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TOWARDS A MORE HOLISTIC TECHNOLOGY INTEGRATION FRAMEWORK: INSTRUCTIONAL TECHNOLOGICAL COMPETENCE

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Tez yazma sürecinde bilimsel ve etik ilkelere uyduğumu, yararlandığım tüm kaynakları kaynak gösterme ilkelerine uygun olarak kaynakçada belirttiğimi ve bu bölümler dışındaki tüm ifadelerin şahsıma ait olduğunu beyan ederim.

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To my mother, Huriye

Thanks for standing by me

All the time…

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BÜTÜNCÜL BİR TEKNOLOJİ ENTEGRASYONU ÇERÇEVESİNE DOĞRU: ÖĞRETİM TEKNOLOJİLERİ YETERLİLİĞİ

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ÖZ

Bu çok aşamalı karma yöntem çalışması iki aşamadan oluşmuştur. Birinci aşama öğretmen adaylarının teknoloji ile ilgili önceki öğrenme yaşantıları, ihtiyaçları, bilgi, beceri ve inançlarına odaklanarak teknolojinin öğretmen adayları için dil öğretiminde ne anlama geldiğini bulmayı amaçlamıştır. İkinci aşama ise elde edilen bulgular ışığında teknoloji entegrasyonu önündeki engellerin kaldırılmasında sunulan görüşlerin ne derece etkili olacağı konusu üzerine gerçekleşmiştir. Araştırma sorularına cevap bulabilmek için anketler, görüşmeler, metaforlar, günlükler ve gözlem formları kullanılmıştır. Birinci aşamada kullanılan gömülü teori metodu sonucunda elde edilen bulgular öğretmen adaylarının teknolojik farkındalıklarının, bilgilerinin, becerilerinin ve teknolojinin içsel değeri hakkındaki inançlarının yetersiz olması nedeni ile öğretmen adaylarının teknolojiyi dil sınıflarının bir parçası olarak görmediklerini göstermiştir. Elde edilen sonuçlar ve gerçekleştirilen detaylı alanyazın araştırmaları problem durumunun çözümüne yönelik üç yeni kavramın önerilmesini gerektirmiştir. Birinci kavram teknoloji ile doğrudan ilişkili iki çeşit inanç olduğunu öneren iki boyutlu teknolojinin algılanan değeri kavramıdır. İkinci kavram öğretim teknolojileri yeterliliği olup; teknolojik farkındalık, bilgi, beceri ve inançları içinde barındıran daha bütüncül bir teknoloji entegrasyonu çerçevesi olarak sunulmuştur. Üçüncü kavram ise S-TECHNO öğretim modeli olup öğretmen adaylarının öğretim teknolojileri yeterliliğini geliştirmeye yöneliktir. İkinci aşama S-TECHNO öğretim modelinin öğretmen adaylarının öğretim teknolojileri yeterliliği üzerinde herhangi bir etkisinin olup olmayacağı üzerine odaklanmıştır. T-test sonuçları, gözlemler ve içerik analizinden elde edilen bulgular S-TECHNO öğretim modelinin öğretmen adaylarının öğretim teknolojileri yeterliliğini geliştirme konusunda etkili olduğunu göstermiştir. Elde edilen sonuçlar, öğretmen adaylarının teknolojiyi sınıflarına entegre etmeleri hususunda

aydınlatıcı görüşler içerdiği için, bu çalışmanın bulgularının eğitim fakültelerinin teknoloji dersleri tasarımında göz önünde bulundurulmasının faydalı olacağı düşünülmektedir.

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ABSTRACT

The purpose of this mixed methods multiphase study was two-fold. First, it sought to describe the trends in student teachers' thinking in relation to instructional technologies. Second, it aimed to examine whether the insights gained from the first stage could contribute to overcome barriers in the path of technology integration. Surveys, interviews, metaphor construction studies, journals and observations were used to find answers to the research questions. Findings obtained from the method of grounded theory employed in the first stage suggested that student teachers did not feel adequately prepared to integrate technology into their classrooms because of their lack of technological awareness, knowledge, skills and beliefs about the inherent value technology has in essence. Based on the findings and ensuing review of literature, this study has resulted in three new constructs. The first construct was the bidimensional construct of perceived value beliefs about technology. The second construct was the development of a new technology integration framework called Instructional Technological Competence (ITC). The third construct was the development of an instructional model called S-TECHNO. Subsequently, the second phase of the study was initiated to investigate the effects of S-TECHNO model on student teachers' ITC. T-test results and findings obtained from content analysis employed in the second phase indicated that the S-TECHNO model was effective in increasing student teachers' ITC. These results have strong implications for teacher education programs since they can provide insights that can increase the likelihood of technology integration by student teachers in their future classrooms.

Key Words : Second Language Teacher Education, Technology integration, Course Design

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Supervisor : Assoc. Prof. Dr. Kemal Sinan ÖZMEN

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LISTS OF SYMBOLS AND ABBREVIATIONS

ELT	English Language Teaching
SLTE	Second Language Teacher Education
L2	Second Language
CHE	Council of Higher Education
MoNE	Ministry of National Education
ISTE	International Society for Technology in Education
ZPD	Zone of Proximal Development
CALL	Computer-Assisted Language Learning
TPACK	Technological Pedagogical Content Knowledge
ITC	Instructional Technological Competence

CHAPTER 1

INTRODUCTION

The shift from behaviorist perspective in the 1960s and 1970s, to a cognitivist perspective in the 1980s and finally to a sociocultural view in the 1990s led to changes in the conceptualization of language teacher education. In addition to what of teaching; who, where and how of teaching has become a matter of interest in the field. More precisely, the widening scope of the knowledge base of L2 teacher education has implied that the field should not only be concerned about the subject matter to be taught but it should also give centrality to student teachers' prior learning experiences, their beliefs, the context and pedagogical practices in L2 teacher education programs (Freeman & Johnson, 1998). Thus, we have come to an understanding that teachers are not passive recipients of transmitted knowledge and skills rather they are active producers of that knowledge in their own learning-to-teach process (Crandall, 2000; Richards & Nunan, 1990). Moreover, we have also recognized that beliefs act as a determinant in what teachers receive and how they put it into practice.

Changing perceptions about teachers have also provided us with an insight that teachers have a leading role in change implementation (Clark & Peterson, 1986; Darling-Hammond, 2006; Richardson, 1996; Verloop, Driel & Meijer, 2001). Today's world is having the heyday of technological developments and all aspects of life are influenced by the spread of technology. Consequently, educational contexts and particularly the field of language teaching could not also help but make instructional use of technology.

Second language teacher education has been responding to the opportunities and challenges presented by emerging technologies since 1920s (Wright, 2010) and the close relationship between technology and language teaching has long been stressed by TESOL educators (e.g. Bax, 2000, 2003, 2011; Chapelle, 2003; Levy, 2009; Thomas & Reinders, 2010; Warschauer & Healey, 1998). The facilities and options technology can offer for

teaching/learning process have enabled us to recognize the key role of teachers in successful implementation of innovations and the central role of teacher education programs as a catalyst to prepare teachers to address the gap between current instructional practices concerning technology and the desired quality from the 21st century instructional practices integrating technology. Accordingly, major reform movements have taken place in the higher education system of many countries. The Turkish education system is no exception.

The Turkish governmen developed several projects and made changes in teacher education programs upon the recognition of the importance of technology for the 21st century teaching and learning practices. For example, Programs of Computer Education and Instructional Technology were established and three compulsory technology-related courses were integrated into all teacher education programs in the 1998 and 2006 reform movements of restructuring education faculties (Parlak-Yılmaz, 2011). However, like many researchers (e.g. An & Reigeluth, 2011;Cuban, 2001; Ertmer, 2005; Ertmer et al., 2012; Harris, Mishra & Koehler, 2009; Hew & Brush, 2007; Keengwe, Onchwari & Wachira, 2008) from other parts of the world, most of the researchers in Turkey (e.g. Aydın, 2013; Aypay, Çelik, Aypay & Sever, 2012; Göktaş, Gedik & Baydas, 2013; Gülbahar, 2007; Varol, 2013) report that effective integration of technology remains low in classrooms.

1.1. Statement of the Problem

Educational sector has been one of the areas inevitably influenced by the advances in technology. Most of the governments all around the world have made high investments in building technology infrastructure in schools and many initiatives have been undertaken for efficient use of technology in classrooms as a result of its increasing popularity. Yet, despite the efforts put in, research has shown that effective integration of technology remains low in classrooms (An & Reigeluth, 2011; Aydın, 2013; Cuban, 2001; Ertmer, 2005; Ertmer et al., 2012; Göktaş, Gedik & Baydas, 2013; Gülbahar, 2007; Harris, Mishra & Koehler, 2009; Keengwe, Onchwari & Wachira, 2008; Varol, 2013). Concerning this problem, several authors (e.g. Ertmer, 1999, 2005; Hew & Brush, 2003; Kay, 2006; Kula, 2010) listed a number of barriers that prevent successful implementation of technology by teachers. Ertmer (1999) classified these obstacles as first order barriers and second order barriers. First order barriers refer to factors extrinsic to the teacher, such as lack of time,

equipment, technical or institutional support, inadequate training and so on. Second order barriers include factors intrinsic to the teacher such as teachers' incomplete beliefs about technology or lack of technological knowledge and skills. However, despite all the insights gained about the obstacles resulting in ineffective technology integration into instruction and suggested solutions to overcome these barriers, the problem continues to exist. Urged by this motive, we set out to find out what other barriers may exist in the path of effective technology integration into K-12 settings. We found it wise to carry out our study with student teachers to investigate the underlying reasons of the low-level use of technology in classrooms because we think that experiences student teachers have in teacher education programs form the basis of their future career as in-service teachers. In a similar vein, Brush and Saye (2009) indicated that low-level of technology use in K-12 settings is often associated with the inadequacy of teacher education programs in terms of technology education. However, despite holding such a central place in preparing teachers, there are many researchers (e.g. Agyei, & Voogt, 2011; Blake, 2007; Brush et al., 2003; Drent & Meelissen, 2008; Gülbahar, 2008; Hu & McGrath, 2011; Kay, 2006; Kula, 2010; Ringstaff & Kelly, 2002; Şahin-Kızıl, 2011; Tınmaz, 2004; Tondeur et al., 2012;) reporting that student teachers do not feel adequately prepared to use technology in their classrooms. Accordingly, the present study started with a broad exploratory question which sought to explore the underlying reasons of student teachers' sense of inadequacy to effectively infuse technology into instruction. Due to the fact that "the strongest case for the use of grounded theory is in investigations of relatively uncharted waters, or to gain a fresh perspective in a familiar situation (Stern, 1980, p. 20), we adopted a grounded theory approach standing closer to Charmaz (2000, 2003, 2006, 2008, 2009) in the first phase of the study and aimed themes to emerge from the data to demystify what was really going on about this long-standing problem. As a result of data analysis and in-depth review of literature, we came up with three independent but interrelated problems that can be discussed as three more underlying reasons that disable teachers to effectively integrate technology into instruction. These problems can be listed as:

- lack of investigation into technology beliefs about technology for technology's sake,
- lack of an overarching technology integration framework,
- lack of a deliberately designed instructional model to guide teacher educators and student teachers for technology integration.

With respect to the first problem, it can be realized that there is no consensus about teacher beliefs concerning technology integration when the literature about teacher beliefs and technology is reviewed. One can come up with various types of beliefs in relation to teachers' views associated with technology such as teacher expectation of learner success, self-efficacy in their own ability to teach, beliefs about the value of specific teaching strategies or materials and content-specific beliefs (Kim et al., 2013). However, it can be found out that much research pertinent to teachers' beliefs and technology focuses on teachers' self-efficacy beliefs (e.g. Abbitt, 2011; Albion, 1999; Brinkerhoff, 2006; Çelik & Yeşilyurt, 2013; Lee & Lee, 2014; Lee & Tsai, 2010; Wang, Ertmer & Newby, 2004) and teachers' epistemological beliefs in relation to technology (e.g. Bråten & Strømsø, 2005; Ertmer, 2005; Kim et al., 2013; Levin & Wadmany, 2006; Liu, 2011). Although these studies have contributed considerably to our conceptualization about the intersection between technology and teacher beliefs, they have not displayed the direct relationship between technology and beliefs. For this reason, we contend that teachers' beliefs about technology for technology's sake should come to the fore.

Regarding the second problem, Mishra and Koehler (2006) proposed the framework of technological pedagogical content knowledge (TPACK) as a means to enhance the efficiency of technology training offered in teacher preparation programs. TPACK framework has quickly become popular among educators and researchers. It has caught such a widespread interest among educators and researchers that hundreds of studies have been carried out with respect to TPACK within a short time (Abbitt, 2011). Even, it has been contended that teachers can integrate technology effectively if they have TPACK (Doering et al., 2014; Harris, Mishra & Koehler, 2009; Koehler & Mishra, 2008; Polly et al. 2010). In other words, TPACK has been seen as the panacea for ineffective technology integration. Nevertheless, Kimmons (2015) contend that TPACK has been readily embraced and used in an uncritical way. It has been neither expanded nor extended. Its theoretical development has not received as much attention as its utilization and it has been adopted as a formalized theory. In this regard, TPACK has some limitations to be considered as an overarching framework of technology integration because of the vagueness with its scope-whether it is about knowledge, skills or both- (Brantley-Dias & Ertmer, 2014) and its ignorance to the constructs of beliefs (Angeli & Valanides, 2009; Brantley-Dias & Ertmer, 2014; Graham, 2011; Neiss, 2005) and awareness.

As to the third problem, several researchers (e.g. Angeli & Valanides, 2009; Archambault et al., 2010; Göktas, Yıldırım & Yıldırım, 2008; Lawless & Pellegrino, 2007; Ottenbreit-Leftwich et al., 2012;) imply that there is a lack of a deliberately designed instructional model for technology training attributing to the lack of consistency among teacher preparation programs in terms of technology education. Moreover, many in field (e.g. Cuban, 2001, 2013; Ertmer et al., 2012; Ottenbreit-Leftwich et al., 2010; Petko, 2012; Smarkola, 2007) contend that technology is used to support traditional instructional practices such as delivery of content through presentations. In the words of Cuban (2013) "For the most part, teachers have tamed the technological innovations seeking fundamental reforms in pedagogy to fit their classroom practice since the early twentieth century" (p. 112).

1.2. Aim of the Study

The aim of the present study was two-fold. The first was to find out whether there were more underlying reasons in depth to be explored or there were shortcomings with the suggested solutions regarding the enduring problem of low-level technology use in classrooms. With this aim in mind, we adopted the method of grounded theory since it can provide depth and breadth into existing research and familiar topics (Milliken, 2010). We aimed to find out student teachers' conscious and subconscious assumptions, needs and familiarity with respect to instructional technologies to identify obstacles at pre-service level. In line with this, we prepared a comprehensive survey to provide a descriptive report of student teachers' prior learning experiences, undergraduate experiences, level of awareness, knowledge, skills, beliefs and needs in relation to instructional technologies. We added open-ended questions at the end of the survey to provide a better understanding about the research problem. Analysis of the quantitative and qualitative data led us to review the literature and subsequently conduct face-to-face interviews. The results obtained from face-to-face interviews and the ensuing review of literature provided us with a more complete understanding of the research problem. The ultimate goal of the present study has become to generate a theory that explains what English student teachers need to perceive technology as a *smooth partner* for their classrooms. In other words, we aimed to provide an insight into how student teachers can achieve "the seamless, day-to-day connection of technology to instruction for the purpose of supporting and extending curriculum objectives and to engage students in meaningful learning" (ISTE, 2003, p. 218).

In this respect, we initiated the second phase of the study. The purpose of the second phase was to suggest solutions to the problems identified which are (a) lack of beliefs about technology for technology's sake, (b) lack of an overarching technology integration framework, (c) lack of a deliberately designed instructional model to guide teacher educators and student teachers for technology integration and to examine whether the insights gained from the first stage could contribute to overcome barriers in the path of technology integration. Regarding the first problem, we have suggested the bidimensional construct of "perceived value of technology" to point to teacher beliefs about technology. By perceived value, we refer to the position of technology in language classrooms in the eyes of student teachers. Perceived value beliefs consist of two sub-constructs: exherent value beliefs and inherent value beliefs with respect to technology. Second, the idea that TPACK is a helpful but insufficient technology integration framework to address to student teachers' needs entirely urged us to develop a more overarching technology integration framework which gives weight not only to the knowledge component but also to the components of awareness, value beliefs and skills of teaching and we have proposed the framework of Instructional Technological Competence (ITC). Third, since most of the student teachers still adhere to traditional views about technology use (Project Tomorrow, 2013) and "the jury is still out on which strategies work best" (Kay, 2006, p.395), another goal of the present study has been to design an instructional model which we have called S-TECHNO to enhance the ITC of student teachers. Therefore, we employed a quasi-experimental research as a second phase in the present study. Through this quasi-experimental design, we aimed to examine whether any change has taken place in student teachers' ITC after running courses based on the S-TECHNO model. The overall goal of the present study was after all to find out whether the insights gained about the trends in relation to instructional technologies in student teachers' thinking could contribute to overcoming barriers in the path of technology integration.

1.3. Significance of the Study

The significance of the present study comes from several reasons. First, this study will be one of the first in Turkey to provide a comprehensive picture about student teachers' experiences with technology by presenting a descriptive report of student teachers' prior learning experiences, undergraduate experiences, level of awareness, knowledge, skills and beliefs in relation to instructional technologies. Second, the current study expands and

extends the technology integration framework of TPACK by giving weight not only to knowledge but also to the constructs of awareness, beliefs and skills. Concomitantly, a new technology integration framework called Instructional Technological Competence (ITC) is proposed. Third, one can come up with various types of beliefs in relation to teachers' views associated with technology such as teacher expectation of learner success, self-efficacy in their own ability to teach, beliefs about the value of specific teaching strategies or materials and content-specific beliefs (Kim et al., 2013). However, it can be found out that much research pertinent to teachers' beliefs and technology focuses on teachers' self-efficacy beliefs (e.g. Abbitt, 2011; Albion, 1999; Çelik & Yeşilyurt, 2013; Brinkerhoff, 2006; Lee & Lee, 2014; Lee & Tsai, 2010; Wang, Ertmer & Newby, 2004) and teachers' epistemological beliefs in relation to technology (e.g. Bråten & Strømsø, 2005; Ertmer, 2005; Kim et al., 2013; Levin & Wadmany, 2006; Liu, 2011). Although these studies have contributed considerably to our conceptualization about the intersection between technology and teacher beliefs, they have not displayed the direct relationship between technology and beliefs. For this reason, we contend that teachers' beliefs about technology for technology's sake should come to the fore. On this matter, we have suggested the new bidimensional construct of "perceived value of technology which consists of two sub-constructs: exherent value beliefs and inherent value beliefs with respect to technology. Fourth, several researchers (e.g. Angeli & Valanides, 2009; Archambault et al., 2010; Goktas, Yıldırım, & Yıldırım, 2008; Kay, 2006; Lawless & Pellegrino, 2007; Ottenbreit-Leftwich et al., 2012) indicated that there is a lack of consistency among teacher preparation programs in terms of technology education. According to Kay (2006) "the jury is still out on which strategies work best" (p.395). In order to enhance the quality of stand-alone instructional technology courses and provide a common language to guide these courses, we have designed and proposed the new S-TECHNO model to enhance the ITC of student teachers.

1.4.Research Questions

This study consisted of two main phases and the following questions guided the study:

Phase One: It refers to the phase in which the prior learning experiences, needs and current state of student teachers' knowledge, skills and beliefs in relation to technology is investigated countrywide. It has the following five questions:

1. What perceptions do student teachers in the ELT programs in Turkey hold about their early learning experiences related to technology?
2. What perceptions do student teachers in the ELT programs in Turkey hold about their undergraduate experiences related to technology?
3. What knowledge and skills do student teachers in the ELT programs in Turkey have about the use of technology in language teaching?
4. What beliefs do student teachers in the ELT programs in Turkey hold about the use of technology in language teaching?
5. What are the needs of student teachers in the ELT programs in Turkey with regards to technology-related courses?

Phase Two: It refers to the phase in which the implementation process starts based on the findings obtained from Phase I. In this phase, it is aimed to find out whether the S-TECHNO model has any impact on the instructional technological competence (ITC) of student teachers upon the completion of the implementation process. It has the following two questions:

6. What is the instructional technological competence level of student teachers in the ELT program of Necmettin Erbakan University (NEU)?
7. Does the S-TECHNO model stimulate any development in the instructional technological competence level of student teachers in the ELT program of NEU?

1.5. Assumptions of the Study

This study aimed to reach all of the student teachers enrolled in the third and fourth grade of ELT programs in the first phase. Hence, the population size was determined as 6000 according to the documents of Higher Education Entrance Exam (2013-2014). Through the sampling error formula, it was calculated that 362 responses would be enough for analyzing the survey. 814 student teachers participated in this study. Thus, we can assume that the participants of the research are representative of the total population. The second assumption of this study is that student teachers have sincerely and honestly responded to the items in the surveys and interviews since the results gained from these tools were consistent with previous studies related to this research area.

1.6. Limitations of the Study

This study aimed to reach all student teachers who received "Instructional Technology" courses at their universities in Turkey. Therefore, we attempted to get into contact with all 47 universities since we aimed to depict the overall situation countrywide. However, 18 universities volunteered to participate in the survey. Another limitation to the study is about the duration of implementation. Studying more than 14 weeks could have provided us with more profound and deeper understanding about the changes occurring in teachers' ITC.

1.7. Definition of Terms

Technology integration: "The seamless, day-to-day connection of technology to instruction for the purpose of supporting and extending curriculum objectives and to engage students in meaningful learning" (ISTE, as cited in Harrington, 2008, p. 4).

Technological Pedagogical Content Knowledge (TPACK): It refers to the knowledge domain which emerges from the interaction of content, pedagogy, and technology knowledge (Mishra & Koehler, 2006).

Teacher belief: "A proposition which may be consciously or unconsciously held, is evaluative in that it is accepted as true by the individual, and is therefore imbued with emotive commitment; further, it serves as a guide to thought and behavior" (M. Borg, 2001, p.186). It is used interchangeably with the words perception, conception or images in this study.

CHAPTER 2

REVIEW OF LITERATURE

To offer a coherent framework for a thorough understanding of the research problems posed, I present my review of literature around the following areas: a) technology in education, b) technology in language teaching, c) technology in pre-service teacher education, d) technological pedagogical content knowledge, e) teacher beliefs and technology, f) technology skills, g) technology awareness, h) cognitive constructivism, i) sociocultural theory, j) andragogy, k) conceptual change theory, l) ISTE standards, m) second language teacher education, n) teacher cognition, o) teacher beliefs, p) reconceptualization of the knowledge base of second language teacher education and q) teacher education models. Each of these sections theoretically clarifies the rationale underpinning the whole study and forms the basis of the Instructional Technological Competence Framework and S-TECHNO instructional model developed at the end of the first phase.

2.1. Technology in Education

Technology has a history of a century in education. With the emergence of a wide variety of technologies since the early 1900s, teachers have used them in different ways to extend the range of their teaching, provide learners with learning materials and motivate their students (Office of Technology Assessment, 1995). Hew (2004) summarized the history of instructional technology in six main periods – silent visual media, audiovisual materials, instructional television, personal computers, Internet, and wireless tools. Media development began with the adoption of silent visual media which included stereographs, slides, study prints, charts, and photograph. Silent visual instructional films began to be used in 1910 with the advent of the motion picture projector and with sound incorporated motion pictures; silent visual media gave its way to audiovisual media. In the 1920s radio

was invented and it was followed by the advent of television in the 1950s. They brought great excitement into the classrooms. In the 1980s, personal computers began to be used for instructional purposes and have since increased. The 1990s brought the Internet and world-wide web (WWW). Currently, the use of wireless tools is increasingly widespread in educational settings.

The underlying reason for this rapid expansion of technology in schools has been the belief that the use of technology will better improve teaching and learning process (Dwyer, 1996; Hew & Brush, 2007; Ozkan & Bada, 2012). Indeed, a number of researchers (e.g. Cradler et al., 2002; Davies, Dean & Ball, 2013; Erben, Ban & Castañeda, 2009; Jonassen, 2000; Rost, 2002; Ottenbreit-Leftwich et al., 2010; Young, 2003;) have identified the benefits of technology use in teaching and learning. Roblyer (2006) provided a summary of elements underlying the rationale of using technology in teaching/learning process and grouped them under four main categories which are motivation, enhanced instructional methods, increased productivity and required information age skills. This proposed classification implies that the use of technology can be a good match for putting constructivist principles into practice in classrooms since these elements can help learners construct their own knowledge while they investigate, collaborate, actively engage in authentic tasks and reflect on their experiences. Providing such a promise of change for teaching and learning, interest in technology has increased and great investments have been made in it in the world of education during the last two decades.

2.1.1. Technology in Foreign Language Teaching

Beginning with the low-tech technologies like chalk and blackboard and continuing with high-tech technologies like computers and the Internet, technology has long been associated with language teaching (Larsen-Freeman & Anderson, 2011). As such, the history of language teaching methods demonstrates parallelism with the evolution of instructional technology. To clarify, teachers who followed grammar-translation method used blackboard and overhead projector for knowledge transmission. For audio-lingual method, audiotape was a powerful tool for oral repetition. Interactive computer applications, simulation software and the Internet were perfect tools in communicative language teaching since the focus of the method was on active student participation, authenticity and meaningfulness (Warshauer & Meskill, 2000). In addition, the expansion of technological facilities has displayed a considerable potential for providing students

with learning experiences to develop their language skills such as reading, listening, speaking, writing etc. Especially, infusion of computer technologies into classrooms has enabled teachers to create more authentic learning environments.

Concerning the influence of computer technologies on language teaching, a number of acronyms have been used (e.g. CAI - Computer Assisted Instruction; TELL – Technology Enhanced Language Learning; CMC- Computer-Mediated Communication; WELL – Web-Enhanced Language Learning). However, Computer-Assisted Language Learning (CALL) has been the most widely used term for the application of computer technologies in language learning and teaching (Hall, 2011). CALL is defined as the use of computers in language teaching and learning (Levy, 1997). Chapelle (2010) provided further detail in her definition and stated that CALL in fact includes "a variety of technology uses for language learning including CD-ROMs containing interactive multimedia and other language exercises, electronic reference materials such as online dictionaries and grammar checkers, and electronic communication in the target language through email, blogs, and wikis" (p.66). The use of computers in language teaching dates back to 1950s and 1960s with large main frames which can only be found at university research centers. However, these computers were not portable and learners had to travel for research facilities (Beatty, 2010). Therefore, Davies (2002) contended that the boom period of CALL in classrooms started with the advent of personal computers in the 1980s.

With reference to changing pedagogies, Warschauer (2000) suggested a classification for the history of CALL consisting of three phases which are Structural CALL, Communicative CALL, and Integrative CALL. Structural CALL was the first phase of CALL development. It was used in 1960s and 1970s. The teaching techniques of structural linguistics were used. Thus, the focus was on form, repetitive drills and feedback were important and CALL took the form of drill and practice programs, grammar and vocabulary tutorials and language teaching instruments (Warschauer & Kern, 2000; Warschauer, 2004). Communicative CALL was the second phase. Here the focus was on content, implicit grammar teaching, language use, fluency, interaction and meaningful activities. In this respect, Warschauer (1996) stated that the purpose of CALL was not to direct learners to find correct answers but rather to encourage learners to write, discuss and think. Language games, programs for paced reading and text reconstruction were used during this phase of CALL (Healey & Johnson as cited in Warschauer, 1996). However, at

the end of the 1980s, communicative CALL was criticized since it focused more on the peripheral rather than the core elements of language teaching (Kenning & Kenning as cited in Warschauer, 1996). Integrative CALL is the last phase of CALL development. Two major technological advancements are central in this phase- multimedia computers and the Internet. Multimedia refers to the combination of text, graphics, sound, animation, and video in a single product. Thanks to multimedia, learners are provided with more authentic experiences since the integration of skills in a single activity is possible. These developments help learners gain more autonomy for their learning since they are able to progress at their own pace and path. Finally, the Internet has considerably influenced the last phase of CALL. Computer-mediated communication has shown that learners can communicate with others at any place and at any time. The communication can be either asynchronous or it can be synchronous. Through the Internet, language learners can reach millions of files and authentic materials that are convenient for their purposes within seconds (Warshauer, 1996). This type of CALL provides learners with highly interactive, authentic and engaging learning experiences and enhances collaboration among learners to a great extent (Gruba, 2004). However, Warschauer (1996) noted that the introduction of a new phase does not mean rejecting prior phases. In other words, although behaviorist and communicative CALL applications still exist, there is a shift towards integrative CALL.

To summarize, developments in technology and language learning are extremely compatible and technology can offer a wide range of learning opportunities for language classrooms. For example, it can address to different learning styles simultaneously, enhance interaction, collaboration, communication, authenticity and promote learner autonomy. It can decrease the workload of teacher and create more student-centered learning environments. Illustrated in this manner, it is crystal-clear that technology should be an integral part of language classrooms. Therefore, teacher education programs should make student teachers aware of the close relationship between language teaching and technology, and inform them about the rationale and potential benefits of instructional technology for language teaching.

2.1.2. Technology in Pre-service Teacher Education Programs

Over the past two decades, there has been a rapid increase in the use of digital technologies and every aspect of life has changed dramatically. Students today grow up surrounded by these technologies. They are tech-savvy and fascinated by the introduction of new

technologies. However, despite being a natural component of students' daily lives, teachers largely fail to make technology an integral part of their classrooms since they report that they do not feel adequately prepared to integrate technology into their classrooms (Drent & Meelissen, 2008; Gray, Thomas, & Lewis, 2010; Gülbahar, 2008; Kula, 2010; Polly et al., 2010; Okojie & Olinzock, 2006; Ottenbreit-Leftwich et al., 2010; Şahin-Kızıl, 2011; Tınmaz, 2004; Tondeur et al., 2012; Yildirim, 2000). In this respect, teacher education programs have a critical role in preparing teacher canditates to address to the evolving needs of the 21st century learners since such programs are the initial step in the professional preparation of teachers prior to entering classrooms. In fact, numerous teacher education programs have made extensive efforts to incorporate technology into pre-service education. For example, Kay (2006) identified ten key strategies employed by teacher education programs to introduce instructional technologies to teacher candidates- including delivering a single technology course, offering mini-workshops, integrating technology in all courses, modeling how to use technology, using multimedia, collaboration among student teachers, mentor teachers and faculty, practicing technology in the field, focusing on education faculty, focusing on mentor teachers, and improving access to software, hardware, and/or support. However; perhaps because of the lack of continuity and consistency in the integration of technology into teacher education programs, evidence shows that the strategies used so far have not ensured any clear outcomes for student teachers' preparedness to use technology (Kay, 2006). In this regard, Koch and Kush (2015) point out that if teacher candidates have meaningful experiences regarding the use of technology in their formal preparation programs, it is highly possible that technology will be integrated effectively in their classrooms. To provide student teachers with *meaningful experiences*, Molebash (2001) suggested that adopting constructivist philosophy can enhance the effectiveness of ICT-related courses in teacher education programs since constructivist ideology recognizes that learning involves dynamic engagement in a rich learning environment where learners interact among themselves, reflect, and evaluate what they have learned and proper use of technology can provide rich environments where learners can explore, partake in problem solving activities, collaborate among themselves, contemplate, and examine the learned materials. In other words, technology provides the tools and interactive environment that can engage the mind actively during the learning process (Okojie, Okojie-Boulder & Boulder, 2008).

