the study was concluded to be trustworthy.

The data was analysed through the categorization of the responses. Firstly, the responses, according to the questions, were categorized under the following headings:

a. Purpose
b. Medium / Channel / Text Type
c. Content Area
d. Interaction
e. Setting / Context
f. Time / Frequency
g. Requests / Suggestions

Once the data had been categorized under these headings, subheadings were created, based on the content of the responses. Then, the categories were organized and tabulated to reach conclusions.

As a final point to consider, it should be noted that the third person feminine subject pronoun was the only pronoun used in the study to refer to each participant in order to preserve anonymity, as there was only one male participant in the study.

Results

The data collected within the context of the present study was analysed through qualitative means of coding. The findings extracted from participants' responses were presented below in Table 1.

Table 1. Participants' Purposes for Learning English / Improving their English Skills

Purposes	Participants
Work (Academic)	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Education	RA4, RA6, RA7, RA8
Social	RA3, RA7
Exams	RA4
Leisure Activities	RA1

The purposes of the participants for learning English, as seen in Table 1, predominantly concentrated on work, which typically requires academic language skills. Data analysis showed that all participants focused on professional purposes for learning English or improving their English skills. Moreover, four participants stated that they intended to use English during their graduate or postgraduate education. Two participants indicated that they needed English for social purposes such as travelling, too. One participant said that she needed to improve her English skills to increase her YDS score, while another one mentioned that watching TV shows without subtitles is a purpose of hers to improve English skills, commenting as, "*Although it is not an academic need, I believe it is related to English skills"*, indicating a perceived parallelism between EAP needs and EGP needs. To elaborate on her purpose, RA1 commented*, "I want to improve my English skills to avoid needing proofreading [for academic articles]. I also want to feel more confident during academic presentations",* suggesting both psychological and external reasons for her desire to improve her proficiency level. Having a

different perspective, RA5 stated that she needed to improve her English skills since she found it *"difficult to translate articles"*, referring to both her own and others' articles, showing that the participant had translation from L1 in her perceived processes of reading or writing.

Table 2. How the Participants Used English

Mediums / Channels / Text Types	Participants
Giving Academic Presentations	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Reading Academic Articles	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Writing Academic Articles	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Telephone Conversations	RA1, RA7
Lecturing	RA1, RA7
Face-to-Face Conversations	RA7
Translation	RA5

How the participants used English language were tabulated in Table 2 with reference to the mediums, channels and text types. It can be observed in Table 2 that all the participants used English language for giving academic presentations along with reading and writing academic articles. As for the channels of communication in English, RA1 and RA7 indicated that they used English in both telephone and face-to-face conversations. Furthermore, lecturing in English and translation were among the ways participants used English language. Exemplifying the need to improve her writing skills, RA8 said, *"When we have a look at one another's articles or abstracts, our sentences look shorter than they are supposed to be"*, referring to the lack of sentence connectors and discourse markers in their written texts. RA1 and RA7 also noted that they need to lecture in English during their post-doc studies and when they attend Erasmus Academic Staff Mobility Program. RA7 concluded the section by saying *"In all the steps you take and all parts of academic life, English is a necessity"*, referring to the perceived need to have a sufficient command of English language within the academia.

Table 3. Participants' Content Areas for Using English

Content Areas	Participants
Nursing (General)	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Surgical Nursing	RA1, RA4, RA7
Pain Studies	RA1
Environmental Studies	RA1
EMT Management	RA1
Nursing Management	RA8
Public Health Nursing	RA8

Regarding the content areas that the participants use English, the findings showed that all the participants used English language within general Nursing context. However, RA1, RA4 and RA7 reported that they needed English particularly for Surgical Nursing. Moreover, RA1 stated that she needed English for the fields of Pain Studies, Environmental Studies, and EMT Management, in line with her research interests. RA8, again referring to her research interests, indicated that she needs English language for the fields of Nursing Management and Public Health Nursing.

Table 4. With whom the Participants Interact

Interaction Groups	Participants
Colleagues	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Experts	RA2, RA3, RA8
Conference Acquaintances	RA1, RA8
Speakers of EFL/ESL	RA7
Native Speakers of English	RA8
Friends (Online)	RA1

As a response to the fourth question of the interview, all of the participants articulated that they interact mostly with colleagues (both native and foreign). On that matter, RA2, RA3 and RA8 said that they also interacted with the experts of the field. Two participants, RA1 and RA8 indicated that they made acquaintances during conferences, so they interacted with them, too. RA7 pointed out that she interacted with speakers of English as a second or foreign language and RA8 stated that she interacted with native speakers of English as well. One participant, RA1, added that she had memberships in several websites focusing on language learning, therefore, she interacted with other members, too.

Table 5. The Setting / Context in which English is Used

Setting / Context	Participants
Academic Conference	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Office	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Abroad	RA2, RA3, RA4, RA5
Own Country	RA2, RA3, RA4
Classroom	RA1
Social Media (Academic Groups)	RA1

The fifth question of the interview intended to reveal the setting or context in which the participants used English language. Regarding this, all participants conveyed that they used English in academic conferences for research presentations and their offices for reading and writing academic articles. Four participants expressed that they used English abroad and three participants said that they used English in their own countries. One of those participants, RA3 said she would need English in academic conferences both abroad and in her own country "*to listen to and give academic presentations*", revealing a perceived need in terms of both receptive and productive skills. RA1, referring to the Erasmus Academic Staff Mobility Program, stated that she used English within classroom context, too. In addition, she added that she also needed English *"on social media to follow academic groups and pages",* indicating that the web-based participation in the academic community was also perceived to have necessitated adequate proficiency in English.

Table 6. Participants' Frequency of Using English

Frequency	Participant
Every day for Writing / Reading	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8
Once or Twice a Year for Conferences	RA1, RA5, RA6, RA8

As shown in Table 6, the participants' responses to the question which asked them how often they used English language were quite similar in content. All the participants set forth that they used English language on a daily basis for reading and writing academic articles. As for conference presentations, four participants specified that they needed English once and twice a year. RA8 expressed that she needed to utilize English language *"5 to 10 days a year for speaking"*, referring to the conferences she attended for research presentations. In brief, all participants were found to make use of English on a daily basis for reading and writing and a few participants needed English to give presentations in academic conferences.

Table 7. Participants' Requests and Suggestions

Request / Suggestion	Participant
Language Course	RA2, RA3, RA4, RA5, RA6, RA7
Lecturing in English	RA8
Receiving Lectures in English	RA8
Organizing International Conferences	RA8

The last section of the interview asked the participants if they had any requests or suggestions regarding EAP. In this section, six participants stated that they would have liked to attend an EAP course. Three of these six participants added that the course they requested should have had a speaking focus and R7 suggested a language course, saying *"If only there was an English course, on condition that its focus was practical use [of English]",* also pointing at the need for production-based teaching/learning. Apart from a language course, RA8 suggested some courses be lectured in English and international conferences be organized for the sake of being more engaged in the language. Upon the completion of the questionnaire, RA6 added, *"Academic English has always been a problem but it has not been solved as of yet"*, indicating the longitudinal perception of English as a problem to be solved.

Discussion and Conclusion

The present study aimed to discover the EAP needs of the research assistants working for a Nursing department in Turkey. The findings indicated that the participants had a general consensus on their need for EAP for work and education purposes. Furthermore, all participants stated that they needed to use English language for giving academic presentations, reading and writing academic articles. Similarly, all participants agreed that they should improve their English in terms of general topics related to nursing. As for the settings where English was / would be used, all participants seemed to be in unison with one another in that academic conferences for

research presentations and their offices for reading and writing articles were the places in which they used English language with colleagues and experts most commonly. Moreover, using English language on a daily basis for academic reading and writing purposes was another issue on which all participants agreed. Lastly, it was seen that a majority of the participants demanded an EAP course be given to improve the aforementioned skills.

The findings of the study appear to be in line with other findings produced within the Turkish context with respect to the language needs of research assistants. For instance, Doğan's (2013) and Çinemre's (2014) findings indicate that the research assistants in their studies perceive themselves to be insufficient in terms of their proficiency level in English language. Similarly, the research assistants who participated in the present study request a language course to be given within the institution they work for, indicating a perception of low competence in English. In addition, both Bakioğlu and Yaman's (2004) and Örücü and Şimşek's (2011) findings show that their participants define English as a problem in the professional lives of research assistants, which corroborates the findings of the present study in which the participants define English in a similar manner. Finally, Poyraz's (2013) findings, which show that research assistants are aware of English as a requirement within the academia are in line with the findings of the present study which indicate that the participants perceive English as a professional necessity. Even though the research assistants mentioned in the reviewed studies are from various academic backgrounds in terms of their specializations, all studies, including the present study, seem to point at the need to increase the level of proficiency in English.

Another significant finding of this study was that all participants reported the need to improve their language skills along with requesting an EAP course to excel in their academic studies and education as also required by the legal context (Hacettepe University, 2013; İstanbul University, 2012) although most of them had attended an intensive English course and they already had sufficient YDS scores for academic promotion (Higher Education Council, 1982). This may be indicating a practical problem in that the paper-based nature of YDS is not adequate in terms of testing language skills, since it does not include writing or speaking sections, which are the areas that the participants reported a need to improve. Apparently, having a YDS score enough to receive graduate-level education or work within the body of a university does not result in an increase in writing or speaking-related self-efficacy as the reports of perceived low competence among the participants with respect to writing academic articles or giving presentations suggest. For this reason, having a relatively high score in YDS may not mean being efficacious with respect to academic speaking and writing among the participants.

Taking into account the EAP needs of the participants, a language course, which was also requested by the participants, can be proposed to the Continuing Education Centre of the institution in order to improve the academic writing and speaking skills of the participants. Since the participants explicitly stated their need to improve the mentioned skills for research purposes, an EGAP or ESAP programme which focuses on productive skills may prove useful for the participants by providing them with knowledge and skills particular to their academic context, serving their EAP needs and gradually increasing their self-efficacy levels with respect to writing academic articles and giving academic presentations.

As for the limitations of the study, it should be noted that the inferences made in this study are limited to the subjective accounts of the participants in which they state their needs to improve their academic writing and speaking skills. However, standardized means of testing these skills can also be utilized in order to reveal what they can and cannot achieve in terms of EAP, which would also provide useful insights to the EAP proficiency levels of the participants. Furthermore, the data collected in this study is limited to a single university in Turkey. In that respect, further study is recommended in order to reach a conclusion regarding the EAP needs of the research assistants in Nursing departments on a regional or national level.

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Effects of Elementary School Teachers' Background Variables on Their Educational Beliefs and Different Types of Computer Use

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Effects of Elementary School Teachers' Background Variables on Their Educational Beliefs and Different Types of Computer Use[1]

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Abstract

The purpose of this study was to investigate whether teachers' background variables affect teachers' educational beliefs and different types of computer use. In addition, this study explored the relationship between teachers' educational beliefs and different types of computer use. The participants in this research were 180 elementary school teachers, including 56 males and 124 females, in central-west Taiwan. A questionnaire was developed for the purpose of collecting relevant information. Moreover, descriptive statistics, factorial analysis, independent samples T-test, one-way ANOVA and product-moment correlation were used as the methods of statistical analysis. To understand elementary school teachers' attitude toward and perception of teachers' educational beliefs and different types of computer use, the researchers interviewed 18 teachers. The results indicated that teachers' educational degrees affected teachers' educational beliefs, while teachers' educational degrees, teaching years, positions, number of classes, and the frequency of technology integration affected different types of computer use. The results of the questionnaire and interviews demonstrated that teachers' educational beliefs were correlated with different types of computer use. Based on the findings, some implications are considered to be of help to elementary school teachers and educators.

Key words: Teachers' background variables, Teachers' educational beliefs, Different types of computer use

Introduction

It has been suggested that the use of computer technology in education may play a vital role in improving students' learning performance. However, the factors associated with teachers' instructions, such as their experiences, attitudes and even educational beliefs, may affect the use of technology. The influence of teachers' educational beliefs on classroom practice has been investigated and well-documented (Buchman,1987; Lumpe, Haney & Czerniak, 2000; Mishra & Koehler, 2006; Nespor, 1987; van Driel, Beijaard & Verloop, 2001). However, the direct impact of teachers' educational beliefs on computer integration is not obvious (Wozney, Venkatesh & Abrami, 2006). Generally speaking, teachers tend to use their past experiences, beliefs, and attitudes toward teaching and learning, to develop their educational beliefs about technology as a teaching method or instructional tool (Ertmer, 2005; McGrail, 2005; Niederhauser & Stoddart, 2001; Windschitl & Sahl, 2002).

Researchers have rarely investigated that different types of educational computer use are in line with teachers' educational belief systems (Windschitl & Sahl, 2002). Ertmer (2005) argued that low-level computer use is likely to be related to teacher-centered or traditional practices. On the contrary, high-level computer use is likely to be associated with student-centered or constructivist practices. To use computers as a cognitive tool in knowledge construction, teachers may consider using computers as learning tools and incorporating computers into the classroom (Hokanson & Hooper, 2000). Previous studies have reported that teachers who hold constructivist beliefs also tend to use computers in more challenging ways (Becker, 2001). It is believed that the more a teacher recognizes the computer as a useful tool to promote important instructions and learning needs, the higher perceived value of computers use will be (Niederhauser & Stoddart, 2001).

With regard to computer instruction programs at elementary level in Taiwan, albeit teacher's positive attitudes toward computer-assisted language learning (CALL) activities, institutional and individual factors impeded their

[1] This article is produced from the second author's Master's dissertation.

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authentic computer application. Research findings continue to emphasize the importance of language teacher development programs in CALL at the elementary level and highlight the need to provide contextualized practice with computer technology in language teacher education programs (Sardegn & Yu, 2015).

Therefore, the purpose of this study was to investigate whether teachers' background variables affect teachers' educational beliefs and different types of computer use. In addition, this study explored the relationship between teachers' educational beliefs and different types of computer use. This study explores three principal research questions as follows:

1. To what extent do different teachers' background variables affect their educational beliefs and different types of computer use?
2. What are the relationships between teachers' educational beliefs and their different types of computer use?
3. What are the effects of teachers' educational beliefs on their computer use?

Literature Review

This section discusses related literature on previous studies of teachers' educational beliefs and different types of computer use. The related studies are divided into three parts: teachers' educational beliefs, computer use, and the relationship between teachers' educational beliefs and computer use.