Taken together, these studies contributed to the idea that teacher education programs can infuse the rationale of technology use through constructivist principles since the potential of technology can best be discovered through constructivist principles. With respect to this, Lee and Lee (2014) suggested that since student teachers do not have their own classrooms to use technologies and apply constructivist principles, they should be provided with authentic and classroom-situated experiences in their training that include microteaching, modeling, collaboration with peers, and instructional designing. Therefore, teacher preparation programs should adopt constructivist perspectives to keep pace with the changing needs of tomorrow's classrooms. Otherwise, technology will remain to be seen as an extra tool to reinforce traditional classroom teaching since research shows that teachers' prior learning experiences as students shape their practices in their classrooms

In addition to increasing constructivist applications to enhance technology integration in teacher preparation programs, Tondeur et al. (2012) suggests that to prepare student teachers for effective technology integration, teacher education programs need to help them construct knowledge of good pedagogical practices, technical skills and content knowledge as well as enabling them to understand the interplay between these concepts. Kurt, Mishra and Koçoğlu (2013) also stated that teachers need to build a knowledge base for effective technology integration in which content knowledge, pedagogical knowledge and technological knowledge intersect. The next section will attempt to provide a detailed account of such a model developed to describe the relationship between technology, pedagogy and content knowledge.

2.2. Technological Pedagogical Content Knowledge

Technological Pedagogical Content Knowledge Framework (TPACK) was proposed by Mishra and Koehler in 2006. The TPACK framework was built on Shulman's concept of Pedagogical Content Knowledge (PCK). The researchers extended the PCK framework to include not only Content Knowledge (CK) and Pedagogy Knowledge (PK) but also Technology Knowledge (TK), and the intersections of content, technology and pedagogy (e.g., TPK, TCK, PCK and TPACK). According to Harris (2009), "TPACK emphasizes the connections among technologies, curriculum content, and specific pedagogical approaches, demonstrating how teachers' understandings of technology, pedagogy, and content can interact with one another to produce effective discipline-based teaching" (p. 396-397).

The TPACK framework is grounded in an understanding that quality teaching and learning do not occur when the three knowledge bases exist separately, but that meaningful and engaged learning happens when there is an interplay and relationship among the three (Nelson, Christopher & Mims, 2009). There are three primary components of teachers' knowledge. These three components are in a constant interplay which results in four new knowledge types which are of equal importance: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge. Shin, Koehler, Mishra, Schmidt, Baran and Thompson (2009) defines each component of TPACK as follows:

Content Knowledge (CK) refers to the knowledge about the subject matter that is to be learned or taught.

Pedagogical Knowledge (PK) refers to the knowledge about the processes and practices or methods of teaching. It includes knowledge about classroom management skills, teaching strategies, evaluation techniques, and the nature of target audience.

Technology Knowledge (TK) refers to the knowledge about both the standard technologies and more advanced technologies. It enables teachers to understand information technology, apply it properly, identify useful technologies, and continually adapt to changes in technology.

Pedagogical Content Knowledge (PCK) derives from Shulman's idea of knowledge of pedagogy that is applicable to the teaching of specific content (Shulman, 1986). PCK is the knowledge about what teaching approaches fit the content and how elements of the content can be arranged for better teaching. The model of PCK emphasizes the importance of teachers' knowing about the learning of their students and the learning environment (Cochran, DeRuiter, & King, 1993; Fives & Buehl, 2008).

Technological Content Knowledge (TCK) refers to the knowledge about the manner in which technology and content influence constrain one another. The use of different technologies can impact students' learning differently.

Technological Pedagogical Knowledge (TPK) refers to the knowledge about how teaching and learning change when particular technologies are used. Teachers need to be equipped with knowledge about various technologies and be able to use them as pedagogical strategies in their classrooms.

Finally, Technological Pedagogical Content Knowledge (TPACK) refers to the knowledge domain which emerges from the interaction of content, pedagogy, and technology knowledge.

Given that technology occupies a central place in K-12 students' lives, the role of technology has long been a matter of concern among language teachers, educators and researchers. As there was a need for a unified framework for effective technology integration, TPACK framework has grown in popularity both in general and specifically in language teaching. Kurt, Mishra and Koçoğlu (2013) expressed this need writing that the construction of a knowledge base for teachers is crucial for effective integration of technology into their teaching and for expecting teachers to add technology education to the learning areas that they are required to teach. TPACK is viewed as a framework which prompts teachers to think about effective ways of integrating technology into their classrooms (Koehler and Mishra, 2008). Nevertheless; in spite of gaining great interest among teachers, educators and researchers as a framework for promoting effective technology integration, TPACK is not without critics. Let us now turn to discuss the weaknesses of TPACK.

2.2.1. Criticisms about TPACK

Having been introduced as the knowledge base teachers need for effective technology integration, TPACK framework has quickly become popular among educators and researchers. It has provided "a common language" for integrating technology into instruction (Hammond & Manfra, 2009).

It has caught such a widespread interest among educators and researchers that hundreds of studies have been carried out with respect to TPACK within a short time (Abbitt, 2011). Even, it has been contended that teachers can integrate technology effectively if they have TPACK (Doering et al., 2014; Koehler & Mishra, 2008; Harris et al., 2009; Polly et al. 2010). In other words, TPACK has been seen as the panacea for ineffective technology integration. Nevertheless, Kimmons (2015) contended that TPACK has been readily embraced and used in an uncritical way. It has been neither expanded nor extended. Its theoretical development has not received as much attention as its utilization and it has been adopted as a formalized theory. In this regard, despite such an enthusiastic embracement, TPACK has got some weaknesses to be considered as a framework of technology integration. The first criticism of TPACK is about the vague boundaries between its seven

knowledge domains (Angeli & Valanides, 2009; Archambault & Crippen, 2009; Archambault & Barnett, 2010; Brantley-Dias & Ertmer, 2014; Cox, 2008; Cox & Graham, 2009; Graham, 2011; Graham, Borup & Smith, 2012; Jimoyiannis, 2010; Kimmons; 2015). Graham (2011) strongly criticizes the imprecision in the framework by stating the difficulty in distinguishing the boundaries between its domains. Even, Brantley-Dias and Ertmer (2014) assert that the fuzziness between boundaries urges one to interrogate whether all the domains exist. Second, TPACK has been challenged because of the lack of clarity about whether to conceptualize it as a framework including seven knowledge domains or as a distinct body of knowledge domain emerging from the intersection of three primary knowledge domains (Angeli & Valanides, 2009; Graham, 2011; Brantley-Dias & Ertmer, 2014). Another serious critique comes from Brantley-Dias and Ertmer (2014) in terms of the ill-defined definition of TPACK since there is an ambiguity whether TPACK is about knowledge or skills or both. Over and above, TPACK's ignorance to the construct of "beliefs" as a technology integration framework is another significant gap to mention (Angeli & Valanides, 2009; Brantley-Dias & Ertmer, 2014; Graham, 2011; Neiss, 2005). However, teachers' beliefs must receive full attention in designing technology-related frameworks because "There is a growing consensus that educational innovations are doomed to fail if the emphasis remains on developing specific skills, without taking into account the teachers' cognitions, including their beliefs, intentions, and attitudes (Trigwell, Prosser, & Taylor as cited in Verloop et al., 2001, p. 453). Let us now discuss the importance of beliefs for the effective integration of technology.

2.3. Teacher Beliefs and Technology

The practice of teaching has got a complex nature and to date, several research studies have been carried out to find out ways of teaching efficiently. Although much research has focused on improving teachers' knowledge-base, it has been conceptualized that knowledge, by itself, cannot explain the complexity of the practice of teaching. Even some researchers argue that teacher beliefs may be more important than computer knowledge and skills (Funkhouser & Mouza, 2013; Kopcha, 2012; Zheng, 2009).

Teachers' beliefs regarding the role of technology in language teaching has a great impact on teachers' use of instructional technologies since beliefs are strong predictors of teachers' behaviors (An & Reigeluth, 2012; Ertmer, 2005; Kopcha, 2012; Ottenbreit-

Leftwich et al., 2010; Pajares, 1992; Wright & Wilson, 2011). Unless teachers had learning experiences which technology was incorporated into successfully and competently, it is not likely that technology can be a part of their classrooms since their prior learning experiences would not inspire them. One can thus assume that the more experience teachers have with instructional technologies in their previous educational experiences, the more committed they will be to use them in classrooms. As regards, Somekh (2007) aptly articulates that tacit understandings of teachers may cause them to teach the way they were taught since these personal theories make it difficult for them to change the way they teach and to introduce the effective integration of technology into their classrooms.

Similarly, Hew and Brush (2007) stated that teacher beliefs about technology can be a major barrier to technology integration since whether or not to use and how to use technology is ultimately depends on the beliefs teachers have towards technology.

Therefore, several scholars in the field have argued that student teachers' pre-existing beliefs about teaching must be brought to a level of conscious awareness (Bailey et al., 1996; Ertmer, 2005; Farrell, 1999; Freeman & Johnson, 1998; Hew & Brush, 2007; Kagan, 1992; Minor et al., 2002; Pajares, 1992; Raths, 2001; Yost et al., 2000) and their false assumptions about the practice of teaching must be eliminated (Darling-Hammond, 2006; Zheng, 2009).

In consequence, if we are to think in terms of technology integration, then we suggest that student teachers' beliefs about the role of technology in language teaching and learning should be surfaced. Being the initial formal step in teachers' professional preparation, teacher education programs should have a major role in challenging student teachers' beliefs concerning the place of technology in language teaching.

2.4. Technology Skills

Skill refers to performing particular tasks in an accurate and fluent way (Winterton et al., 2006). In teacher education, it points to what the teacher has to be able to do (Freeman, 1989). Technology skills,on the other hand, refer to the "ability to use knowledge and experience to determine effective materials, content, and tasks, and to monitor and assess results appropriately" (Hubbard & Levy, 2006, p.16). Since knowing-that doesn't necessarily assure know-how, lack of specific technology skills is referred as another

important barrier to technology integration (Ertmer, 1999; Hew & Brush, 2007; Kopcha, 2012; Pelgrum, 2001).

2.5. Technology Awareness

Awareness is defined as "the capacity to recognize and monitor the attention one is giving or has given to something" (Freeman, 1989, p. 33). It requires paying attention to the situation one finds himself in and it is necessary for making an informed choice (Larsen-Freeman, 1983). Freeman (1989) suggests that awareness is the unifying superordinate which integrates the constituents of knowledge, skills and attitudes. In other words, teachers can see what knowledge, skills and beliefs they have for something through awareness. Gattegno (as cited in Freeman, 1989) incisively pointed out that awareness is needed to make what is known more conscious and work on it to change it in order to make it more useful. Accordingly, we define technological awareness in our context as student teachers' recognition of the position of technology, rationale of using technology, potential and capabilities of technology, and strengths and weaknesses of technology in terms of language teaching as well as student teachers' level of awareness about what knowledge, skills and beliefs they have in relation to technology.

2.6. Technology Integration Process in Turkey

The first initiatives concerning technology integration in Turkey date back to 1980s. In response to the requirements of the globalizing world, several projects have been developed to increase the quality of national education. According to Parlak-Yılmaz (2011) the technology integration process in Turkey can be divided into three periods. The first stage began in the 1980s and ended in 1997 when the duration of basic education was increased to 8 years as a response to the developments taking place in the 21st century which is called the second phase. With the 2003 e-Transformation Turkey Project, the third period started and it still continues.

In the first period the computers were used for teaching about computer use. Later, it was followed by the development of computer-assisted education (CAE) project in 1988. The second project named National Education Development Project (NEDP), started in 1992 and was completed in 1997. After this project, two more pilot projects- the 53 Computer Try-out School Project and 182 Computer Laboratory School Project- were carried out.

Computer laboratories were set up to provide students with technology education (Parlak-Yılmaz, 2011). Özar and Askar (as cited in Akcaoglu, 2008) stated that secondary and vocational schools were provided with 2,400 computers between 1985 and 1987, and 6500 more computers in 1996. In 1997, the compulsory education was increased from 5 to 8 years. In 1998, the Basic Education Project (BEP) was introduced. Following these developments, Programs of Computer Education and Instructional Technology were established and compulsory technology-related courses (i.e. Computer and Instructional Technology and Material Development courses) were integrated into all teacher education programs within the reform movement of restructuring education faculties (Parlak-Yılmaz, 2011). As a result of the changes, Varank (2003) indicated that 2,802 information technology classrooms were established in primary schools. In 2001, Turkey's EU membership process began. In line with the e-Europe initiative, Turkey developed its own e-Transformation Project. The projects of "Open a School to the World, Connect it to the Internet" and the MNE Internet Access Project (2003) aimed to provide schools with Internet connection. In order to support the work carried out within the project of BEP, the Basic Education Support Project (BESP) financed by European Commission was put into effect. In 2007, the Secondary Education Project was introduced to renew ICT course programs in secondary schools. Since teachers are key figures in using technology tools in classrooms, such projects as Intel Teacher Training Project, the Microsoft Innovative Teachers Program and Information Technologies, the Formatter Teacher Program and the Microsoft Cooperation in Education Program were developed to provide teachers with technology education through in-service seminars and workshops. Successful technology integration also requires providing teachers with effective content and teaching materials. In line with this, the Education Portal Prototype Formation Project, the Information Access Portal Project and the Production of Educational Materials through Authoring Software projects were put into practice (Parlak-Yılmaz, 2011). One of the recent projects carried by the MONE is the 'The Fatih Project', which stands for 'Movement of Enhancing Opportunities and Improving Technology'. It was initiated in 2010. According to Uluyol (2012), the purpose of the project was to enhance quality and provide learners with equal opportunities in education. The project also aimed to create smart classes in all K-12 schools countrywide. Karabacak (2016) stated that K-12 schools were provided with interactive boards, internet substructure and e-content educational programs and every teacher and students were given tablet computers through this project. In addition,

workshops were offered for in-service teachers. Uluyol (2012) indicated that the funding allocated to education through the FATİH Project is the biggest in the history of Turkey.
The goal of all these projects has been to enhance the quality of education in Turkey. However, it can be clearly seen that there are still failures in ICT integration despite such big-scale initiatives (Goktas, Gedik & Baydas, 2013; Uluyol, 2012). We think that one of the reasons for the failures experienced in those projects has been ignorance to improving professional preparation programs because teacher education programs act as a bridge between being a student and a teacher. Lack of attention to student teachers' existing beliefs, knowledge and skills cause innovations to fail since they are the ultimate users of technology in classrooms. According to Clark and Peterson (as cited in Ertmer, 2005) "Teachers' belief systems can be ignored only at the innovator's peril" (p. 291). Therefore, we contend that student teachers must be the first addressees to receive training before the implementation of innovations.

2.6.1. Technology and Pre-service Teacher Education in Turkey

Teacher education has been a matter of issue among other educational concerns in Turkey because a teacher is the key person for the success of students and for successful implementation of a school curriculum. Since the beginning of the last century, there have been many changes in initial teacher education programs in Turkey. After the foundation of the Republic in 1923, the Turkish educational system was centralized with the act of The Law on Unification of Education and all the educational systems were put under the control of the Ministry of Education in 1924. In the second half of the century, two considerable changes took place. The Basic Law for National Educational was accepted in 1973. With this law, teachers were educated in higher education institutions. The major change in higher education in Turkey occurred in 1981. With the Turkey's higher education reform law, all academies and teacher training institutions were integrated into the universities thus providing a unified higher education for preparing teachers. In addition, the responsibility of training teachers was handed over to universities from Ministry of National Education. In 1989, the duration of undergraduate programs of teacher education was determined as four years (Tarman, 2010). In order to increase the effectiveness of teacher education programs, two important reform movements were undertaken as a result of the incorporation between the Ministry of National Education (MoNE) and the Council of Higher Education (CHE) in 1998 and 2006. Yavuz and

Topkaya (2013) summarize these changes under three headings: (a) unification of teacher education programs at pre-service level, (b) addition of new courses related to pedagogy and subject-matter knowledge, (c) establishment of partnership between schools and universities.

In 1998, the duration of compulsory education was increased to 8 years. The idea behind this reform movement was based on the adoption of constructivist perspectives in education. English lessons were incorporated into the syllabi of 4th graders (YÖK, 1998). Accordingly, a number of new courses were introduced into teacher education programs which were 'Teaching English to Young Learners', 'Short Story Analysis and Teaching', 'Drama Analysis and Teaching', 'Approaches to English Language Teaching', 'Instructional Technologies and Material Development', 'Material Evaluation and Adaptation' and so on. (Yavuz & Topkaya, 2013).

In 2006, the second important reform was put into practice. YÖK (2007) explains the reasons behind this reform movement as follows:

- To update the programs of education faculties in accordance with the requirements of the globalizing World,
- To identify the learning outcomes and the standards that teacher education programs should have since Turkey is one the members of European Higher Education Area,
- To overcome the shortcomings of the 1998 teacher education reform.

In consequence, some changes have been made in teacher education programs such as the definition of learning outcomes, topics to be covered in courses, teaching, evaluation and assessment methods. In addition, the consecutive teacher education model gave way to concurrent model after eight years of experience in education faculties (Yiğit, 2012)

Finally, three ICT-related courses have been introduced into teacher education programs with the reform movements of 1998 and 2006 in order to develop student teachers' technological competence. They are 'Computer I', 'Computer II' and 'Instructional Technology and Material Development (ITMD)' courses. The courses of 'Computer I' and 'Computer II' aim to help student teachers gain basic technology literacy such as learning about the basic concepts of information and communication technologies and develop skills in using hardware and software applications. Each of these courses consists

of four hours (two hours for theory and two hours for practice). The 'ITMD' course extends and goes beyond basic skills and focuses more on the integration of teaching, learning and technology It also consists of four hours (two hours for theory and two hours for practice) (YÖK, 2007).

Thus far, we have explained the topics which focused on the relationship between technology and English language teaching. I will now move on to provide the theoretical framework of the study.

2.7. Theoretical Framework

A theoretical framework underlies one's worldview that guides his/her study. Constructivism, a theory of learning and knowledge construction, provided the framework for the study. Constructivism suggests that learning takes place as a result of one's own active construction of new experiences rather than someone else's lecturing. Central to this theory are the propositions that cognitive dissonance is the stimulus for learning (Fosnot & Perry, 2005; Jonassen, 1991; Posner, Strike, Hewson & Gertzog, 1982; Savery & Duffy, 1995), learners use their existing ideas to make sense of new experiences (Appleton, 1997; Fosnot & Perry, 2005; Harasim, 2012; Merriam & Bierema, 2014) and students are active learners who construct their knowledge through interaction with the environment (Driscoll, 2000; Harasim, 2012; Jacobsen, Eggen & Kauchak, 2009; Merriam & Bierema, 2014; Schunk, 2008). In constructivism; according to Ertmer and Newby (1993), "humans create meaning as opposed to acquiring it" (p.62). In constructivism, learning activities must include active engagement, inquiry, problem solving, and collaboration. Teachers are not the sages on the stages but guides and facilitators who urge students to question, challenge, and formulate their own ideas, opinions, and conclusions (Abdal-Haqq, 1998).

Although constructivism is a theory of learning that explains how knowledge is constructed, there are a variety of perspectives within the constructivist theory (Ernest, 1995). However, two major trends appear on the scene in constructivist-based education: the Piagetian cognitive constructivism and the Vygotskian social constructivism (Cobb, 2005; Powell & Kalina, 2009; Richardson, 2005; Vadeboncoeur, 1997). Although important differences exist between these two forms of constructivism, there are striking similarities in terms of their implications for enhancing learning process. Cobb (2005) suggests that the central issue in education should not be to cause dispute between different

perspectives; rather it should be to find out ways of coordinating them. In light of this suggestion, we blend the tenets drawn from cognitive constructivism and sociocultural theory since we think they have complementary rather than adversarial perspectives. We have adopted an eclectic form of constructivism and the definition provided by Fosnot to guide the present study. According to Fosnot (1996):

> Constructivism is a theory about knowledge and learning; it describes both what "knowing" is and how one "comes to know". Based on work in psychology, philosophy, and anthropology the theory describes knowledge as temporary, developmental, non-objective, internally constructed, and socially and culturally mediated. Learning, from this perspective, is viewed a self-regulatory process of struggling with the conflict between existing personal models of the world and models of reality as a human meaning-making venture with culturally developed tools and symbols, and further negotiating such meaning through cooperative social activity, discourse, and debate. (p.ix)

Now, let us explain each form of constructivism in detail.

2.7.1 Cognitive Constructivism

Cognitive constructivism is based on Piaget's theory of cognitive development and learning. The main focus of the theory is on the individual and how the individual constructs knowledge. It centers attention on the reasoning ability of individuals and highlights that individuals acquire knowledge by organizing and reorganizing data as they go through new experiences. Cognitive constructivists emphasize individuals' internal mental structures in constructing knowledge building on experience (Powell & Kalina, 2009).

The key concepts of the Piagetian constructivism involve schemata, assimilation, accommodation, disequilibrium and equilibrium. According to the theory, individuals construct new knowledge based upon the interaction between their previous knowledge (schemata) and current understandings (Richardson, 2005; Vadeboncoeur, 1997). Knowledge construction is stimulated by internal cognitive conflict (Applefield, Huber & Moallem, 2001) when individuals face a new phenomenon which is incompatible with their existing schemas. This state of disequilibrium emerges when individuals try to make sense of the data to obtain a state of equilibrium (Eggen & Kauchak, 2013). Individuals go through the processes of assimilation and accommodation for equilibration. Assimilation occurs when the learner simply incorporates new experiences into existing cognitive structures (schemata). Accommodation takes place when the learner has to modify or create new schemata (Powell & Kalina, 2009). Thus, it can be inferred that teacher educators should provide student teachers with learning experiences that create cognitive

dissonance and challenge their pre-existing knowledge in order to accommodate their naive understandings about teaching.

In the Piagetian constructivism, action is defined as the source of knowledge. In other words, individuals' actions on objects lead to cognitive development (Beilin & Fireman, 2000). Therefore, teachers should provide learners with hands-on experiences and create classroom situations that promote discovery learning (Powell & Kalina, 2009).

Although certain shared characteristics can be seen both in cognitive and social constructivism, changing understandings about human learning have shown that stressing an individualistic orientation in learning cannot adequately explain the complex nature of knowledge construction. Because how, when and where learning occurs influence learning processes (Vygotsky, 1978), constructivism has taken on a social emphasis (Beck & Kosnik, 2006). According to sociocultural theory, learning doesn't occur only within an individual; rather, learning is a social and collaborative activity, which takes place through engaging in social activities.

2.7.2 Sociocultural Theory

The sociocultural theory has emerged from Vygotsky's ideas (1978, 1986) and it has been extended by some scholars (e.g. Lantolf, 2000; Leont'ev, 1981; Wertsch, 1985). Like cognitive constructivism, this theory regards humans as active learners in a learning process and refers to the prerequisite role of biological factors; unlike cognitive constructivism, it puts emphasis on the role of social interactions and draws attention to the importance of the context in human learning rather than positioning individual processes at a center stage in higher mental processes. In sociocultural theory, knowledge is constructed individually and it is mediated socially (Windschitl, 2002). It is a holistic theory that is centered upon the concepts of community, integration and inquiry, and it is contingent on attitudes values and actions (Beck & Kosnik, 2006). The theory draws attention to the historical, social and cultural milieu in which individuals are born and live (Hong & Pawan, 2015).

The Vygotskian theory suggests that language and culture influence what learners learn and the way how they interpret them and it occurs beyond individuals' conscious control (Beck & Kosnik, 2006). In this theory, learning is viewed as a "dynamic social activity that is situated in physical and social contexts, and distributed across persons, tools and

activities" (Johnson, 2006, p.237). According to Lantolf (2008), human cognition originates in and is shaped by the social activities individuals take part in.

With the Vygotskian sociocultural theory, learning has come to be understood as a concept extending well beyond an isolated action occurring in one's solitary mind to a concept that "arises not *through* interaction but *in* interaction" (Ellis, 2000, p.209) and is directly influenced by the contexts in which it takes place. According to Vygotsky (as cited in Wertsch, 1985) development cannot be thought separately from its social, historical and cultural context.

Sociocultural theory is not a prescriptive but a descriptive theory with holistic perspectives regarding human learning and it suggests that context in which we live and work, the social activities in which we participate and all aspects of ours like beliefs, values and actions etc. do have a direct impact on our learning (Beck & Kosnik, 2006). Moreover, the theory has got some major tenets that provide insight for teacher educators to promote student teachers' conceptual development and learning-to-teach process. Lantolf (2000) indicates that, the concept of *mediation* lies at the core of sociocultural theory because the paradigm contends that human mind is mediated. According to him, Vygotsky advocates that humans act on the physical world by relying on tools (Lantolf, 2000). These tools are created in specific cultures in specific times and they carry with them the features of that culture and time. Johnson (2009) states that there are three types of tools which humans employ to mediate their activities. They are cultural artifacts and activities, concepts and social relations. According to Johnson and Golombek (2003, p.733), mediational means include three levels which are object-regulation, other-regulation and self-regulation. In object-mediated regulation individuals seek help from cultural artifacts in their environment such as a lesson plan. In other-regulated mediation, individuals seek help from other people such as discussions with other teachers. Lastly; in self-regulated mediation, individuals gain control over both their cognition and activity. This process is dialogic and it provides a transformative process in which a shift from other-regulation to self-regulation takes place. In Vygotsky's sense, the concept of *internalization* can explain this transformative process. According to Vygotsky (as cited in Wertsch, 1985), there are two levels of mental function which are lower and higher functions. While lower functions refer to biologically programmed behaviors, higher mental functions are socially mediated. Each form of higher behavior is mediated on two levels: first on the interpsychological

plane then on the intrapsychological plane. The interpsychological plane refers to a process when people interact with others or use cultural artifacts. The intrapsychological plane refers to the process of appropriation, reconstruction and internalization of resources by individuals to regulate their own activities (Johnson & Golombek, 2003). Internalization doesn't mean simply appropriating concepts, knowledge or skills from the outside in (Johnson, 2009). According to Bruner (as cited in Lee & Smagorinsky, 2000), learning on the interpsychological plane usually involves mentoring provided by more culturally knowledgeable persons to the less knowledgeable persons through the process called *scaffolding* According to Johnson (2009), scaffolding in Vygotskian sense, is a psychological tool that helps to reduce the cognitive load to perform a certain task. This negotiation and creation of meanings through collaboration is crucial for higher mental functions in sociocultural theory since the gap between the interpsychological and intrapsychological planes is bridged through this collaborative act (Turuk, 2008).

Finally, the *Zone of Proximal Development (ZPD)* is perhaps the best known tenet of the sociocultural theory. In contrast to Piaget's developmental stages that document how individuals make sense of experiences according to their ages, Vygotsky (1962) believed that there is a zone of proximal development and children can outperform beyond their current developmental stage throught the help of an adult. This term is defined as "the distance between the actual level of development as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p.86).

The ZPD captures all the fundamental concepts of sociocultural theory. More precisely, through mediational means, transition from interpsychological level to intrapsychological level takes place within the ZPD. The concept implies that a learner can perform beyond his/her current ability level if supported appropriately. It also suggests that the responsibility of the teachers is to assess the learners' ZPD and provide guidance in the area where improvement will take place. Murray and Arroyo (2002) stated that the tasks should be challenging but not overwhelming. If learning materials are too difficult or easy, students get bored or frustrated. Therefore, the quality of mediation is of crucial importance for the internalization to take place. The ZPD actually shows us the inherent interconnectedness of the cognitive and the social (Johnson, 2009).

In the context of pre-service teacher education, student teachers' zone of proximal development can defined as a space between their naive and maturing understanding about teaching with the support of appropriate mediational means. Teacher educators, mentors, peers, courses in teacher education programs, technology tools, action research, reflective journals, theoretical readings, practicing opportunities etc. can all be suggested as sources for stimulating student teachers' higher-level cognitive development. However, the important thing here is the employment of these mediational tools in a strategic and goal-oriented way (Johnson, 2009). Sociocultural theory has not only expanded our understanding about human cognition in general but it has also provided profound implications for language teacher education. According to Johnson (2006), many factors have advanced our understanding about the field of language teacher education; yet none has been more influential than teacher cognition research given that it provided insight into the complex nature of learning-to-teach process. However, the way how teacher cognition is perceived has also changed. With the shift from behaviorist stance to a sociocultural view on learning, it has come to be recognized that the cognitive and the social is inherently interconnected and teacher cognition originates in and is directly influenced by the social activities they take part in. In other words, it has been understood that teachers' prior learning experiences, their understanding about the activities they are involved in and the contexts in which they have experiences regarding teaching and learning do have a great impact on how and why they do what they do.

2.7.3. Principles of Constructivism

As aforementioned, there are many varieties of constructivism and according to many in the field (e.g. Berk & Winsler, 1995; Cobb, 2005; Ernest, 1995), it will be a waste of time to focus too much on differences between all the variants of constructivism since there are salient characteristics common among most.

There is a number of list of constructivist principles that can provide a framework in the design of learning environments suggested by various theorists and researchers (e.g. Brooks & Brooks, 1993; Doolittle, 1999, 2001; Duffy & Savery, 2001; Fosnot & Perry, 2005; Gagnon & Collay, 2001; Honebein, 1996; Lebow, 1993; Jonassen, 1991) which can be summarized as in Table 1.

Table 1

Core Principles of Constructivism

(Brooks&Brooks, 1999, p. 33)	●Posing problems of emerging relevance to students. ●Structuring learning around primary concepts; ●Seeking and valuing students' points of view; ●Adapting curriculum to address students' suppositions; ●Assessing student learning in the context of teaching.
(Honebein, 1996, p. 11-12)	●Provide experience in and appreciation for multiple perspectives ●Embed learning in realistic and relevant contexts ●Encourage ownership and voice in the learning process ●Embed learning in social experience ●Encourage the use of multiple modes of representation ●Encourage self-awareness in the knowledge construction process.
(Lebow,1993, p.5-11)	●Maintain a buffer between the learner and the potentially damaging effects of instructional practice ●Provide a context for learning that supports both autonomy and relatedness ●Embed the reasons for learning into the learning activity itself. ●Support self-regulated learning by promoting skills and attitudes that enable the learner to assume increasing responsibility for the developmental restructuring process ●Strengthen the learner's tendency to engage in intentional learning processes, especially by encouraging the strategic exploration of errors.
(Duffy&Savery, 2001, p.3-7)	●Anchor all learning activities to a larger task or problem. ●Support the learner in developing ownership for the overall problem or task ●Design an authentic task. ●Design the task and the learning environment to reflect the complexity of the environment they should be able to function in at the end of learning ●Give the learner ownership of the process used to develop a solution. ●Design the learning environment to support and challenge the learner's thinking ●Encourage testing ideas against alternative views and alternative contexts. ●Provide opportunity for and support reflection on both the content learned and the learning process.
(Jonassen, 1991, p.11-12)	●Create real-world environments that employ the context in which learning is relevant ●Focus on realistic approaches to solving real-world problems ●The instructor is a coach and analyzer of the strategies used to solve these problems ●Stress conceptual interrelatedness, providing multiple representations or perspectives on the content ●Instructional goals and objectives should be negotiated and not imposed ●Evaluation should serve as a self-analysis tool ●Provide tools and environments that help learners interpret the multiple perspectives of the World ●Learning should be internally controlled and mediated by the learner.
(Doolittle, 2003, p. 86)	●The construction of knowledge and the making of meaning are individually and socially active processes ●The construction of knowledge involves social mediation within cultural context ●The construction of knowledge is fostered by authentic and real-world environments ●The construction of knowledge takes place within the framework of the learner's prior knowledge and experience ●The construction of knowledge is integrated more deeply by engaging in multiple perspectives and representations of content, skills, and social realms ●The construction of knowledge is fostered by students becoming self-regulated, self-mediated, and self-aware.
(Gagnon & Collay 2001, p.6)	●Learners think individually to make personal meaning of learning events. ●Learners think collaboratively to make shared meaning of learning events. ●Learners connect their prior knowledge and previous experiences to learning events. ●Learners pose question and respond to questions about learning events. ●Learners present their thinking about learning events to others. ●Learners reflect on their collective and individual thinking during learning events.
(Fosnot & Perry 2005, p.33-34)	●Learning requires invention and self-organization on the part of the learner. ●Disequilibrium facilitates learning. ●Reflective abstraction is the driving force of learning. ●Dialogue within a community engenders further thinking. ●Learning is the result of activity and self-organization and proceeds towards the development of structures.

In addition, the theory of andragogy, the theory of conceptual change, ISTE standards and teacher cognition research are paid particular attention to provide a sound basis for the study, and comprehend the multi-faceted and complex nature of learning-to-teach with technology.

2.7.4. Andragogy

Although how adults learn has been a matter of concern since 1920s (Merriam, 2001), it was Malcolm Knowles that popularized the concept of andragogy in 1968. The term is defined as "the art and science of helping adults learn" (Knowles, 1980, p.43). The theory suggests that adults have different learning characteristics than children since they enter higher education programs with a wealth of experiences and special traits. Therefore, educators should not provide instruction to adult learners in the same way they do with children (Knowles, 1984).

Initially, Knowles (1973) proposed four assumptions about adult learning. He added two more assumptions in 1983 and 1998 in order. Knowles, Holton and Swanson (1998) define them as key principles applicable to all adult learning environments. His model includes the following six principles: (a) the learner's need to know, (b) self-directed learning, (c) the role of learners 'experiences, (d) readiness to learn, (e) orientation to learning and problem solving, (f) motivation to learn.

The need to know: Adults want to learn why they need to learn something. Knowles et al. (1998) suggest that adult learners should be provided with the purpose behind learning new content. They should be made conscious about the advantages and disadvantages of learning something since it will influence the amount of effort they will put in learning it.

The learner's self-concept: As individuals mature, they need to take more control in organizing their learning. The educators' treatment of adult learners as children creates a serious problem in their education. Therefore, facilitators should respect to adult learners' self-concept and provide a learning environment which allows learners to assume ownership of their learning (Knowles et al., 1998).

The role of the learners' experiences: Adults come into learning environments with years of experiences, beliefs, biases and habits which have a major impact in shaping adults' learning. They can either provide rich sources or have negative effects for adult learning. Therefore, teachers of adult learners should elicit these experiences and if they have the

potential to lead positive outcomes, educators of adults use them as a foundation upon which adults will construct new knowledge; but if they are likely to inhibit learning new content, educators should encourage adult learners to examine their beliefs and habits to open their minds for more scientific understandings.

Readiness to learn: Adult learners become ready to learn in order to meet their needs. Educators of adult learners should not wait passively for adult learners to be ready to learn; rather "their readiness to learn may be stimulated by helping them to assess the gaps between where they are now and where they want and need to be (Knowles et al., 1998, p.294).

Orientation to learning: Adult learners' orientation to learning is life-centered rather than subject-centered. In other words, adult learners prefer problem-solving-centered, relevant and meaningful learning activities which will enable them to cope with real-life situations. For this reason, educators should provide adult learners with activities which enable them to apply what they learn to an issue of personal relevance (Knowles et al., 1998).

Motivation to learn: Adults are motivated to learning through both external and internal motivators. However, Knowles et al. (1998) presume that internal motivators (e.g. the desire for increased job satisfaction, self-esteem, quality of life) are the most potent ones. Wlodowski (as cited in Knowles et al., 1998) suggested that adults' motivation was contingent upon four factors which are success, volition, value and enjoyment. Now that andragogy predicated that the internal motivation have a more profound impact on learning to take place, then adults should be provided with knowledge they will see a value in learning it.

Based on these assumptions, we infer that adults learn different than children given that adult learners need to know the rationale of learning something and they look for autonomy, authenticity, relevance, applicability and value in learning something new. In addition, Knowles (1998) acknowledged that many of these core principles also apply to children given that activities that require inquiry, critical thinking, real-life application and collaboration enhance not only adults' learning but also children's.

Consequently, the assumptions of the andragogy model must be considered in the design of learning environments in teacher education programs to prepare student teachers better for the future. Eventually, we can expect them to be effective teachers if they receive effective education.

2.7.5. The Conceptual Change Theory

When student teachers enter teacher education programs, they are already familiar with the processes of learning and teaching. According to Britzman (as cited in Chong, Ling & Chuan, 2011), student teachers' cumulative school experiences serve as a frame of reference that shapes their images of teachers. As such, it is often these incomplete conceptions and images which form the basis on which student teachers builds what they learn in their professional preparation courses (Kagan, 1992). It is thus suggested that one of the roles of teacher education programs should be to help student teachers develop a more sophisticated understanding concerning the processes of language teaching and learning.

In that sense, many scholars (Lee, 2004; Posner, Strike, Hewson & Gertzog, 1982; Pajares, 1992; Kagan, 1992; Tillema & Knol, 1997; Philippou & Christou, 2002; Woolfolk Hoy, Davis & Pape, 2006; Mezirow, 1997; Duit & Treagust, 2003; Thompson & Zeuli, 1999) put forward the strategy of creating cognitive dissonance to challenge student teachers' immature beliefs. Based on the notion of creating cognitive dissonance, the conceptual change theory (Posner et al., 1982; Strike & Posner, 1992) can be offered to be integrated into teacher education programs. Although much of the work has been carried out in the area of science education, the theory of conceptual change has also been applied in pre-service teacher education (Ho, Watkins & Kelly, 2001; Knowles & Holt-Reynolds, 1991; Liljedahl, 2010; Rolka, Rösken & Liljedahl, 2006; Rolka, Rösken & Liljedahl, 2007; Tillema, 2000; Tillema & Knol, 1997) given that student teachers come to teacher education programs with simple conceptions and personal theories about the teaching/learning processes.

This model takes its roots from developmental psychology, cognitive psychology and social constructivism (Appleton, 1997). The theory implies that learners' conceptions and beliefs should be challenged by alternative conceptions to make them aware about the discrepancies and anomalies in their pre-existing knowledge, skills and beliefs in order to create dissatisfaction and cognitive dissonance in them. This dissonance stimulates a reaction in learners concerning their existing conceptions. Learners either maintain or alter them. More precisely, Posner et al. (1982) theorized that creating cognitive dissonance is preliminary to change the status quo in students 'existing conceptions and there are four conditions to be met for conceptual change to take place: becoming dissatisfied with

current conceptions, finding the new conception intelligible, understanding the plausibility of the new conception and recognizing the fruitfulness of the new conception. These stages can be described in detail as follows:

- There must be dissatisfaction with current conceptions: Learners must see the inadequacy of their existing conceptions to solve the problems they confront in order for cognitive change to take place.
- A new conception must be intelligible: Learners must be able to make sense of the new conception. They must understand what possibilities are inherent in the new conception to solve the problems they meet.
- A new conception must appear plausible: The new conception must be consistent with other well-established beliefs and must show its potential in dealing with the unsolved problems that are not overcome by existing conceptions.
- A new conception must be fruitful: Learners must see the new conception as a productive tool which can do more than it does with the current problems.
- Based on the tenets of constructivist theories, this model should be integrated into teacher education programs given that it can help teacher educators to challenge student teachers' oversimplified views about the teaching and learning processes.

2.7.6. Standards for Technology Integration in Teacher Education

International Society for Technology in Education (ISTE) is a globally-recognized professional education organization that provides teachers and students with guidelines for the knowledge and skills they need to have for the effective use of technology in teaching and learning. ISTE (2008) recommends five standards to be attained by teachers to ensure technology integration. The first standard is "Facilitate and inspire student learning and creativity" which means that teachers need to integrate their knowledge of subject matter, teaching and learning, and technology to enhance student learning. This standard suggests modeling, promoting creative thinking and active engagement, offering authentic experiences and providing meaningful learning environments. The second standard of ISTE is "Design and develop digital age learning experiences and assessments" which means that, authentic learning experiences and assessment incorporating contemporary tools and resources. To achieve this standard, teachers should create technology-enriched and learner-centered environments. They should employ both summative and formative

assessment methods to inform learning and teaching. The third standard is "Model digital age work and learning" which means that teachers should demonstrate knowledge, skills and work in concert with global and digital requirements of the modern society. This standard includes fluency with technology systems, collaboration and information exchange with students, peers and parents through digital tools and various types of media and formats and using information resources to support research and learning. ISTE's fourth standard is "Promote and model digital citizenship and responsibility". Here, teachers should model and teach legal and ethical use of digital technology, provide equitable access to digital tools and thus address to diverse needs of students, and increase cultural understanding and global awareness using digital communication tools. The fifth standard is "Engage in professional growth and leadership" which means that teachers should be lifelong learners who continuously improve their professional practice and become models in demonstrating the effective use of digital resources. To attain this standard, teachers should participate in learning communities to discover new and creative ways of using digital tools and resources. They should be leaders in developing others' technology skills and contribute to the renewal of the teaching profession. In addition, they should always self-regulate themselves by evaluating and reflecting on current research in order to make effective use of existing and emerging digital tools. According to ISTE (n.d.), these standards should not be seen as "typical boxes educators need to check". Rather, they should guide as a framework for teachers to prepare their students enter an increasingly technologizing and globalizing world.

2.7.7. Second Language Teacher Education

Second language teacher education is a relatively young field which has witnessed many changes over the past 40 years. Its conceptualization has been influenced by many factors, but none has been "more significant than the emergence of a substantial body of research now referred to as teacher cognition" (Johnson, 2006, p.236).). This research has been influenced by epistemological shifts that led to varying conceptualizations about the way how human beings learn in general and how teachers learn to teach in particular and it, in turn, influenced the activity of teacher education (Johnson, 2006).

Freeman (2002) identified three periods to demonstrate the shift from positivist epistemological perspective to an interpretative epistemological view in language teacher

education. This classification enables one to better understand how teacher cognition has been informed by different intellectual traditions.

In the period prior to mid-1970s, the dominant view was process-product paradigm in teacher education as in general education The major goal of this approach was to identify good teaching behaviors and produce prescriptive knowledge (Freeman & Johnson, 1998). This approach focused on effective teaching behaviors and resulting learning outcomes (Velez-Rendon, 2002). As Anderson, Evertson and Brophy (1979) noted that the primary aim of this research was " to define relationships between what teachers do in the classroom (the processes of teaching) and what happens to their students (the product of learning) " (p.193). In addition, the role of teacher education programs was transmitting knowledge and teacher learning was understood in terms of the mastery of know-what and know-how in those programs.

However, the paradigm shift from behaviorism to cognitivist view in general education began to change the understanding about the practice of teaching as well. In the behaviorist view, teachers' mental lives, their experiences and context did not receive attention. According to Freeman & Johnson (1998), teachers' individual experiences and perspectives were ignored and the complexity of teaching was reduced to a discrete set of behaviors in process-product research paradigm. However, the process-product research was discredited because of viewing the practice of teaching as such a simple process consisting of discovery about which teacher behaviors are effective and how they affect learning outcomes. Influenced by the cognitivist view, researchers rejecting the process-product approach contended that teachers should be seen as active decision makers and learners as active participants in the individual and social construction of knowledge (Fang, 1996). Teachers were no longer seen as implementers of what is prescribed but as thinking decision-makers who construct knowledge in the course of their work (Borg, 2006). With this new conceptualization, teaching was regarded as a "professional" and "thinking activity" (Calderhead, 1987, p. 1). Therefore, the process-product research paradigm gave its way to an interpretative research paradigm, drawn largely from ethnographic research in sociology and anthropology which provides insight about the complexity of teaching practice.

In the mid-1970s, concepts such as teacher planning, teacher judgement and teacher decision-making emerged. These concepts stressed the importance of teachers' thought

processes (Johnson & Freeman, 1998). These areas are significant in that they were the key foci in the emergence of the field of teacher cognition which made the most important contributions to the conceptualization of teachers and teaching in the last 40 years (Borg, 2006; Johnson, 2006).

While the 1970s was a marker of change in how teachers and their mental lives were conceived, 1980s was a very intensive period in terms of research in teacher cognition. Concepts such as teaching as decision-making, importance of teacher beliefs, the hidden pedagogy, the apprenticeship of observation, pedagogical content knowledge all generated during this period (Freeman, 2002). All of these concepts referred to the significant role of context in teacher learning. Context came to be seen no longer simply as physical spaces in which learning and teaching take place (Freeman, 2002).

In the 1990s, the shift from process-product paradigm was almost complete. Unlike 1980s, the focus was mostly on consolidating and deepening understanding about the changes occurred in terms of the mental lives of teachers in the last decade rather than doing empirical research about it. The central role of teachers, their background and early learning experiences, the activity of teaching itself, the role of context in the learning to teach process became established components of our understanding of language teacher cognition (Freeman, 2002).

In light of the discussion above, we can say that behaviorist perspectives on teacher cognition was found to be insufficient in explaining the complexity of teachers' mental lives and gave its way to a sociocultural stance. According to sociocultural view, teacher cognition is shaped by the social activities teachers take part in. This suggests that teachers' prior learning experiences as learners, professional preparation experiences as student teachers and teaching experiences as teachers and the contexts within which these experiences take place influence what they think about themselves, their students and the activities of L2 teaching (Johnson, 2006). In other words, this sociocultural turn informs the research of teacher cognition not only about the what of teaching but also about the who, the where and the how of teaching leading to a growing understanding about the knowledge-base of L2 teacher education.

2.7.8. Teacher Cognition

The shift from behaviorism to constructivism moved away the emphasis from teacher behaviors and student achievement to what teachers know, believe and think. This new field of interest is termed as teacher cognition and refers to "the unobservable dimension of teaching" (Borg, 2003, p.81). Teacher cognition is one of the critical areas of interest in that it changed the way how teachers, teaching and schools were perceived (Freeman, 2002). With this new perspective, teachers were no longer seen as conduits who translate knowledge into practice in classrooms rather we have come to an understanding that teachers are the practitioners who construct "new knowledge and theory through participating in specific social contexts and engaging in particular types of activities and processes" (Richards, 2008, p. 6).

Teacher cognition is shaped by the interplay between schooling, professional coursework, contextual factors and classroom practice (Borg, 2003). Schooling is defined as early learning experiences teachers had as learners, professional coursework as the education teachers receive in teacher education programs, contextual factors as parents, principals, standards implementation, classroom and school conditions etc., and classroom practices as the experiences teachers gain while teaching in actual classrooms. According to Borg (2003), teacher cognition and classroom practices mutually influence each other with contextual factors playing an important role in informing both of them. Teachers' experiences as learners shape their cognition about learning and teaching and some researchers (e.g. Holt & Reynolds, 1992; Borg, 2003) indicate that they may continue to affect teachers throughout their professional lives. In addition, there is a reciprocal relationship between professional education and teacher cognition. It has been suggested that teacher learners' prior beliefs must be taken into account since ignoring them will position teacher education programs as a weak form of intervention in teachers' career (Borg, 2006; Richardson, 1996). Last but not least, teacher cognition takes the central role in the process of teaching and teachers' prior learning experiences and professional education can be seen as precursors that influence its development.

Clark and Peterson (1986) state that teaching process consists of two major domains-teachers' thought processes and teachers' actions. Studies of teacher cognition focus on the thought processes of teachers (Ellis, 2006). According to Clark and Peterson (1986), research about teachers' thinking can be classified into three categories: teacher planning,

teachers' interactive thoughts and decisions, and teachers' theories and beliefs. They further maintained that teachers' theories and beliefs constituted the smallest and youngest part of the research on teachers' thought processes thus far. However, this final category has received particular interest among researchers because the findings of several studies have shown that planning, decision-making processes and teacher behaviors are directly influenced by teachers' beliefs (Borg, 2011; Farrell & Lim, 2005; Johnson, 1994; Kagan, 1990; Nespor, 1987; Nisbett & Ross, 1980; Pajares, 1992; Richardson, 1996; Woods, 1996). Since beliefs underlie teachers' thought processes and actions, examining student teachers' beliefs must be the first step in teacher education programs. Therefore, the current investigation centers on student teachers' beliefs and because the purpose of the study is concerned with the process prior to classroom practice, the relationship between beliefs, early educational experiences and professional coursework will be discussed in detail.

2.7.9. Teacher Beliefs

A move away from behaviorist view to constructivist perspective brought about growing understanding about the practice of teaching. Focus on observable teacher behaviors and the influences of these on learning outcomes gave its way to understanding teachers' thought processes. In the mid-1970s, the research was concerned with teachers' planning and decision-making which form the first two categories of teachers' thought processes (Clark & Peterson, 1986). However, the research on these areas fell short of explaining the reasons why teachers act the way they do and inquiries into teachers' knowledge and beliefs commenced in the late 1980s in order to analyze the underlying reasons of teachers' actions in classrooms (Zheng, 2009). Shulman (1986) drew attention to the neglect of subject matter knowledge among various research paradigms in the study of teaching and he referred the lack of interest in subject matter as "missing paradigm". Several studies were carried out regarding teachers' subject matter knowledge; however, research has shown that knowledge, by itself, cannot explain the complexity of the practice of teaching and investigations about teachers' beliefs gained increasing significance (Zheng, 2009). Therefore, having an in-depth understanding about teacher beliefs has been of crucial importance since they act as a filter through which new information about teaching and learning is screened for meaning and put into practice in classrooms. Munby (1982) stated that there is a need for more research because inquiry into this topic is central to a more

complete and useful understanding of thought processes in teaching. Pajares (1992) indicated that beliefs are the best indicators of teachers' decisions, planning and classroom practices. Indeed, research has demonstrated that beliefs influence and shape teachers' thinking and actions (Hancock & Gallard, 2004; Nunan, 2004; Pajares, 1992; Richards, 1998; Shavelson & Stern, 1981; Thompson, 1992). Considering these premises, beliefs were seen as the most valuable psychological construct for teacher education (Fenstermacher, 1979; Pajares, 1992; Pintrich, 1990).

Although beliefs lie at the very heart of teaching (Kagan, 1992), there is no consensus on the term "belief" and on its definition. There is plentitude of terms in the area of teacher cognition to refer to the concept of beliefs such as attitudes, perceptions, conceptions, implicit theories etc. (Pajares, 1992).

There are also numerous definitions for beliefs proposed by several researchers. Below are some of them:

"any simple proposition, conscious or unconscious, inferred from what a person says or does, capable of being preceded by the phrase 'I believe that….'" (Rokeach, 1968, p.113)

"…. the information, attitudes, values, expectations, theories, and assumptions about teaching and learning that teachers build up over time and bring with them to the classroom" (Richards, 1998, p.66)

"a belief system is a set of conceptual representations which signify to its holder a reality or given state of affairs of sufficient validity, truth or trustworthiness to warrant reliance upon it as a guide to personal thought and action" (Harvey, as cited in Zheng, 2009, p.74).

"belief speaks to an individual's judgment of the truth or falsity of a proposition, a judgment that can only be inferred from a collective understanding of what human beings say, intend, and do" (Pajares, 1992, p. 316).

"Teacher belief is broadly defined as tacit, often unconsciously held assumptions about students, classrooms, and the academic material to be taught" (Kagan, 1992, p.62)

"beliefs are thought of as psychologically held understandings, premises and propositions about the world that are accepted as true by the individual holding the belief" (Richardson, 1996, p.103).

"a belief is a proposition which may be consciously or unconsciously held, is evaluative in that it is accepted as true by the individual, and is therefore imbued with emotive commitment; further, it serves as a guide to thought and behavior" (Borg, 2001, p.186).

"beliefs are permeable and dynamic structures that act as a filter through which new knowledge and experience are screened for meaning" (Zheng, 2009, p. 74)

As can be seen, a generally accepted definition of beliefs is lacking and it is a broad term, thereby, Pajares (1992) pointed out the importance of narrowing down the scope of the term "belief" and make a distinction between different types of beliefs. Accordingly, we will investigate student teachers' beliefs about the role of technology in language teaching.

2.7.9.1. Sources of Beliefs

Beliefs are dynamic structures and they bulid up over time. They are influenced and shaped by different factors. Richardson (1996) notes three major sources with regard to the formation of beliefs which are personal experiences, experiences with schooling and instruction and experiences with formal knowledge.

2.7.9.1.1. Personal Experiences

Personal experiences refer to the aspects of life that shape one's view of the world, of self, of culture, of society and of schooling which in turn affect their beliefs about learning to teach and teaching. The case study of Clandinin and Connelly (1991) is an example on this topic that has found the influence of personal experience on teaching practice. They worked with an elementary teacher who grew up in a tightly knit community. Their research showed that his upbringing in such a community had affected his image of teaching and his approach to involve the community in his school (Richardson, 1996).

2.7.9.1.2. Experiences with Schooling and Instruction

Schooling experiences are regarded as a key factor in shaping student teachers' beliefs about teaching profession (Borg, 2006; Darling-Hammond, 2006; Johnson, 1994; Lortie, 1975; Nespor, 1987; Pajares, 1992; Reeves, 2009; Richardson, 1996) given that student teachers spend at least 12 years in elementary and secondary schools as students during which they form "guiding images" about teaching and "intuitive screens" through which they make sense of their professional experiences (Goodman, 1988). That is to say, student

teachers do not enter teacher education programs tabula rasa rather they bring with them preconceptions about the practice of teaching when they begin their professional preparation. Their experiences as learners influence their conceptualization about what it means to teach and learn. Lortie (1975) explains this phenomenon with the term apprenticeship of observation. He asserts that student teachers spend approximately 13.000 hours observing their teachers prior to receiving their formal professional education and it is during this apprenticeship of observation that they form mental structures on almost all aspects of the teaching profession (Borg M., 2004; Freeman, 1992; Freeman & Johnson, 1998; Holt & Reynolds, 1992; Phipss & Borg S., 2009). Numerous studies (e.g. Bailey et al., 1996; Farrell, 1999; Johnson, 1994; Numrich, 1996; Murphy & Mason, 2006; Zheng, 2009) supported Lortie's findings which demonstrated that student teachers' prior learning experiences strongly influence their images of teachers, students, activities etc. Johnson (1999), for instance, stated that these experiences form the basis of our images about teachers and learners, and they provide a foundation by which we justify our teaching practices. However, it has been reported that student teachers are not aware of the influence of their preprogram beliefs on their conception of teaching profession. According to many in the field (e.g. Decker & Rimm-Kaufman, 2008; Holt-Reynolds, 1992, 2000; Pajares, 1992; Raths, 2001; Richardson, 1996; Stuart & Thurlow, 2000; Tillema, 2000; Woolfolk Hoy et al., 2006) student teachers have incomplete and traditional views of teaching when they set foot in teacher education programs which may impede new learning. Wall (2016), for instance, indicated that most of the student teachers have robust perceptions that support the traditional techniques of transmissive learning and these exisiting pre-conceptions act as an obstacle in the path of implementing more student-centered theories.

Many scholars in the field thus argue that student teachers' pre-existing beliefs about teaching must be brought to a level of conscious awareness (Bailey et al., 1996; Farrell, 1999; Freeman & Johnson, 1998; Kagan, 1992; Minor et al., 2002; Raths, 2001; Yost et al., 2000) and their false assumptions about the practice of teaching must be eliminated (Darling-Hammond, 2006; Zheng, 2009). At this point, teacher education programs have a great responsibility in making student teachers aware of the influence of their prior cognitions on their conception of teaching since what student teachers will learn in teacher education programs will compete with their long-held beliefs and images (Farrell, 2006). Collectively, these studies outline a critical role for teacher education programs in taking

student teachers' pre-existing beliefs into consideration because ignoring them "is likely to hinder the internalization by teachers of the new ideas they are exposed to and practice they are encouraged to adopt" (Borg, 2006, p.54).Therefore, student teachers' pre-existing cognitions must be integrated into the curricula of teacher education programs appropriately in order to increase the effectiveness of these programs.

Student teachers enter teacher education programs with long-held beliefs about schools, classrooms, teachers, students, pedagogical practices. According to Knowles and Holt-Reynolds (1991) student teachers have opinions about almost all topics or concepts that teacher educators plan to teach. Prospective teachers' beliefs act as filters in interpreting the content of the formal professional courses and exert a significant power on what student teachers acquire from teacher education programs. Therefore, teacher education programs should not disregard student teachers' prior cognitions given that they are expected to play a key role in changing prospective teachers 'underdeveloped perceptions about their profession. According to Kennedy (1999), teacher education programs act as a bridge between student teachers' past and future and they are therefore well situated to change student teachers' incomplete images of teaching. If these preconceptions are not surfaced and acknowledged during pre-service education, Darling-Hammond (2006) indicates that student teachers may fail to understand what they learn in teacher education programs and develop required skills thoroughly.

Considering all of this evidence, it is concluded that student teachers draw on their pre-existing schemata while interpreting new experiences. Thus, teacher preparation programs are of crucial importance in understanding the part of the "iceberg" beneath the surface and making student teachers' lay-theories explicit is essential to challenge and change their beliefs about teaching. Nevertheless, views on the influence of pre-service teacher education courses on student teacher beliefs are contradictory. While some studies (e.g. Almarza, 1996; Burke, 2006; Kagan, 1992; Kunt & Özdemir, 2010; Pajares, 1992; Peacock, 2001; Urmston, 2003) indicate that teacher education programs are weak interventions that hardly have any impact on student teachers' beliefs attributing to the rigidity and stability of them, other studies (e.g. Borg, 2011; Cabaroğlu & Roberts, 2000; Debreli, 2012; Farrell, 2006; MacDonald et al., 2001; Mattheoudakis, 2007; Raths, 2001; Richards, 1998; Richards, Ho & Giblin, 1996; Wilkins & Brand, 2004; Yaman, 2010) have shown that teacher preparation programs can influence teacher candidates' beliefs. As teacher education programs act as a bridge between past and future of student teachers and

they are expected to lead the teacher to come to an understanding about his or her own beliefs and develop them (Smith, as cited in Bailey et al., 1996), Cabaroğlu and Roberts (2000) suggest the impact of teacher education programs on student teachers' beliefs should be viewed with caution. They contend that teacher education programs are not an end but a beginning in student teachers' professional lives and the contention that beliefs remain unchanged in teacher preparation programs might be due to shortcomings in those programs. For example, Kagan (as cited in Cabaroğlu & Roberts, 2000) put forward that no systematic effort can be found in teacher education programs to make student teachers' beliefs explicit. Along similar lines, Lee (2015) stated that the study carried out by Wideen et al. showed us that the low impact of teacher education programs results from the widely adoption of the technical-rationalist model in teacher education programs. Lee (2015) further maintained that if student teachers' beliefs are not challenged deliberately with appropriate pedagogical strategies, it is highly possible that student teachers draw on their traditional views of teaching when they face difficulties in their future classrooms. It is therefore essential that student teachers' beliefs should gain publicity in the design of teacher education programs. Then, how can teacher educators surface and challenge student teachers' preprogram beliefs that may interfere with student teachers' interpretation about the content of their professional preparation courses? The research on this area acknowledges that belief change can take place through the combination of constructivist practices and based on the related literature, we infer that what can be done to promote belief change in student teachers can be grouped under five main categories: providing awareness-raising opportunities (Bransford et al., 2005; Kagan, 1992; Mattheoudakis, 2007; Murphy & Mason, 2006; Nespor, 1987; Pajares, 1992; Stuart & Thurlow, 2000) , creating cognitive dissonance (Kagan, 1992; Lee, 2004; Mezirow, 1997; Pajares, 1992; Philippou & Christou, 2002; Posner, Strike, Hewson & Gertzog, 1982; Thompson & Zeuli, 1999; Tillema & Knol, 1997; Woolfolk Hoy et al., 2006) providing experiences for practice (Albion & Ertmer, 2002; Doyle, 1997; Ertmer, 2005; Richardson, 1996), enhancing collaboration (Borko & Putnam, 1996; Ertmer et al., 2003), and promoting reflection (Borg, 2011; Freeman, 1991; Mattheoudakis, 2007; Murphy & Mason, 2006; Richards & Lockhart, 1994; Richardson, 1996; Zheng, 2009). Texts and class discussions (Murphy & Mason, 2006) can be added as further suggestion that can help sustain change process. To sum up, although there are doubts about the impact of teacher education programs on changing student teachers' beliefs, we are of the opinion that it is mostly

related with the quality of teacher education programs. These programs are located between student teachers' prior learning experiences as learners and their future experiences as teachers (Kennedy, 1999) and they are well situated to alter student teachers' oversimplified ideas of teaching. Von Glasersfeld (1993) advocates that if student teachers are encouraged to apply constructivist theories, they get enthralled within a short time. For this reason, teacher education programs should provide student teachers with experiences where their beliefs are challenged and constructivist strategies are implemented in order to optimize their impact on student teachers.