In order to measure teachers' educational beliefs, many scholars who are devoted to education have been generating and substantiating many instruments (Hermans, Tondeur, van Braak & Valcke, 2008; Kerlinger & Kaya, 1959a, 1959b; Woolley et al, 2004). In 2001, Niederhauser and Stoddart examined the characters of different teachers' beliefs, investigating over 2170 elementary and secondary teachers and identifying two diverse categories of beliefs about the effective use of computer technology: transmission-oriented, in which computers are used as teaching tools to deliver information, give reinforcement and trace student progress; and constructivist-view, being different from transmission-oriented, computers are used to gather, analyze and integrate information. In the meantime, the researchers in Taiwan also distinguished teachers' educational beliefs into three aspects: (1) student-centered, which means that teachers emphasize students' independent decision and learning, (2) teacher-centered, which signifies that teachers have the authority to determine learning in the classroom, and (3) interactive, which emphasizes the interaction and communication between teachers and students (Lin, 2001). Furthermore, Woolley et al. (2004) developed the Teachers Beliefs Survey (TBS). The findings of the survey showed different traits between the following two dimensions: traditional teaching and constructivist teaching. The former is mainly teacher-centered and stresses traditional methods of the curriculum and evaluation, while the latter is considered to be student-centered and have novel approaches to teaching and learning. With innovations in education, teachers are expected to integrate innovative educational beliefs and apply them to teaching and learning. The discrepancy between belief systems depends on the extent to which teachers adopt traditional and constructivist teaching beliefs. Whether or not belief systems in teachers are specific, this aspect of teachers' educational beliefs is a current issue for educational researchers.

With the influence of computers on educational environment, many researchers have explored how frequently teachers and students use computers by recording the time teachers and students spend using computers and measuring the rates of applying technology in the classroom (e.g., Mathews & Guarino, 2000; O'Dwyer, Russell & Bebell, 2004). Through analytical revisions, computer-assisted instruction results in small but positive effects compared to those found in traditional instruction (Blok, Oostdam, Otter & Overmaat, 2002; Torgerson & Elbourne, 2002). However, although computers provide feasible methods and efficient teaching and learning advantages in education, many researchers argued that computers are under-used in many schools, and the potential of computer technology has not been accomplished in terms of quantity or quality of use (Abrami, 2001; Conlon & Simpson, 2003; Demetriadis et al., 2003; Ertl & Plante, 2004; Hayes, 2007; Muir-Herzig, 2004; Pelgrum, 2001; Sutherland et al., 2004; Wilson, Notar & Yunker, 2003; Wooley, 1998). Similarly, the categories of educational computer use were differentiated between computers as information resource tools, computers as authoring tools and computers as knowledge construction tools (Ainley, Banks & Fleming, 2002). The results recommended a three-factor structure, identified as basic computer skills (to develop students' technical computer skills), the use of computers as an information tool (to research and process information) and the use of computers as a learning tool (to practice knowledge and skills), and concluded that computer use should not be examined in a singular, but instead a multifaceted aspect (O'Dwyer et al., 2004; Tondeur et al., 2007).

There is growing evidence that teachers, adopting constructivist beliefs, are highly positive computer users (Becker, 2001; Niederhauser & Stoddart, 2001). Typically, constructivism differs from the knowledge-transmission model of learning. The knowledge-transmission learning model regards teachers as the source of knowledge and students as passive recipients of knowledge. As compared with knowledge-transmission model, in constructivism, instead of focusing on learning objects or ways that are transmitted from one person to another, students and teachers are involved in learning; interactions, feedbacks and experiences are the outcomes of learning (Howard, McGee, Schwartz & Purcell, 2000; Lee, Ardeshiri & Cummins, 2016; Scardamalia & Bereiter, 2006). Teachers who adhere to constructivist beliefs are likely to focus on student-centered learning, organizing activities to promote independent learning, peer discussions, meaningful understanding and student decision-making. Generally speaking, they emphasize more on the process of student learning than product (Brooks, 2002). An obvious finding is that computer usage experience is definitely related to teachers' attitudes toward a computer. In other words, the more experiences teachers have with computers, the more likely they will show positive attitudes toward computers (Rozell & Gardner, 1999). Positive computer attitudes are prone to facilitating computer integration in the classroom (van Braak et al., 2004). These early experiences with computers "can shape teachers' subsequent encounters for years to come, despite great efforts to persuade them differently" (Ertmer, 2005, p. 30). For example, Hermans et al. (2008) indicated that teachers' "traditional beliefs had a negative impact on integrated use of computers" (p. 1499). On the contrary, constructivist beliefs were identical with educational computer use. In a similar vein, Overbay, Patterson, Vasu, and Grable (2010) discovered that "constructivist practices and beliefs were significant predictors of technology use" (p. 103). Additionally, a survey by Ravitz, Becker and Wong (2000) indicated that the more extensively teachers employed technology, the more flexible and greater changes would take place in their teaching from a constructivist perspective.

From the literature review mentioned above, it is believed that teachers' educational beliefs are vital factors that may considerably influence different types of computer use. Particularly, Richardson (2003) indicated that constructivist pedagogical beliefs are student-centered, consisting of idea sharing and the instruction of planned or unplanned domain knowledge. As compared with traditional instruction, teachers who hold a constructivist view are likely to take advantage of the technology and involve students in learning. There is no doubt that teachers' educational beliefs play a crucial role in using computers to facilitate teaching and learning. However, few studies have been conducted to examine the relationships between teachers' educational beliefs and different types of computer use in Taiwan. Therefore, the purpose of this study was to investigate whether teachers' educational beliefs are in line with different types of computer use in elementary schools in Taiwan.

Method

Research Design

The overall design of this study combined both quantitative and qualitative research methods. Methodological triangulation was employed to increase the credibility and validity of the results. Therefore, an organized questionnaire and semi-structured interviews were employed in the study. Additionally, the questionnaire was modified and examined by the second researcher's supervisor and expert teachers so as to ensure the validity and reliability of the instrument. The basic research framework of the study included teachers' background variables (gender, teaching years, educational degree, degree of urbanization (rural/ urban), number of classes, position in school and the frequency of technology integration); teachers' educational beliefs (student discipline, course and teaching plan, teaching and evaluation, and student learning); different types of computer use (basic computer skills, computers as information tools, and computers as learning tools).

Participants

The participants in the questionnaire survey were 180 elementary school teachers in central-west Taiwan, based on purposeful sampling. There were 56 male teachers (31.1%) and 124 female teachers (68.9%) who participated in this study. Ten schools in Yunlin County, Taiwan were involved in the study. The teacher's background consisted of gender, teaching years, educational degree, degree of urbanization (rural/ urban), number of classes, position in school, teaching subject, and the frequency of technology integration.

Instruments

A questionnaire was developed for the purpose of collecting information from elementary school teachers about their background, educational beliefs and different types of computer use. The questionnaire encompassed three parts: (1) teachers' background variables, (2) teachers' educational beliefs, and (3) different types of computer use.

Teachers' Background Variables

This study investigated teachers' background variables by considering the following facts: gender, teaching years, educational degree, degree of urbanization (rural/urban), number of classes, position in school and the frequency of technology integration.

Teachers' Educational Beliefs

In this study, teachers' educational beliefs were measured through the scale developed by Zhu and Yeh, (2003). To make it suitable for the current educational environment, the researchers revised some parts of the scale. The teacher beliefs survey for elementary school teachers focuses on the aspect of constructivist teaching (CT) and it embraces four sub-dimensions: (1) student discipline, (2) course and teaching plan, (3) teaching and evaluation, and (4) student learning. In the student discipline dimension, it contains items such as ''Teachers should respect students' different points of view" and" Teachers should have the attitude of loving education when disciplining students." In the course and teaching plan dimension, it contains items such as ''Teachers should have independent abilities in designing courses and choosing materials" and "The main goal of course and teaching is to develop students' self-esteem, achievement and the willingness to learn." In teaching and evaluation dimension, it contains items such as "Teachers should not evaluate all the students by the same standard" and "In addition to cognitive evaluation, it is necessary to include the evaluation of affective and psychomotor skills in a learning evaluation." In student learning dimension, it contains items such as "The learning effect of students comprehending what they have learned is better than that of being informed by others" and "Students should be responsible for their learning." The respondents were asked to rate each statement on a five-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree.

Different Types of Computer Use

To substantiate whether profiles in teachers' educational beliefs are relevant to different types of computer use in school, the researchers included an additional instrument in the questionnaire (Tondeur et al., 2007). This instrument was designed to measure different types of computer use in Flemish primary education. The aspect of basic computer skills describes the use of computers as a school subject to teach students technical computer skills, such as "I teach students to use computer terms correctly." and ''I teach students how to make good use of the keyboard and mouse."

In addition to the use for school subjects, the second and third facets expressed more dimensions of educational uses for computers. The aspect of computers as information tools embraces such items as ''I teach students how to use the computer to exchange information with others," ''I teach students how to use the computer to organize information" and "I teach students how to use the computer for looking up the meaning of a word." Finally, The aspect of computers as learning tools encompasses items such as ''I teach students how to use the computer for problem solving," ''I teach students how to use computers for direct instruction, i.e. to learn something new" and "I think that students can use the computer to 'catch up' if they have fallen behind with their work." The respondents were asked to examine the cognition level that they use computers to practice various tasks on five-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree.

Interviews

The researchers conducted semi-structured interviews (Berg, 2007; Tutty, Rothery & Grinnell, 1996). The outline of the interview questions was previously arranged. The interview questions consisted of two parts. The

first part is guided questions and the other part is explanation of details. The researchers selected 18 elementary school teachers as the interviewees in accordance with a purposeful sampling strategy (Patton, 1990). Patton (1990) suggested that at least 10% of the participants needed to be included as interviewees. The goal of the interview is to know elementary school teachers' perceptions about teacher's educational beliefs and different types of computer use. There are six interview questions.

Data Collection Procedures

Measures of teacher's background, teachers' educational beliefs and different types of computer use were administered to all of the participants in order to investigate their attitudes toward teachers' educational beliefs and different types of computer use, and explore the relationships between teachers' educational beliefs and different types of computer use. The questionnaire was sent to 200 elementary teachers in 10 schools. Above all, the completion rate was 90%, of which 180 elementary school teachers participated in this study. Following the questionnaire, semi-structured interviews were conducted with 18 teachers to explore in depth about their attitude toward teachers' educational beliefs and different types of computer use. Each of the interviewees' responses was transcribed.

Data Analysis

In this study, the collected data were analyzed quantitatively and qualitatively, respectively. In the quantitative aspect, the teachers' educational beliefs and different types of computer use results were analyzed. In the qualitative aspect, the interviews on elementary school teachers' feedback on teachers' educational beliefs and different types of computer use was also documented and discussed. The following methods were used:

1. Descriptive statistic was used to analyze the times distribution and percentage of samples in teachers' background characteristics, and the Mean and the SD of teachers' educational beliefs and different types of computer use.
2. Factor analysis was adopted to reduce the numbers of variables and inspect the validity and the factorial structure of teacher's educational beliefs and different types of computer use.
3. Reliability analysis (Cronbach's α) was applied to test the reliability of the instrument. The Cronbach's alpha of teachers' educational beliefs scale reveals a high internal consistency of 0.777, whereas the Cronbach's alpha of different types of computer use scale reveals a high internal consistency of 0.934.
4. Independent samples T-test and one-way ANOVA were used to determine whether the differences in teachers' background characteristics were attributed to other factors.
5. Pearson product-moment correlation provided a measure of the strength of the relationship between variables.
6. Interview comprised interviewees' responses and feelings toward teachers' educational beliefs, and different types of computer use were transcribed and discussed.
7. Methodological triangulation was employed to increase the credibility and validity of the results. Therefore, an organized questionnaire and semi-structured interviews were employed in the study. Additionally, the questionnaire was modified and examined by the expert teachers so as to ensure the validity and reliability of the instrument.

Results

Results for Research Question 1: To What Extent Do Different Teachers' Background Variables Affect Their Educational Beliefs and Different Types of Computer Use?

To answer this research question, the researchers present analyses of (1) independent samples T-test and one-way ANOVA for teachers' educational beliefs and (2) independent samples T-test and one- way ANOVA for different types of computer use.

Results of Independent Samples T-test and One-way ANOVA for Teachers' Educational Beliefs and Different Types of Computer Use

Independent samples T-test and one-way ANOVA were employed to determine whether there are any effects of teachers' personal characteristics on teachers' educational beliefs (student discipline, course and teaching plan,

teaching and evaluation and student learning, please see Table 1) and different types of computer use (basic computer skills, computers as an information tool and computers as learning tools, please see Table 2) to stay in the accounting form. The results are shown in Table 1 and Table 2.

Table 1. ANOVA analysis in educational degree and teachers' educational beliefs

		SS	DF	MS	F	P-value
Student Discipline	Between Groups	2.879	2	1.439	5.203	0.006
	Within Groups	48.963	177	0.277		
	Total	51.842	179			
Course and Teaching Plan	Between Groups	2.208	2	1.104	4.171	0.017
	Within Groups	46.863	177	0.265		
	Total	49.072	179			
Teaching and Evaluation	Between Groups	0.396	2	0.198	0.604	0.547
	Within Groups	57.986	177	0.328		
	Total	58.382	179			
Student Learning	Between Groups	0.509	2	0.255	0.991	0.373
	Within Groups	45.469	177	0.257		
	Total	45.978	179			

* $p < 0.05$

Table 2. ANOVA analysis in educational degree and different types of computer use

		SS	DF	MS	F	P-value
Basic Computer Skills	Between Groups	2.979	2	1.490	3.289	0.040
	Within Groups	80.168	177	0.453		
	Total	83.148	179			
Computers as An Information Tool	Between Groups	2.352	2	1.176	2.272	0.106
	Within Groups	91.631	177	0.518		
	Total	93.984	179			
Computers as Learning Tools	Between Groups	10.316	2	5.158	15.196	0.000
	Within Groups	60.080	177	0.339		
	Total	70.396	179			

Table 1 and Table 2 demonstrated the results of whether there are any effects of teacher's background variables on teachers' educational beliefs and different types of computer use. The data showed that there was a significant interaction effect between educational degree and the sub-dimension of student discipline ($p < 0.05$). There was also a significant interaction effect between educational degree and the sub-dimension of course and teaching plan. Likewise, the results proved that the variation in the aspect of basic computer use would be significantly affected by the factor of teacher's educational degree ($p < 0.05$), number of classes and frequency of technology integration. Moreover, the variation in the aspect of computers as learning tools could be significantly affected by the factor of teaching years, teacher's educational degree, teacher's position in school, and frequency of technology integration. Additionally, the variation in the aspect of computers as information tools might be significantly affected by the factor of the frequency of technology integration.