2.7.10. Reconceptualizing the Knowledge Base of Second Language Teacher Education

There have been many changes in the field of L2 teacher education over the past 40 years. With shifting epistemologies, the conceptualization of the knowledge base of language teacher education has also changed both in terms of content and delivery.

Historically, the knowledge base of second language teacher education has been grounded in the positivist epistemological stance (Graves, 2009). According to this paradigm, the role of teacher education programs was providing student teachers with knowledge about language and language learning and knowledge about classroom teaching skills and pedagogic issues (Richards, 2008). The role of student teachers was viewed as receiving what they were transmitted and applying what they received in different contexts (Freeman & Johnson, 1998).

However, the shift towards an interpretative epistemological perspective and research on teacher learning, teacher cognition, the role of reflection, pedagogical content knowledge, teacher professional knowledge, personal and practical knowledge, the role of prior learning experiences and the role of context has led to the reconceptualization of the knowledge base of L2 teacher education (Crandall & Christison, 2016). The relevance of the traditional knowledge-base of the field derived from other disciplines was questioned and a new orientation which focuses on the centrality of the work of "teaching" itself in teacher education programs has been recognized. Thus, a number of proposals have been made about the content of the knowledge base of language teacher education (e.g. Day, 1993; Richards, 1998). With their seminal article "Reconceptualizing the knowledge-base of language teacher education", Freeman and Johnson (1998) proposed a different view of

what constitutes the knowledge-base of L2 teacher education. They posited that the knowledge-base of the SLTE must not only include the mastery of know-what and know-how, it must also account for the activity of teaching itself, the teacher who does it, the context in which it is done and the pedagogy by which it is done. Accordingly, Richards (2008) suggested that course work in areas such as reflective teaching, classroom research, and action research should form the main parts in the curriculum of teacher education programs.

These changing perspectives have also led to changes in the form of delivery. In the positivistic epistemological view, the knowledge transmission model was prevailing. Student teachers were expected to receive what they were transmitted by sages on the stages and apply what they learnt in the classrooms. However, research has shown that teachers generally fail to translate knowledge and theories into practice in their classrooms. Therefore, a shift towards a sociocultural perspective has taken place in SLTE. With this new perspective, situated and social nature of teacher learning was emphasized (Richards, 1998). With sociocultural perspectives, it has been conceptualized that teachers are not passive recipients of transmitted knowledge and skills rather they are active producers of that knowledge in their own learning to teach process (Crandall, 2000; Richards & Nunan, 1990). Then, how should teacher education programs prepare student teachers to understand the nature of practitioner knowledge? Freeman (2002) contends that teacher education programs must teach teacher learners "the skills of reflectivity and it must provide the discourse and vocabulary that can serve participants in renaming their experience" (p.11).

These shifting conceptualizations about the practice of teaching, teachers and the role of teacher education programs have consequently led to a reconsideration of the models that shape the knowledge-base of L2 teacher education.

2.7.11. Teacher Education Models

The move toward social views on teacher learning has changed understanding about the professional preparation of student teachers. Grounded in the positivist paradigm, early models of teacher education envisaged the process of learning to teach as imitating or modeling the practices of others. However, changing trends have demonstrated that teachers construct their own knowledge of teaching through engagement in classrooms as

students, as teacher learners in teacher education programs and as practitioners in classrooms (Johnson, 2009). It has thus been widely accepted that teacher education programs must go beyond equipping student teachers with prescribed skills and predetermined knowledge; rather professional preparation courses must provide them with opportunities to understand the reasons behind their actions.

Historically, three major models have been influential in the professional education of L2 teachers. They are the craft model, the applied science model and the reflective model (Wallace, 1991).

2.7.11.1. The Craft Model

Based on the traditional knowledge transmission approach, this model supports the idea that student teachers can learn to teach by imitating what experienced professional practitioners do. That is, student teachers study with expert teachers, they are provided with practical tips and good models of teaching, and then they practice what they have learnt over and over again until they reach professional competence.

2.7.11.2. The Applied Science Model

The applied science model is defined as probably the most prevalent model underlying most teacher education programs. In this model, student teachers are informed about the findings of scientific knowledge and experimentation by academics or researchers and they are expected to apply them when they teach in classrooms. When needed, periodic-updating is done by experts and teachers practice the updated knowledge. As a result, it is assumed that professional competence is achieved by teachers.

Nevertheless, the craft model and the applied science model have been discredited for some reasons. Having transmissive-oriented perspectives, both models hold an oversimplified view about learning to teach. Student teachers are seen as passive recipients of what is transmitted in teacher education programs and they are expected to apply what they learn in their classrooms. The role of context and teachers' mental lives are disregarded. If teachers fail to get results that conform to research findings or cannot apply what experts show, then it is conceived as a failure on teachers' part.

As to the specific criticisms about each model, the craft model has been questioned about the competency level of experts and it has been a matter of concern whether experts are

doing what they are saying. The applied science model has been criticized as its basic assumption that providing student teachers with scientific knowledge will be adequate for the learning to teach process has widened the gap between theory and practice.

Considering the shortfalls of both models, Wallace (1991) suggested the reflective model which emphasized not only the know-what and know-how of teaching but also the context and teachers' thought processes.

2.7.11.3. The Reflective Model

Referring mainly to the studies of Schön (1983, 1987) who pointed out that learning is dependent upon the integration of experience with reflection and of theory with practice (Humphreys & Susak, 2000), Wallace (1991) proposed the reflective model which draws attention not only to experience but also to scientific knowledge. He further stated that teacher education should be based on two types of knowledge which are received knowledge and experiential knowledge. Received knowledge refers to research findings, data, and theories associated with the field of second language teaching and it can be gained through courses such as linguistics, TEFL methodology, educational management and administration etc. Experiential knowledge, on the other hand, refers to the professional's ongoing experience and derives from knowing-in-action and reflection. Knowing-in-action relates to what student teachers bring to the training process. The reflective model emphasizes that student teachers do not come to teacher education programs with blank minds; rather they have pre-existing cognitions about the practice of teaching, the role of teachers and learners, types of activities etc. because they spent almost 12 years in educational settings before they start receiving their professional education. Reflection pertains to bringing these unconsciously stored cognitions to the surface. According to this model, the effectiveness of professional courses is contingent upon quality reflecting on what is practiced. The reflective model suggests that teacher education programs should ensure that the relationship between the received knowledge and experiential knowledge is reciprocal. Student teachers should be provided with experiences through which they can apply received knowledge so that such experiences can feed back into their received knowledge upon reflection.

To sum up, in line with the sociocultural views of learning, the reflective model not only addresses to disciplinary knowledge but also to teachers' thought processes and the

importance of context. It regards student teachers as active agents in their learning to teach processes that develop their own theories through practicing and reflecting.

CHAPTER 3

METHODOLOGY

This chapter provides detailed information about research design, context and participants, data collection, implementation process, data analysis, and validation of the study.

3.1. Research Design

A mixed methods research design was adopted in this study. Sandelowski (2000) stated that combinations in the mixed-method studies occur either at the method level or technique level. Combinations at the method level can be used to increase the scope of a study. Likewise, Wolfer (1993) stated that different methodologies are used for different aspects of reality. Sandelowski (2000) noted that the technique level is the site where most discussions about combinations in mixed-method research take place. This level encompasses combinations regarding the techniques of sampling, data collection and data analysis perceived as qualitative and quantitative. Accordingly, Newby (2010) pointed out that mixed method research design seeks to combine both quantitative and qualitative traditions because research issues in education are often complicated and in order to gain a better understanding about a phenomenon both approaches are required. Strauss and Corbin (as cited in Dornyei, 2007) stated that the issue in mixed methods research design is not whether to use qualitative or quantitative form of research but rather how these two forms of research interact to enhance the development of theory. According to Dörnyei (2007), mixed methods research improves the validity of research and increases the generalizability of the results.

Creswell (2012) stated that there are six forms of mixed methods research design:

- the convergent parallel design
- the explanatory sequential design

- the exploratory sequential design
- the embedded design
- the transformative design
- the multiphase design

As to our study, it consisted of two main phases. Combinations occurred both at the method level and the technique level. At the method level, we combined grounded theory method with quasi-experimental research strategy. At the technique level, an array of quantitative and qualitative data collection and analysis techniques were employed. We adopted the multiphase design in our study since we investigated a problem "through an iteration of connected quantitative and qualitative studies that are sequentially aligned, with each new approach building on what was learned previously to address a central program objective" (Creswell & Clark, 2011, p.100). In the multiphase design, there is a set of research questions specific to each phase. All of them contribute to advancing one research objective by building upon what has been found out in previous stages (Creswell & Clark, 2011). The multiphase design embraces all the basic variants of mixed methods research design (i.e. the convergent, explanatory, exploratory and embedded designs) (Creswell, 2012).

In the first phase of the present study, we employed the method of grounded theory. Grounded theory was proposed by Glaser and Strauss in the 1960s. In grounded theory, one doesn't have a theory to test but generate a theory from the data collected and analyzed (Strauss & Corbin, 1990).Strauss and Corbin (1994) state that grounded theory is a general methodology for generating a theory that is grounded in data through constant data collection and analysis processes. The grounded theorist sets out to explore how a certain group of people describe their reality when a gap appears in the existing knowledge or when a new point of view is needed (Markey & Tilki, 2014). In grounded theory, data collection and data analysis take place concurrently and the results of the analysis inform what data to collect next (Thornberg & Charmaz, 2014). In Payne's (2007) terms, there is a dynamic interplay between data collection and data analysis. Both qualitative and quantitative methods can be used in grounded theory (Boychuk Dunscher & Morgan, 2004; Cohen, Manion & Morrison, 2007; McGhee, Marland & Atkinson, 2007; Thornberg & Charmaz, 2014).

Since grounded theory was first proposed, it has undergone considerable changes introduced by different grounded theorists. The three prevailing grounded theory traditions are Glaserian grounded theory, Straussian grounded theory and constructivist grounded theory. We took up a stance closer to constructivist grounded theory because Charmaz (2000, 2006, 2008, 2009) extends the former versions of grounded theory by a constructivist worldview. More precisely, she stresses the importance of subjective experiences of the researcher and his/her interaction with the participants and the social world. Charmaz (2006) stated that "… neither data nor theories are discovered. Rather we are part of the world we study and the data we collect.We construct our grounded theories through our past and present involvements and interactions with people, perspective, and research practices" (p. 10).

However, although important differences exist between these models, there is a number of core components of grounded theory approach (Cohen & Manion, 2007; Creswell, 2012; Kenny& Fourie, 2015) listed below and we took all these defining characteristics into consideration throughout the first phase of the present study.

- Theoretical sampling: It refers to the process of ongoing data collection and analysis until theoretical saturation is reached. In other words, the researcher collects data and analyzes it immediately without waiting. The results obtained enable the researcher decide what data to collect next. This process continues until new data doesn't yield new insights for the categories developed (Cohen, Manion & Morrison, 2007; Creswell, 2012).
- Coding Process: It is the first analytic step to interpret the data gathered. According to Charmaz (2006) coding is the bridge between the data collected and the theory generated out that data.
- Constant comparison: In grounded theory, there is an iterating process of analyzing the data and comparing it with new sets of data until theoretical saturation is reached. To generate a theory, a constant comparison between incidents, categories, and incidents and categories is required till there is a perfect fit with all the data (Cohen, Manion & Morrison, 2007; Creswell, 2012)
- A core variable: The researcher identifies a core category to which most of the categories can be related. The researcher uses this core variable as the basis for proposing the theory (Cohen, Manion & Morrison, 2007; Creswell, 2012).

- Theory development: As a result of theoretical sampling, coding process, constant comparison, theoretical saturation, selection of a core variable, the theory grounded in the data emerges. The theory accounts for all the data processed in this process.
- Memo writing: The researcher notes down all his/her ideas, thoughts, comments, reflections, evaluations, and predictions in memos throughout the research process. It acts as a self-reflection tool and helps researchers elaborate on their ideas. They can inform the data collection, data analysis and theory development processes.

In the second phase of the present study, we employed a quasi-experimental design in order to find out whether S-TECHNO model would have an impact on student teachers' Instructional Technological Competence. There are two main types of quantitative research design, experimental designs and non-experimental designs. In the experimental designs, researchers manipulate the processes in a tightly controlled environment, introduce an intervention and measure the difference it makes (Cohen, Manion & Morrison, 2007). Experimental designs differ from non-experimental designs by the key element of control. In non-experimental designs, extraneous influences are not controlled. Experimental research enables one to investigate the causal relationships between variables (Muisj, 2004). In experimental studies, the effect of the independent variable on the dependent variable is observed.

A typical experimental study involves experimental and control groups. To reduce bias, persons are allocated to groups through random assignment. Experimental groups are exposed to "treatment" and the control groups provide a basis for comparison. Progress is measured by administering pre-tests before the intervention and post-tests after the treatment has been completed. Experimental and control groups must be as similar as possible in a true experimental study. However, the random assignment of persons to experimental and control groups is not possible in educational settings. Therefore, researchers employ a quasi-experimental design which is similar to experimental study except for randomization (Dörnyei, 2007).

Muisj (2004) states that in quasi-experimental research, the similarity of experimental and control group is important though it is not likely to get a complete parity. In addition, the pre-test post-test design will be similar to that of experimental study in order to gather as much information as possible to see the independent variable-caused change on the dependent variable. In their study, Heinsman and Shadish found that both experimental and

quasi-experimental studies produced comparable results and the design of quasi-experimental studies can be improved by avoiding from selecting voluntary participants and by equating control and experimental groups on one or more variables (as cited in Dörnyei, 2007).

In our quasi-experimental research design, we assigned treatment and control groups, administered pre-tests to both groups, undertook activities with the treatment group only and then administered post-tests to examine the differences between the treatment and control groups. In this study, the independent variable was the intervention through S-TECHNO model. The dependent variable was student teachers' ITC-technological awareness, beliefs, knowledge and skills. Figure 1 illustrates the research design of the current study

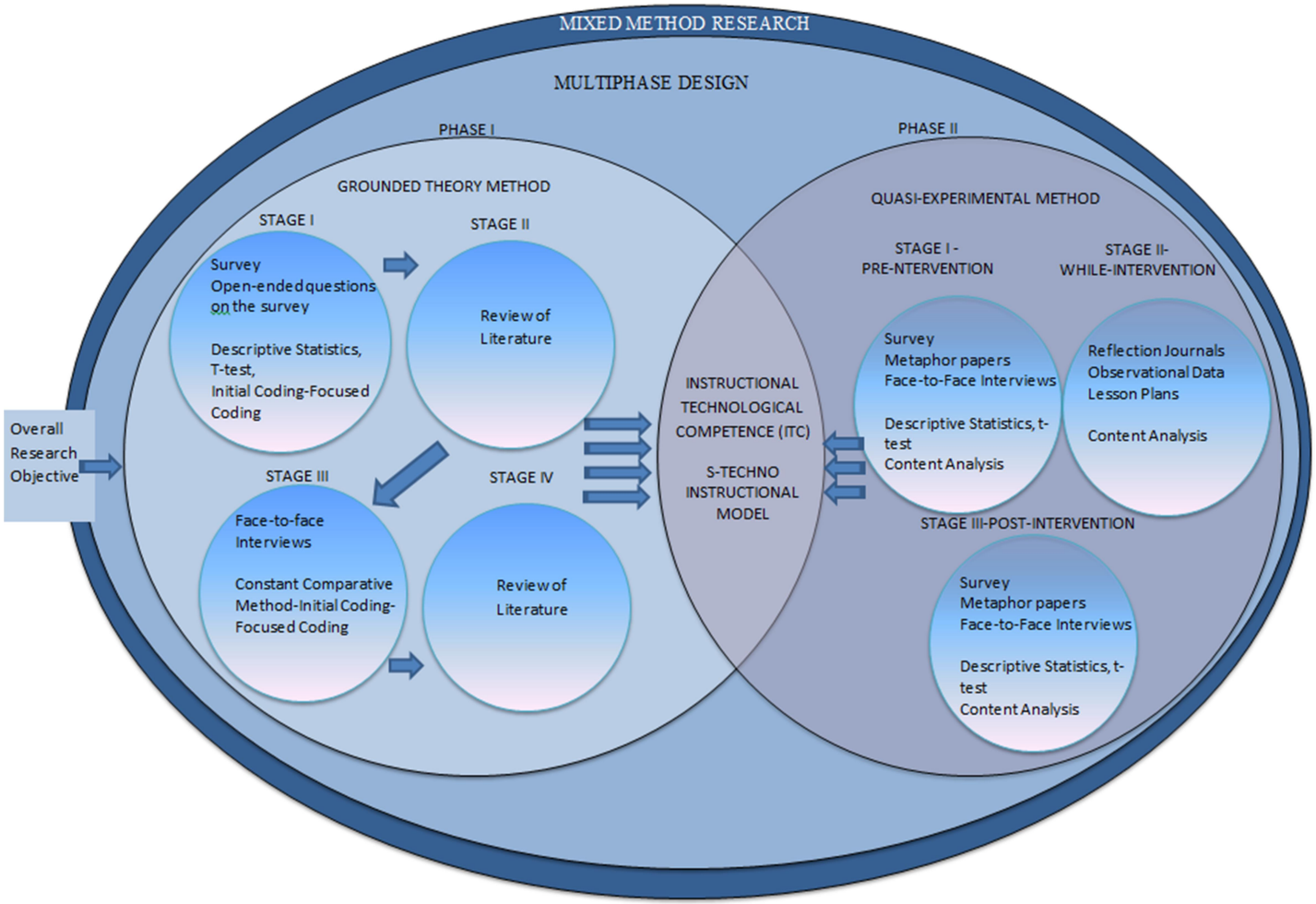

Figure 1. Research Design of the Study

Having explained the research design of the study, I will articulate the research questions and hypotheses of this study phase by phase in the following section.

Phase I

Research Question 1: *What perceptions do student teachers in the ELT programs in Turkey hold about their early learning experiences related to technology?*

1. H_1: There is a difference between student teachers who said technological tools were used in their early learning experiences and who did not say technological tools were used in their in their early learning experiences in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.
2. H_1: There is a difference between student teachers who think their early learning experiences helped them understand the relationship between teaching, learning and technology and who do not think their early learning experiences helped them understand the relationship between teaching, learning and technology in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.
3. H_1: There is a difference between student teachers who think their early learning experiences with technology will help them incorporate technology in their future career and who do not think their early learning experiences with technology will help them incorporate technology in their future career in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Research Question 2: *What perceptions do student teachers in ELT programs in Turkey hold about their undergraduate experiences related to technology?*

4. H_1: There is a difference between student teachers who think the technology-related courses they received were theory-based and who do not think the technology-

related courses they received were theory-based in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

5. H_1: There is a difference between student teachers who think the technology-related courses they received were for acquiring basic skills and who do not think the technology-related courses they received were for acquiring basic skills in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.
6. H_1: There is a difference between student teachers who think the technology-related courses they received were practice-based and who do not think the technology-related courses they received were practice-based in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.
7. H_1: There is a difference between student teachers who think the technology-related courses they received were contextualized for ELT and who do not think the technology-related courses they received were contextualized for ELT in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.
8. H_1: There is a difference between student teachers who think the technology training they received was adequate and who do not think the technology training they received was adequate in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

9. H_1: There is a difference between student teachers who think their teacher training experiences have helped them understand the relationship between teaching, learning and technology and who do not think their teacher training experiences have helped them understand the relationship between teaching, learning and technology in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.
10. H_1: There is a difference between student teachers who think their teacher training experiences have encouraged them to use technology effectively in teaching and learning and who do not think their teacher training experiences have encouraged them to use technology effectively in teaching and learning in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Research Question 3: *What knowledge and skills do student teachers in ELT programs in Turkey have about instructional technologies?*

Research Question 4: *What beliefs do student teachers in ELT programs in Turkey hold about the use of technology in language teaching?*

Research Question 5: *What are the needs of student teachers in ELT programs in Turkey with regards to technology-related courses?*

Phase II

Research Question 6: *What is the instructional technological competence level of student teachers in the ELT program of Necmettin Erbakan University (NEU)?*

Research Question 7: *Does the S-TECHNO model stimulate any development in the instructional technological competence level of student teachers in the ELT program of NEU?*

11. H_0: There is no difference between treatment and control groups in terms of (a) the frequency of using different types of technologies, (b) technology skills, (c) relating technology tools to language teaching, (d) preparedness level to use technology for

language teaching, (e) technology knowledge, (f) technological content knowledge, (g) technological pedagogical knowledge and (h) technological pedagogical content knowledge before the intervention process.

12. H_1: Student teachers who participate in courses offered through S-TECHNO model will have higher scores on (a) the frequency of using different types of technologies, (b) technology skills, (c) relating technology tools to language teaching, (d) preparedness level to use technology for language teaching, (e) technology knowledge, (f) technological content knowledge, (g) technological pedagogical knowledge and (h) technological pedagogical content knowledge compared to student teachers in the control group.
13. H_1: There will be an increase in post-test scores on (a) the frequency of using different types of technologies, (b) technology skills, (c) relating technology tools to language teaching, (d) preparedness level to use technology for language teaching, (e) technology knowledge, (f) technological content knowledge, (g) technological pedagogical knowledge and (h) technological pedagogical content knowledge for student teachers who participated in courses offered through S-TECHNO model.

3.2. Context and Participants

Phase One: The first phase of the study was undertaken in the first semester of 2015-2016 academic year. Because we were concerned with getting a general picture of the current state of technology among student teachers studying in the ELT programs countrywide, we planned to conduct our survey in as many universities as possible. The participants were a convenience sample of third and fourth grade student teachers who had successfully completed receiving technology-related courses in . We particularly aimed to carry out our research with student teachers who had successfully completed receiving technology-related courses because it was essential to understand where technology stood for them in order to gain penetrating insight into their intention to integrate technology. Most importantly, an investigation into student teachers' prior learning experiences, needs and familiarity level with respect to instructional technologies could help us demystify what was really going on about this long-standing problem.

There is standardized teacher education program designed by the Council of Higher Education in Turkey. Student teachers studying in ELT programs receive the courses of

Computer I, Computer II and *Instructional Technology and Material Development (ITMD)* courses by the end of the second year. The courses of *Computer I* and *Computer II* aim to help student teachers gain basic technology literacy such as learning about the basic concepts of information and communication technologies and develop skills in using hardware and software applications. Each of these courses consists of four hours (two hours for theory and two hours for practice). The *ITMD* course extends and goes beyond basic skills and focuses more on the integration of teaching, learning and technology. It also consists of four hours (two hours for theory and two hours for practice) (YÖK, 2007). Hence, the 3rd and 4th grade student teachers were well-suited to participate in the survey of the present study. We found information about the number of universities which had ELT programs and the number of students from the 2013 and 2014 guides of Higher Education Entrance Exam (YGS). According to these documents, there were 58 universities which had programs of English language teaching and 47 of them had 3rd and 4th graders when this study was conducted. There is quota system in university admissions in Turkey. Quotas are announced for each program of each university in those guides. When we made calculations about the number of student teachers who were enrolled in the 3rd and 4th grade of those universities, we found out that the maximum number could be 6000. Therefore, the population size was determined as 6000.

It is commonplace in survey research literature to sample 10% of the population (Creswell, 2012; Dörnyei, 2007; Gay, Mills and Airasian, 2006). However, Creswell (2012) stated that the size of the sample is of considerable importance to lessen the sampling error. In order to determine the sample size for our study, we used the sampling error formula. With a confidence interval of 95%, it was calculated that 362 responses would be enough for analyzing the survey.

We sent an e-mail to all 47 universities in which we explained the aim of the study and asked for whether they could help us conduct the survey to their students. However, 20 out of 47 universities volunteered to take part in the survey. We sent the surveys by post. The introductory page of the survey informed participants about the purpose of the study and voluntary participation in the survey. Finally, 18 universities sent back the surveys. We received approximately 1200 responses. However, 814 of the surveys had been completed elaborately. Therefore, we determined the 814 responses as the final sample for the first phase of the study which satisfied the required number for data analysis. Of the 814

participants, 223 of them were male and 591 female. In Turkey, ELT programs are mostly preferred by female students.

The data gathered from the survey led the researcher to carry out face-to-face interviews to deepen her understanding about the results obtained. Interviews were conducted to a purposeful sample of 20 student teachers from four different universities. Of the interview participants 9 were male and 11 female. The overall results gained in the first phase led the researcher to initiate the second phase.

Phase Two: The second phase of the study was undertaken in the second semester of 2015-2016 academic year. The goal of the second phase was to find out whether S-TECHNO model would have an impact on student teachers' ITC and a quasi-experimental design was used. In experimental designs, there should be at least 15 participants in each group (Dörnyei, 2007; Creswell, 2012). Participants in the present study were a convenience sample of 80 student teachers enrolled at the English Language Teaching Program of Necmettin Erbakan University, Turkey. As the universe of the second phase, Necmettin Erbakan University is a newly-established university. It has 8 English language teaching classes in total. There are two classes at all levels and more than 350 student teachers enrolled in this program. The students of the program have more or less the same socioeconomic background.

There were 41 student teachers in the treatment group. 33 of the participants were female and 8 of them male. The control group consisted of 39 student teachers and 30 of them were female and 9 of them were male. Although the class size was equal in both groups, two student teachers in the control group did not want to take part in the study. The participants were 3rd graders who had successfully completed technology-related courses. They enrolled in a required three-credit course named Teaching Language Skills II. The researcher wanted to launch her study in this course because the results gained from the first phase of the study had shown that student teachers wanted field-specific experiences with technology. The class met for four hours once a week and fourteen weeks in total. We administered pre-tests to both groups, undertook activities with the treatment group only and then administered post-tests to examine the differences between the treatment and control groups. All of the participants (n=80) responded to the questionnaire and wrote metaphor papers. Interviews were conducted with 6 student teachers from each group. All of the 12 participants were female. Only the student teachers in the treatment group (n=41) were observed and kept reflection journals.

3.3. Data Collection

In this study, both qualitative and quantitative data collection tools were used including surveys, interviews, documents and observation scheme. Now, let us explain how they were used to find responses to our research questions.

3.3.1. Surveys

The first phase of the present study started with conducting "the Survey of Student Teachers' Beliefs, Knowledge and Skills Regarding the Use of Technology" in a range of ELT programs of universities in Turkey. It was a descriptive survey which sought to describe the trends in student teachers' thinking in relation to instructional technologies by investigating their prior learning experiences, needs, knowledge, skills and beliefs. It consisted of dichotomous questions, multiple-choice questions, likert scales and open-ended questions.

Demographic Information: The first section of the survey asked about the gender of student teachers.

Technological Pedagogical Content Knowledge: The second section of the survey examined the level of student teachers' technology knowledge. The questionnaire of English as a foreign language (EFL) teachers' Technology Pedagogy and Content Knowledge (TPACK) was developed by Bostancıoğlu (2014). We received permission to use the survey via email. This survey was specifically designed to assess student teachers' levels of TPACK. The construct validity of the EFL-TPACK questionnaire was established with factor analysis (50 items, 6 factors). Responses were measured by a 5-point Likert scale which ranged from strongly disagree to strongly agree. The content validity of the survey was established with 36 CALL experts. The survey was found to be a reliable and valid tool with a cronbach alpha ranging from .81 to .89 across the factors.

The third, fourth and fifth sections of the survey were descriptive. It was prepared by the researcher to describe the trends in student teachers' current technology knowledge and skills, and their prior and undergraduate experiences with technology. Since our purpose was not to explore or test relationships between variables or explain causality, but rather to describe the current state of technology with student teachers, we were not concerned with validity and reliability issues in these sections.

Technology Use in Daily Life: In order to discover the current state of student teachers' frequency of technology use and technology skills, a range of Likert-scale questions were asked in the third section.

Technology Use for Instructional Purposes: The fourth section investigated the familiarity level of student teachers with different types of technologies that could be used for instructional purposes.

Learning Experiences Related to Technology: The fifth section asked questions about student teachers' early learning experiences (primary/secondary education) and undergraduate experiences with respect to the use of technology.

Open-ended Questions: The last section of the survey consisted of open-ended questions seeking to understand student teachers' beliefs about technology. It intended to find out where technology stands for student teachers for instructional purposes. This part also investigated what student teachers need to be able to integrate technology into instruction effectively.

A pilot study was carried out with 100 student teachers from three different universities. Student teachers were provided with a blank sheet to make comments regarding the conciseness of the survey. For example, the first version of the survey received criticism regarding its length and unclarity with some open-ended questions. Based on the feedback received from student teachers, a number of changes were made on the survey (see Appendix 2 for the survey).

In the second phase of the study, the reduced version of the same survey was used both in the treatment and control groups. The survey consisted of the sections of *Technological Pedagogical Content Knowledge, Technology Use in Daily Life* and *Technology Use for Instructional Purpose* in order to examine whether the implementation of S-TECHNO model would have an impact on the treatment group's level of awareness, skills and knowledge about instructional technologies.

3.3.2. Interviews

Interviews, being one of the qualitative method of inquiry, allow a researcher to investigate a phenomena that is not observable. It is interactive and elicits additional data if the answers given by respondent are not clear (Mackey & Gass, 2005). There are mainly three types of interviews: structured, semi-structured and unstructured interviews. We employed

semi-structured interviews which encompassed a set of pre-prepared open -ended questions to guide the researcher and enable the researcher to elaborate on certain issues (Dörnyei, 2007).

Interviews were used both in the first phase and second phase of the study. Creswell (2007) indicated that theoretical saturation can be achieved with 20 to 30 participants. Thus in the first phase, the researcher carried out interviews with 20 participants from four different universities in order to clarify and elaborate on the results she gained from the survey. In parallel with the research questions of the first phase, 28 questions were formulated. Questions were grouped under six headings which were: general questions related to technology use, questions related to prior learning experiences, questions related to undergraduate experiences, questions related to technology knowledge, questions related to technology skills, questions related to beliefs and questions related to needs about technology (see Appendix 3 for interview questions). Each interview lasted for about 90 minutes.

In the second phase, entry and exit interviews were undertaken with treatment and control groups. Six participants from each group took part in the interviews. In the entry interview, five questions were asked. They were about student teachers' prior learning experiences, knowledge, skills and beliefs about technology (see Appendix 4 for entry interview questions). In the exit interview, the first five questions were responded by both the treatment and control groups. However, four more questions were asked to the student teachers in the treatment group to receive their opinions about the intervention process (see Appendix 5 for exit interview questions). Each interview lasted for about 45 minutes.

3.3.3. Documents

3.3.3.1. Metaphor Papers

Student teachers enter teacher education programs with a myriad of experiences and beliefs about teaching, learning, technology etc. Hence, the beliefs they hold strongly influence what they receive in their courses. Therefore, one of the goals of teacher education programs must be to identify student teachers' naive perceptions and transform them into scientific conceptions. One way of eliciting student teachers' beliefs is using metaphors (Saban, 2010; Leavy, 2007). According to MacCormac (1990), metaphors allow us to juxtapose the familiar with the unfamiliar. Saban (2010) stated that metaphors

can have a crucial role in gaining insight into student teachers' thinking. In a similar vein, Leavy (2007) warned that metaphors shed light on subconsciously held ideas. If these implicit theories are left unexamined, they just serve to reinforce the traditional classroom practices.

We used metaphors in the second phase of the study. Considering the potential of metaphors in making the tacit explicit, we asked student teachers to construct metaphors about the role of technology before the intervention process to identify their beliefs about technology before the intervention process started. Similar to the technique employed by Saban (2010), we distributed a paper with the prompt "Technology in language teaching is like …. because ….". At the end of the intervention process, student teachers were re-asked to construct metaphors about the role of technology in language teaching. They were requested to update their metaphors if they experienced any change in their perceptions regarding the role of technology. This was intended to investigate whether the intervention process had any impact on student teachers' beliefs about the place of technology in language teaching.

3.3.3.2. Reflection Journals

Another way of gathering qualitative data is asking learners to keep journals through which they will record their impressions about their learning experiences. In this form of data collection, the researcher may request the learners to address certain topics and may provide guidelines for the content (Mackey & Gass, 2005). In the second phase of the study, student teachers kept online journals. They were asked to reflect on their learning experiences and beliefs throughout the intervention process. Student teachers were provided with ten guiding questions to write about (see Appendix 6 for reflection questions) and they were free to write whatever they wanted with respect to the course. After each course, they wrote their opinions and shared their entries with the researcher via email. Some of the student teachers preferred delivering their entries by hand. Keeping journals was intended for making student teachers' beliefs explicit and increasing their awareness about new experiences. Through journals, we sought to find out whether the intervention process had any impact on student teachers' beliefs about the place of technology in language teaching.

3.3.4. Observations

Observations provide researchers to collect data on the participants' behavior and actions within a particular context. There are many different ways a researcher can observe classrooms and one of which is structured observation. Structured observations involve using observation checklists to provide careful description of learners' activities (Dörnyei, 2007). We made observations in the second phase of the study during microteaching activities of student teachers. We used the Technology Integration Observation Instrument, developed by Hofer, Grandgenett, Harris and Swan (2011). This instrument was designed to assess the quality of technology integration in lesson plans. The researchers stated that this instrument was based on the constructs of technological pedagogical (TPK), technological content (TCK), and technological pedagogical content knowledge (TPACK) since it aimed to focus on the integration of content, pedagogy and technology. This observation checklist was found to be reliable and valid. The inter-rater reliability coefficient value of the instrument was .802. Internal consistency was .914. The test-retest reliability of the instruments was 93.9% and the instrument's construct and face validities were confirmed by seven TPACK experts (Hofer et al., 2011).

3.3.5. Lesson Plans

After a five-week training program which was intended for student teachers to gain familiarity with instructional technologies, student teachers were expected to put what they learnt into practice. Student teachers were provided with a lesson plan template and they were required to design two lesson plans based on the grade level and subject they selected. They were also required to teach these lessons during microteaching sessions.

3.4. Implementation Process

Results of the survey, interviews and the ensuing review of literature in the first phase showed us that there was a lack of consistency among teacher preparation programs in terms of technology education. This provided us with a rational motive to develop the S-TECHNO model in order to bridge this gap and to enhance the ITC of student teachers. Hence, we conducted a quasi-experimental study with student teachers studying in the ELT program of Necmettin Erbakan University to figure out whether S-TECHNO model could be used as an effective instructional model to guide teacher educators in instructional technology courses and to enhance student teachers' ITC. There were two third-grade

classes. They were assigned as treatment and control groups randomly. There were 41 student teachers in the treatment group and 39 student teachers in the control group.

Before starting courses with the treatment group, the researcher carried out a survey, face to face interviews and a study on metaphor construction both with the treatment and control groups. While implementing the model, the treatment group was also asked for keeping journals.

The implementation process lasted for 14 weeks. In accordance with the steps of the model, the first five weeks aimed to help student teachers understand the rationale of using technology through moving from reflection on their prior learning experiences, to theoretical readings, to hands-on experiences and to the development of understanding. The remaining nine weeks allowed student teachers to contextualize and implement what they learnt and would learn as a result of their self-initiated research to solve the problems posed. The student teachers started to prepare lesson plans in relation to specific language skills to be developed in their students and they made presentations. Here, the researcher and the instructor of the course kept observation checklists to evaluate the performance of student teachers (see Appendix 1 for the course schedule).

In the present study, the classes were run considering the following points

- Posing problems: Student teachers were provided with a language learning problem at the end of each class. They were asked such questions as “Did you encounter such problems when you were students?”, “How did your former teachers deal with those problems?”, “Were you satisfied with the solutions?”, “How would you solve the problem if you were in your teacher’s shoes?” etc. The next class, they were provided with alternative solutions provided by the researcher for the first five weeks and by their peers for the remaining nine weeks. This was intended for causing cognitive dissonance in student teachers to facilitate the conceptual change process.
- Discussions on Required Readings: In the present study, student teachers were provided with required readings in accordance with the topic of each week and discuss on them to have a more profound understanding about what they were learning.
- Hands-on experiences with technologies presented
- Contextualizing technologies for language teaching

- Assignment: At the end of each class, student teachers were given assignments to practice and relate what they learnt to ELT. They were often asked to choose a theme from the course books of primary/secondary school students and integrate the technology learnt that day to teach that unit (see Appendix… for the course outline)

When the implementation process ended, the researcher carried out the survey, face to face interviews and the study on metaphor construction both with the treatment and control groups one more time. This was done for identifying whether any difference took place between the treatment and the control group, and whether any change occurred within the treatment group with respect to their level of technological awareness, knowledge, skills and belief. Here, the intention was to determine whether S-TECHNO model can be used as an effective instructional model to guide teacher educators in instructional technology courses and to enhance student teachers' ITC.

3.5. Data Analysis

We employed both descriptive and inferential statistics to analyze the quantitative data gathered in the first phase of the study. Descriptive statistics presents data, summarises basic features of the sample and the measures and describes what is going on in a study. Inferential statistics goes beyond pure description of the data. It makes inferences and predictions from the data collected and tries to generalize them. We analyzed the data obtained from surveys using frequency, mean, independent-samples t-test, paired-samples t-test and Pearson's Product Correlation. To analyze the qualitative data obtained from open-ended questions and interviews, we used the method of grounded theory. Grounded theory is used not only as a methodology but also as a method for data analysis (Cutcliffe, 2005). As a method of data analysis, it requires constant comparison of data which helps the researcher to conceptualize the main concerns within the study site. For the qualitative data collected in the first phase, we followed the data analysis procedure suggested by Charmaz (2000, 2002, 2006). According to Charmaz, there are at least two components of the data analysis in grounded theory which are initial and focused coding.

Initial coding: Open-coding or initial coding refers to examining each line of the data gathered. This line-by-line coding requires a close reading of the data and allows the researcher to detect analytic ideas to proceed with further data collection and data analysis. Codes are labels or short names that are created by defining what is seen in the data. They

enable the researcher to grasp the hidden assumptions of the participants. They are also the pivotal link between data collection and theory development. During initial-coding, the researcher remains open to all theoretical possibilities (Charmaz, 2006). Through coding, the researcher makes the familiar unfamiliar. In other words, this process allows the researcher to see the material in a new light. Initial coding enables the researcher to see the areas in which he/she lacks needed data (Charmaz, 2004). Subsequently, the researcher engages in further data collection and attempts to complete the gaps in the emerging data (Charmaz, 2003).

Focused coding: Selective or focused coding refers to the phase in which the researcher search for the most frequent codes. Focused codes are more directed than initial codes and represent general and recurrent themes (Charmaz, 2002). "Focused codes provide analytic tools for handling large amounts of data; reevaluating earlier data for implicit meanings, statements, and actions; and subsequently, generating categories in the emerging theory" (Charmaz, 2003, p.443).Through focused coding; the researcher develops categories which capture the data collected. A category entails certain codes. Codes that are raised to the level of a category take on a more conceptual and analytical stance. Thus, the codes are no longer seen as descriptive tools but as tools to synthesize data. Just as initial coding provides the basis for focused coding, focused coding leads to the ultimate theoretical framework by linking categories that come to the fore in the analysis stage.

In the present study, the initial coding phase started with the analysis of open-ended questions at the end of the surveys. Written responses of the student teachers were examined line by line and incident to incident and each line of data was named on each page of the written data. In some places, in vivo codes were used and we did coding with gerunds given as suggested by Charmaz (2006). The researcher kept writing memos during the analysis to clarify her ideas about the emerging data. Emerging concepts and detected gaps from the written interviews led the researcher to conduct face-to-face interviews in different universities. This process refers to the theoretical sampling of grounded theory which means "gathering further, more specific data to illuminate, extend or refine theoretical categories and make them more precise" (Charmaz, 2006. p.444) As soon as the researcher conducted an interview, she personally transcribed the audio recordings verbatim and coded them line by line. During memo-writing, the researcher discerned some gaps to be investigated by further data collection. Having coded each interview the researcher made use of constant comparative method to find similarities and differences

between the data collected. After each comparison, the researcher thought about what category the code at issue indicates to link the concrete data to more abstract ideas (Bryant & Charmaz, 2007). The researcher developed subcategories of a category or categories by linking the codes. When the researcher analyzed and compared the fourth interview data with the data analyze beforehand, she came to recognize that new data provided no new insights (Charmaz, 2003) which referred to the phenomenon of theoretical saturation in grounded theory. Ensuing focused-coding, the researcher focused on the relationships between these categories and raised them to theoretical codes which enable researchers to develop their grounded theory (Charmaz, 2006) (see Appendix… for the list of coding system). After that, the researcher reviewed the related literature to find out where the data emerged fit in with it.

In the second phase, we analyzed the quantitative data using frequency, mean and t-test. We employed one widely used inferential statistic to find out whether there is a statistically significant difference between the means of two groups or between pre-test and post-test scores which is the t-test. There are two types of t-test: independent samples t-test and dependent samples t-test (Nunan & Bailey, 2009). In independent samples t-test, the results of two different groups are compared and in dependent samples t-test two sets of scores obtained from the same group are measured (Dörnyei, 2007).

Student teachers in the experimental and control groups responded to the reduced version of the Survey of Student teachers' Beliefs, Knowledge and Skills regarding the use of technology before and after intervention. To find out whether the intervention process created a statistically significant difference in the pre- and post-survey results of the experimental group, we used paired-samples-t-test to make comparison within the group. We also employed independent samples t-test to make comparison between the results of experimental and control groups.

To analyze the qualitative data gathered from interviews and reflection journals, qualitative content analysis was used. Content analysis reduces and interrogates the written data into summary form through using pre-existing categories and emergent themes in order to develop or test a theory (Cohen, Manion & Morrison, 2007, p. 476). There are different types of content analysis (e.g. deductive analysis, inductive analysis) (Hatch, 2002; Mayring, 2000, Cohen, Manion & Morrison, 2007; Hsieh & Shannon, 2014). In the present study, we tended to adopt a more deductive approach. We employed the typological analysis as suggested by Hatch (2002). In deductive analysis, "categories are usually

derived from theoretical constructs or areas of interest devised in advance of the analysis (pre-ordinate categorization) rather than developed from the material itself" (Cohen, Manion & Morrison, 2007, p. 475) The findings from deductive content analysis provide evidence that support or do not support a theory or a conceptual framework (Hsieh & Shannon, 2014). Given that we aimed to find out whether student teachers' ITC (i.e. technological awareness, beliefs, knowledge and skills) could be enhanced by offering courses through S-TECHNO model, we had a priori categories constructed from our research questions. The typologies that framed our analysis were technological awareness, beliefs, knowledge and skills. Through the coding process, we looked for evidence related to participants' perceptions about the topics of interest. Having identified the codes within them, we looked for connections across the codes and we constructed categories. After that, we set out to find out what relationships might exist among categories, and finally we came up with some generalizations that pulled out all resultant findings together. We also made use of inductive analysis since we were open to emerging themes from the data.

We used the typological analysis for analyzing the metaphor papers as well. Our typologies were "exherent value beliefs" and "inherent value beliefs". First, we read all of the written statements by repeating the question whether the metaphor at hand fits in the category of exherent value beliefs or inherent value beliefs. The rationale provided by student teachers about their metaphors facilitated the process of placing them under the appropriate category. Next, we looked for patterns, relationships and themes within our typologies as suggested by Hatch (2002). Then, we constructed codes, subcategories and categories within typologies of interest and finally supported our findings by quoting student teachers' statements

Lastly, observational data and lesson plans were analyzed using the Technology Integration Observation Instrument (Hofer et al., 2011). The instrument consists of 6 categories: curriculum goals and technologies; instructional strategies and technologies; technology selection(s); fit; instructional use; and technology logistics. Each category is scored using a scale of 1 to 4. For example, a rating of 4 for the category of "instructional use" means that "Instructional use of technologies is maximally effective in the observed lesson" (Hofer et al., 2011). The authors suggested that the first four categories in the rubric addressed apparent instructional plans while the last two categories addressed to the implementation of those plans. In line with this, we used the first four rows to evaluate

student teachers' lesson plans and the last two rows were used to assess implementation of these lesson plans.

3.6. Validation of the Study

To validate the accuracy of findings in this study, the researcher used the following techniques:

Prolonged engagement: This technique refers to developing trust with participants (Creswell, 2007). The researcher's being a research assistant in the university under study and her role as a facilitator and participant-observer during the study established the rapport and trust between her and the participants. She offered courses, conducted surveys and interviews, and made observations within the fifteen weeks and took notes about the procedures. This enabled her to get in direct contact with the participants and understand things from their viewpoints within their daily contexts.

Triangulation: This process refers to making use of multiple references to corroborate findings. We employed three types of triangulation in our study which are method triangulation, data source triangulation (i.e. person, time and space), investigator triangulation The researcher collected data from different sources (e.g. surveys, interviews, observation, memo-writing, lesson plans) for method triangulation. As to data source triangulation, before the implementation process, survey data was collected from 18 universities and interviews were carried out in 4 different universities. Data was collected before, during and after the implementation process. For investigator triangulation, the researcher kept observation checklists with the participation of another instructor during microteaching sessions.

Peer debriefing: It refers to an external review of the findings by a peer (Creswell, 2007). After the researcher collected data from interviews, journals and metaphor papers, she initiated the coding process. In order to establish coding agreement, the researcher selected a colleague who is a doctoral student as the second coder. According to Miles and Huberman (1994), at least 5-10 pages should be coded by researchers separately. In line with this, the first ten pages of the interviews and journals were coded by the coders independently and the results were compared. Having a constructivist worldview, the researcher preferred using a negotiated agreement process rather than formulas to establish the coding reliability (Forman & Damschroder, 2007). More precisely, the researcher and

the second coder reviewed each rendition, discussed and resolved contradictions when they arose. In addition, all of the metaphor papers were coded separately by the coders and the same procedure was followed to reach agreement on codings. When researchers could not reach consensus on categorizing metaphors, student teachers were asked to clarify their metaphors. Lastly, in case of any discrepancy in scoring the technology integration observation instrument, the researcher and the other instructor dicussed upon the scores until an agreement was reached.

Member checking: This process includes soliciting participants' views about the credibility of the findings (Creswell, 2007). The researcher contacted student teachers after each data analysis process and asked them to confirm whether her interpretations of the data gathered from documents, interviews and reflection journals provided by them were congruent with their beliefs and assumptions.

Thick description: The researcher provided rich and detailed descriptions about the research process, setting and participants to ensure the transferability and confirmability of the study.

Clarifying researcher bias: Researcher bias may impact the research process. In order to reduce it, researchers should stick to the principle of reflexivity in qualitative research. In other words, researchers must be aware of their underlying philosophies and preconceptions. They should not allow their assumptions to orchestrate their study but they should give voice to participants' interpretations. Accordingly, we kept memos to confront our subjectivity and assumptions and constantly compared the data gathered from student teachers. We provided direct quotes from participants. In line with the implications of grounded theory, we did not undertake a full-scale review of literature beforehand as it would have influenced the resultant findings. Emerging data from the materials gathered subsequently led us to review the literature. The techniques of triangulation, member checking, peer review and thick description also helped us to minimize our subjectivity in the study.

CHAPTER 4

RESULTS

This chapter presents the results obtained from both quantitative and qualitative findings gained in the first and second phase of the study.

4.1. Phase One

Phase one refers to the stage in which student teachers' prior learning experiences, needs, knowledge, skills and beliefs in relation to technology are investigated countrywide to provide a comprehensive picture about their current state of experiences with technology. In this phase, both quantitative and qualitative findings were obtained. While reporting the results, quantitative and qualitative findings will be presented respectively.

4.1.1. Quantitative Research Findings

In the first phase of the study, 814 student teachers enrolled in the third and fourth grades of 18 different ELT programs responded to the survey. Of the 814 participants, 223 of them were male (27.4%) and 591 female (72.6%). As to the use of technology for educational purposes, 7% of the student teachers reported that they do not use technology, 16 % of them said that they have been using technology less than 1 year, majority of the student teachers (47%) stated that they use technology between 1 and 5 years, 11% of them indicated that they use technology between 5 and 8 years and 19% of them reported that they use technology more than 8 years.

Table 2

Demographic Information of the Respondents (N=814)

		Frequency	%
Gender	Male	223	27.4
	Female	591	72.6
Duration of technology use for educational purposes	I do not use	57	7
	less than 1 year	112	16
	1-5 years	320	47
	5-8 years	73	11
	more than 8 years	136	19

4.1.1.1. Findings Demonstrating Student Teachers' Early Learning Experiences in Relation to Technology

Student teachers do not enter teacher education programs tabula rasa rather they bring with them preconceptions about the role of technology in the teaching and learning process. Since these pre-program beliefs about technology are influential on student teachers' perceptions about the position of technology in language teaching, we formulated the first research question to find out what student teachers think about their prior learning experiences in terms of technology use.

Table 3

Student Teachers' Primary and Secondary School Experiences Related to Technology

	No		Yes		M	SD
	f	%	f	%		
Technological tools were used.	199	24	615	76	1.76	0.43
My early learning experiences helped me understand the relationship between teaching, learning and technology.	429	53	385	47	1.47	0.50
My early learning experiences with technology will help me incorporate technology in my future career.	440	54	374	46	1.46	0.50

As can be seen in Table 3, 76% of the student teachers in ELT programs reported that the technological tools were used in their early learning experiences. %53 of them did not agree that the use of technology in their early learning experiences helped them understand the relationship between teaching, learning and technology, and %54 of them said that their early learning experiences would not help them integrate technology into their

classes. This indicates that more than half of the student teachers in ELT programs do not find the technology use in their previous learning experiences exemplary for their future career.

4.1.1.1.1. Hypothesis One

H_1: There is a difference between Student teachers who said technological tools were used in their early experiences and who did not say technological tools were used in their early experiences in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge

Table 4

Differences between Student Teachers Based on Their Responses about the Use of Technology in Their Early Learning Experiences

What perceptions do student teachers in ELT programs in Turkey have about their primary and secondary education experiences related to technology?	Technological tools were used	n	M	SD	t	p
Applicability to Language Teaching	No	199	3.32	0.66	-.827	.409
	Yes	615	3.37	0.61		
Preparedness for Instructional Use	No	199	3.19	0.70	902	.368
	Yes	615	3.14	0.67		
Technology Knowledge	No	199	4.04	0.70	-.073	.942
	Yes	615	4.04	0.71		
Technological Content Knowledge	No	199	3.95	0.75	1.123	.245
	Yes	615	3.88	0.80		
Technological Pedagogical Knowledge	No	199	3.49	0.77	-.609	.543
	Yes	615	3.53	0.78		
Technological Pedagogical Content Knowledge	No	199	3.73	0.70	.625	.533
	Yes	615	3.69	0.74		

When Table 4 is examined to find out whether there is a difference between who said technological tools were used in their primary/secondary education and who said technological tools were not used in their primary and secondary education in terms of relating technology tools to language teaching, preparedness level for instructional use, their technology knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge, it can be seen that alternative hypothesis of H_1 is rejected for all the subscales which are "relating technology tools to language teaching" (t=-.827, M=3.32/3.37, SD=0.66/0.61), "preparedness level for instructional use" (t=902, M=3.19/3.14, SD=0.7/0.67) "TK" (t=-.073, M=4.04/4.04,

SD=0.7/0.71), "TCK" (t=1.123, M=3.95/3.88, SD=0.75/0.8), "TPK" (t=-.609, M=3.49/3.53, SD=0.77/0.78), and "TPCK" (t=.625, M=3.73/3.69, SD=0.7/0.74) since there is no significant difference between two groups of student teachers (p>.05).

4.1.1.1.2. Hypothesis Two

H_1: There is a difference between Student teachers who think their early learning experiences helped them understand the relationship between teaching, learning and technology and who do not think their early learning experiences helped them understand the relationship between teaching, learning and technology in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 5

Differences between Student Teachers Based on Their Responses about the Usefulness of Their Early Learning Experiences regarding Technology

What perceptions do student teachers in ELT programs in Turkey have about their primary and secondary education experiences related to technology?	My early learning experiences helped me understand the relationship between teaching, learning and technology	n	M	SD	t	p
Applicability to Language Teaching	No	429	3.23	0.59	-6.059	**.000**
	Yes	385	3.49	0.64		
Preparedness for Instructional Use	No	429	3.01	0.67	-6.487	**.000**
	Yes	385	3.31	0.64		
Technology Knowledge	No	429	3.96	0.72	-3.811	**.000**
	Yes	385	4.14	0.65		
Technological Content Knowledge	No	429	3.77	0.84	-4.664	**.000**
	Yes	385	4.03	0.70		
Technological Pedagogical Knowledge	No	429	3.24	0.74	-12.014	**.000**
	Yes	385	3.84	0.69		
Technological Pedagogical Content Knowledge	No	429	3.57	0.75	-5.354	**.000**
	Yes	385	3.84	0.68		

When Table 5 is examined to find out whether there is a difference between Student teachers who think and do not think their early learning experiences helped them understand the relationship between teaching, learning and technology in terms of relating technology tools to language teaching, preparedness level for instructional use, their technology knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge, it can be seen that

alternative hypotheses of H_1 was accepted for all the subscales: "relating technology tools to language teaching" (t=-6.059, M=3.23/3.49, SD=0.59/0.64), "preparedness for instructional Use" (t=-6.487, M=3.01/3.31, SD=0.67/0.64), "TK" (t= -3.811, M=3.96/4.14, SD=0.72/0.65), "TCK" (t=-4.664, M=3.77/4.03, SD=0.84/0.70), "TPK" (t=-12.014, M=3.24/3.84, SD=0.74/0.69), and "TPCK" (t=-5.354, M=3.57/3.84, SD=0.75/0.68) since there is a significant difference between two groups of student teachers ($p<.05$).

4.1.1.1.3. Hypothesis Three

H_1: There is a difference between Student teachers who think their early learning experiences with technology will help them incorporate technology in their future career and who do not think their early learning experiences with technology will help them incorporate technology in their future career in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 6

Differences between Student Teachers Based on Their Responses about the Effectiveness Their Early Learning Experiences regarding Technology

What perceptions do student teachers in ELT programs in Turkey have about their primary and secondary education experiences related to technology?	My early learning experiences with technology will help me incorporate technology in my future career.	n	M	SD	t	p
Applicability to Language Teaching	No	440	3.26	0.60	-4.599	**.000**
	Yes	374	3.46	0.64		
Preparedness for Instructional Use	No	440	3.02	0.67	-6.394	**.000**
	Yes	374	3.31	0.64		
Technology Knowledge	No	440	3.97	0.73	-3.151	**.002**
	Yes	374	4.13	0.67		
Technological Content Knowledge	No	440	3.79	0.83	-4.030	**.000**
	Yes	374	4.01	0.71		
Technological Pedagogical Knowledge	No	440	3.27	0.74	-10.941	**.000**
	Yes	374	3.82	0.71		
Technological Pedagogical Content Knowledge	No	440	3.58	0.75	-5,273	**.000**
	Yes	374	3.84	0.69		

When Table 6 is examined to find out whether there is a difference between student teachers who think and do not think their early learning experiences with technology will help them incorporate technology in their future career in terms of relating technology tools to language teaching, preparedness level for instructional use, technology knowledge,

technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge, it can be seen that the alternative hypothesis of H_1 is accepted for all the subscales which are "relating technology tools to language teaching" (t= -4.599, M= 3.26/3.46, SD= 0.60/0.64), "preparedness for instructional use" (t= -6.394, M=3.02/3.31, SD=0.67/0.64), "TK" (t= -3.151, M=3.97/4.13, SD=0.73/0.67), "TCK" (t=-4.030, M= 3.79/4.01, SD=0.83/0.71), "TPK" (t= -10.947, M= 3.27/3.82, SD= 0.74/0.71), and "TPCK" (t= -5.273, M= 3.58/3.84, SD=0.75/0.69) since there is a significant difference between two groups of student teachers ($p<.05$).

4.1.1.2. Findings Demonstrating Student Teachers' Undergraduate Experiences in Relation to Technology

According to Kennedy (1999), teacher education programs act as a bridge between student teachers' past and future and they are therefore well situated to change student teachers' incomplete images about the teaching and learning process. We agree that experiences student teachers have in teacher education programs form the basis of their future career as in-service teachers. Therefore, we formulated the second research question to explore what Student teachers think about the technology education they received in their teacher education programs.

Table 7

Student Teachers' Undergraduate Learning Experiences related to Technology

How do you describe the technology–related courses you have received as part of your undergraduate coursework?	No		Yes		M	SD
	f	%	f	%		
Theory-based	379	47	435	53	1.53	0.50
For acquiring basic skills	387	47	427	53	1.53	0.50
Practice-based	637	66	177	34	1.34	0.48
Contextualized for ELT	666	70	148	30	1.30	0.46

Table 7 shows that 53% of student teachers in Turkey reported the technology-related courses offered at their programs were theory-based and for acquiring basic skills. Only 34% of them stated that the technology-related courses they received in their undergraduate programs were practice-based and 30% of them indicated that technology-related courses were related to English language teaching. Results demonstrate that more

than half of the student teachers in ELT programs find the technology-related courses in their universities theory-based and for acquiring basic skills.

4.1.1.2.1. Hypothesis Four

H_1: There is a difference between student teachers who think and who do not think the technology-related courses they received were theory-based in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 8

Differences between Student Teachers Based on Their Responses about whether the Technology-related Courses They Received were Theory-based

What perceptions do student teachers in ELT programs in Turkey have about their undergraduate experiences related to technology?	Theory-based.	n	M	SD	t	p
Applicability to Language Teaching	No	379	3.44	0.65	3.732	**.000**
	Yes	435	3.28	0.59		
Preparedness for Instructional Use	No	379	3.28	0.67	5.413	**.000**
	Yes	435	3.03	0.66		
Technology Knowledge	No	379	4.11	0.71	2.482	.013
	Yes	435	3.99	0.70		
Technological Content Knowledge	No	379	4.04	0.72	5.020	**.000**
	Yes	435	3.77	0.82		
Technological Pedagogical Knowledge	No	379	3.78	0.70	9.449	**.000**
	Yes	435	3.30	0.77		
Technological Pedagogical Content Knowledge	No	379	3.81	0.70	4.134	**.000**
	Yes	435	3.60	0.74		

When Table 8 is examined to find out whether there is a difference between student teachers who think and do not think the technology-related courses they received were theory-based in terms of their opinions about the applicability of different technologies to language teaching, their sense of preparedness for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK, it can be seen that the alternative hypothesis of H_1 was accepted for all subscales which are "relating technology tools to language teaching" (t= 3.732, M= 3.44/3.28, SD= 0.65/0.59), "preparedness for Instructional Use" (t=5.413, M= 3.28/3.03, SD= 0.67/0.66), "TK" (t= 2.482, M= 4.11/3.99, SD=0.71/0.70), "TCK" (t= 5.020, M= 4.04/3.77, SD= 0.72/0.82), "TPK" (t= 9.449, M=

3.78/3.30, SD= 0.70/0.77), and "TPCK" (t= 4.134, M= 3.81/3.60, SD= 0.70/0.74) since there is a significant difference between two groups of student teachers (p<.05). The results indicate that student teachers who report that the technology-related courses they received were theory-based have lower mean scores in terms of their opinions about the applicability of different technologies to language teaching, preparedness for instructional use, and TK, TCK, TPK, and TPCK.