Results for Research Question 2: What Are the Relationships between Teachers' Educational Beliefs and Their Different Types of Computer Use?

To answer this research question, the researchers present analyses of (1) Pearson product-moment correlation for teachers' educational beliefs and (2) Pearson product-moment correlation for teachers' educational beliefs and different types of computer use.

Results of Pearson Product-moment Correlation for Teachers' Educational Beliefs and Their Different Types of Computer Use

Pearson product-moment correlation was conducted to examine the correlation coefficient between teachers' educational beliefs and different types of computer use. Table 3 showed the correlation between teachers' educational beliefs and different types of computer use. In Table 3, teachers' educational beliefs was found to be positively and significantly correlated with different types of computer use ($p < 0.01$).

Table 3. Correlation between teachers' educational beliefs and different types of computer use

Variables	Teachers' Educational Beliefs	Different Types of Computer Use
Teachers' Educational Beliefs	-	0.491^{**}
Different Types of Computer Use	0.491^{**}	-

** $p < 0.01$

Furthermore, to investigate every variable of educational beliefs and different types of computer use precisely, the researchers presented Table 4 to show the correlation between the four sub-dimensions of teachers' educational beliefs and the three aspects of different types of computer use.

Table 4. Correlation between the four sub-dimensions of teachers' educational beliefs and the three aspects of different types of computer use

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Student Discipline	-	0.459^{**}	0.372^{**}	0.225^{**}	0.373^{**}	0.324^{**}	0.357^{**}
(2) Course and Teaching Plan	0.459^{**}	-	0.467^{**}	0.392^{**}	0.401^{**}	0.381^{**}	0.391^{**}
(3) Teaching and Evaluation	0.372^{**}	0.467^{**}	-	0.301^{**}	0.316^{**}	0.328^{**}	0.322^{**}
(4) Student Learning	0.225^{**}	0.392^{**}	0.301^{**}	-	0.155^{*}	0.207^{**}	0.167^{*}
(5) Basic Computer Skills	0.373^{**}	0.401^{**}	0.316^{**}	0.155^{*}	-	0.701^{**}	0.577^{**}
(6) Computers as Information Tools	0.324^{**}	0.381^{**}	0.328^{**}	0.207^{**}	0.701^{**}	-	0.646^{**}
(7) Computers as Learning Tools	0.357^{**}	0.391^{**}	0.322^{**}	0.167^{*}	0.577^{**}	0.646^{**}	-

* $p < 0.05$; ** $p < 0.01$

Based on Table 4, every dimension of teachers' educational beliefs and every aspect of types of computer use were found to be positively correlated with student discipline, course and teaching plan, teaching and evaluation, basic computer skills and computers as learning tools ($p < 0.01$). Above all, student learning was investigated to be significantly related to computer as learning tools ($p < 0.05$), while other variables were positively correlated with student learning and computers as learning tools ($p < 0.01$).

Based on Table 3 and Table 4, the results suggested that teachers' educational beliefs are highly correlated with different types of computer use ($p < 0.01$). In addition, there are significant relationships between the four sub-dimensions of teachers' educational beliefs and the three aspects of different types of computer use ($p < 0.05$, $p < 0.01$).

Results for Research Question 3: What Are the Effects of Teachers' Educational Beliefs on their Computer Use?

To answer this research question, the researchers present the analysis of a semi-structured interview. There are six interview questions in this interview and each question consisted of two parts, guided questions and explanation questions for more details. In order to understand teachers' concepts about their educational beliefs and attitudes toward computer use, the researchers designed 6 interview questions for 18 teachers, 10 (5 males and 5 females) from an urban area, and 8 (4 males and 4 females) from a rural area.

According to the six interview questions, questions 1 to 3 were opinions of the factors and effects on teachers' educational beliefs and different types of computer use. Questions 4 to 5 were in search of teachers' awareness of the relationship between teachers' educational beliefs and different types of computer use. Question 6 "Do you have any suggestions to improve teaching by considering educational beliefs and applying computer use?" was added in case other possible feedback was left out. The interview was completed in both English and Chinese.

The interview results were categorized as follows:

1. What is your educational belief? Which factors affect your educational beliefs?

Based on the results of the interview, teachers' educational beliefs included teachers' expectations not only for students' behaviors, learning and performances but also the interaction with parents and the self-examination. There were two main factors that affected teachers' educational beliefs: external factors and internal factors. The external factors consisted of schools', parents' and students' feedback and support, students' characteristics, the motivation by educational books and workshops; the internal factors consisted of teachers' self-expectation toward students, parents and themselves, their concepts toward the society and their teaching experiences. The following quotation presented the excerpts from the interviewees:

Teacher A, D and Q: My educational belief is to develop students' living and learning attitudes and communicate with parents so as to build a peaceful and happy learning environment. The support from school and parents may influence my educational beliefs.

2. Do you consider computers to be useful tools for teaching? Why?

All the interviewees considered computer as useful tools in assisting their teaching. Computers could provide the information, authentic materials and multiple ways for teaching and learning. In addition, they could improve teachers' teaching and motivate students' learning. The excerpts were displayed as follows:

Teacher D, K and L: I regard the computer, especially usage of the Internet, as a tool to promote teaching and learning. It helps students develop learning motivation, establish active learning attitudes and broaden students' horizons. The positive aspects of using the computer are presented.

3. What are the factors that influence your computer use? Why?

In addition to students' and parents' feedback and support, the convenience, time and course contents were the other important factors that affected teachers' computer use. The following quotation demonstrated the excerpts from the interviewees:

Teacher F and N: I think a computer can be applied to teaching when teachers want to control the class and establish an active atmosphere in the classroom for a long time. However, computers should be used appropriately.

4. Do you think teachers' beliefs are in accordance with different types of computer use? Why?

Most of the teachers thought that their educational beliefs were correlated with their computer use. Teachers' educational beliefs and their computer use affected each other mutually. The excerpts from the interviewees were shown as follows:

Teacher B, C, H and M: Yes. The type of teaching material, the expectation of constructive learning abilities or the remediation of teaching and learning can be solved by means of different types of computer use.

5. Do you think your educational belief promotes computer use in your teaching? Why?

Most of the interviewees thought that their educational beliefs promoted their computer use. The more positive and firm educational beliefs teacher built, the more frequent and active usages of computers they would have. Most of the teachers valued computers as vehicles to facilitate teaching and learning. Furthermore, computers were regarded as the remediation for compensating students' insufficiencies in their learning. The following showed the excerpts from the interviewees:
Teacher A, D, I and Q: Yes. With support from schools, parents and students, we teachers can build more positive educational beliefs. Furthermore, the educational beliefs would lead to the improvement and innovation of our teaching, including different creative ideas by using the technology.

6. Do you have any suggestions to improve teaching by considering educational beliefs and applying computer use?

In order to improve and enhance teachers' teaching and students' learning, we need to consider some aspects: (1) our government should increase the educational budget and carry out the technology education course for students. Additionally, it has to hold educational and computer-related workshops, popularize in-service training

courses about computer use and integrate websites for teachers. (2) Schools have to increase the hardware and software equipments for teachers to execute their teaching and motivate students' learning. (3) Teachers, parents and students all have to formulate correct concepts about computer use. (4) In addition to being aware of teaching materials, teachers can interact and exchange information with other teachers for the purpose of strengthening their educational beliefs and teaching abilities about computer use. The following quotation was the excerpts from the interviewees:

Teacher A, H and R: Our government should increase the educational budget, hold educational and computer-related workshops and integrate websites for teachers to inquire and use.

Discussion

Discussion on Research Question 1: To What Extent Do Different Teachers' Background Variables Affect Their Educational Beliefs and Different Types of Computer Use?

The results showed that teachers who had a higher educational degree were more likely to have constructivist beliefs about student discipline and course and teaching plan. Moreover, teachers having a higher educational degree with teaching years between 6 to 15 and 16 to 25 years might have more positive attitudes toward different types of computer use. On the contrary, when a teacher's educational degree was lower and their teaching years were over 26 years, they might have a lower adoption on different types of computer use. Additionally, teachers who used computers in assisting their teaching once or twice a week, three or four times a week or everyday had positive attitudes toward computer use than those who never used computers in assisting their teaching. As many researchers argued, computer-assisted instruction showed small but positive effects compared to those found in traditional instruction (Blok, Oostdam, Otter & Overmaat, 2002; Torgerson & Elbourne, 2002). Furthermore, the results showed that homeroom teachers valued computers as learning tools more than subject teachers. Homeroom teachers might have a greater tendency to instruct students to use computers to compensate for their insufficiency and solve problems in learning, and they tended to explore further research in specific subjects.

Discussion on Research Question 2: What Are the Relationships between Teachers' Educational Beliefs and Their Different Types of Computer Use?

The researchers performed Pearson product-moment correlations to compute the relationship between teachers' educational beliefs and different types of computer use. A significant positive relationship between teachers' educational beliefs and different types of computer use was found in this study, with coefficients up to 0.491 ($p<0.01$). Furthermore, the four sub-dimensions of teachers' educational beliefs were significantly correlated with different types of computer use, with coefficients ranging from 0.155 ($p<0.05$) to 0.701 ($p<0.01$). Several studies asserted that teachers who use computers in different ways due to their conceptions of using ICT are related to their existing teaching beliefs or belief system (Higgins & Moseley, 2001; Sugar et al., 2004).

Moreover, the evidence showed that teachers who adopt constructivist beliefs are highly positive computer users (Becker, 2001; Niederhauser & Stoddart, 2001). In other words, the findings indicated that teachers who focused on student-centered constructivist teaching and had positive attitudes toward the four sub-dimensions of teachers' educational beliefs were likely to have active concepts and applications on different types of computer use.

Discussion on Research Question 3: What are the Effects of Teachers' Educational Beliefs on their Computer Use?

In this study, 180 participants completed the questionnaires and 18 teachers were the interviewees. The findings in this study imply that some factors of a teacher's background information significantly affect teachers' educational beliefs and different types of computer use. Furthermore, teachers' educational beliefs are highly correlated with different types of computer use.

1.What is your educational belief? Which factors affect your educational beliefs?

The factors which affected teachers' educational beliefs include (1) teachers' teaching experiences, (2) educational books or workshops, (3) interactions with students and parents, and (4) feedbacks and supports from schools, parents and students. The following quotation presented the excerpts from the interviewees:

Teacher B and G: I think it is important to respect every student's uniqueness and give different guidance and homework according to different characteristics and situations. Students' feedback would be the most important factor to affect my educational beliefs.

2. Do you consider computers to be useful tools for teaching? Why?

All participants (18 interviewees) considered computer to be a useful tool for teaching. Besides finding information and receiving messages, they thought that computers could provide multiple ways to motivate student learning and innovate teaching. The excerpts were displayed as follows:

Teacher H and Q: Computers can provide authentic materials such as pictures, videos and similar situations so as to combine the living environment with learning and reinforce students' cognition and learning experiences.

3. What are the factors that influence your computer use? Why?

Time, course contents, equipment, convenience of technology, students' needs and parents' feedbacks were the factors that influenced the interviewees to use computers. When the effects of using computers were positive and obvious, teachers would have greater aspirations to use computers. The following quotation demonstrated the excerpts from the interviewees:

Teacher L: There are two reasons for me to use a computer. On the one hand, it can help me complete my teaching work, such as grading students' performances, revising the compositions and building the website about student learning. On the other hand, it can provide a prompt channel for me to receive the latest information easily.

4. Do you think teachers' beliefs are in accordance with different types of computer use? Why?

Most of the teachers expressed that teachers' educational beliefs are in line with different types of computer use. Teachers who have more positive beliefs may use computers more often and value the computer application more. Furthermore, it is believed that teachers who have firm educational beliefs are likely to use computers in a positive and active way. The excerpts from the interviewees were shown as follows:

Teacher D, F, G, N and P: Yes, The more positive beliefs teachers have, the more frequent and active usage and application of computers will be.

5. Do you think your educational belief promotes computer use in your teaching? Why?

Yes. Because most of the teachers expect students to have multiple performances in different orientations and learn in various ways, the appropriate computer use cannot only facilitate teachers' teaching but also improve student learning. Teachers play an important role as gatekeepers to guide students to obtain useful and concrete information. Computer use can be valued a lot, but it should be connected with teaching and learning carefully. The following showed the excerpts from the interviewees:

Teacher B, C, H and M: Yes. I think that every student should not be left behind. Thus, I apply computers to help them catch up and reinforce their motivation for learning.

6. Do you have any suggestions to improve teaching by considering educational beliefs and applying computers?

On the one hand, teachers have to consider the discrepancy of technological abilities among students, being well prepared and aware of computer-assisted materials, interacting with other teachers to learn successful examples about computer-assisted teaching and insisting on concrete educational beliefs. On the other hand, the government and schools need to give help and support on software and hardware, increase the educational budgets, hold educational and computer-related workshops, popularize in-service training courses and integrate websites for teachers to use. The following quotation was the excerpts from the interviewees:

Teacher B, K and N: By means of gathering and integrating materials for teaching, teachers can broaden their horizons and cope with problems in different dimensions. Through interaction with other teachers about the appropriate software application, teachers can strengthen their interests and effectiveness.

Conclusion and Implications

Based on research findings, four conclusions are drawn below. Firstly, the results demonstrated that the factor of educational degree had a significant effect on the aspects of student discipline and course and teaching plan. Therefore, teachers' educational degree was the main factor that affected their teaching methods in disciplining students and planning the course.

Secondly, teaching years, educational degree, number of classes, position in school and the frequency of technology integration were the factors that influenced different types of computer use. The results showed that teachers who have a higher educational degree and teaching years between 6 to 15 and 16 to 25 years are more likely to regard computers as basic skills and learning tools. In addition, depending on how often teachers integrate technology into their teaching, it is convincing that the effects of their computer use were more significant than those who never used it. Moreover, the results illustrated that homeroom teachers are more likely to use computers as learning tools than subject teachers.

Thirdly, accordingly, results showed that teacher's educational beliefs were highly correlated with different types of computer use. Hence, teachers' educational beliefs and different types of computer use affect each other mutually. Both concepts are important and worthy of further study.

Fourthly, most of the interviewees mentioned that teachers' educational beliefs were of vital importance in their teaching, and computers were vehicles to facilitate teaching and learning. The more positive beliefs teachers have, the more frequent and active usage and application of computer will be. Thus, teachers' educational beliefs can be considered to be an important factor that influences different types of computer use.

The conclusion and pedagogical implications for teachers including teachers' educational beliefs (student discipline, course and teaching plan, teaching and evaluation and student learning), different types of computer use (basic computer skills, computers as information tools and computers as learning tools) and the relationship between teachers' educational beliefs and different types of computer use were addressed in the following sections.

Teachers' educational beliefs

The results demonstrated that the sub-dimensions of student discipline and course and teaching plan were significantly affected by teachers' educational degrees. In other words, when teachers got higher educational degrees, they might create multiple viewpoints and positive attitudes toward controlling students' behaviors, counseling and guiding students, and planning course content. Additionally, teachers with higher education degrees were likely to have more constructivist concepts and be focused on students' interests, needs and abilities in a student-centered fashion. Therefore, the researchers suggested that teachers be encouraged to attend educational courses or to promote their academic degree in order to improve teaching techniques and develop constructivist concepts. If teachers establish broader mindsets, they are probably able to cope with different conditions and multiple perspectives. Both teachers and students might benefit.

Different types of computer use

According to the results, most of the teachers regarded computers as useful tools in assisting their teaching. Although teachers implemented computers for teaching at variable rates, the results still displayed important effects on computer use. To increase the rate of computer use in teaching, the researchers offer some specific suggestions. Firstly, computer-related workshops or in-service training should be systematically popularized to teachers in order to enhance teachers' computer knowledge and techniques. Secondly, some teachers are afraid of using computers or cannot connect computers with teaching and learning. By means of interacting and exchanging information with other teachers, teachers can build various perspectives and learn different methods of computer use. Finally, it is important to advocate the convenience and benefits of computer-assisted teaching. The more effects and benefits teachers realize, the more likely they will use computers.

The relationship between teachers' educational beliefs and different types of computer use

Based on constructivist educational beliefs, teachers are prone to taking positive attitudes toward teaching practice, including using computers in their teaching. Similarly, computer use in teaching is also a factor that may influence teachers' educational beliefs. They are mutually correlated. Therefore, there are some implications for education.

Firstly, our government needs to increase the educational budget to provide state-of-the-art hardware and software equipment in schools. With sufficient technological resources, teachers and students are more likely to be motivated to apply technology in teaching and learning.

Secondly, the Ministry of Education and other education-related departments are supposed to integrate websites for teachers to inquire and use; they also need to hold workshops regularly in order to improve and strengthen teachers' education and computer skills.

Thirdly, teachers are expected to develop firm and concrete educational beliefs in their teaching. What is valued in their teaching may affect their decisions and performance in the classroom. If teachers want to instruct students to receive different dimensions of knowledge, computers are used as vehicles to assist teachers in achieving their goal. Moreover, teachers can adjust and reinforce their educational beliefs and computer applications in terms of their teaching experience, educational books or journals, and cooperation and interaction with other teachers. Teachers are expected to consider students' needs and personal characteristics and examine their own teaching goals and beliefs continuously. Most importantly, teachers' educational beliefs and teaching skills need to be more flexible for the purpose of following educational trends.

Fourthly, parent and student feedback and support are vital elements for teachers to enhance and promote their teaching. The positive feedback and support strengthen teachers' confidence in their own beliefs and increase their enthusiasm for discovering various ways of teaching as well.

Fifthly, since teachers' educational beliefs were highly related to different types of computer use, every aspect of influencing factors is worthy of investigation in order to contribute positive findings to the pedagogical environment.

Limitations and Suggestions for Future Research

Limitations

The findings of this study might contribute to the Ministry of Education, educators and teachers who would like to enhance the rate and interest in computer use in education. Nevertheless, based on the research design in the study, the findings have their limitations, which are listed below.

Firstly, because of the limitation of the area, the research area was restricted to central-west Taiwan. There might be a limitation in discovering different results.

Secondly, the study was conducted in 10 schools (180 teachers); a larger population might have yielded more conclusive results.

Thirdly, this research mainly focused on elementary school teachers' concepts on teachers' educational beliefs and different types of computer use. One limitation is that the discrepancy between elementary school teachers and teachers at different stages in viewpoints are not explored (e.g. junior high school teachers, senior high school teachers, college teachers, etc.).

Suggestions for Future Research

The findings of this study might contribute to elementary school teachers and educators who would like to enhance computer use in education. This study was aimed at exploring the relationship between elementary school teachers' educational beliefs and different types of computer use. Nevertheless, there are some limitations in this study that were mentioned above. Therefore, the researchers provide some suggestions for future studies.

Firstly, the research was conducted in central-west Taiwan because of the limitation in geographical area. If future researchers could investigate related studies in other counties or cities, it might provide more comparable results. For example, teachers who teach in big cities might have more resources and opportunities to enhance computer-assisted teaching, the concepts of educational beliefs and different types of computer use might be different between cities and counties.

Secondly, the sample size of the study can be increased. Only 180 elementary school teachers participated in this study. The researchers recommend that future researchers involve more participants in future studies. If a greater number of participants could join a related study, the results of the research might be applied to other contexts and the findings could be inferred to the same situation, not just restricted to this study. For this reason, more participants are suggested for future research.

Thirdly, this study emphasized the results of elementary school teachers' educational beliefs and different types of computer use. If the research could be broadened to higher levels of education such as junior high school teachers, senior high school teachers or college teachers, different findings might be discovered. Generally speaking, students' levels on technological skills would be improved in the process of education. That is, students who have higher educational degrees would have learned more specific and various techniques about computers. Thus, it is necessary for teachers who teach in junior high schools, senior high schools or colleges to teach advanced computer skills to students in order to fit the students' skill levels. Teachers are supposed to develop more expertise as the educational level of students increases. The different results of teachers' educational beliefs and different types of computer use on various educational stages are worth exploring in the future.

Finally, this study found that teachers' educational beliefs were correlated with different types of computer use. With a view to strengthening positive constructivist educational beliefs and enhancing teachers' computer use in education, more specific methods and intensive research studies are suggested in the future.

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Turkish EFL Learners' Willingness to Communicate in English

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Abstract

Willingness to communicate in a second language has gained importance recently with the increasing popularity of communicate language teaching. However, different factors which influence learners' willingness to communicate have not been widely investigated in the Turkish classroom context. Thus, this study investigated English as a foreign language (EFL) learners' willingness to communicate (WTC) in Turkish EFL context and its interaction with different factors such as gender, proficiency levels. 711 preparatory school students at a state university in Turkey participated in this study. For data collection, willingness to communicate scale adapted from Peng and Woodrow (2010) was utilized in order to investigate Turkish preparatory students' willingness to communicate in English. Firstly, descriptive analysis of the scale was carried out through Statistical Package for Social Sciences (SPSS). Then, independent samples t-tests and one-way ANOVA were conducted to investigate the effects of gender and language proficiency variables on learners' willingness to communicate. The results of the study indicated that the learners in this study were moderately willing to communicate in English. It was found that learners were more willing to communicate in controlled situations compared to more meaning-focused situations. With regard to the effect of gender on Turkish EFL learners' WTC, it was found that female EFL learners are more willing to communicate in English in the classroom compared to male EFL students. Lastly, learners who have higher language proficiency levels were found to have higher WTC level compared to learners who have lower language proficiency levels.

Key words: Willingness to communicate, EFL learners, gender, proficiency level

Introduction

"Willingness to Communicate" (WTC) was originally introduced with reference to communication in the native language and it was defined as a predisposition to initiate or avoid communication when free to do so (McCroskey and Baer, 1985). WTC was also considered as a personality-based trait (McCroskey & Richmond, 1991) and it was indicated that people's tendencies to talk change significantly from one another. Likewise, Baker and MacIntyre (2000) propose WTC as a trait-like predisposition which implies that individuals show similar WTC tendencies regardless of different contexts or receivers. McCroskey and Richmond (1991) conducted a cross-cultural comparative study to investigate the relations among WTC, communication apprehension, self-perceived communicative competence, and introversion in Micronesia, Australia, Sweden, Puerto Rico and the United States. They found significant differences in the mean scores of the U.S., Swedish, Australian, and Micronesian students. It was reported that American students had the highest willingness to communicate, whereas Micronesian students had the lowest willingness to communicate. Swedish students had the highest self-perceived communicative competence and Micronesian students had the lowest. However, McCroskey and Richmond (1991) stated that there is a need to broaden data from different cultures for any kind of generalization regarding the effect of culture on willingness to communicate.

In the 1990s, WTC research in L1 received the attention of the researchers in the second language research area. Based on Gardner's (1985) socio-educational model, some studies were carried out in the Canadian contexts to investigate WTC model in a L2. MacIntyre & Charos (1996) investigated WTC in a second language. MacIntyre's (1994) L1WTC model was broadened in L2 by adding motivation, personality, and context to the structural model as the determinants of WTC. The results showed that L2 communication frequency is directly

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affected by perceived communication competence. Both perceived competence and anxiety had direct influence on WTC and personality traits influenced motivation and WTC.

In 1998, a comprehensive model of L2WTC was suggested by MacIntyre et al. taking into consideration that WTC should be treated as as a situational variable instead of a trait-like variable. A pyramid figure which has twelve constructs was developed to illustrate the probable determinants of willingness to communicate in L2. Figure 1 displays six categories of the model; communication behavior (I), behavioral intention (II), situated antecedents (III), motivational propensities (IV), affective cognitive context (V), and social and individual context (VI). While WTC is directly affected by the layers I, II, III, the last three layerslayers (IV, V, VI) have enduring effects on WTC. In this pyramid, WTC was put into layer II and it was defined as the final step before speaking in a second language. In the layer III, state communicative self-confidence and desire to communicate with a specific person are placed as situational variables. At the bottom of the pyramid, there are intergroup climate and personality as enduring influences. Intermediate layers consist of motivational propensities and affcetive-cognitive context, which involve motivation, intergroup attitudes, L2 self confidence, communicative competence, and social situation (See Figure 1). This model has gained importance since its proposal because it is "the first attempt at a comprehensive treatment of WTC in the L2" (MacIntyre, Clement, Dörnyei, & Noels, 1998, p. 552). Different aspects of this model have been investigated by many researchers since its proposal in 1998.

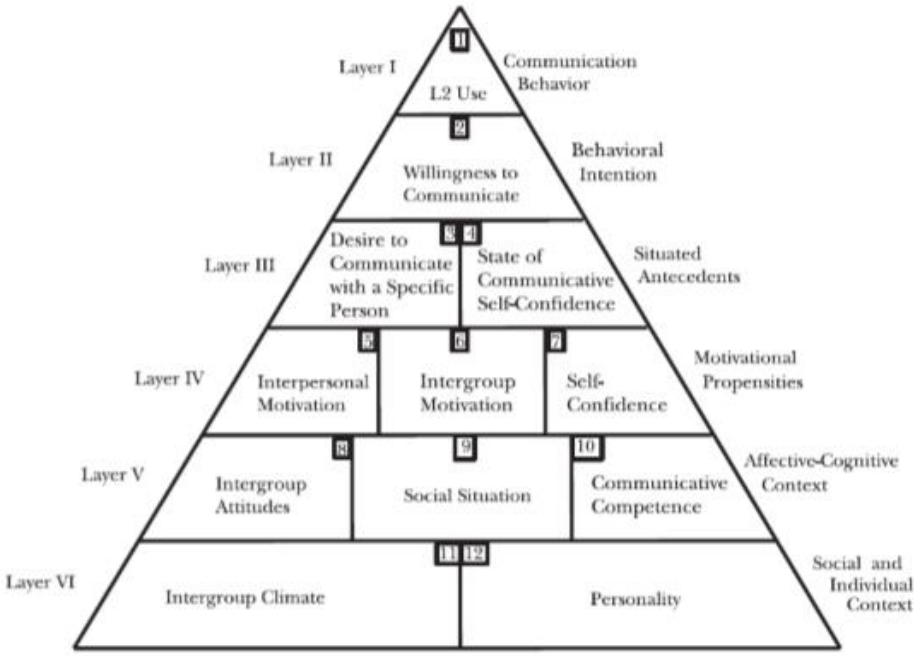

Figure 1. Heuristic Model of Variables Influencing WTC (MacIntyre, Clément, Dörnyei, Kimberly, & Noels, 1998)

In the Turkish context, research on willingness to communicate is quite limited. In 2005, Bektaş investigated to what extent Turkish university students are willing to communicate and the WTC model that she proposed can explain the relations among different variables in this EFL context. Participants consisted of 356 university students in Turkey. The results of the structural equation model (SEM) analysis indicated that students' attitude toward the international community and their perceived linguistic self-confidence are direct indicators of students' L2WTC. On the other hand, it was found that students' motivation to learn English and their personality had an indirect effect on learners' WTC. Lastly, it was found that their personality directly influenced learners' attitude toward the international community. Similar to Bektaş's (2005) study, Atay and Kurt (2009) also investigated the willingness to communicate in the Turkish context through the data collected from 159 intermediate level Turkish EFL students in Istanbul. Both qualitative and quantitative research methodologies were utilized. A strong correlation as found between perceived communication competence and WTC supporting the results of the previous WTC studies (MacIntyre & Charos, 1996). Also, it was found that international posture directly affects the willingness to communicate of Turkish EFL students. However, desire

to learn English was not found to be an important determinant of WTC. On the other hand, qualitative findings indicated that situational variables such as teacher, peers, topics have also influences on WTC.

Considering that the variables which affect the willingness to communicate of prospective English teachers have not been investigated before, Şener (2014) looked into L2WTC with university students studying at the English language teaching department in the Turkish context. As a first step, 274 university students at English department took the questionnaire. For qualitative data analysis, 26 students and 11 instructors working at the ELT department were interviewed. The quantitative data were calculated through T-test, ANOVA, Pearson correlation and multiple regression analysis. The regression results showed that self-confidence was the most important antecedent of WTC and it directly affects WTC in English. The results of Pearson correlation coefficients which were calculated for the variables anxiety, motivation, attitude, communication competence, personality, and willingness to communicate showed a strong correlation among these variables.