4.1.1.2.2. Hypothesis Five

H_1: There is a difference between Student teachers who think and who do not think the technology-related courses they received were for acquiring basic skills in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 9

Differences between Student Teachers Based on Their Responses about whether the Technology-related Courses They Received were for Acquiring Basic Skills

What perceptions do student teachers in ELT programs in Turkey have about their undergraduate experiences related to technology?	For acquiring basic skills	n	M	SD	t	p
Applicability to Language Teaching	No	387	3.42	0.62	2.840	**.000**
	Yes	427	3.29	0.63		
Preparedness for Instructional Use	No	387	3.29	0.65	5.674	**.000**
	Yes	427	3.03	0.68		
Technology Knowledge	No	387	4.07	0.69	1.239	.216
	Yes	427	4.01	0.72		
Technological Content Knowledge	No	387	4.0	0.71	3.787	**.000**
	Yes	427	3.8	0.84		
Technological Pedagogical Knowledge	No	387	3.74	0.69	7.878	**.000**
	Yes	427	3.32	0.79		
Technological Pedagogical Content Knowledge	No	387	3.80	0.68	3.881	**.000**
	Yes	427	3.60	0.76		

When Table 9 is examined to find out whether there is a difference between student teachers who think and do not think the technology-related courses they received were for acquiring basic skills in terms of relating technology tools to language teaching, preparedness level to use technology for language teaching, TK, TCK, TPK, and TPCK, it can be seen that the alternative hypothesis of H_1 was accepted for the following subscales:

"relating technology tools to language teaching" (t= 2.840, M=3.42/3.29, SD= 0.62/0.63), "preparedness for instructional use" (t= 5.674, M=3.29/3.03, SD= 0.65/0.68), "TCK" (t= 3.787, M= 4/3.8, SD= 0.71/0.84), "TPK" (t=7.878, M=3.74/3.32, SD=0.69/0.79), and "TPCK" (t=3.881, M=3.8/3.6, SD=0.68/0.76) since there is a significant difference between two groups of student teachers ($p<.05$). This indicates that student teachers who report that the technology-related courses they received were for acquiring basic skills have lower mean scores with the applicability of different technologies to language teaching, their preparedness level for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK.. However the alternative hypothesis of H_1 is rejected for "TK" since there is no significant difference ($p>.05$) two groups of student teachers (t=1.239, M=4.08/4.01, SD=0.69/0.72). This demonstrates that both groups of student teachers have almost the same scores in technology knowledge.

4.1.1.2.3. Hypothesis Six

H_1: There is a difference between student teachers who think the technology-related courses they received were practice-based and who do not think the technology-related courses they received were practice-based in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 10

Differences between Student Teachers Based on Their Responses about whether the Technology-related Courses They Received were Practice-based

What perceptions do student teachers in ELT programs in Turkey have about their undergraduate experiences related to technology?	Practice-based	n	M	SD	t	p
Applicability to Language Teaching	No	538	3.15	0.62	-15.274	**.000**
	Yes	276	3.77	0.63		
Preparedness for Instructional Use	No	538	3	0.65	-9.419	**.000**
	Yes	276	3.45	0.68		
Technology Knowledge	No	538	3.94	0.69	-5880	**.000**
	Yes	276	4.24	0.72		
Technological Content Knowledge	No	538	3.77	0.71	-6.463	**.000**
	Yes	276	4.13	0.84		
Technological Pedagogical Knowledge	No	538	3.34	0.69	-9.738	**.000**
	Yes	276	3.87	0.79		
Technological Pedagogical Content Knowledge	No	538	3.58	0.68	-6.676	**.000**
	Yes	276	3.93	0.76		

When Table 10 is examined to find out whether there is a difference between student teachers who think and do not think the technology-related courses they received were practice-based in terms of their opinions about the applicability of different technologies to language teaching, their sense of preparedness for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK, it can be seen that alternative hypothesis of H_1 was accepted for all scales: "relating technology tools to language teaching" (t= -15.274, M= 3.15/3.77, SD= 0.62/0.63), "preparedness for instructional use" (t= -9.419, M= 3/3.45, SD= 0.65/0.68), "TK" (t=-5.880, M= 3.94/4.24, SD= 0.69/0.72), "TCK" (t= -6.463, M= 3.77/4.13, SD=0.71/0.84), "TPK" (t= -9.738, M=3.34/3.87, SD= 0.69/0.79), and "TPCK" (t=-6.676, M=3.58/3.93, SD=0.68/0.76) are accepted since there is a significant difference between two groups of student teachers ($p<.05$). The results indicate that student teachers who report that the technology-related courses they received were practice-based have higher mean scores with the applicability of different technologies to language teaching, preparedness level for using different technologies in language teaching, and TK, TCK, TPK, and TPCK.

4.1.1.2.4. Hypothesis Seven

H_1: There is a difference between student teachers who think the technology-related courses they received were contextualized for ELT and who do not think the technology-related courses they received were contextualized for ELT in terms of (a) relating

technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 11

Differences between Student Teachers Based on Their Responses about whether the Technology-related Courses They Received were Contextualized for ELT

What perceptions do student teachers in ELT programs in Turkey have about their undergraduate experiences related to technology?	Contextualized for ELT	n	M	SD	t	p
Applicability to Language Teaching	No	569	3.17	.50	-13.477	**.000**
	Yes	245	3.8	.66		
Preparedness for Instructional Use	No	569	3.03	.63	-8.028	**.000**
	Yes	245	3.43	.69		
Technology Knowledge	No	569	3.96	.72	-5.816	**.000**
	Yes	245	4.24	.61		
Technological Content Knowledge	No	569	3.78	.80	-6.203	**.000**
	Yes	245	4.15	.70		
Technological Pedagogical Knowledge	No	569	3.36	.75	-9.662	**.000**
	Yes	245	3.89	.71		
Technological Pedagogical Content Knowledge	No	569	3.59	.72	-6.846	**.000**
	Yes	245	3.96	.70		

When Table 11 is examined to find out whether there is a difference between student teachers who think and do not think the technology-related courses they received were contextualized for ELT in terms of their opinions about the applicability of different technologies to language teaching, their sense of preparedness for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK, it can be seen that the alternative hypotheses of H_1 was accepted for all subscales which are "relating technology tools to language teaching" (t=-13.477, M=3.17/3.8, SD=0.5/0.66), "preparedness for instructional use" (M=3.03/3.43, SD=0.63/0.69), "TK" (t=-5.816, M=3.96/4.24, SD=0.72/0.61), "TCK" (t=-6.203, M=3.78/4.15, SD=0.8/0.7), "TPK" (t=9.662, M=3.36/3.89, SD=0.75/0.71), and "TPCK" (t=-6.846, M=3.59/3.96, SD=0.72/0.70) are accepted since there is a significant difference between two groups of student teachers ($p<.05$). The results indicate that student teachers who report that the technology-related courses they received were contextualized for ELT have higher mean scores with the applicability of different technologies to language teaching, their

preparedness level for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK.

Table 12

Student Teachers' Undergraduate Learning Experiences Related to Technology

How do you describe the technology–related courses you have received as part of your undergraduate coursework?	No		Yes		M	SD
	f	%	f	%		
I have received adequate training in the use of technology for teaching.	436	54	378	46	1.46	0.50
My teacher training experiences have helped me understand the relationship between teaching, learning and technology.	413	51	401	49	1.49	0.50
My teacher training experiences encouraged me to use technology effectively in teaching and learning	431	53	383	47	1.47	0.50

Table 12 illustrates that 54% of the student teachers do not think that they have received adequate technology training for instruction. 51% of them stated that their teacher training experiences have not helped them understand the relationship between teaching, learning and technology and 53% of the student teachers pointed out that their teacher training experiences have not encouraged them to use technology effectively in teaching and learning. This indicates that more than half of the student teachers in ELT programs do not find the technology education they received adequate and effective to be able to use it in their classrooms competently.

4.1.1.2.5. Hypothesis Eight

H_1: There is a difference between student teachers who think the technology training they received was adequate and who do not think the technology training they received was adequate in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 13

Differences between Student Teachers based on Their Responses about the Adequacy of the Technology Training They Received in Their Teacher Education Programs

What perceptions do student teachers in ELT programs in Turkey have about their undergraduate experiences related to technology?	I have received adequate training in the use of technology for teaching	n	M	SD	t	p
Applicability to Language Teaching	No	436	3.20	0.6	-8.087	**.000**
	Yes	378	3.54	0.61		
Preparedness for Instructional Use	No	436	2.97	0.65	-8.863	**.000**
	Yes	378	3.37	0.64		
Technology Knowledge	No	436	3.87	0.75	-8.164	**.000**
	Yes	378	4.25	0.59		
Technological Content Knowledge	No	436	3.67	0.82	-9.439	**.000**
	Yes	378	4.16	0.65		
Technological Pedagogical Knowledge	No	436	3.16	0.71	-16.845	**.000**
	Yes	378	3.94	0.62		
Technological Pedagogical Content Knowledge	No	436	3.51	0.75	-8.470	**.000**
	Yes	378	3,92	0.65		

When Table 13 is examined to find out whether there is a difference between student teachers who agree and do not agree on the adequacy of technology training they received in their teacher education programs in terms of their opinions about the applicability of different technologies to language teaching, their sense of preparedness for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK, it can be seen that the alternative hypothesis of H_1 was accepted for all subscales which are "relating technology tools to language teaching" (t=-8.087, M=3.20/3.54, SD=0.6/0.61), "preparedness for instructional use" (t=-8.863, M=2.97/3.37, SD=0.65/0.64), "TK" (t=8.164, M=3.87/4.25, SD=0.75/0.59), "TCK" (t=-9.439, M=3.67/4.16, SD=0.82/0.65), "TPK" (t=-16.845.439, M=3.16/3.94, SD=0.71/0.62), and "TPCK" (t=-8.470, M=3.51/3.92, SD=0.75/0.65) are accepted since there is a significant difference between two groups of student teachers ($p<.05$). The results indicate that student teachers who report that they have received adequate technology training in their teacher education programs have higher mean scores with the applicability of different technologies to language teaching, their preparedness level for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK.

4.1.1.2.6. Hypothesis Nine

H_1: There is a difference between student teachers who think their teacher training experiences have helped them understand the relationship between teaching, learning and technology and who do not think their teacher training experiences have helped them understand the relationship between teaching, learning and technology in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 14

Differences between Student Teachers based on Their Responses about the Usefulness of the Technology Training They Received in Their Teacher Education Programs

What perceptions do student teachers in ELT programs in Turkey have about their undergraduate experiences related to technology?	My teacher training experiences have helped me understand the relationship between teaching, learning and technology	n	M	SD	t	p
Applicability to Language Teaching	No	413	3.2	0.59	-7.492	**.000**
	Yes	401	3.52	0.62		
Preparedness for Instructional Use	No	413	2.95	0.64	-9.107	**.000**
	Yes	401	3.37	0.64		
Technology Knowledge	No	413	3.86	0.75	-8.042	**.000**
	Yes	401	4.24	0.59		
Technological Content Knowledge	No	413	3.66	0.83	-9.046	**.000**
	Yes	401	4.14	0.67		
Technological Pedagogical Knowledge	No	413	3.13	0.69	-17.286	**.000**
	Yes	401	3.94	0.63		
Technological Pedagogical Content Knowledge	No	413	3.49	0.73	-8.745	**.000**
	Yes	401	3.92	0.66		

When Table 14 is examined to find out whether there is a difference between student teachers who agree and do not agree on the usefulness of their undergraduate experiences in helping them understand the relationship between teaching, learning and technology in terms of their opinions about the applicability of different technologies to language teaching, their sense of preparedness for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK, it can be seen that alternative hypotheses of H_1 was accepted for all subscales which are "relating technology tools to language teaching" (t=-7.492, M=3.2/3.52, SD=0.59/0.62), "preparedness for instructional use" (t=-9.107, M=2.95/3.37, SD=0.64/0.64), "TK" (t=-8.042, M=3.86/4.24, SD=0.75/0.59), "TCK" (t=-9.046, M=3.66/4.14, SD=0.83/0.67), "TPK" (t=-17.286, M=3.13/3.94, SD=0.69/0.63), and

"TPCK" (t=-8.745, M=3.49/3.92, SD=0.73/0.66) since there is a significant difference between two groups of student teachers (p<.05). The results indicate that student teachers who report that their teacher training experiences have helped them understand the relationship between teaching, learning and technology have higher mean scores with the applicability of different technologies to language teaching, their preparedness level for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK.

4.1.1.2.7. Hypothesis 10

H_1: There is a difference between student teachers who think their teacher training experiences have encouraged them to use technology effectively in teaching and learning and who do not think their teacher training experiences have encouraged them to use technology effectively in teaching and learning in terms of (a) relating technology tools to language teaching, (b) preparedness level to use technology for language teaching, (c) technology knowledge, (d) technological content knowledge, (e) technological pedagogical knowledge and (f) technological pedagogical content knowledge.

Table 15

Differences Between Student Teachers based on Their Responses about the Efficiency of the Technology Training They Received in Their Teacher Education Programs

What perceptions do student teachers in ELT programs in Turkey have about their undergraduate experiences related to technology?	My teacher training experiences encouraged me to use technology effectively in teaching and learning	n	M	SD	t	p
Applicability to Language Teaching	No	431	3.2	0.6	-7.801	**.000**
	Yes	383	3.53	0.61		
Preparedness for Instructional Use	No	431	2.96	0.65	-8.788	**.000**
	Yes	383	3.36	0.64		
Technology Knowledge	No	431	3.87	0.75	-8.024	**.000**
	Yes	383	4.24	0.59		
Technological Content Knowledge	No	431	3.66	0.82	-9.428	**.000**
	Yes	383	4.15	0.66		
Technological Pedagogical Knowledge	No	431	3.15	0.71	-16.816	**.000**
	Yes	383	3.93	0.62		
Technological Pedagogical Content Knowledge	No	431	3.5	0.75	-8.519	**.000**
	Yes	383	3.92	0.65		

When Table 15 is examined to find out whether there is a difference between Student teachers who agree and do not agree on the efficiency of their undergraduate experiences in encouraging them to use technology in teaching and learning in terms of their opinions

about the applicability of different technologies to language teaching, their sense of preparedness for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK, it can be seen that the alternative hypothesis of H_1 is accepted for all subscales which are "relating technology tools to language teaching" (t=-7.801, M=3.2/3.53, SD=0.6/0.61), "preparedness for instructional use" (t=-8.788, M=2.96/3.36, SD=0.65/0.64), "TK" (t=-8.024, M=3.87/4.24, SD=0.75/0.59), "TCK" (t=-9.428, M=3.66/4.15, SD=0.82/0.66), "TPK" (t=-16.816, M=3.15/3.93, SD=0.71/0.62), and "TPCK" (t=-8.519, M=3.5/3.92, SD=0.75/0.65) are accepted since there is a significant difference between two groups of student teachers ($p<.05$). The results indicate that student teachers who report that their teacher training experiences have encouraged them to use technology in teaching and learning have higher mean scores with the applicability of different technologies to language teaching, their preparedness level for using different technologies in language teaching, and their TK, TCK, TPK, and TPCK.

4.1.1.3. Findings Demonstrating Student Teachers' Knowledge and Skills in Relation to Technology

There are a number of barriers that prevent successful implementation of technology by teachers. Ertmer (1999) refers to some of those obstacles as second order barriers which include teachers' lack of technological knowledge and skills among others. According to Ertmer (1999), second-order barriers are more difficult to overcome since "they are less tangible than first-order barriers but also because they are more personal and more deeply ingrained" (p. 51). In order to get a general picture of student teachers' technological knowledge and skills, we formulated the third research question. The part of "technology use in daily life" in the survey aimed to explore student teachers' technology skills in their daily lives. The part of "technology use for instructional purposes" in the survey sought to find out student teachers' knowledge about the applicability of different technologies to ELT and their preparedness level to use different types of technologies in language teaching. The EFL-TPACK questionnaire was used to identify student teachers' technological knowledge.

Table 16

Frequency of Technology Use by Student Teachers

	Never		Rarely		Sometimes		Usually		Always		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	64	8	40	5	88	11	237	29	385	47	4.03	1.22
Interactive whiteboard	129	16	155	19	225	28	188	23	117	14	3.01	1.28
TV/DVR	91	11	197	24	219	27	179	22	128	16	3.07	1.24
Smartphones/Cell phones	33	4	53	7	100	12	156	19	472	58	4.21	1.13
Projectors	73	9	136	17	229	28	173	21	203	25	3.37	1.27
Mp3player/ipod	127	16	174	21	218	27	157	19	138	17	3	1.31
Podcasts	224	28	224	28	204	25	93	11	69	9	2.46	1.24
Audio/Video Production	86	11	136	17	250	31	196	24	146	18	3.22	1.23
Clickers	253	31	221	27	192	24	89	11	59	7	2.36	1.23
Databases	184	23	174	21	267	33	122	15	67	8	2.65	1.21
Drill and Practice Programs	100	12	181	22	292	36	159	20	82	10	2.93	1.14
Internet	26	3	42	5	81	10	128	16	537	66	4.36	1.06
Word processors	25	3	45	6	153	19	224	28	367	45	4.06	1.07
Spreadsheets (i.e. Excel)	94	12	187	23	247	30	157	19	129	16	3.05	1.23
Presentation software	38	5	66	8	141	17	235	29	334	41	3.94	1.15
Simulations	169	21	150	18	228	28	151	19	116	14	2.87	1.33
Webpagedevelopment tools	220	27	173	21	222	27	122	15	77	10	2.59	1.29
Mashup	353	43	204	25	158	19	59	7	40	5	2.05	1.17
Tutorials	216	27	157	19	237	29	132	16	72	9	2.62	1.27
Blogs	142	17	157	19	240	30	175	22	100	12	2.92	1.26
Wikis	116	14	100	12	225	28	232	29	141	17	3.22	1.27
Forums	103	13	128	16	232	29	221	27	130	16	3.18	1.24
Videosharing sites	49	6	52	6	128	16	231	28	354	44	3.97	1.18
SocialNetworks	49	6	42	5	96	12	189	23	438	54	4.14	1.18
Edmodo	300	37	125	15	151	19	101	12	137	17	2.57	1.5
Developing software	335	41	181	22	165	20	79	10	54	7	2.18	1.25
									Overall Mean Score		3.16	

As can be seen from Table 16, the most commonly used technology tools stated by student teachers are “Internet” (82% of the student teachers reported that they either use the internet usually or always) with mean score (M= 4.36) and standard deviation (SD=1.06), “smartphones/cellphones” (77% of the student teachers reported that they either use the smartphones/cellphones usually or always) with mean score (M= 4.21) and standard deviation (SD=1.13), and “social networks” (77% of the student teachers reported that they either use the social networks usually or always) with mean score (M=4.14) and standard deviation (SD=1.18). The least commonly used technology tools stated by student teachers are “mashups” (68% of the student teachers reported that they either use the mashups never or rarely) with mean score (M= 2.05) and standard deviation (SD=1.17), “developing software” (63% of the student teachers reported that they either develop software never or rarely) with mean score (M= 2.18) and standard deviation (SD=1.25) and “clickers” (58% of the student teachers reported that they either use the clickers never or rarely) with mean score (M= 2.36) and standard deviation (SD= 1.23).

According to Table 16, student teachers in ELT programs highly use some technology tools such as Internet, computers/laptop/tablets, smartphones/cellphones, social networks, video sharing sites, presentation software and word processors. On the other hand, technologies like mashup, clickers, software development, edmodo, podcasts, web page development tools, simulations, databases, tutorials, interactive whiteboard and spread sheets have low level of use among student teachers. TV/DVR, projectors, mp3 player/iPod, audio video production tools, drill and practice programs, word processors, blogs, wikis and forums are among the moderately used technology tools. Results also show that the overall mean score of the use of different types of technologies by student teachers is (M= 3.16) which indicates that the frequency of using different types of technologies by student teachers is at a moderate level.

Table 17

S*tudent Teachers' Competency Level with Different Types of Technologies*

	Very Poor		Poor		Fair		Good		Excellent		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	51	6	40	5	87	11	374	46	262	32	3.93	1.09
Interactive whiteboard	51	6	84	10	174	21	332	41	173	21	3.60	1.12
TV/DVR	23	3	45	6	135	17	343	42	268	33	3.97	0.99
Smartphones/Cell phones	13	2	27	3	64	8	279	34	431	53	4.34	0.88
Projectors	30	4	74	9	177	22	295	36	238	29	3.78	1.08
Mp3player/ipod	34	4	57	7	150	18	313	39	260	32	3.87	1.07
Podcasts	135	17	135	17	209	26	197	24	138	17	3.08	1.32
Audio/Video Production	65	8	83	10	215	26	246	30	205	25	3.54	1.20
Clickers	209	26	202	25	194	24	139	17	70	9	2.58	1.27
Databases	183	23	161	20	255	31	146	18	69	9	2.70	1.24
Drill and Practice Programs	102	13	146	18	220	27	223	27	123	15	3.15	1.24
Internet	28	3	40	5	82	10	244	30	420	52	4.21	1.04
Word processors	38	5	43	5	107	13	273	34	353	43	4.06	1.09
Spreadsheets (i.e. Excel)	82	10	119	15	211	26	218	27	184	23	3.37	1.26
Presentation software	35	4	50	6	106	13	278	34	345	42	4.04	1.09
Simulations	135	17	137	17	238	29	164	20	140	17	3.05	1.31
Webpagedevelopment tools	196	24	152	19	228	28	147	18	91	11	2.74	1.3
Mashup	282	35	214	26	192	24	85	10	41	5	2.25	1.18
Tutorials	192	24	161	20	228	28	154	19	79	10	2.71	1.28
Blogs	121	15	136	17	222	27	184	23	151	19	3.13	1.31
Wikis	94	12	96	12	157	19	269	33	198	24	3.47	1.29
Forums	95	12	88	11	194	24	253	31	184	23	3.42	1.27
Videosharing sites	27	3	41	5	95	12	287	35	364	45	4.13	1.02
SocialNetworks	34	4	34	4	85	10	237	29	424	52	4.21	1.06
Edmodo	250	31	97	12	150	18	156	19	161	20	2.85	1.52
Developing software	281	35	193	24	165	20	113	14	62	8	2.36	1.29
									Overall Mean Score		3.41	

Table 17 shows that the competency level of student teachers' is high with "smartphones/cellphones" (87% of the student teachers reported that they either use the smartphones/cellphones in a good or excellent way) with mean score (M= 4,34) and

standard deviation (SD=.88), the “Internet” (82% of the student teachers reported that they either use the internet in a good or excellent way) with mean score (M= 4.21) and standard deviation (SD= 1.04), “social networks” (81% of the student teachers reported that they either use the social networks in a good or excellent way) with mean score (M=4.21) and standard deviation (SD=1.06). The competency level of student teachers is low with “mashups” (61% of the student teachers reported that they either use the mashups poorly or very poorly) with mean score (M= 2.25) and standard deviation (SD=1.18), “developing software” (59% of the student teachers reported that they are either poor or very poor at developing software) with mean score (M= 2.36) and standard deviation (SD=1.29) and “clickers” (51% of the student teachers reported that they either use the clickers poorly or very poorly) with mean score (M= 2.58) and standard deviation (SD=1.27).

Results show that student teachers are quite skillful at using some technology tools such as Internet, computers/laptop/tablets, smartphones/cellphones, social networks, video-sharing sites and presentation software. On the other hand, student teachers expresses low level of competency with technology tools such as mashups, software development, clickers, edmodo, web page development tools, databases, tutorials, simulations and podcasts. Interactive whiteboard, projectors, mp3 player/iPod, audio video production tools, drill and practice programs, word processors, spreadsheets, blogs, wikis and forums are among the technologies that student teachers indicate moderate level of competency in. Results also show that the overall mean score of the student teachers’ competency level of different technology tools is (M= 3. 41) which indicates that student teachers’ skills at using different types of technologies is at a moderate level.

Table 18

Student Teachers' Views about the Applicability Level of Different Types of Technologies to Language Teaching

	Very Low		Low		No opinion		Moderate		High		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	72	9	63	8	31	4	217	27	431	53	4.07	1.29
Interactive whiteboard	44	5	100	12	37	5	240	30	393	48	4.03	1.23
TV/DVR	102	13	192	24	64	8	247	30	209	26	3.33	1.40
Smartphones/Cell phones	84	10	161	20	202	25	186	23	181	22	3.27	1.29
Projectors	61	8	128	16	54	7	252	31	319	39	3.79	1.31
Mp3player/ipod	115	14	199	24	98	12	222	27	180	22	3.19	1.39
Podcasts	127	16	198	24	155	19	184	23	150	18	3.04	1.35
Audio/Video Production	75	9	157	19	71	9	256	31	255	31	3.56	1.35
Clickers	160	20	179	22	250	31	136	17	89	11	2.77	1.25
Databases	148	18	198	24	182	22	194	24	92	11	2.86	1.28
Drill and Practice Programs	94	12	136	17	86	11	266	33	232	29	3.50	1.36
Internet	29	4	65	8	31	4	191	24	498	61	4.31	1.09
Word processors	54	7	97	12	44	5	243	30	376	46	3.97	1.26
Spreadsheets (i.e. Excel)	134	17	172	21	102	13	203	25	203	25	3.21	1.44
Presentation software	47	6	80	10	56	7	229	28	402	49	4.06	1.21
Simulations	94	12	170	21	152	19	199	24	199	24	3.29	1.35
Webpagedevelopment tools	131	16	211	26	192	24	169	21	111	14	2.90	1.28
Mashup	198	24	156	19	297	37	109	13	54	7	2.59	1.18
Tutorials	152	19	181	22	192	24	176	22	113	14	2.90	1.32
Blogs	134	17	182	22	121	15	232	29	145	18	3.09	1.37
Wikis	83	10	151	19	124	15	278	34	178	22	3.39	1.29
Forums	87	11	177	22	115	14	262	32	173	21	3.32	1.31
Videosharing sites	51	6	100	12	58	7	261	32	344	42	3.92	1.24
SocialNetworks	151	19	157	19	136	17	160	20	210	26	3.15	1.46
Edmodo	111	14	149	18	269	33	150	18	135	17	3.06	1.25
Developing software	165	20	183	23	263	32	122	15	81	10	2.72	1.23
									Overall Mean Score		3.36	

Table 18 demonstrates that the applicability of some technologies to language teaching stated by student teachers is high with the "Internet" (61% of the student teachers reported that internet is highly relevant to English language teaching) with mean score (M=4.31) and standard deviation (SD=1.09). "computers/laptops/tablets" (53% of the student teachers reported that computers/laptops/tablets are highly relevant to language teaching) with mean score (M=4.07) and standard deviation (SD=1.29), "presentation software" (49% of the student teachers reported that presentation software is highly relevant to language teaching) with mean score (M=4.06) and standard deviation (SD=1.21). Student teachers have little or no insight about the applicability of some technologies such as "mashups" (80% of the student teachers reported that they have little or no insight about the applicability of mashups to language teaching) with mean score (M=2.59) and standard deviation (SD=1.18), "developing software" (75% of the student teachers reported that they have little or no insight about the applicability of developing software to

language teaching with mean score (M=2.72) and standard deviation (SD=1.23) and "clickers" (73% of the student teachers reported that they have little or no insight about the applicability of clickers to language teaching with mean score (M=2.77) and standard deviation (SD=1.25).

Results indicate that student teachers report moderate level of applicability with some technologies such as Internet, computers/laptop/tablets, smartphones/cellphones, video-sharing sites and presentation software. On the other hand, student teachers expresses little or no insight about the applicability of mashups, software development, clickers, edmodo, web page development tools, databases, tutorials, social networks, mp3player/iPod, excel, blogs, TV/DVR, smartphones/cell phones, forums, wikis, simulations and podcasts to language teaching. Results also show that the overall mean score of the student teachers' ideas about the applicability of different types of technologies to ELT is (M=3. 36) which indicates that student teachers have little or no insight about the applicability of the majority of different types of technologies to language teaching.

Table 19

Student Teachers' Preparedness Level of Using Different Types of Technologies in Language Teaching

	Not at all		Very little		Fairly Well		Quite Well		Perfectly		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	64	8	67	8	134	17	318	39	231	28	3.72	1.19
Interactive whiteboard	58	7	104	13	204	25	286	35	162	20	3.48	1.15
TV/DVR	54	7	74	9	217	27	304	37	165	20	3.56	1.11
Smartphones/Cell phones	127	16	131	16	134	17	182	22	240	30	3.34	1.44
Projectors	40	5	91	11	213	26	268	33	202	25	3.62	1.12
Mp3player/ipod	60	7	111	14	224	28	240	30	179	22	3.45	1.18
Podcasts	141	17	173	21	236	29	167	21	97	12	2.89	1.26
Audio/Video Production	77	10	128	16	220	27	229	28	160	20	3.33	1.22
Clickers	224	28	213	26	209	26	112	14	56	7	2.46	1.22
Databases	208	26	187	23	226	28	138	17	55	7	2.56	1.23
Drill and Practice Programs	124	15	161	20	243	30	180	22	106	13	2.98	1.25
Internet	33	4	54	7	129	16	263	32	335	41	4	1.10
Word processors	33	4	66	8	155	19	271	33	289	36	3.88	1.11
Spreadsheets (i.e. Excel)	81	10	136	17	217	27	209	26	171	21	3.31	1.25
Presentation software	36	4	78	10	140	17	273	34	287	35	3.86	1.13
Simulations	157	19	166	20	232	29	142	17	117	14	2.87	1.31
Webpagedevelopment tools	213	26	206	25	222	27	113	14	60	7	2.51	1.22
Mashup	311	38	232	29	166	20	69	9	36	4	2.12	1.14
Tutorials	222	27	185	23	237	29	106	13	64	8	2.52	1.24
Blogs	149	18	152	19	227	28	191	24	95	12	2.92	1.27
Wikis	122	15	118	15	215	26	229	28	130	16	3.16	1.28
Forums	115	14	123	15	203	25	241	30	132	16	3.19	1.28
Videosharing sites	41	5	55	7	149	18	276	34	293	36	3.89	1.12
SocialNetworks	110	14	143	18	128	16	185	23	248	31	3.39	1.42
Edmodo	250	31	127	16	155	19	153	19	129	16	2.74	1.46
Developing software	316	39	178	22	182	22	89	11	49	6	2.24	1.24
Overall Mean Score											3.15	

Table 19 shows that student teachers feel perfectly prepared only with the Internet for instructional purposes (73% of the student teachers reported that they feel well prepared to use internet for instructional purposes) with mean score (M=4) and standard deviation (SD=1.10). Student teachers do not feel adequately prepared with some technologies such as "mashups" (67% of the student teachers reported that they are not adequately prepared to use mashups in their teaching) with mean score (M=2.12) and standard deviation (SD=1.14), "software development" (61% of the student teachers reported that they are not adequately prepared to develop software for instructional purposes) with mean score (M=2.24) and standard deviation (SD=1.24) and "clickers" (54% of the student teachers reported that they are not adequately prepared to use clickers in their teaching) with mean score (M=2.46) and standard deviation (SD=1.22).

As it is seen, student teachers are well prepared to use some technology tools such as Internet, computers/laptop/tablets, video-sharing sites and presentation software, Word

processors, projectors and TV/DVR. On the other hand, student teachers express low level of preparedness with technology tools such as mashups, software development, clickers, edmodo, web page development tools, databases, tutorials, simulations and podcasts. Results show that the overall mean score of the student teachers' preparedness level of different technology tools is (M=3. 15) which indicates that student teachers' preparedness level of using different types of technologies for instructional purposes is at a moderate level. It can also be said that student teachers do not feel properly prepared with the majority of the technology tools that can be used in English language teaching.