Oz, Demirezen, and Pourfeiz (2015) were the first to investigate the relationship between the ideal L2 self and L2WTC in a Turkish context. Interrelationships among communication competence, communication anxiety, integrativeness, attitudes towards the learning situation, motivation, instrumental orientation, ideal L2 self and L2WTC were investigated in their study. Participants of the study consisted of 134 English as a foreign language learners in an EFL teacher education program. Structural equation modeling was utilized for data analysis and the results of the analysis showed that communication competence and communication anxiety were found to be the strongest determinants of willingness to communicate while other variables had indirect effects on learners' WTC. It was also found that there was not a significant direct path from integrativeness and the ideal L2 self to motivation and WTC while they directly influenced self-perceived communication competence and communication anxiety. Hence, Oz et al. (2015) suggested encouraging learners' willingness to communicate through supporting their self-perceived communication competence by means of helping them have more positive perceptions of their ideal L2 selves.

The Purpose and Significance of the Study

From the perspective of L2 acquisition theories, learners should use the target language to learn it. However, not all of the learners have the same level of willingness to communicate in a classroom setting which could prevent successful L2 acquisition. So, it is necessary to investigate learners' willingness to communicate in a classroom setting. The number of the studies on willingness to communicate should be increased to understand EFL learners' communication intentions. As can be seen in the literature section, many studies have confirmed the validity of the WTC model developed by MacIntyre et al. (1998) in terms of explaining learners' L2WTC and its relation with different variables. However, most of them were conducted in Canada where French is taught as a second language (MacIntyre & Charos, 1996; Baker &MacIntyre, 2000; MacIntyre, Baker, Clement, & Donovan, 2002). Only a limited number of studies were carried out in English as a second language (ESL) learning context (Hashimoto, 2002; Clement, Baker,& MacIntyre, 2003), or English as a foreign language (EFL) learning environments (Yashima, 2002; Kim, 2004; Bektaş, 2005). In the Turkish context, research on willingness to communicate is also quite limited. Therefore, the main goal of this study is to determine to what extent EFL learners are willingness to communicate in the Turkish context, and to find out different individual factors that can influence learners' willingness to communicate.
Accordingly, the research questions of the study are as in the following:
1- What is the Turkish EFL learners' perceived level of their L2WTC in a classroom setting?
2- Does Turkish EFL learners' L2WTC differ with regard to proficiency levels and gender variables?

Method

Participants

711 preparatory school students at a state university in Turkey participated in the study. Most of these students were recent graduates of high schools and they started university based on their exam scores they acquired from nationwide university selection and placement test (YGS) which was administered by Higher Education Council Students Selection and Placement Centre (ÖSYM). The majority of the 711 survey participants were Turkish citizens (99%), while only four of them had other nationalities. The age of 614 participants ranged from 17 to 19, while 83 of them were between ages 20-22 which indicates a young group of learners. Majority of the participants were female (60%) while males consist of less than half of the participants (39%).

English proficieny levels of the participants varied from elementary (ELE) to advanced (ADV). Slightly more than half of the students (56%) were at pre-intermediate and elementary levels, while 43% of the students were at advanced and intermediate levels. Considering these percentages, it can be stated that levels of the participants were fairly distributed.In order to understand the willingness to communicate of students studying at School of Foreign Languages at Hacettepe University, including students from different levels is very significant because this fair distribution will present a more realistic picture of the situation.

Table 1. Nationality, Level, Age and Gender Distribution of the Participants

		n	*%*
Nationality	Turkish	707	99.4
	Other	4	0.6
	Total	711	100.0
Level	ADV	147	20.7
	INT	165	23.2
	PIN	180	25.3
	ELE	219	30.8
	Total	711	100.0
Gender	Female	429	60.3
	Male	282	39.7
	Total	711	100.0
Age	17-19 ages	614	86.4
	20-22 ages	83	11.7
	23-25 ages	7	1.0
	26-28 ages	2	0.3
	28-above	5	0.7
	Total	711	100.0

Instrument

In the study, data were collected by means of a questionnaire and a scale. In order to understand students' background, a questionnaire with 14 items was utilized in the study. It consists of questions that give information about students' background such as age, gender, class, nationality, how long they have been studying English.

The scale was designed with ten items to investigate learners' WTC levels. Both translation and back translation methods were conducted to prevent any semantic loss during the translation of surveys (Brislin, 1980). The match between the original English and its Turkish translation was rated by five bilingual raters who have at least Master's degree in English on a scale of 10. The main goal of this step was to reduce the risk of item

translation difference (Şireci & Berberoğlu, 2000). Secondly, a different set of five raters who have the same qualifications examined the synonymy between the original English version and the back-translated English version on a scale of 10.

For WTC scale, ten items (Cronbach's alpha= .94) adapted from Peng and Woodrow (2010) served to assess Turkish preparatory students' willingness to communicate in English. Peng & Woodrow's (2010) study indicated a two-factor solution for WTC: WTC in meaning-focused activities (e.g., giving a speech in the classroom) consists of six items and WTC in form-focused activities (e.g., asking the meaning of a word) consists of four items. After adapting the questionnaire items in accordance with the research goals and the context, a pilot study was conducted to examine the existence of factors that the questionnaire is assumed to measure, check the reliability, and to see any problems regarding the data collection procedure, clarity, layout. The data of the pilot study were analyzed through SPSS and the reliability coefficient of the WTC (Ten Items) scale was found as .87.

Data Analysis

Data was collected from preparatory students at Hacettepe School of Foreign Languages through willingness to communicate scale. As a first step, descriptive analysis of the scale (e.g. maximum and minimum scores, mean, and standard deviations) was carried out through Statistical Package for Social Sciences (SPSS). Then, independent samples t-tests and one-way ANOVA were conducted to investigate the effects of variables on learners' willingness to communicate in the classroom.

Results and Discussion

Turkish EFL Learners' Perceived Level of L2WTC in English in a Classroom Setting

The first research question in this study aims at finding out to what extent Turkish EFL students are willing to communicate in their language classes. For this purpose, the summated score of 10 WTC items were calculated and Table 2. presents the descriptive statistics of summated score for WTC in English.

For the evaluation of the WTC scores of students, the ratio of the mean WTC score was compared with the full score. The full score of the scale was 60. Following Liu& Jackson (2008), the mean score which was above 48 was classified as high WTC, the mean score between 36 and 48 represented a moderate WTC, and the mean score below 36 was interpreted as low WTC.

In this study, the mean score (37.16), along with the median (37.00) and mode (34.00), was between 36 and 48. This finding revealed that the participants in this study were moderately willing to communicate in English in a language class. This finding supports the findings of Bektaş's (2005) and Şener's (2014) study.

Table 2. Descriptive statistics of summated score for WTC in English

	Min	*Max*	*Mean*	*SD*	*Median*	*Mode*
Summated WTC score	10	60	37.16	1.02	37.00	34.00

Participants' WTC levels were also examined at items levels. Table 3 displays descriptive statistics in detail. WTC scale includes items for meaning-focused activities and form-focused activities. Items WTC1, WTC2, WTC3, WTC4, WTC5, and WTC6 measure students' WTC level for meaning-focused activities. As the Table4.2 shows, 60% of the participants were unwilling to do a role-play standing in front of the class (WTC1), while 47% of them reported unwillingness for doing role-plays at their desk (WTC6). Similarly, 46% of the participants stated that they were unwilling to give a short self-introduction without notes (WTC2), while 48% of them reported unwillingness for giving a short presentation about one's hometown with the help of notes (WTC3). However, when asked to translate a spoken utterance from Turkish into English in a group (WTC4), 55% of the participants reported willingness to do it. Also, a large group of participants (65%) reported high level of willingness for asking a teacher to repeat what he/she just said in English (WTC5).

Scale items WTC7, WTC8, WTC9, and WTC10 were designed to explore participants' WTC for form-focused activities. Compared to meaning-focused activities, participants reported higher willingness for form-focused activities (ranging from 63 to 71). A large proportion of participants (71%) indicated that they were willing to ask their peers sitting next to them in English the meaning of an English word (WTC7). For asking group mates in English the meaning of the word they do not know (WTC8), they (63%) also reported willingness.

Table 3. Descriptive statistics of WTC scale items

Willingness to Communicate *Items*	*Total Mean*	*SD*
1- I am willing to do a role-play standing in front of the class in English (e.g., ordering food in a restaurant).	2.95	1.46
2- I am willing to give a short self-introduction without notes in English to the class.	3.58	1.46
3- I am willing to give a short speech in English to the class about my hometown with notes.	3.44	1.45
4- I am willing to translate a spoken utterance from Turkish into English in my group.	3.64	1.47
5- I am willing to ask the teacher in English to repeat what he/she just said in English because I didn't understand.	3.97	1.47
6- I am willing to do a role-play in English at my desk, with my peer (e.g., ordering food in a restaurant).	3.47	1.55
7- I am willing to ask my peer sitting next to me in English the meaning of an English word.	4.25	1.52
8- I am willing to ask my group mates in English the meaning of word I do not know.	3.93	1.52
9- I am willing to ask my group mates in English how to pronounce a word in English.	3.96	1.52
10- I am willing to ask my peer sitting next to me in English how to say an English phrase to express the thoughts in my mind.	3.92	1.48
Total WTC Score	3.71	1.49

More than half of the participants (64% and 63% respectively) also indicated that they were perhaps, probably, definitely willing to ask their group mates or peers sitting next to them how to pronounce a word (WTC9) or how to say an English phrase (WTC10).

Overall, results of the WTC scale indicated that participants reported higher level of willingness to communicate in controlled situations such as pronunciation, vocabulary learning compared to less-controlled situations such as giving a speech, doing a role-play. Findings also revealed that participants were less willing to communicate in activities which are performed in front of the class and require more complicated language use such as giving a speech without notes. This situation may result from higher possibility of making mistakes in these activities and fear of negative evaluation of their peers or teachers, which could pose a threat their face.

The Comparison of the Turkish EFL Learners' L2WTC with regard to the Proficiency Levels Variable

One-way ANOVA tests were conducted in order to explore the impact of proficieny levels on EFL learners' L2WTC. Subjects were divided into four groups according to their proficiency levels (Elementary, Pre-Intermediate, Intermediate, Advanced). There was a statistically significant difference at the p< .05 level in WTC levels for the four proficiency levels: F (3, 710) = 14.69, p = .00.

Table 4. One-way ANOVA for learners' WTC in terms of their proficiency levels

		Sum of Squares	df	Mean Square	F	p
WTC levels in the classroom context	Between Groups	4412.136	3	1470.712	14.695	.000
	Within Groups	70759.611	707	100.084		
	Total	75171.747	710			

Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Elementary level group (M= 36.82, SD= 9.42) was significantly different from both Pre-intermediate (M=34.09, SD= 9.23) and Advanced level groups (M= 41.44, SD= 9.93). However, it did not differ significantly from Intermediate level group (M= 37.15, SD= 11.50). Similarly, the mean score for Pre-intermediate group (M=34.09, SD= 9.23) was significantly different from Elementary level (M= 36.82, SD= 9.42), Intermediate level (M= 37.15, SD= 11.50), and Advanced level groups (M= 41.44, SD= 9.93). Also, the mean score for Intermediate level group (M=37.15, SD= 11.50) was significantly different from Pre-intermediate level (M= 34.09, SD= 9.23) and Advanced level groups (M= 41.44, SD= 9.93). Lastly, the mean score for Advanced level (M= 41.44, SD= 9.93) significantly differed from other three proficiency level groups.

Table 5. Tukey HSD test on four proficiency levels

Level	Level	Mean Difference	Std. Error	p
Ele	Pre-int	2.727*	1.006	.035
	Int	-.335	1.031	.988
	Adv	-4.620*	1.066	.000
Pre-int	Ele	-2.727*	1.006	.035
	Int	-3.063*	1.078	.024
	Adv	-7.347*	1.112	.000
Int	Ele	.335	1.031	.988
	Pre-int	3.063*	1.078	.024
	Adv	-4.284*	1.134	.001
Adv	Ele	4.620*	1.066	.000
	Pre-int	7.347*	1.112	.000
	Int	4.284*	1.134	.001

The Comparison of the Turkish EFL Learners' L2WTC with regard to the Gender Variable

Independent samples t-tests were conducted in order to investigate possible significant difference between female and male Turkish EFL learners with regard to their willingness to communicate in English in the classroom context.

Table 6. t-test results for Turkish EFL students' WTC with regard to the gender variable

	Gender	N	Mean	SD	t	p
WTC levels in the classroom context	Female	429	38.03	10.07	2.77	.006
	Male	282	35.84	10.48		

Table 6 indicates that there is a significant difference between WTC levels of female and male Turkish EFL learners in a learning setting ($p<.05$). The results revealed that female EFL learners are more willing to communicate in English in a learning environment compared to male EFL learners.

Conclusion

Overall, the students in this study were found to be moderately willing to communicate in a classroom setting. Students' willingness to communicate for form-focused and meaning-focused activities was evaluated through different scale items. According to the results, it was found that students were more willing to communicate in controlled situations compared to more meaning-focused situations. For the meaning-focused activities, a great majority of them reported unwillingness to do a role-play in front of the class, whereas they were found to be more moderate for role-play activities at their desks. Compared to role-play activities, the mean scores of their willingness for giving a self-introduction or a short presentation about hometown were slightly higher. This finding supported the findings of Bektaş's (2005) and Şener's (2014) study which also showed that Turkish EFL learners had moderate level of willingness to communicate in English. All these studies which were conducted at different state universities in Turkey revelaed that Turkish EFL learners are willing to communicate in English to some extent, but none of them revealed a high level of willingness to communicate. From the perspective of L2 acquisition theories, learners should use the target language to learn it. However, the findings reveal that this is not the case in the Turkish EFL classroom context which could prevent successful L2 acquisition. So, it is necessary to investigate different factors which may affect learners' willingness to communicate. More studies on willingness to communicate and individual difference factors should be conducted to understand EFL learners' communication intentions which could help practitioners to foster their learners' WTC in English in their classroom.

With regard to the effect of gender on Turkish EFL learners' WTC, it was found that female EFL learners are more willing to communicate in English in the classroom compared to male EFL students, which conformed to other findings of some researchers in SLA area (MacIntyre, Baker, Clement & Donovan, 2002; Maftoon & Sarem, 2013). On the other hand, this result contradicted another group of researchers whose studies revelaed that there is no significant difference between female and male EFL learners' willingness to communicate (Afghari & Sadeghi, 2012; Baker & MacIntyre, 2000; Valadi, Rezaee & Baharvand, 2015). This result is important in terms of offering more insights towards the current literature because there are different findings related to the effect of gender on learners' WTC in English. Taking into consideration this result, language teachers should be careful about their male EFL learners' active participation into their lessons. Male learners should be encouraged to speak more during language classes through different methods such as group work, pair work in a positive learning environment.

In terms of the comparison of the Turkish EFL students' WTC in English with respect to their proficiency levels, significant differences were found among four proficiency levels. Learners who have higher language proficiency were found to have higher WTC level compared to learners who have lower language proficiency. The result of this study conformed to other finding found by Matsuoka and Evans (2005). In their study, language proficiency as well as some other motivational factors were found to be a strong indicator of learners' WTC in English. The finding of this study was also verified by Yashima et al. (2004) study which revealed that language proficiency and frequency of communication are directly related with the active participation in the community of practice. This finding indicates that self-confidence in communication is a strong indicator of one's willing to communicate in L2. Similarly, MacIntyre et al. (1998) supported the view that WTC may serve as a situated model where different factors such as language proficiency may have different effects on learners' WTC in English.

All in all, the findings of this study offered more insights towards the current literature about Turkish EFL learners' WTC in a learning setting and its interaction with some variables such as gender, language proficiency levels. In this study, cluster random sampling method was utilized and the population consisted of students at Hacettepe University in Ankara, Turkey. Considering this specific group of learners and learning context, any generalization from this study should be carefully done. The participants of the study were selected from only one university due to different constraints, so it may not be appropriate to generalize the findings of the study to all university level students in Turkey. Thus, more research is needed to broaden the current understanding of the EFL learners' WTC in English. Secondly, this study dealt with only WTC in speaking mode. Future studies should also investigate learners' WTC in other modes such as writing, reading, listening through different instruments which are designed for these purposes.

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Development, Validity and Reliability Study of Technological Pedagogical Content Knowledge (TPACK) Efficiency Scale for Mathematics Teacher Candidates

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Development, Validity and Reliability Study of Technological Pedagogical Content Knowledge (TPACK) Efficiency Scale for Mathematics Teacher Candidates

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Abstract

The aim of this study is to develop a valid and reliable measurement tool that can be used to determine the technological pedagogical content knowledge efficiency of mathematics teacher candidates. The study is conducted with 453 elementary and secondary school preservice mathematics teachers. SPSS and AMOS programs are used for statistical analysis. Since the conceptual framework of TPACK is obvious, the scale items are written around this existing frame in TPACK sub-dimensions, and for that reason only Confirmatory Factor Analysis (CFA) is performed on the predetermined factors. Total correlations of the items in the scale range from .33 to .86. The results of the t-test between the item average points of the upper 27% and lower 27% groups show that the differences were significant for all items and factors. The internal consistency Cronbach Alpha coefficient calculated for the overall scale was .98, and for sub-dimensions it was between .81 and .97. These results indicate that the reliability of the scale is high. As a result of the confirmatory factor analysis, the criterions for the reconstructed model adaptation are examined considering the modification proposal, and the model adaptation is found sufficient. As a result, the use of measurement tool consisting of seven sub-dimensions with 79 items in five Likert type is made ready. The obtained TPACK efficiency scale proves to be a valid and reliable measurement tool that can be used in determining the self-efficiency of teacher candidates.

Key words: TPACK Scale, Mathematics Teacher Candidates

Introduction

Today, what is expected from education is to raise individuals who have qualified workforce, who are conscious about the effective use of capital, who can enter into competition with global economy, and who are able to use technology effectively in every field. Education system's fulfilling these services depends largely on the quality of teacher who has an important role in the operation of system. The quality of the teacher is the main contributing because that will make education system successful or unsuccessful. For this reason, it is of utmost importance that the teachers are trained with the necessary competences before the service.

The efficiency expected from the teachers differs according to the expectations of each era. For instance, when we were an agricultural society, the most important efficiency expected from teachers who were trained at village institutes was to educate the villagers about agriculture and improve the villages where they carried out their duties. In today's knowledge society, it is one of the most important efficiency that the teacher has good knowledge of the field and pedagogy as well as being able to use the technology effectively in learning environments.

According to National Council of Teachers of Mathematics (NCTM), the expectation from a teacher is not only using technology and bringing hardware and software to the class, but also providing an environment which is facilitative and supportive in students' learning using technology effectively with appropriate teaching strategies and techniques without ignoring the learning styles and individual differences of the students. Hereunder, technology is not the solution to everything. Technology can only be an effective tool for education if it enhances learning opportunities, and actualises actualizes significant learning. Therefore, it becomes more and more important that which, when and how technology will be used by teachers.

A great amount of budget and effort is spent on the use of technology in the education process (TED, 2009). It has been determined that despite the investments made in order to provide technological infrastructure to the

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schools through a major project called FATİH project in our country, there is a problem about the integration of educational technologies into the teaching process (Ciftci, Taskaya & Alemdar, 2013).

Technology integration defines teaching-learning environments as effective and efficient use of technology in all aspects of the teaching-learning process, including teaching and learning (Yalin et al., 2007). In other words, it is knowing how to integrate technology into the course at each stage from planning to evaluation. It is the effective use of technology in overcoming difficulties related to the subject, in the usage of different teaching methods, in the establishment of relations between conceptual knowledge, and in the evaluation processes. In order for teacher candidates to achieve the desired success in their professional lives, first of all, they should accept the role of technology in education, and have the ability to use it (Erdemir et al. 2009). Since the teacher candidates will come across with student groups who have fascination with technology. Teachers should be equipped with the skills and knowledge to use technology in university years in order to use technology effectively in their professions. Mishra and Koehler (2006) show the lack of a model and theory for the integration of technology as a reason for the inconvenience. For this reason, they recommend Technological Pedagogical Content Knowledge (TPACK) in order to determine teachers' competences in this field and to provide a theoretical framework.

TPACK is a type of knowledge that has emerged from Mishra and Koehler's incorporation of technology knowledge in 2006 to the definition of pedagogical content knowledge brought into field by Shulman (1986). TPACK is a model that highlight the coexistence and interaction of three disciplines; technology, pedagogy and content (content knowledge), which make up the framework of this model. It is important that the teacher has technological knowledge of how to use the technological programs, or it is important that the teacher has knowledge of any topic in the field, however it is the only basic. If a teacher knows something, but cannot explain it with appropriate methods and techniques, or if he cannot present it to the students with appropriate presentation, it is not important how well the teacher knows the topic. Since interaction of content knowledge with other components, technology and pedagogy, must be considered. TPACK, an interaction of the technology, pedagogy and knowledge dimensions, is a concept beyond these three components and is a kind of knowledge that emerges from the interaction of these three.

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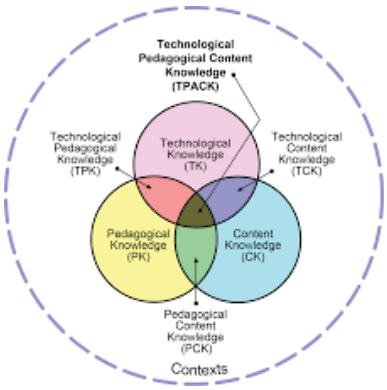

Figure 1: TPACK model

As it is seen in figure, TPACK model consists of three knowledge types: (i) Technology Knowledge (TK), (ii) Pedagogical Knowledge (PK), (iii) Content Knowledge (CK). The three sub-types of knowledge composed with the interaction of these three types of knowledge are (iv) Technological Pedagogical Knowledge (TPK), (v) Technological Content Knowledge (TCK) (vi) Technological Pedagogical Knowledge (TPK), and at the junction point of the three types of knowledge, Technological Pedagogical Content Knowledge (TPACK) takes place. As it is seen TPACK consists of seven sub-dimensions.

Technology Knowledge: It is a knowledge that consists of information and usage of book, chalk, blackboard also modern technologies such as internet, smart board, tablet, e-mail. In sum, technology knowledge is the information and skills that teachers should have in using technology.

Content Knowledge: It refers to the subjects in the field and the related knowledge (Mishra-Koehler, 2006). Content knowledge is an information about learning and teaching the subject. Knowledge is the thing given in

courses There are different subjects, and basic principles, hypothesis, theories, proofs and algorithms based on these subjects.

Pedagogical Knowledge: It includes knowledge such as teaching methods, strategies and techniques used in the classroom, how the learning takes place, classroom management, and evaluation of the students. The teacher with this knowledge knows how to learn the student and how to measure and evaluate the learning outcome and knows effective classroom communication techniques.

Pedagogical Content Knowledge: It is a type of knowledge that includes effective teaching methods and techniques that can be used in teaching any topic and appropriate assessment-evaluation approaches. What is important here is to integrate pedagogy with the field. It is not knowing the subject or teaching method but it is being able to blend and integrate these two appropriately. In addition, pedagogical content knowledge includes knowledge about the learning disabilities and difficulties, and the use of pedagogical methods to overcome these disabilities and difficulties.

Technological Content Knowledge: It is the knowledge of selecting and using the most appropriate technology for the subject area, in a word, content. It can also be defined as the ability to know and evaluate which technology is the most appropriate technology for any subject. Considering that there are many applications today, it is not important to have knowledge about a large number of technologies, but it is important to choose the most appropriate and economical ones among these technologies.

Technological Pedagogical Knowledge: It covers what the technologies used in teaching are and what pedagogical knowledge is needed when using these technologies. Not every technology matches every learning method. According to the technology used, assessment-evaluation methods and classroom management can change and technology and pedagogy influence each other.

Technological Pedagogical Content Knowledge: It covers what kind of technologies used in teaching and what pedagogical knowledge is needed when using these technologies. Not every technology matches every learning method. According to the technology used, assessment-evaluation methods and classroom management can differ, and technology and pedagogy influence each other.

TPACK, which is the basis of teaching and learning process, requires having knowledge of what facilitates and challenges students in learning the concepts, how technology helps solving problems that students face, how technology structures and strengths the foreknowledge of students (Canbazoglu Bilici et al., 2013). The training of mathematics teacher candidates during the undergraduate education and the determination of the TPACK competencies and the changes in these efficiency are an influential factor in the use of technology in the educational environment. For this reason, it is necessary to carry out researches on how teachers and teacher candidates can improve their competencies in the integration of technology.

Many scale development and adaptation studies have been carried out in order to determine the efficiency and attitudes of teacher candidates and teachers about technology integration. Various TPACK scales are used in 22 of 30 study subjects reviewed in the field literature. Six of these scales are developed in Turkey. The scale developed by Schmidt et al. (2009) is the most adapted one. (Canbazoglu Bilici, 2013)

Dikkartin, Ovez and Akyuz (2013) has adapted the Technological Pedagogical Content Knowledge (TPACK) scale developed by Schmidt et al. (2009) into Turkish. The scale obtained after the linguistic equivalence test has been applied to 473 undergraduate elementary mathematics teaching students. Explanatory and confirmatory factor analysis has been carried out to examine the structure validity and factor structure. In addition, a model of structural equality has been developed in order to examine the relationship between the dimensions of the scale. Reliability and significance of differences between the upper and lower 27% groups have been examined by the Cronbach Alpha coefficient. Findings have revealed that the scale had a four-factor structure, and that the compliance indexes have been within the acceptance limit, also the reliability of Cronbach's alpha have been 0.91 and the reliability of all subscales have been found 0.70 and have been found that all differences between the item averages of the upper and lower 27% groups are significant.

The first scale developed for TPACK was conducted by Koehler and Mishra in 2005. The 13-item scale was developed for teacher candidates, and had a total of 33 items. It aimed to evaluate the TPACK development, online course designs and learning environment of teacher candidates.

The other scale developed by Schmidt et al. in 2009 to measure the development and implementation of TPACKs of 124 classroom teacher candidates during courses is "Teaching and Technology Knowledge Survey of Teacher Candidates". Seven sub-dimensions of EFA and TPACK models were obtained, and Cronbach's alpha coefficient for each dimension was calculated. According to this, Cronbach alpha reliability coefficient of seven factors, CK, PK, PACK, TK, TCK, TPK and TPACK, was between .79 and .93. Exploratory factor analysis (EFA) was used for construct validity. In the first EFA result applied to the scale consisting of the first 75 items, a second EFA was created by subtracting some items (28 items) that adversely affected the validity from the scale and a final 5-Likert scale consisting of 47 items was created.

The TPACK scale developed by Archambault and Crippen (2009), another study in the literature, was applied to 596 teachers, and it had 24 scale items. It was aimed to determine the perceptions of teachers about the 7 subscale dimensions related to TPACK using the scale which was investigated for validity and reliability. Pedagogical knowledge, pedagogical content knowledge and content knowledge points were the highest, teachers were very confident in this field, but they were less confident when these fields were combined with technology. There was a low relationship between technology and pedagogy, technology and the field, and a high correlation between pedagogy and the field (Timur, 2011).

It is aimed to measure the self-confidence of teachers in four subscales, TK, TCK, TPK and TPACK, in the TPACK scale developed for science teachers by Graham et al. (2009). There were 31 items in the scale applied to 15 teachers and the Cronbach alpha reliability coefficient was 0.90. At the beginning of the research, teachers' self-confidence towards TK was found to be highest. At the end of the research, it was found that the increase of self-confidence levels of teachers in TCK was higher than other information.

Chai, Koh and Tsai (2010) investigated the profiles of 1185 teacher candidates for TPACK in Singapore using the scale developed by Schmidt et al. (2009). It was determined that the TK, PK, CK and TPACK development of teacher candidates developed a large effect size in the last test when compared to preliminary test. Although they found some differences in TPACK perceptions according to gender, they did not find any difference in terms of teaching level.

When the national field was considered, various data collection tools and TPACK questionnaires were developed towards both teachers and teacher candidates. When the studies were examined, it was seen that some studies were on developing original scales while some were adaptation of developed scales into Turkish and their usage.