Table 20

Technology Knowledge of Student Teachers in ELT Programs

Technology Knowledge	M	SD
I know how to save data into/from a digital device (i.e.flash disk,USB, stick,CD).	3.96	1.26
I know how to play audio and video files on my computer.	4.39	0.85
I know how to use computer mediated communication (CMC) technologies(e.g. email, chat)	4.34	0.84
I know how to record video files (i.e. using a video camera)	4.27	0.86
I know how to create images on my computer (i.e. using Windows Paint).	4.19	0.94
I know how to record audio files (i.e. using a dictaphone)	3.88	1.10
I know about basic computer hardware (i.e. CD-Rom, mother-board, RAM) and their functions.	3.51	1.19
I know how to use generic office applications (i.e. Word, Powerpoint, Excel).	3.99	0.99
I know how to edit images on my computer (i.e. using Photoshop).	3.73	1.12
I know how to use electronic / online dictionaries.	4.21	0.98
I know how to use web 2.0 technologies (e.g. blogs, social networks, and wikis)	4.02	0.99
Overall Mean Score	4.04	

The descriptive statistics for technological knowledge indicates that student teachers in ELT programs scored highest in technology knowledge (M=4.04). The items with the highest mean scores are about student teachers' knowledge and ability with playing audio and video files (M=4.39, SD=0.85), using CMC technologies (M=4.34, SD=0.84) and using electronic/online dictionaries (M=4.21, SD=0.98). The items with relatively low mean scores are knowledge about computer hardware and their functions (M=3.51, SD=1.19), editing images (M=3.73 SD=1.12) and recording audio files (M=3.88, SD=1.10).

Table 21

Content Knowledge of Student Teachers in ELT Programs

Content Knowledge	M	SD
I can monitor my own writing for accuracy.	3.88	0.95
I can comprehend English speech accurately.	3.79	0.9
I can monitor my own speech for accuracy.	3.77	0.92
I can comprehend English texts accurately.	3.86	0.89
I am familiar with the culture(s) of target language communities.	3.72	0.92
I am familiar with the differences between spoken and written English.	3.86	0.93
Overall Mean Score	3.81	

The results show that student teachers seem to have moderate level of knowledge with respect to their content area (M=3.81).

Table 22

Pedagogical Content Knowledge of Student Teachers in ELT Programs

Pedagogical Content Knowledge	M	SD
I can assess student learning in multiple ways.	3.77	0.89
I can select teaching materials appropriate to the needs of learners.	3.91	0.87
I can choose an appropriate approach to teach learners (i.e. communicative approach, direct method).	3.80	0.92
I can adapt my teaching style to different learners.	3.8	0.9
I can facilitate learning through individual, partner, group, and whole class activities.	3.89	0.91
I can plan when and how to use the target language, including meta-language I may need in the classroom.	3.74	0.91
I can keep students on task.	3.73	0.86
I can identify linguistic problems experienced by learners (i.e. phonological, lexical or grammatical problems).	3.73	0.87
I can design language courses around the requirements of the curriculum .	3.62	0.93
I can facilitate learning by creating a comfortable environment in which learners are willing to take risks.	3.68	0.93
I can react supportively to learners' interaction.	3.76	0.94
I am aware of the contextual factors that could inhibit/promote English teaching.	3.74	0.88
Overall Mean Score	3.76	

When Table 22 is examined, it is seen that while selecting suitable materials in line with learners' needs has the highest mean score (M=3.91), designing language courses around the requirements of the curriculum has the lowest mean score (M=3.62, SD=0.93). The results demonstrate that student teachers in ELT programs feel moderately competent in understanding the relationship between know-what and know-how of language teaching (M=3.76, SD=.90).

Table 23

Technological Content Knowledge of Student Teachers in ELT Programs

Technological Content Knowledge	M	SD
I know about technologies that I can use to teach English language grammar	3.65	0.95
I know about technologies that I can use to teach reading in English.	3.76	0.95
I know about technologies that I can use to teach writing in English.	3.69	0.94
I know about technologies that I can use to teach English vocabulary.	3.81	0.95
I know about technologies that I can use to teach pronunciation of English words.	3.80	0.96
I know about technologies that I can use to teach listening in English.	3.84	0.94
I know about technologies that I can use to teach about the differences between cultures.	3.67	0.99
Overall Mean Score	3.74	

Table 23 shows that student teachers rated themselves above average in technological content knowledge (M=3.74). While technologies related to teaching listening (M=3.84, SD=.94) have the highest mean score, technologies related to teaching about the differences between cultures have the lowest mean score (M=3.65, SD=.95).

Table 24

Technological Pedagogical Knowledge of Student Teachers in ELT Programs

Technological Pedagogical Knowledge	M	SD
I can adapt the use of the technologies that I am learning about to different teaching activities	3.55	0.94
I can choose technologies that enhance students' learning for a lesson.	3.59	0.91
I can choose technologies that enhance the teaching approaches for a lesson.	3.57	0.92
I can design, using technology, relevant learning experiences to promote student learning.	3.55	0.93
I think critically about how to use technology in my classroom.	3.53	0.94
I can engage students in solving authentic problems using digital technologies and resources	3.45	0.94
I can choose technologies to be used in assessment	3.43	0.95
Overall Mean Score	3.52	

The results show that technological pedagogical knowledge is the lowest scored construct of the TPACK framework (M=3.52). While technologies to be used in assessment has the lowest score (M=3.43, SD=.95), knowledge of technologies that can enhance learning has the highest score (M=3.59, SD=.91).This indicates that student teachers feel somewhat confident about whether they can integrate technology and pedagogy in an efficient way.

Table 25

Technological Pedagogical Content Knowledge of Student Teachers in ELT Programs

Technological Pedagogical Content Knowledge	M	SD
I can use a range of technologies that enable students to become active participants	3.72	0.93
I can use a range of technologies to help students pursue their individual curiosities.	3.69	0.92
I can use technology effectively to communicate relevant information to students and peers.	3.74	0.93
I can facilitate intercultural understanding by using technology to engage students with different cultures.	3.66	0.93
I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.	3.77	0.89
I can provide equitable access to digital language learning tools and resources.	3.66	0.88
I can teach lessons that appropriately combine English linguistic concepts, technologies, and teaching approaches.	3.66	0.89
Overall Mean Score	3.7	

Table 25 illustrates that student teachers in ELT programs scored higher than moderate for technological pedagogical content knowledge construct (M=3.70). Results indicate that student teachers somewhat agree that they are capable of integrating content, technology and pedagogy.

To sum up, student teachers in ELT programs feel confident with their technology knowledge (M=4.04, SD=1.01). Because they live in a world surrounded by technology, it is expected that they have basic knowledge and skills with technology. Although student teachers' confidence level is higher than moderate with other constructs of the TPACK, it can be seen that knowledge types including technology have lower mean scores (i.e. TCK, TPK & TPCK) than knowledge types that do not include technology (i.e. CK & PCK). This indicates that student teachers feel less competent with knowledge types involving technology integration. When mean scores of TPACK constructs are compared with the mean scores of frequency of technology use, competency in technology use, applicability of technologies to language teaching and preparedness level with instructional technologies, one can see that student teachers scored higher in EFL-TPACK questionnaire. This indicates that since student teachers are not aware of many other types of technologies available, they evaluate themselves based on the technologies they know about in EFL-TPACK questionnaire.

4.1.2. Qualitative Research Findings

4.1.2.1. Findings Demonstrating Student Teachers' Beliefs about Technology

One of the most important barriers cited by many researchers is beliefs related to technology. In order to explore what the meaning of technology is for student teachers and to understand the general trend in student teachers' views about technology; we posed the fourth research question. Student teachers were requested to respond to the three open-ended questions at the end of the survey. Based on Feenberg's two main views about technology which are instrumental view and substantive view, student teachers' beliefs were categorized through typological analysis. The table below presents the number of student teachers and the views they subscribe to.

Table 26

Frequency of Student Teachers' Views about the Role of Technology in Language Teaching

Views about technology	Frequency (N=814)	Percent (%)
Instrumental view	585	72
Substantive view	43	5
Unable to be categorized	186	23

As can be seen from the data in Table 26 the majority of the student teachers (72%) hold instrumental views about technology and the minority of the student teachers (5%) have a closer stance to substantivist view. 23% of the responses were unable to be categorized because some participants had not written anything at all or they had not provided any rationale for their statements (e.g. "Technology has an important role in language teaching."). We also generated 10 categories from the data obtained. The categories were developed based on the roles technology was ascribed to have. 9 of these categories were related to the theme of instrumental view. The categories developed were: (a) a barrier in the path of creativity, (b) device, (c) facilitator, (d) helper, (e) quality enhancer, (f) resource provider, (g) exhilarator, (h) motivator and (i) time saver. As their labels suggest all these 9 categories give the idea that technology is a means to an end. The remaining 1 category "part of education" was related to a more substantivist view and stressed the

inevitability of using technology in language teaching. The table below presents an overview of the findings related to student teachers' beliefs about technology. It also presents sample statements about student teachers' views about technology from each university.

Table 27

Categories and Sample Statements about Student Teachers' Beliefs about the Role of Technology

Universities	Instrumental View									Substantive View
	Categories									
	A Barrier in the path of creativity	Device	Facilitator	Helper	Quality Enhancer	Resource Provider	Exhilarator	Motivator	Time-Saver	Part of education
A	---	Technology means a computer in the classroom.	Technology can make learning easier.	Technology helps develop learning strategies	It promotes student-centered learning.	Technology gives opportunity to the students in terms of doing homework, communicating, researching and increase their awareness.	It helps students to have fun during lesson	Technology use provides variety in education. Thus, it is motivating for both teachers and learners.	It saves time.	---
B	---		Students can understand subjects easily	It is a support for the teacher as well as the student.	Technology provides enhanced learning and teaching.	Technology has importance in that it helps collecting data, getting information	It makes lesson enjoyable	The role of technology is enhancing learners' motivation	It is easy and time saving to use it in teaching	Technology is a must for this generation since they grow up with technology.
C	---	Overhead projectors and transparences	It facilitates teachers' job.	It helps students to comprehend the subject better		Technology is accessing to the knowledge faster.	---	---	---	It is 2015 and we have to use technology to adapt to the World better
D	---	---	Thanks to its facilities, technology makes teaching and learning easier.	---	The role of technology in language teaching is to enhance the quality in teaching and learning.	Technology provides learners and teachers with authentic materials.	Technology makes classes funny and enjoyable	It draws students' attention and motivates learners in lessons.	---	Technology has always been a friend of mine. It enabled me to develop my language skills. Therefore, I want my students to adopt it to improve their learning.
E	---	Technology is a useful device for education.	Technology is a kind of facilitator. It helps the	Technology accelerates learning and decreases	İt makes lessons more permanent and	I can prepare lots of things in with internet, power point.	It is fun and does not allow students to	Technology enhances student motivation.	Technology has a crucial role if we want to use time effectively.	Technology is very important for courses, when we consider kids grow up with technology

			teacher and student to do their best without doing extra work.	effective filter of students.	understandable.		get bored.			in today's World
F	---	Technology is practically used to ease our hardships. Students do their presentations, homework and research through technology..	---	It helps teachers prepare their lessons effectively.	---	It gives me variety of different options. It provides limitless resources.	Technology makes classrooms more colorful and attractive.	It is the primary tool in motivating learners.	---	It is important in the every step of education because it will be nonsense to deny its power for language learning and teaching.
G	---	It is a device making presentation easy and help get information.	Technology makes everything more clear. It provides visually, voice.	Technology is an aid for me to reach different ideas, activities, and find creative ways to teach ELT or transmit information.	Technology is a tool which helps us enrich our lessons and provide comprehensible input.	It provides sources for our field that I cannot find in Turkey. It makes it easy to find texts, songs or other materials.	It helps lessons not to be monotonous.	Technology enhances student motivation	It saves time.	I think technology has a very important role. Today's students are more interested in using technological tools while they are learning. So, we can use technology as a part of their life.
H	---	---	Technology makes the lesson easier and understandable, especially when some part of the lesson is on the theory and needs some visuality	The role technology is to help teachers about what to teach and how to teach.	It is an effective tool to stimulate students' critical thinking and encourage them to make creative homework.	It gives opportunity to rich various materials in different skill such as listening speaking .it also provides authentic material.	Technology is for teaching better and funnier	I think it has a very critical role. For example as I observed during my internship program, smart boards make students more motivated.	It is important for time management.	It is a must for teacher to use it. A good teacher cannot avoid using it.
I	---	Technology is using modern tools in educational settings.	It makes teaching and learning easier.	It is a helper for teachers and students.	---	It makes easier to access knowledge. Especially, students in rural places can have better	Learning and teaching can sometimes be boring.	Technology enhances students' motivation.	It helps save time.	Technology use must be compulsory in public schools because students have positive attitudes towards learning thanks to

						opportunity with technology	We can use technology then.			it.
J	---	Computers, laptops projectors etc. that are used for educational purposes.	It makes learning and teaching easier.	---	It enhances the understanding of students and teachers' teaching.	It is a knowledge paradise.	It makes lessons less boring.	Through visuals and audio tools, it draws learners' attention and makes them motivated.	It has multimedia so it can saves time for teachers while preparing for the lessons.	---
K	---	The use of devices to facilitate learning and teaching	It makes learning and teaching easier	It helps learners.	---	---	---	It motivates learners and make them more interested in the lesson.	---	---
L	---	---	Technology makes learning process easier and smooth.	Technology is a kind of aid that gives opportunity to understand something effectively	All students have different learning styles so teacher can address to them thanks to tech	It provides classroom materials.	It makes learning more enjoyable.	Technology helps to increase students' motivation	---	Technology must be integrated into English courses because technology can guide them while learning English.
M	---	---	It facilitates learners' understanding .	Technology helps the teacher to teach the lesson and also helps students to understand the lesson very well.	In my opinion technology makes learning better and permanent.	Providing students with more understandable information with images, videos and graphics.	---	Students are more motivated and more interested in subjects with technology.	Time is important for us so the technology helps us to use the time effectively. With the help of the time, we can do more work in a short time.	Technology is very important for students to understand because they complement each other.
N	Technology is not necessary in education. Because it makes student lazy and restrict the power of imagination.	---	Technology makes learning easy.it is suitable for more multiple intelligences.	By using technology we can teach the lesson in the best way	Technology promotes teaching and learning.it help students understand various subjects.	We can find millions of different materials thanks to technology.	It makes lessons more fun.	The role of technology is to increase the attention of learners.	Thanks to technology education can be taught better in a shorter time.	İt makes up almost all of the education during this century especially with the new generation. We can say that its the only thing that'll attract them in class as their Daily lives are based on it

O	---	---	Technology makes learning easier. Technology is a facilitator.	It is a helper for students and learners.	Technology is a tool which makes teaching and learning process better	It provides limitless sources to education.	The role of technology in education is to prevent running boring lessons	It motivates learners.	It is time-saving since it offers visuals and audial tools synchronously	Technology is a part of the World. If so I think it should be integrated with education. If it is used appropriately it will be better not only for students but also for teachers.
P	---	---	Technology facilitates learning	It helps teacher teach the language easily.	---	We can show whatever we want related to the lessons, topics to our pupils in the classroom through technology	Technology makes lessons more colorful interesting and attractive.	Technology enables to keep students motivation high with different interactive activities for language learning.	It is time saving.	Technology has a big place in our lives. Although it has pros and cons, it is inevitable. So they must be used in classrooms as well
Q	---	It has supplementary role with OHP, tape recorders etc.	It makes learning easy.	---	It is an important tool that should be used to enhance language learning.	Technology has a lot of sources to learn something in education.	Technology provides joyful class hours.	---	---	---
R	---	---	The role of technology is facilitating the learning process.	It helps students as well as teachers in the teaching and learning process.	It helps reinforce what we learn and make learning more permanent.	It provides us with lots of materials.	If teachers use technology, lessons will be fun.	---	It has many advantages one of which is time management.	Technology and education can be thought as a whole because it is always with us during learning.

Table 27 illustrates that the instrumental view about technology (72%) is the dominant perspective across the participating universities. Only a small percent of student teachers (5%) have substantive views about technology.

4.1.2.2. Findings Demonstrating Student Teachers' Needs about the Use of Technology in Language Teaching

The last question of the first phase was about identifying learners' needs to find out the barriers that cause student teachers to report that they feel unprepared to use technology in their classrooms. Student teachers were asked to provide an answer to the fourth open-ended question at the end of the survey. We generated six themes and eight categories from the data gathered from 18 different ELT programs. The themes were (a) lack of technology awareness, (b) lack of technology knowledge, (c) lack of technology skills, (d) teacher educators' lack of knowledge and skills, (e) increase in the number of technology-related courses and (f) enhancing infrastructure capacity at universities. 2 of the categories were related to the theme of "lack of technology awareness" and they were *need for discovering the potential of technology* generated based on the data gathered from 4 ELT programs and *need for understanding the rationale of using technology* developed based on the data gathered from 8 ELT programs. The category of *need for learning about different types of technologies* was about the theme of "lack of technology knowledge" articulated by all of the universities (N=18). The theme of "lack of technology skills" had two categories which were *need for practice-based courses* and *need for contextualizing technologies to ELT.* This theme was also highlighted by all the universities. The category of *need for modeling of technology use by teacher educators* was related to the theme of "teacher educators' lack of knowledge and skills" and it was stated by 11 universities. The last two categories were *need for having more technology courses* and *need for having more equipped classrooms at universities* were respectively about the themes of "increase in the number of technology-related courses" stated by eight universities and "enhancing infrastructure capacity at universities" pointed out by 10 universities. The table below shows an overview of the findings pertinent to student teachers' needs about technology use in language teaching and also presents sample statements from student teachers from each participant university.

Table 28

Themes and Categories Showing Student Teachers' Needs About Technology Education and Sample Statements from Student Teachers

Universities	THEMES							
	Lack of Technology Awareness		Lack of Technology Knowledge	Lack of Technology Skills		Teacher educators' lack of knowledge and skills	Increase in the number of Technology Related-Courses	Enhancing Infrastructure Capacity at Universities
	Category	*Category*	*Category*	*Category*	*Category*	*Category*	*Category*	*Category*
	Need for discovering the potential of technology	*Need for understanding the rationale of using technology in ELT*	*Need for learning about different types of technologies*	*Need for practice-based courses*	*Need for contextualizing technologies to ELT*	*Need for modeling of technology use by teacher educators*	*Need for having more technology courses*	*Need for having more equipped classrooms at universities*
A	---	I want to see the relationship between technology and ELT	I want to know more about software because they are really beneficial for my education and future career and I do not know enough about them	I need much more practicing opportunities.	These courses should focus more on ELT classes so that we can get the idea of using technology in English classes.	We need more competent instructors to teach how to use technology.	The hour of technology-related courses should be increased	We need computers, speakers and overhead projectors in our classrooms.
B	We must be taught what we can do with technology in education.	---	I would like to know more about web tools because I think that I can make use of them better.	---	Technology-related courses should be offered in more interactive and field-related ways.	---	---	Smart boards is the most important device today in classrooms. If a classroom has smart board we won't need extra devices like computers mp3 players.
C	I know the advantages of using technology but I want to see whether they really work or not. Instructors should provide use with such chances.	---	I want to know about mashup, tutorials, edmodo because I do not have information about them.	These courses should be practice-based.	We should learn how to integrate it with ELT.	---	More technology-related courses should be offered because we use it always and we should know how to use it in education.	---
D	---	I can say that	Audio-video production We do	We need more	I need to know how to use	There is no teacher	---	Some new

		technology is necessary for effective learning because technology is common all over the world but I need to believe in its usefulness in education	not have any information about this area.	practice with technology tools.	these tools in language teaching.	who can teach us the use of technology in this university.		technological devices we need. For example, more equipped classrooms, smart boards etc.
E	---	Teacher educators only say that we should use technology and it is important but why?	I would like to know more about web tools because internet is a perfect tool for teaching. I should be more knowledgeable about it	We should practice what we learn in order understand.	Understanding how they can be used in ELT.	Instructors should model and guide us about the use of technology for teaching English.	---	---
F	---		I wish I could learn everything related to computer. We just learnt how to prepare presentations.	It should include both theoretical and practical parts. After something is taught it should be practiced.	I need to know which tool can be used with what skill.	---	---	---
G	---	The importance of technology must be stressed. We must understand why we should use technology.	We only learnt specific programs like PowerPoint We can use them while teaching but I do not believe that's enough.	There should be more practice oriented courses The courses we take are usually theory oriented.	I need to learn the ways of using technology in English classrooms.	Our teachers must guide us about using technology.	There should be extra lessons for technology. In these lessons necessary things should be learnt.	We are students studying at university. But in our university we have just projectors. They are not enough. We should increase our options
H	---	We were taught that we should use technology. But, actually I want to see the rationale why technology is an important part of teaching and how important it will be in the future. We must be informed about this.	Podcasts because I do not know much about them.	We had the knowledge well but we did not practice much. I need to practice more.	Even if you know how to use some software, you should be aware of how to use them in English as tools	---	---	More budget should be allocated and technological devices should be on everywhere

I	---	---	They just increased my using of Microsoft word, PowerPoint programs. I want to know more about technology.	Technology courses should be designed not only for theory but also for practicing and experiencing.	---	---	Our instructors generally use technology to read their presentations.	I would like to see more technology use There should be some extra programs to teach how to use technology in ELT classrooms. We especially did not have a course like that.	---
J	---	We were informed that we must use technology but I cannot still understand why this is that important. We should be made aware of the reasons.	I would like to know more about all technology areas related with technology because as a trainee I need to know these in order to be a good trainer.	They should be more practice-based I need to have more practice about preparing lesson plans worksheets with technology.	I need to know how to use them while teaching language skills.		---	---	---
K	---	---	Different technological tools should be used. We did not learn about different programs. We just learned 3 programs.	Technology-related courses should be offered in a practice-based way. No one can learn better than doing	We should have more opportunities to see how they are used while teaching English		Our education system cannot still use it the way it should be. We have a smart board but none of the teachers have used it so far	---	---
L	---	---	I need to see more innovative technologic tools other than projectors and PowerPoint.	Unless it comes to application there is no importance that there is a technology course but if it comes to application and it is applied deeply, it will be relevant	---	---	We need more instructors who can use technology effectively.	I think, we do not have enough technology courses. So our program should require a technology-related course.	---
M	I have not discovered the real power of technology for ELT yet. I need to	---	I need to know new technology programs and be aware of the usage of other educational programs in different countries for language teaching	These courses can be elaborated with some practice part.	These courses should focus on teaching how we can use technology in language teaching		---	---	There should be enough computers for each student a projector in class

	learn it.							
N	---	Understanding why we should use technology.	We should be trained more in terms of knowing about web tools	It is based on theory. We did not make any practice on it. We just learnt its benefits to the lessons Our technology related courses were theory oriented Now I do not know how to use e.g. Smart board.	I want to learn how to infuse technology into ELT.	I want my instructors to use technologies effectively and competently so that I can learn how to use technology better.	There should be more technology-related courses in our curriculum.	I would like to see more technology use at university however we do not even have internet connection.
O	---	We should also focus more on why we must use technology in our classrooms.	I want to learn about specific tools for teaching reading, writing, listening and speaking.	We should do more practice.	These courses must show us how technology is employed in ELT.	---	---	I need faster internet connection.
P	Just as we are able to do everything easily in our lives, we must be taught how language learning can be easier with technology.	---	I do not know how to use excel, movie maker I would like to learn them for instructional purposes.	I need more practice under guidance	I need courses which show me how technology is used effectively in language teaching.	---	---	We need classes that are full of technologic devices.
Q	---	---	I need to know about social media sites because these attract students' attention more.	Technology courses can be offered in a more practice oriented way.	Integration of technology with ELT must be taught in these courses.	A few hours are not enough for understanding technology use. More hours should be allocated to technology training.	---	---
R	---	---	I need to know about blogs and creating games. They are so popular. We can also learn about designing our own page.	Firstly, theoretical part and then the time for practice.	I think we need to learn using them in language teaching.	I think technology use is not enough in classes. Teacher educators should use more and more so that we can come up with concrete ideas about the use of technology in education.	Life is changing and needs of the learners are changing. Thus, more technology-related courses should be offered	---

From the data in Table 28, it is apparent that the greatest demand by student teachers is for *learning about different types of technologies* which was mentioned by all universities (N=18). It is respectively followed by the *need for practice-based courses* (n=17), *need for contextualizing technologies to ELT* (n=17), *need for understanding the rationale of using technology* (n=12), *need for modeling of technology use by teacher educators* (n=11), *need for having more equipped classrooms at universities* (n=10), *need for having more technology courses* (n=8) and *need for discovering the potential of technology* (n=4).

4.1.2.3. Results Obtained from Interviews

To understand the research problems better, and refine and extend the findings obtained from the survey, we held interviews in four different universities with 20 student teachers in ELT programs. The categories generated were in consistency with the findings obtained from the survey. Results from the interviews provided further insight and more in-depth information with respect to the research questions. Table 29 presents the themes and categories developed from the interviews.

Table 29

Frequency of Themes and Categories Developed From the Interview Data Gathered From Four Different ELT Programs in Turkey

		Universities (N=4)			
Themes	Categories	A	B	C	D
		Participants (N=20)			
Inefficiency of student teachers' prior learning experiences with respect to the use of technology in language teaching	Inadequate and ineffective use of technology in student teachers' prior learning experiences	4	5	5	5
Inefficiency of teacher education programs in terms of technology training	Inadequate training on developing student teachers' technology knowledge	1	5	5	5
	Inadequate training on developing student teachers' technology skills	5	5	5	5
	Inadequate training on developing technology awareness in student teachers	5	5	5	5
	Inadequate training on helping student teachers understand the inherent value of technology	3	5	4	5
	Teacher educators' lack of technology knowledge and skills	5	5	5	5
	Emphasis on the "material development" part of the instructional technology and material development courses	--	5	--	5
	Lack of technology infrastructure	5	1	1	2

Theme One: Inefficiency of student teachers' prior learning experiences with respect to the use of technology in language teaching

Category One: Inadequate and ineffective use of technology in student teachers' prior learning experiences

When student teachers were asked to express their opinions about the use of technology in their prior learning experiences, almost all of the interviewees (n=19) talked about the inadequate and ineffective use of technology in their classrooms. For example, one of participants from the University of B said,

> When I was in high school, the Fatih project was initiated. Our teachers went to seminars related to this project. They got certificates. However, our geography teacher was the only one who tried to use technology. Except him, other teachers were not using it.

Alluding to the incompetency of his previous teachers in using instructional technologies, one interviewee from the University of C said,

> I think that in our system, technology is only used for some kind of get-away from the class, from the course for the teachers and also for the students. It makes us lazy and this is the biggest problem I think. It is not being used effectively and makes people lazy. It demotivates

> the students also the teachers and you know it is something like we open the page, watch some videos, listen to some songs and that's all and this is not teaching and this is not appropriate for classroom teaching. So, I cannot say that technology was used as it must be.

Referring to the importance placed on university entrance examinations, one of the participants from the University of D stated, "No, we did not use technology tools. It is just about our education system because we had an exam and we just focused on that exam"

Concurring with other student teachers, one interviewee from the University of A said,

> In primary school, technology was like something fragile. I was afraid to touch it. I felt that it would break down when I touch it. In my secondary education, we used it for listening activities. In high school, we never used technology tools. I prepared my first power point presentation at university.

As the data shows, none of the student teachers have exemplary experiences with instructional technologies that can encourage them to use it in their future career.

Theme Two: Inefficiency of teacher education programs in terms of technology training

In order to elicit interview participants' opinions about the technology training they received in their teacher education programs, we asked some questions including the themes of technology knowledge, technology skills, technology beliefs and their needs in relation to technology education. We developed 7 categories from the interview data as can be seen from Table 29.

Category One: Inadequate training on developing student teachers' technology knowledge

When student teachers were asked whether the technology-related courses they received have enhanced their technology knowledge, most of the participants (n=16) referred to the inadequacy of their programs in increasing their technology knowledge. For example, one of the student teachers from the University of B said,

> We do not have much knowledge about the technologies related to ELT but at least we saw that we can make use of technological devices while teaching English. But I cannot say the course content was adequate. In addition, I know that it will take a lot of time to find the right sources since we do not have enough knowledge about instructional technologies.

Similarly, one interviewee from the University of C said, "Partially just a few points. We have some background knowledge. However, if the course is below your background knowledge you cannot learn new things."

Referring to the low number of technologies they learnt in their courses, one interviewee from the university of D said, "We learnt about edmodo and coca corpus but technology is not all about this. By the way, we learnt these in our method courses not in ITMD courses"

Only one of the participants from the University of A stated that the technology courses she received did not enhance her knowledge and added that, "I am thinking different than

my friends because I took the Instructional technology and material development courses from a different professor." And she maintained that,

> All of us used the technology in the same way. There was no difference among us. I mean we always used what we already know such as YouTube, slides but we did not use any creative or alternative technologies. We always used the easier ones.

Interview data show that most of the student teachers do think that their ELT program has helped them develop their technology knowledge.

Category Two: Inadequate training on developing student teachers' technology skills

When student teachers were asked whether the technology-related courses they received have enhanced their technology skills, all of the interview participants noted that their courses did not have the chance to practice new technologies or relate them to language teaching. For example, one interviewee from the University of A said, "We learnt new things and we prepared some assignments and lesson plans but we did not practice them at university." Similarly, one participant from the University of D said, "I did not have any chance to practice. So, my technology skills did not develop. Actually, what we learnt from the course was so superficial that I did not feel the necessity to practice it"

Pointing to the failure of their universities in teaching them how to use technology for teaching English language, one of the participants from the University of C stated "We did not learn something like…Any special program which can be used in our teaching… Just…I mean there is nothing new. We do not know any special program that can be used in ELT."

One of the participants from the University of B stated,

> Our professor was attending to the courses of all programs. That's why; she did not do anything related to ELT. She gave us assignments and we did them. The computer courses we took were for acquiring basic skills. In this term, we made some preparations for our assignments. We saw that some of our friends did not even know how to insert pictures to a word file. As you see, the course we received in the first grade was all that. Leave aside contextualizing it for ELT.

This category suggests that all of the student teachers did not have much chance to practice with technology and contextualize it to ELT.

Category Three: Inadequate training on developing technology awareness in student teachers

When student teachers were asked whether the technology-related courses they received have enhanced their technology awareness, all of the participants stated that they would

like to be made aware of different types of technologies. For example, one interviewee from the University of D said, “I need to see more innovative technologic tools other than projectors and PowerPoint”. Similarly, participant from the University of B stated, “I would like to learn about different technologies that can be used for educational purposes rather than only focusing on office programs.”