Another study is by Kaya, Emre and Kaya (2010) who adapted the scale developed by Schmidt et al. (2009) into Turkish adding "I don't understand" option. The scale aimed to determine whether TPACK self-confidence levels of the classroom teachers had a significant difference in terms of their gender and class levels. In the scale in which t-test and one-way ANOVA analysis was used, it was determined that TPACK self-confidence levels did not have a significant difference in terms of gender, however it showed a significant difference in terms of teacher candidates' class levels at five dimensions of TPACK (TK, PK, CK, PACK, TCK). It was concluded that it could be used in Turkey. Savas (2011) who adapted the Teacher Candidates' Perception of TPACK Scale which was developed by Makinster, Boone and Trautman (2010) investigated the TPACK perceptions of science teacher candidates.

Sahin (2011) developed a 47-item questionnaire to measure TPACK perceptions of teacher candidates. The Cronbach Alpha coefficient for the subscales of the developed scale varied between 0.88 and 0.93, and high correlations were obtained especially in the sub-dimensions of technology, pedagogy and content knowledge.

As a result of factor and reliability analysis of his study conducted to investigate the attitudes of Turkish primary school mathematics teacher candidates towards computer and technology, Dogan (2010) found that the reliability coefficient was .94. The study group of scale consisted of 361 teacher candidates studying at elementary mathematics teaching at two different universities. 16 of the Likert type 39 questions were related to pedagogy, 13 of them were related to technology and 10 of them were related to content knowledge of TPACK. As a result of the research, it was determined that teacher candidates were generally positive about using computer and were able to use computers adequately. It was also determined that they were positive about computer and information technologies. Perception and attitudes were independent of gender.

Oksuz, Ak and Uca (2009) developed a measurement tool that could be used in determining the perceptions of teacher candidates / teachers about the use of technology in teaching primary mathematics. As a result of the item analysis of the scale applied to 348 people, a scale consisting of 73 items was obtained with a positive

point of 63 and a negative point of 10 items. The internal coefficient of consistence (Cronbach Alpha) of the scale was calculated as .96. The internal coefficient of consistence calculated for the sub-dimensions were .95, .96, .84 respectively. According to the results of the research, this scale which was called Perception Scale of Technology Use in Elementary School Mathematics Teaching (TUPS) was a valid and reliable tool that could be used in the field of education.

Although TPACK studies, during the recent years in Turkey, have become a fastest growing research field, the number of scales specific to the field of mathematics is little if any. Some of the field-specific scale development studies are either adaptations (Dikkartin-Ovez and Akyuz; 2013, Mandaci-Sahin et al., 2011) or can be used for all branches (Sahin, 2011, Sancar- Tokmak et al., 2012). In some scales developed specifically for the field, a discrimination of elementary and secondary school mathematics teacher candidates / teachers is seen (Oksuz et al., 2009). Moreover, many of the available scales in literature do not provide answers to the problems that are sought in this research. Thereby, it is aimed to develop a scale that will respectively have the ability to respond to sub problems of the research, include the appropriate assessment and evaluation approaches to program together with the skills indicated in the updated curriculum in 2013, measure the competence related to integration of DGY used in mathematics and BITs such as manipulative and interactive sites to education, be up-to-date and be used by both secondary school and high school teachers/teacher candidates.,

Method

Participants

In order to develop to TPACK scale which is used as data collection tool in the study, elementary and secondary school mathematics teaching students studying at state universities in Turkey, and the students of Mathematics Department at Faculty of Science training for pedagogical formation are included into the study. This study is conducted with 453 students, 327 females and 126 males, who are elementary and secondary school mathematics teaching teacher candidates studying at 4 different geographical regions, Central Anatolia, Aegean, Mediterranean and Southeastern Anatolia regions (Necmettin Erbakan University Pamukkale University Department of Elementary Mathematics Teaching, Akdeniz University, Gaziantep University) during 2014-2015 academic year.

Data collection

The data of this scale, prepared to determine the efficiency of technological pedagogical content knowledge of mathematics teacher candidates, has been collected by taking the following steps. These are i) Literature review and item pooling ii) Expert opinion iii) Item-total correlations iv) Confirmatory factor analysis v) Cronbach Alpha internal consistency reliability, vii) Examining the correlation between sub dimensions

While forming the items of this scale prepared to determine the sufficiency of technological pedagogical content knowledge of mathematics teacher candidates, local and foreign literature have reviewed, and the scales based on TPACK developed by Sahin (2011), Graham et al. (2009), Schmidt et al. (2009), Ropp (1999) have been used. In addition, a pool of items consisting of 93 items have been created by taking the curriculums of the secondary school and high school mathematics education, and the proposals of the qualifying program which can be the related scale item into consideration. After the revisions, the scale item numbers have been reduced to 84. Below is the question distribution of the TPACK scale item pool according to the dimensions and the items representing that dimension.

Table 1: The distribution of TPACK scale item pool according to dimensions

Sub-Dimension	Number of Items	Items that Represent Sub-dimension
Technology Knowledge	16	I1: I know how to solve a technical problem in my computer. I2: I can keep up with the latest technology. I5: I have technical knowledge related to the technology I will use. I10: I know how to use my smartphone I13: I can use cloud storage technology (like Google Drive, Dropbox) I15: I can download videos via video sharing sites (like YouTube, Vimeo, Daily Motion).

Sub-Dimension	Number of Items	Items that Represent Sub-dimension
Content Knowledge	7	I17: I have enough knowledge about algebra learning area. I20: I have enough information about the numbers and operations learning area. I21: I follow symposiums, panels and conferences related to mathematics. I22: I follow curriculum changes related to mathematics. I23: I know the historical development of mathematics.*
Pedagogy Knowledge	8	I25: I can prepare different activities according to the learning styles of the students. I29: I can choose class management strategies according to the method, technique and material used in the class. I30: I can apply different learning approaches (project-based learning, multiple intelligence, problem-based learning) in the classroom. I31: I know the necessary precautions against negative situations that can be faced in the class.
Pedagogical Knowledge	19	I32: I can choose appropriate teaching strategies for sub- learning fields (e.g. Algebra, geometry, numbers). I38: During the mathematics learning process, I can provide a democratic classroom environment to enhance my students' critical thinking skills. I41: During the mathematics learning process, I can organize activities to improve my students' problem-solving skills / strategies. I42: I can create learning environments that allow different mathematical concepts to be related within each other. I44: I can identify students' learning difficulties and conceptual misconceptions about a particular mathematics subject. I46: I can choose an appropriate assessment tool for a subject related to a math class.
Technological Content Knowledge	19	I52: I have enough knowledge to use math lesson related technologies in the classroom. I54: I consider the possibilities that the technology I use will have for the teaching of the subject concerned. I56: I can use Dynamic Mathematics / Geometry Software (such as Geogebra, Sketchpad, Desmos and Cabri II) effectively. I58: I can use calculators effectively and competently. I59: I can use Computer Algebra Systems (such as Derive, Mathematica and Maple) effectively. * I61: I can use internet effectively to access programs such as math video, application, MEB Vitamin.
Technological Pedagogical Knowledge	11	I62: I can use technologies that are appropriate for individual differences. I64: Depending on the level of the student group, I can determine at what stage of the class I will use the technology. I67: I can use the technological tool I used for teaching also for the assessment and evaluation process I70: I can use technology to give students the skills beyond cognition (such as analysis, synthesis, evaluation)
Technological	13	I75: I follow the applications and latest developments in mathematics. I77: I can organize different learning activities for different

Sub-Dimension	Number of Items	Items that Represent Sub-dimension
Pedagogical		technologies to be used in mathematics education.
Content Knowledge		I79: With dynamic geometry software, I can show multiple representations of geometric concepts.
		I81: I can arrange electronic worksheets that improve mathematical reasoning skills.
		I82: I can identify misconceptions in any learning field using Computer Algebra Systems and appropriate Dynamic Geometry and Mathematical Software

* Represents the omitted items in the scale.

In order to ensure the content validity of the data, the opinions of 3 experts who have dealt with scale development previously and a Turkish language expert to evaluate the related items in terms of language and narration are considered. After making the necessary editing in the scale in the direction of experts' views, the test form consisting remaining 84 items have been applied to 513 teacher candidates. However, after taking out the 58 scale forms which are incomplete and filled out randomly, 453 scale forms are used for analysis. Prior to the application, a guideline has been prepared for the teacher candidates who would respond to scale items, and the application is conducted face-to-face and verbal explanations are made when necessary.

In the arranged scale, the data is prepared in 5-point Likert scale type and the options are organized and pointed as "1-Strongly Agree", "2-Slightly Agree", "3-Neither Agree nor Disagree", "4-Slightly Disagree", "5-Strongly Disagree" respectively. There has been no item with negative expression.

There are seven dimensions, Technological Knowledge (1.-16. items), Content Knowledge (CK) (17.-23. items), Pedagogical Knowledge (PK) (24.-31. items), Pedagogical Content Knowledge (PACK) (32.-50. items), Technologic Content Knowledge (TCK) (51.-61. items), Technological Pedagogical Knowledge (TPK) (62.-71. items), Technological Pedagogical Content Knowledge (TPACK) (72.-84. items).

Analysis of Data

The data set obtained after the survey have been analyzed using SPSS 20 (Statistical Package for Social Sciences) and Amos 20.0 package programs. Descriptive statistics, Cronbach's Alpha reliability analysis, Confirmatory Factor Analysis (CFA) and correlation analysis techniques have been used in the data set analysis. Factor analysis can be used to indicate the theoretical structures underlying the particular data set and the extent to which these structures reflect real values (Henson and Roberts, 2006, as cited by: Bulbul, 2012, p.162). In order to test how many of the scales developed in the scale development studies gathered around which factors, firstly the Exploratory Analysis Factor (EFA) was constructed and then the Confirmatory Factor Analysis (CFA) have been used to test this structure.

CFA is an analysis to assess how well the various established variables are supported by a theoretical basis (Sumer, 2000). In other words, the CFA is based on testing the predictions that certain variables will predominantly be on predetermined factors based on a theory (Secer, 2015). CFA is used to test the presence of these theoretical constructs. The variables in CFA are selected in a predetermined pattern and the ratio of these variables in the determined factors are examined (Cakir, 2011). The TPACK model is the basis for this research. In other words, since the conceptual framework of TPACK already exists in the literature, the scale items are written around this existing frame in TPACK sub-dimensions. The sub dimensions of TPACK theory are identified as 7 sub-factors, TK, CK, PK, TCK, TPK and TPACK. For this reason, only Confirmatory Factor Analysis (CFA) has been performed on these predetermined factors in this study.

Findings

The Kaiser-Meyer-Olkin sampling adequacy criterion and the Bartlett test have been applied to determine the suitability of the data set for factor analysis and sample adequacy. For the factor analysis of sampling consisting 455 people in terms of size, first of all the suitability of the data set is examined and it was found that Kaiser Meyer Olkin (KMO) value is 0,96 and Barlett value is 27858.88. As the KMO value is higher than .70 and Barlett test value is significant ($p < .05$), the data set is evaluated as appropriate for factor analysis.

Table 2: KMO values table

Kaiser-Meyer-Olkin	**0,962**
Bartlett X2	27858,88
P	0,000

The confirmatory factor analysis results of TPACK scale

When the literature is reviewed, it is seen that there is a large number of fit index that are used to determine the adequacy of model tested in Confirmatory Factor Analysis (CFA). These are χ2/df, RMSEA, SRMR, GFI, NFI, NNFI, AGFI indexes (Karademir, 2013). There is no consensus about which fit index will be accepted as standard (Tanguma, 2001; Munro, 2005; Simsek, 2007). In this study, Chi-Square Fit Test (χ2), Degrees of Freedom (df), χ2 / df, Standardized Root-Mean-Square Error (SRMR) exact fit indexes The Root-Mean-Square Error (RMSEA) are calculated and reported.

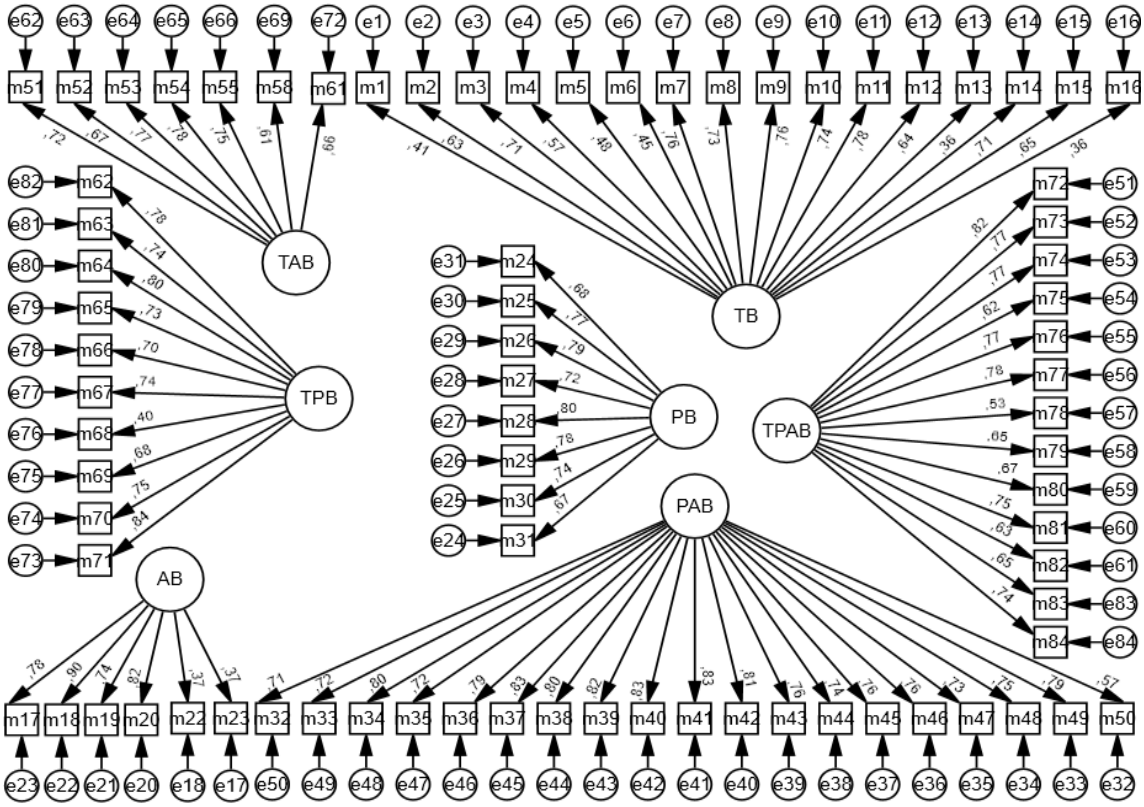

Figure 2: First CFA results of TPACK self-efficacy scale

The seven-factor structure of the scale, developed on the basis of the TPACK model, is tested with CFA. It is seen that the factor load of five items (m21, m23, m56, m57, m59) are below .30 in the CFA result and these items are removed from the data set. Then the CFA is performed again.

The fit value (χ2 / Sd = 3.25, RMSEA = .07, SRMR = .10) obtained with CFA indicates that the seven-factor model has been in accord with obtained data at acceptable levels (Browne & Cudeck, 1993; Carmines & McIver, 1981; Hooper, Caughlan and Mullen (2008). Less than 5 can be accepted for χ2 / df value, and if tχ2 / df value that it is less than 3 which, it means that the model has a perfect fit value (Kline, 2005, Tabachnick and Fidell, 2007). In addition, if the RMSEA value is less than 0,08, it means value has a good fit (Hoe, 2008), if SRMR value is a value between .05-.10, it means value is acceptable.

In order to obtain better fit values, the modification index values are examined and the correlations between the error values of the items under the same factor are released (Figure 3.2). Modification indexes show a decrease in the resulting Chi-square value shows that when a constant or a new parameter is added Chi square value decreases (Sumer, 2000). When the items are examined, semantic closeness is observed and it is reanalyzed after adding these modifications to the model. The fit values ($\chi 2$ / Sd = 2.21, RMSEA = .05, SRMR = .08) obtained after making the necessary modifications indicate that the collected data fit well with the seven-factor model (Browne and Cudeck, 1993; Carmines and McIver, 1981).

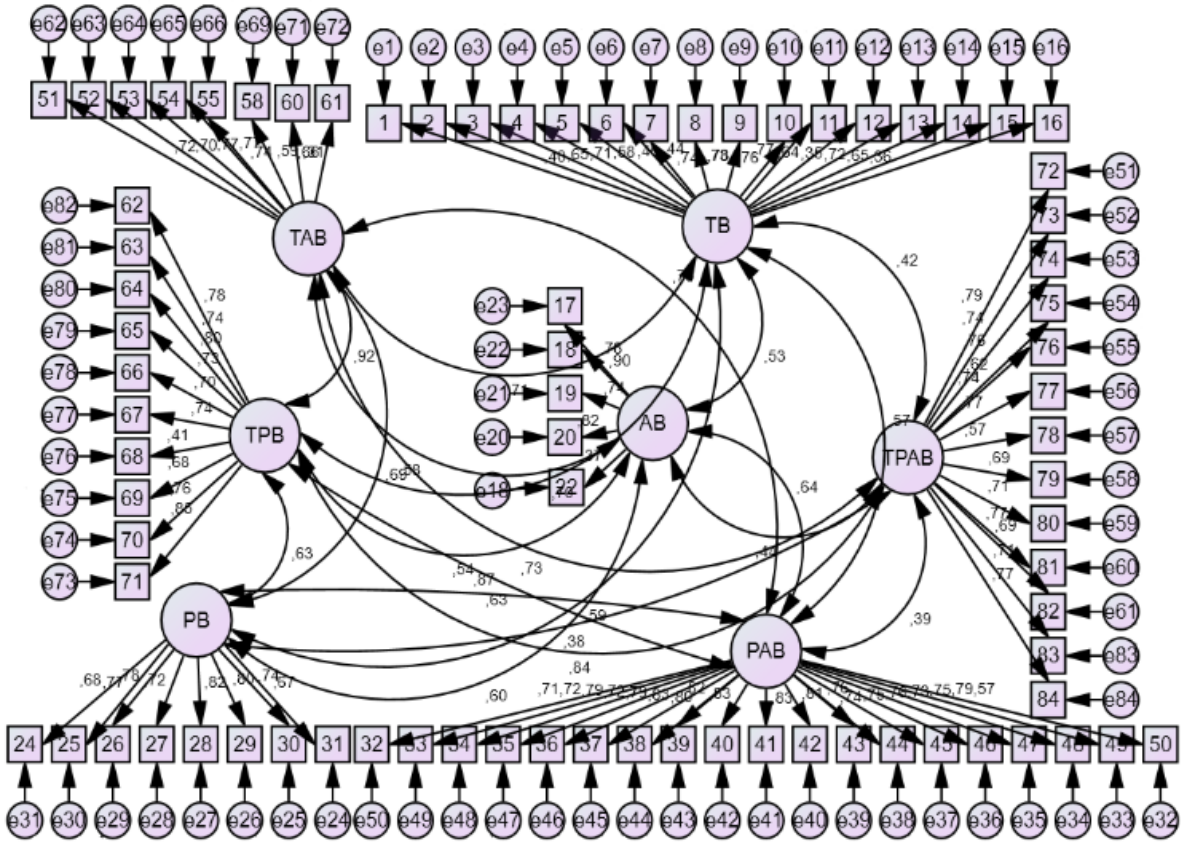

Figure 3: Second CFA Results of TPACK self-efficacy results

As a result of CFA, the factor loads of the items in the dimensions of CK, PCK, PK, TCK, TK, TPACK and TPK are .37-.90, .57-.83, .67-.80, .61-.78, .36 -.78, .53-.82 and .40-.84, respectively (Figure 3). Each factor load is found significant at .001 level.

The Relations between dimensions of TPACK scale

It is aimed to obtain information about the internal consistency of the scale by calculating the relations between the dimensions of the TPACK competency scale. For this, the relationships between the scale dimensions CK, PCK, PK, TCK, TK, TPACK and TPK are analyzed using Pearson correlation technique. The findings are shown in Table 3.

Table 3: The mean, standard deviation values points obtained from the TPACK scale dimensions and the relation between the scale dimensions

Dimensions	**X**	**Ss**	**PCK**	**TCK**	**TPACK**	**PK**	**TK**	**TPK**
PCK	38,98	13,81						

Dimensions	**X**	**Ss**	**PCK**	**TCK**	**TPACK**	**PK**	**TK**	**TPK**
TCK	19,32	5,93	0,65*					
TPACK	37,29	10,73	0,33*	0,66*				
PK	17,57	5,90	0,81*	0,58*	0,32*			
TK	37,55	11,78	0,43*	0,63*	0,44*	0,47*		
TPK	24,86	8,03	0,58*	0,82*	0,76*	0,58*	0,63*	
CK	12,45	4,13	0,59*	0,52*	0,41*	0,56*	0,47*	0,49*

Table 3 shows the mean, standard deviation values points obtained from the TPACK scale dimensions and the correlation between the scale dimensions. If the correlation coefficient is between .70-1.00 absolute value, it is a high; if it is between .30-.70, it is a medium; if it is between .00-.30, it is a low relation (Buyukozturk, 2007: 32). The correlation values are found between .32-.82. When the correlation values are examined, it is seen that scale dimensions show high and medium level positive relations with each other. When Table 3 is examined, between TPACK and PCK, a high-level relation and between TCK and TK, a medium level relation is seen. The mean points obtained from 94 scale dimensions are 12.45 (Ss=4.13), 38.98 (Ss=13.81), 17.57 (Ss=5.9), 19.32 (Ss=5.93), 37.55 (Ss=10.73), 37.29 (Ss=10.73) and 24.86 (Ss=8.03) respectively for CK, PCK, PK, TCK, TK, TPACK and TPK dimensions.

Result of TPACK scale Cronbach Alpha Internal Consistency Reliability Analysis

It is seen that the calculated internal consistency coefficient for the overall scale is .98. As seen in Table 4, the coefficients of internal consistency calculated for CK, PCK, PK, TCK, TK, TPACK and TPK dimensions are .83, .97, .91, .85, .91, .94 and .91 respectively. These findings show that TPACK scale is a reliable data collection tool in different samples.

Table 4. Cronbach alpha coefficients calculated for TPACK scale dimensions

Dimensions	Cronbach Alfa
PCK	.97 (19 items)
TPACK	.94 (13 items)
PK	.91 (8 items)
TK	.91 (16 items)
TPK	.91 (10 items)
TCK	.85 (8 items)
CK	.83 (5 items)
Overall Scale	.98 (79 items)

Examination of discriminant validity of TPACK scale

Another way applied within the context of item analysis is to test the item mean points difference between the lower 27% and upper 27% groups using unrelated t-test. If the difference between the groups is significant in the desired direction, it is seen as the sign of consistency of test in terms of internal consistency (Buyukozturk, 2007:172). Item total correlation refers to the relationship between the point obtained from the test items and the point obtained from the overall test.

The discriminant validity study of the scale is conducted with data from 453 participants. In the first step of the discriminant validity study, participants are divided into two groups with 27% upper and lower according to the overall point of the scale. Then, the average point of these two groups are compared with the independent sample t test. When the results obtained are examined, it is seen that the average of points got from each item in CK, PCK, PK, TCK, TK, TPACK and TPK dimensions are significantly higher when compared to the points of participants in 27% group (Table 5)

When Table 5 is examined, it is seen that item-total correlations for all the items in the scale change between .33 and .86, and the t-values are significant (p <.001). In general, item total correlations of 0.30 and above indicate that items distinguish individuals well (Buyukozturk, 2010). From these results it can be said that the items in the measure are high in reliability and the items in each dimension of the scale are successful in distinguishing, in a word discriminating, the 27% upper and lower group. In other words, each item on the scale is sufficient to distinguish the people who it measures in terms of the dimensions (the features they measure).

Table 5: Total correlations of corrected items of TPACK scale and material and results of t test results of upper 27%, lower 27% points *
Correlated total item correction (CTIC)** p <.01

Factor	**Item**	**t**	**CTIC***
TK	m1	6.92**	0.5
	m2	10.28**	0.69
	m3	10.43**	0.72
	m4	9.85**	0.63
	m5	8.68**	0.58
	m6	7.63**	0.54
	m7	11.10**	0.67
	m8	10.08**	0.64
	m9	8.55**	0.64
	m10	9.52**	0.62
	m11	11.75**	0.68
	m12	9.96**	0.68
	m13	8.43**	0.47
	m14	9.25**	0.57
	m15	9.25**	0.58
	m16	7.81**	0.42
CK	m17	10.80**	0.72
	m18	11.65**	0.78
	m19	10.52**	0.66
	m20	10.36**	0.72
	m22	8.46**	0.34
PK	m24	9.71**	0.69
	m25	10.34**	0.82
	m26	11.08**	0.82
	m27	9.95**	0.75
	m28	11.28**	0.78
	m29	12.23**	0.79
	m30	12.52**	0.75
	m31	10.89**	0.67
PCK	m32	12.19**	0.73
	m33	12.21**	0.76
	m34	10.90**	0.82
	m35	10.75**	0.76
	m36	10.16**	0.82
	m37	11.23**	0.85
	m38	11.26**	0.83
	m39	11.84**	0.85
	m40	12.25**	0.85

Factor	**Item**	**T**	**CTIC***
PCK	m43	10.28**	0.77
	m44	10.64**	0.78
	m45	12.08**	0.80
	m46	13.62**	0.80
	m47	13.67**	0.80
	m48	11.01**	0.80
	m49	10.79**	0.82
	m50	10.80**	0.63
	m51	14.45**	0.73
TCK	m52	15.42**	0.76
	m53	16.17**	0.79
	m54	12.78**	0.78
	m55	11.90**	0.74
	m58	10.55**	0.57
	m60	10.28**	0.33
	m61	13.17**	0.64
	m62	16.79**	0.80
TPK	m63	18.32**	0.79
	m64	15.95**	0.79
	m65	12.52**	0.71
	m66	13.30**	0.74
	m67	13.81**	0.77
	m68	10.42**	0.44
	m69	16.40**	0.75
	m70	16.96**	0.79
	m71	18.71**	0.86
	m72	19.45**	0.76
TPACK	m73	16.41**	0.69
	m74	16.03**	0.78
	m75	12.38**	0.67
	m76	15.99**	0.77
	m77	15.08**	0.76
	m78	8.60**	0.64
	m79	11.73**	0.75
	m80	11.41**	0.77
	m81	14.25**	0.79
	m82	9.55**	0.73
	m83	9.93**	0.75

Factor	**Item**	**t**	**CTIC***
	m41	11.64**	0.84
	m42	11.99**	0.84

Factor	**Item**	**T**	**CTIC***
	m84	12.59**	0.78

Conclusion

The scale which is developed to measure the efficiency of mathematics teacher candidates is conducted with 453 teacher candidates studying at elementary and secondary school mathematics teaching departments of 4 different universities. Only Confirmatory Factor Analysis (CFA) is performed on the 7 accepted sub-factors (dimensions) of the TPACK theory. The final scale consists of 79 items, CK (5 items), TK (16 items), PK (8 items), PCK (20 items), TCK (8 items), TPK (10 items) and TPACK (12 items).

The calculated Cronbach Alpha coefficient for the general scale is .98 while this value changes between .81 and .97 in sub-dimensions. As a result, this shows that the reliability of the scale is high. In parallel with the results of the study, the Cronbach Alpha coefficient of the 27-item TPACK scale, which was adapted to Turkish by Dikkartin and Ovez (2013) after being applied to 473 preservice mathematics teacher, was found .91. Similarly, it was seen that the Cronbach Alpha coefficients of subscales of TPACK scale were ranging between .82 and .86 values.

When the results of the research are examined, a high correlation is found between PK and PCK and between TPK and TCK. TPACK has a high-level relation with TPK, and TCK has a medium level relation with TK. The scale developed by Timur (2011) indicated that low level correlation with TK and, PK with TK and CK but PK and CK were high level correlation.

This scale, which is developed to measure the TPACK efficiency of preservice mathematics teachers and consist of 79 items in the 5-point Likert type, is a reliable and valid measuring tool that can be used by both researchers and educators. It is also at the level that can be used to determine the efficiency of teacher candidates and teachers in the educational environments that will be designed within TPACK framework.

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