In addition, one of the participants from the University of C stated that she wanted to understand the potential of technology for ELT and said, “We should be made aware of different technologies. We are always using the same devices. I also want to see how they can work in ELT.”

One interviewee from the University of A has also noted that he would like to understand the necessity of using technology in language teaching and stated, “I can say that technology is necessary for effective learning because technology is common all over the world but I need to believe in its usefulness in education.”

This category indicates that student teachers generally use the same programs in their courses and they want to raise their awareness about different types of technologies that can be used in language teaching.

Category Four: Inadequate training on helping student teachers understand the inherent value of technology

When student teachers were asked what they think the role of technology in ELT is, most of them (n=17) expressed instrumental views about the use of technology in education. For example, one of the student teachers from the University of C said:

> If there is no technology, the learning-teaching process can be managed in different ways. However, if technology is used, learning can be easier and time can be used efficiently. I also want to add something else. If the teachers always use technology, this influences his/her professional development as well. If he/she says that let’s play a song and listen or dance, these lessons won’t be useful since teacher doesn’t spend much effort for preparing these lessons.

One interviewee from the University of D stated,

> It is just a means. I think we should just use to technology when necessary. I mean we should not use it all the time. I think the hardcopies are more effective than the softcopies because the learners can see and also can touch. Touching is very important for me. You can make the course more effective not true all the time by using technology but you can make a class so efficient without technology

Concurring with other participants, one interviewee from the University of A said, “It compensates for teachers’ shortcomings in terms of pronunciation, finding materials,

listening activities, you make your students watch videos, you teach them cultural things, you find authentic materials."

Similarly, one interviewee from the University of B stated:

> It increases motivation since new generation is willing to use technology. However it should not be used that much. Imagine that you are always hearing the sound of water dripping in this room. It first draws your attention but after a while, we get accustomed to hearing that sound. It is like this. If we use technology at intervals, students become happy. It acts like a reward and increases their motivation. However if it is used all the time, it becomes ordinary and doesn't create the same effect.

Interview data also revealed that only 3 of the participants took a closer stance to substantive view. For example, one participant from the University of C said,

> Old people say that we were communicating better before the cell phones entered our lives. I think technology was not a matter of issue in the past but it is must in today's world. Students always see tablets, computers, LCD TVs, smartphones around. If technology is part of students' lives, it should be part of education.

Likewise, one interviewee from the University of A said, "Today's kids have cell phones computers even at the age of five. As they are growing up with technology, if we do not keep up with them, you will be like an outsider in the classroom."

This category showed that most of the student teachers (n=17) have not grasped the inherent value technology has for language teaching. Only 3 participants see it as part of education considering the effects it has on our daily lives.

Category Five: Teacher educators' lack of technology knowledge and skills

Interview data also revealed that all of the participants (N=20) do not find most of their professors competent enough to use technology effectively. For example, one interviewee from the University of A said,

> Students are criticizing their professors. Why? What are they doing? While there is a projector there, they are trying to show us things through the small screen of their laptops. We love our professors but we do not approve such actions.

Similarly, one participant from the University of B stated:

> Some of our professors are using it redundantly. We have got our books open on our desks. They run the courses with presentations. But these presentations should include different things from our books. Instead of translating the same thing and showing it on the PowerPoint they must summarize them briefly but clearly. They are first reading from the presentation. Then, they are trying to tell us what they understand from these statements. In my opinion PowerPoint presentations must act like reminders. The professor must look for the key words and talk about them in detail.

Concurring with other participants, one participant from the University of C indicated:

> I am not saying that technology is not important but it is not a must because I have not learnt English with technology. But, I can say that if the teacher is so knowledgeable about the use of technology, then this teacher must certainly use it so that learners can have aha moments but I

> am wondering where such teachers are. I have never seen. Technology tools are used for presentations at our university most of the time and some lecturers run courses by reading from the slides. Then why should I pay attention to this lesson? I believe that if technology is used consciously for educational purposes, this will be amazing but this cannot be with our lecturers or with us.

Referring to the monotonous use of technology, one interviewee from the University of D said:

> The way our lecturers and teachers use technology is very mundane and dull. They come and look and they point and they read it from there and good. One of the professors used it the other day and I got really bored. The way you use it is really important.

This category suggests that student teachers want to see effective and creative ways of using technologies. However, they all disapprove the way technology is used by their professors.

Category six: Emphasis on the "material development" part of the instructional technology and material development courses

One of the striking finding emerged from the interview data was the emphasis on the "material development" part of the instructional technology and material development courses. Student teachers from the universities of B and D pointed out that instructors offering the courses of Instructional Technology and Material Development favor the part of material development over the part of instructional technology. For example, one student teacher from the University of B said, "We focused on the material design of that course. We did not do anything related to technology. In this course, we worked with colorful papers." Similarly, one interviewee from the University of D stated, "In ITMD courses, we focused on developing materials with colorful papers. We did not use technology."

Category seven: Lack of technology infrastructure

One of the emergent themes from the interview data was lack of technology infrastructure. Almost half of the student teachers (n=9) mentioned they need more technological equipment in their universities. For example, one interviewee from the University of D said "We have learnt about some tools and websites but we cannot use the internet in the school easily. The Wi-Fi cannot connect to internet. Likewise, one interviewee from the University of C said:

> We are also aware of some software programs that we can use but we do not have the chance to access them either because of pricing and sometimes they can be very expensive but if we have such kind of lab here so we could be acquainted with them

Similarly, one interviewee from the University of B stated:

> We do not have a language lab. For listening activities, there are loudspeakers only in the prep school. Other classrooms do not have and we bring our own speakers. It is questionable how adequate it can be for listening courses. Making listening activities through earphones cannot be compared to making it through just one loudspeaker for 40 students. Our university lacks technological hardware. If universities have ELT programs then they must have language labs accordingly.

Concurring with other participants, one interviewee from the University of A stated:

> Our university is lack of technological hardware. We need loud speakers but we cannot find. Some classrooms do not have internet connections. For example in one of my presentations I needed to use internet however there was no internet connection and I had to argue with my group friends. We often experience such difficult situations

The interview data reveals that universities still suffer from low capacity of technology infrastructure and almost half of the student teachers remark this problem.

4.2. Phase Two

Phase two refers to the phase in which the implementation process starts based on the findings obtained from phase one.

4.2.1. Quantitative Research Findings

80 third grade student teachers in the ELT program of NEU who successfully completed the technology-related courses took part in the second phase of the study and they responded to the reduced version of the Survey of Student Teachers' Beliefs, Knowledge and Skills Regarding the Use of Technology. The reduced version consisted of the sections of EFL-TPACK Questionnaire*, Technology Use in Daily Life* and *Technology Use for Instructional Purposes.* It was conducted before and after the implementation process in order to examine whether the implementation of S-TECHNO model had any impact on the treatment group's level of awareness, skills and knowledge about instructional technologies compared to the control group. There were 41 student teachers in the treatment group. 33 of them were female (80.5%) and 8 of them were male (19.5%). 39 student teachers from the control group volunteered to take part in the study. 30 of them were female (76.9%) and 9 of them were male (23.1%).

Table 30

Demographic Information of the Respondents (N=814)

	Gender	Frequency	Percent (%)
Treatment Group	Male	8	19.5
	Female	33	80.5
Control Group	Male	9	23.1
	Female	30	76.9

In addition, we conducted the entry and exit interviews with six participants from each group. All of the 12 participants were female.

4.2.1.1. Findings Demonstrating Student Teachers' Instructional Technological Competence Level before the Intervention Process

4.2.1.1.1. Hypothesis 11

H_0: There is no difference between treatment and control groups in terms of (a) the frequency of using different types of technologies, (b) technology skills, (c) relating technology tools to language teaching, (d) preparedness level to use technology for language teaching, (e) technology knowledge, (f) technological content knowledge, (g) technological pedagogical knowledge and (h) technological pedagogical content knowledge before the intervention process.

Table 31

The Frequency of Using Different Types of Technologies by the Treatment Group before the Intervention Process

	Never		Rarely		Sometimes		Usually		Always		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	-	-	-	-	6	15	18	44	17	42	4.27	.71
Interactive whiteboard			11	27	16	39	10	24	4	10	3.17	.95
TV/DVR	2	5	4	10	16	39	15	37	4	10	3.37	.97
Smartphones/Cell phones	1	2	3	7	2	5	3	7	32	78	4.51	1.05
Projectors	13	32	10	24	16	39	-	-	2	5	2.22	1.06
Mp3player/ipod	8	20	12	29	8	20	9	22	4	10	2.73	1.28
Podcasts	21	51	11	27	5	12	1	2	3	7	1.88	1.19
Audio/Video Production	15	37	15	37	4	10	4	10	3	7	2.15	1.24
Clickers	31	76	6	15	3	7	1	2	-	-	1.37	.73
Databases	29	71	4	10	5	12	3	7	-	-	1.56	.98
Drill and Practice Programs	11	27	12	29	10	24	6	15	2	5	2.41	1.18
Internet	-	-	1	2	2	5	16	39	22	54	4.44	.71
Word processors	2	5	3	7	10	24	11	27	15	37	3.83	1.16
Spreadsheets (i.e. Excel)	9	22	17	42	8	20	3	7	4	10	2.41	1.20
Presentation software	-	-	5	12	14	34	13	31	9	22	3.63	.97
Simulations	23	56	10	24	6	15	1	2	1	2	1.71	.98
Webpage development tools	18	44	8	20	7	17	6	15	2	5	2.17	1.28
Mashup	32	78	3	7	3	7	1	2	2	5	1.49	1.08
Tutorials	21	51	11	27	4	10	2	5	3	7	1.9	1.22
Blogs	16	39	7	17	11	27	5	12	2	5	2.27	1.25
Wikis	17	42	6	15	8	20	7	17	3	7	2.34	1.37
Forums	14	34	7	17	11	29	5	12	4	10	2.46	1.34
Video sharing sites	2	5	-	-	2	5	14	34	23	56	4.37	.97
Social Networks	2	5	5	12	2	5	7	17	25	61	4.17	1.26
Edmodo	11	27	5	12	13	32	7	17	5	12	2.76	1.36
Developing software	24	59	4	10	5	12	6	15	2	5	1.98	1.33
									Overall Mean Score		2.75	

As can be seen from Table 31, the most commonly used technology tools stated by the treatment group are the "Internet" (93% of the student teachers reported that they either use the internet usually or always) with mean score (M= 4.44) and standard deviation (SD=0.71), "video-sharing sites" (90% of the student teachers reported that they either use the video-sharing sites usually or always) with mean score (M= 4.37) and standard deviation (SD=0.97), and "smartphones/cellphones" (85% of the student teachers reported that they either use the smartphones/cellphones usually or always) with mean score (M= 4.51) and standard deviation (SD=1.05). The least commonly used technology tools stated by student teachers are "clickers" (91% of the student teachers reported that they either use the clickers never or rarely) with mean score (M= 1.37) and standard deviation (SD=0.73), "mashups" (85% of the student teachers reported that they either use mashups never or rarely) with mean score (M= 1.49) and standard deviation (SD=1.08) and "databases"

(81% of the student teachers reported that they either use databases never or rarely) with mean score (M= 1.56) and standard deviation (SD=0.98).

According to Table 31, the treatment group highly use some technology tools such as the Internet, computers/laptop/tablets, smartphones/cellphones, social networks, video sharing sites, presentation software and word processors. However most of the technologies like mashups, clickers, software development, podcasts, web page development tools, simulations, databases, tutorials, projectors, mp3 player/iPod, podcasts, audio video production tools, drill and practice programs, blogs, wikis, forums and educational websites like edmodo are among the never or rarely used technology tools. Results also show that the overall mean score of the frequency of using different technologies by student teachers is (M= 2.75) which indicates that the frequency of using different technologies by treatment group is at a low level.

Table 32

The Frequency of Using Different Types of Technologies by the Control Group before the Intervention Process

	Never		Rarely		Sometimes		Usually		Always		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	-	-	-	-	5	13	12	31	22	56	4.44	.72
Interactive whiteboard	-	-	4	10	16	41	9	23	10	26	3.64	.99
TV/DVR	2	5	2	5	10	26	14	36	11	28	3.77	1.09
Smartphones/Cell phones	-	-	2	5	1	3	8	21	28	72	4.59	.79
Projectors	3	8	16	41	14	36	6	15	-	-	2.59	.85
Mp3player/ipod	5	13	10	26	10	26	5	13	9	23	3.08	1.36
Podcasts	19	49	12	31	6	15	2	5	-	-	1.77	.90
Audio/Video Production	8	21	13	33	11	28	5	13	2	5	2.49	1.12
Clickers	29	74	5	13	4	10	1	3	-	-	1.41	.79
Databases	19	49	10	26	7	18	1	3	2	5	1.90	1.12
Drill and Practice Programs	14	36	8	21	11	28	2	5	4	10	2.33	1.30
Internet	-	-	1	3	4	10	6	15	28	72	4.56	.79
Word processors	2	5	5	13	10	26	14	36	8	21	3.54	1.12
Spreadsheets (i.e. Excel)	6	15	15	39	10	26	4	10	4	10	2.62	1.18
Presentation software	2	5	6	15	9	23	15	39	7	18	3.49	1.12
Simulations	24	62	9	23	6	15	-	-	-	-	1.54	.76
Webpage development tools	25	64	6	15	4	10	3	8	1	3	1.69	1.10
Mashup	36	92	1	3	1	3	-	-	1	3	1.18	.72
Tutorials	27	69	6	15	5	13	1	3	-	-	1.49	.82
Blogs	19	49	4	10	8	21	5	13	3	8	2.21	1.38
Wikis	15	39	4	10	8	21	8	21	4	10	2.54	1.45
Forums	14	36	6	15	7	18	7	18	5	13	2.56	1.47
Video sharing sites	4	10	3	8	7	18	13	33	12	31	3.67	1.28
Social Networks	5	13	2	5	6	15	7	18	19	49	3.85	1.42
Edmodo	35	90	1	3	2	5	1	3	-	-	1.21	.66
Developing software	29	74	7	18	1	3	1	3	1	3	1.41	.88
									Overall Mean Score		2.67	

As can be seen from Table 32, the most commonly used technology tools stated by the control group are the “Internet” (97% of the student teachers reported that they either use the internet usually or always) with mean score (M=4.56) and standard deviation (SD=0.79), “smartphones/cellphones” (93% of the student teachers reported that they either use the smartphones/cellphones usually or always) with mean score (M=4.59) and standard deviation (SD=.79), and “computers/laptops/tablets” (87% of the student teachers reported that they either use the computers/laptops/tablets usually or always) with mean score (M=4.44) and standard deviation (SD=0.72). The least commonly used technology tools stated by student teachers are “mashups” (95% of the student teachers reported that they either use mashups never or rarely) with mean score (M=1.18) and standard deviation (SD=0.72), “edmodo” (93% of the student teachers reported that they either use edmodo never or rarely) with mean score (M=1.21) and standard deviation (SD=0.66) and “clickers” (87% of the student teachers reported that they either use the clickers never or rarely) with mean score (M=1.41) and standard deviation (SD=0.79).

As can be clearly understood from Table 32, the control group highly use some technology tools such as the Internet, computers/laptop/tablets and smartphones/cellphones. Social networks, video sharing sites, presentation software, word processors. However most of the technologies like mashups, clickers, software development, podcasts, web page development tools, simulations, databases, tutorials, projectors, podcasts, audio video production tools, drill and practice programs, blogs, wikis, forums and educational websites like edmodo are among the never or rarely used technology tools. Results also show that the overall mean score of the frequency of using different technologies by student teachers is (M=2.68) which indicates that the frequency of using different technologies by the control group is at a low level.

Table 33

The C*ompetency Level of the Treatment Group in Using Different Types of Technologies before the Intervention Process*

	Very Poor		Poor		Fair		Good		Excellent		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	-	-	-	-	5	12	27	66	9	22	4.10	.58
Interactive whiteboard	-	-	4	10	14	34	15	37	8	20	3.66	.91
TV/DVR	-	-	3	7	4	10	23	56	11	27	4.02	.82
Smartphones/Cell phones	-	-	1	2	2	5	16	39	22	54	4.44	.71
Projectors	9	22	4	10	18	44	9	22	1	2	2.73	1.12
Mp3player/iPod	1	2	3	7	9	22	20	49	8	20	3.76	.94
Podcasts	13	32	12	29	11	27	5	12	-	-	2.20	1.03
Audio/Video Production	14	34	10	24	10	24	5	12	2	5	2.29	1.21
Clickers	19	46	11	27	9	22	2	5	-	-	1.85	.94
Databases	15	37	14	34	10	24	2	5	-	-	1.98	.91
Drill and Practice Programs	9	22	10	24	13	32	6	15	3	7	2.61	1.20
Internet	-	-	3	7	8	20	18	44	12	29	3.95	.89
Word processors	1	2	5	12	8	20	17	42	10	24	3.73	1.05
Spreadsheets (i.e. Excel)	10	24	9	22	13	32	6	15	3	7	2.59	1.22
Presentation software	2	5	3	7	7	17	20	49	9	22	3.76	1.04
Simulations	17	42	14	34	8	20	1	2	1	2	1.90	.97
Webpage development tools	17	42	10	24	12	29	1	2	1	2	2.00	1.02
Mashup	26	63	9	22	4	10	2	5	-	-	1.56	.87
Tutorials	19	47	11	27	5	12	6	15	-	-	1.95	1.09
Blogs	11	27	14	34	8	20	3	7	5	12	2.44	1.30
Wikis	12	29	8	20	8	20	8	20	5	12	2.66	1.41
Forums	13	32	6	15	10	24	7	17	5	12	2.63	1.41
Video sharing sites	2	5	1	2	3	7	19	47	16	39	4.12	1.00
Social Networks	-	-	3	7	7	17	13	32	18	44	4.12	.95
Edmodo	18	44	9	22	9	22	2	5	3	7	2.10	1.24
Developing software	19	46	12	29	8	20	1	2	1	2	1.85	.99
									Overall Mean Score		2.88	

Table 33 shows that the competency level of treatment group is high with "smartphones/cellphones" (93% of the student teachers reported that they either use the smartphones/cellphones in a good or excellent way) with mean score (M=4.44) and standard deviation (SD=.71), "video-sharing sites" (86% of the student teachers reported that they either use the video-sharing sites in a good or excellent way) with mean score (M=4.12) and standard deviation (SD=1.00) and "social networks" (76% of the student teachers reported that they either use the social networks in a good or excellent way) with mean score (M=4.12) and standard deviation (SD=0.95). The competency level of the treatment group is low with "mashups" (85% of the student teachers reported that they either use the mashups poorly or very poorly) with mean score (M=1.56) and standard deviation (SD=0.87), "developing software" (75% of the student teachers reported that they are either poor or very poor at developing software) with mean score (M=1.85) and standard deviation (SD=0.99) and "clickers" (73% of the student teachers reported that

they either use the clickers poorly or very poorly) with mean score (M=1.85) and standard deviation (SD=1.27).

Results show that while student teachers are quite skillful at using some technology tools such as computers/laptop/tablets, smartphones/cellphones, social networks, video-sharing sites and TV/DVR, they express low level of competency with most of the technology tools such as mashups, software development, clickers, edmodo, web page development tools, databases, tutorials, simulations, podcasts, projectors, audio video production tools, drill and practice programs, spreadsheets, blogs, wikis and forums. Results also show that the overall mean score of the student teachers' competency level with different types of technologies is (M=2.88) which indicates that student teachers' competency level of using different technologies is at a low level.

Table 34

The C*ompetency Level of Control Group in Using Different Technologies before the Intervention Process*

	Very Poor		Poor		Fair		Good		Excellent		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	-	-	-	-	4	10	20	51	15	39	4.28	.65
Interactive whiteboard	2	5	-	-	7	18	22	57	8	21	3.87	.92
TV/DVR	-	-	1	3	8	21	20	51	10	27	4.00	.76
Smartphones/Cell phones	-	-	-	-	1	3	11	28	27	69	4.67	.53
Projectors	3	8	6	15	14	36	14	36	2	5	3.15	1.01
Mp3player/ipod	3	8	6	15	7	18	13	33	10	26	3.54	1.25
Podcasts	21	54	12	31	5	13	1	3	-	-	1.64	.81
Audio/Video Production	9	23	10	26	11	28	9	23	-	-	2.51	1.10
Clickers	33	85	5	13	1	3	-	-	-	-	1.18	.45
Databases	30	77	8	21	-	-	1	3	-	-	1.28	.60
Drill and Practice Programs	18	46	7	18	6	15	5	13	3	8	2.18	1.35
Internet	1	3	2	5	1	3	19	49	16	41	4.21	.92
Word processors	3	8	6	15	5	13	14	36	11	28	3.62	1.27
Spreadsheets (i.e. Excel)	7	18	13	33	7	18	10	26	2	5	2.67	1.20
Presentation software	3	8	4	10	8	21	15	39	9	23	3.59	1.19
Simulations	27	70	6	15	4	10	-	-	2	5	1.41	.75
Webpagedevelopment tools	27	69	6	15	4	10	-	-	2	5	1.56	1.05
Mashup	36	92	2	5	1	3	-	-	-	-	1.10	.38
Tutorials	31	80	5	13	2	5	1	3	-	-	1.31	.69
Blogs	18	46	7	18	3	8	8	21	3	8	2.26	1.43
Wikis	20	51	1	3	5	13	9	23	4	10	2.38	1.55
Forums	16	41	6	15	4	10	7	18	6	15	2.51	1.55
Videosharing sites	3	8	2	5	5	13	12	31	17	44	3.97	1.22
SocialNetworks	3	8	-	-	6	15	11	28	19	49	4.10	1.17
Edmodo	37	95	1	3	1	3	-	-	-	-	1.08	.35
Developing software	31	80	5	13	2	5	-	-	1	3	1.33	.81
								Overall Mean Score			2.67	

Table 34 shows that the competency level of control group is high with "smartphones/cellphones" (97% of the student teachers reported that they either use the smartphones/cellphones in a good or excellent way) with mean score (M= 4,67) and standard deviation (SD=.53), "computers/laptops/tablets" (90% of the student teachers reported that they either use the computers/laptops/tablets in a good or excellent way) and "social networks" (77% of the student teachers reported that they either use the social networks in a good or excellent way) with mean score (M= 4.10) and standard deviation (SD= 1.17). The competency level of the control group is low with "edmodo" (98% of the student teachers reported that they either use the edmodo poorly or very poorly) with mean score (M= 1.08) and standard deviation (SD= 0.35) "mashups" (97% of the student teachers reported that they either use the mashups poorly or very poorly) with mean score (M= 1.10) and standard deviation (SD= 0.38), "clickers" (98% of the student teachers reported that they either use the clickers poorly or very poorly) with mean score (M= 1.18) and standard deviation (SD= 0.45). Results show that while student teachers are quite skillful at using some technology tools such as computers/laptop/tablets, smartphones/cellphones, the Internet, social networks, and TV/DVR, they express low level of competency with most of the technology tools such as podcasts, mashups, software development, clickers, edmodo, web page development tools, databases, tutorials, simulations, podcasts, projectors, audio video production tools, drill and practice programs, spreadsheets, blogs, wikis and forums. Results also display that the overall mean score of the student teachers' competency level with different types of technologies is (M= 2.67) which indicates that student teachers' competency level of using different technologies is at a low level.

Table 35

Views of Treatment Group about the Applicability Level of Different Types of Technologies to Language Teaching before the Intervention Process

	Very Low		Low		No opinion		Moderate		High		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	-	-	1	2	1	2	13	32	26	63	4.56	.67
Interactive whiteboard	-	-	3	7	3	7	10	24	25	61	4.39	.92
TV/DVR	-	-	5	12	12	29	17	42	7	17	3.63	.92
Smartphones/Cell phones	3	7	9	22	12	29	9	22	8	20	3.24	1.22
Projectors	1	2	9	22	11	27	11	27	9	22	3.44	1.14
Mp3player/iPod	2	5	4	10	16	40	13	32	6	15	3.41	1.02
Podcasts	12	29	9	22	11	27	6	15	3	7	2.49	1.27
Audio/Video Production	3	7	7	17	10	24	14	34	7	17	3.37	1.18
Clickers	26	63	6	15	8	20	1	2	-	-	1.61	.89
Databases	21	51	6	15	10	24	3	7	1	2	1.95	1.14
Drill and Practice Programs	10	24	5	12	6	15	11	27	9	22	3.10	1.51
Internet	-	-	3	7	3	7	15	37	20	50	4.27	.90
Word processors	1	2	6	15	7	17	12	29	15	37	3.83	1.16
Spreadsheets (i.e. Excel)	4	10	12	29	11	27	5	12	9	22	3.07	1.31
Presentation software	-	-	4	10	4	10	16	39	17	42	4.12	.95
Simulations	22	54	8	20	8	20	2	5	1	2	1.83	1.07
Webpage development tools	21	51	7	17	3	7	7	17	3	7	2.12	1.40
Mashup	27	66	6	15	5	12	3	7	-	-	1.61	.97
Tutorials	16	39	8	20	7	17	7	17	3	7	2.34	1.35
Blogs	17	42	11	27	7	17	4	10	2	5	2.10	1.20
Wikis	17	42	14	34	5	12	2	5	3	7	2.02	1.19
Forums	14	34	8	20	8	20	8	20	3	7	2.46	1.34
Video sharing sites	3	7	-	-	3	7	12	29	23	56	4.27	1.12
Social Networks	7	17	9	22	12	29	8	20	5	12	2.88	1.27
Edmodo	16	39	7	17	5	12	6	15	7	17	2.54	1.55
Developing software	21	51	3	7	5	12	8	20	4	10	2.29	1.50
									Overall Mean Score		2.96	

Table 35 demonstrates how applicable the treatment group finds different types of technologies to language teaching. The applicability level of some technologies such as the "computers/laptops/tablets" (63% of the student teachers reported that computers/laptops/tablets are highly relevant to language teaching) with mean score (M=4.56) and standard deviation (SD=0.92), "Interactive whiteboard" (61% of the student teachers reported that interactive whiteboard is highly relevant to English language teaching) with mean score (M=4.39) and standard deviation (SD=0.92), and "video-sharing sites" (56% of the student teachers reported that video-sharing sites is highly relevant to language teaching) with mean score (M=4.27) and standard deviation (SD=1.12) is high for language teaching according to the treatment group. On the other hand, student teachers stated that they have little or no insight about the applicability of some technologies to language teaching such as "mashups" (93% of the student teachers reported that they have little or no insight about the applicability of mashups to language teaching) with mean

score (M=1.61) and standard deviation (SD=0.97), “clickers” (98% of the student teachers reported that they have little or no insight about the applicability of clickers to language teaching with mean score (M=1.61) and standard deviation (SD=0.89) and “databases” (90% of the student teachers reported that they have little or no insight about the applicability of databases to language teaching with mean score (M=1.95) and standard deviation (SD=1.14) .

Results indicate that student teachers report high level of applicability about some technologies to be used in language teaching such as the Internet, computers/laptop/tablets, smartphones/cellphones, video-sharing sites and presentation software. On the other hand, student teachers express little or no insight about the applicability of some technologies such as mashups, software development, clickers, edmodo, web page development tools , databases, tutorials, social networks, mp3player/iPod, excel, blogs, TV/DVR, smartphones/cell phones, forums, wikis, simulations and podcasts to language teaching. Results also show that the overall mean score of the student teachers’ ideas about the applicability of technology tools to ELT is (M=2.96) which indicates that student teachers have little or no insight about the applicability of the majority of different types of technologies to language teaching.

Table 36

Views of Control Group about the Applicability Level of Different Types of Technologies to Language Teaching Before the Intervention Process

	Very Low		Low		No opinion		Moderate		High		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	-	-	-	-	1	3	16	41	22	56	4.54	.55
Interactive whiteboard	1	3	-	-	4	10	16	41	18	46	4.28	.86
TV/DVR	1	3	3	8	11	28	14	36	10	26	3.74	1.02
Smartphones/Cell phones	1	3	4	10	4	10	14	36	16	41	4.03	1.09
Projectors	2	5	3	8	7	18	17	44	10	26	3.77	1.09
Mp3player/iPod	6	15	7	18	11	28	9	23	6	15	3.05	1.30
Podcasts	21	54	11	28	5	13	1	3	1	3	1.72	.97
Audio/Video Production	6	15	7	18	9	23	13	3	4	10	3.05	1.26
Clickers	32	82	5	13	1	3	1	3	-	-	1.26	.64
Databases	25	64	7	18	4	10	2	5	1	3	1.64	1.04
Drill and Practice Programs	13	33	8	21	5	13	6	15	7	18	2.64	1.53
Internet	1	3	-	-	-	-	13	33	25	64	4.56	.75
Word processors	5	13	1	3	7	18	15	39	11	28	3.67	1.28
Spreadsheets (i.e. Excel)	9	23	9	23	13	33	5	13	3	8	2.59	1.21
Presentation software	1	3	5	13	6	15	14	36	13	33	3.85	1.11
Simulations	26	67	9	23	1	3	1	3	2	5	1.56	1.05
Webpage development tools	26	67	6	15	5	13	1	3	1	3	1.59	.99
Mashup	35	90	4	10	-	-	-	-	-	-	1.10	.31
Tutorials	28	72	7	18	1	3	3	8	-	-	1.46	.88
Blogs	16	41	9	23	6	15	6	15	2	5	2.21	1.28
Wikis	17	44	6	15	3	8	10	27	3	8	2.38	1.46
Forums	14	36	9	23	5	13	8	21	3	8	2.41	1.37
Video sharing sites	2	5	3	8	2	5	19	49	13	33	3.97	1.09
Social Networks	5	13	6	15	7	18	11	28	10	26	3.38	1.37
Edmodo	35	90	4	10	-	-	-	-	-	-	1.10	.31
Developing software	30	77	7	18	-	-	1	3	1	3	1.36	.84
									Overall mean score		2.73	

Table 36 demonstrates how applicable the control group finds different types of technologies to language teaching. The applicability level of some technologies such as the "Internet" (64% of the student teachers reported that the Internet is highly relevant to language teaching) with mean score (M=4.56) and standard deviation (SD=0.75), "computers/laptops/tablets" (56% of the student teachers reported that computers/laptops/tablets are highly relevant to language teaching) with mean score (M=4.54) and standard deviation (SD=0.55), "Interactive whiteboard" (46% of the student teachers reported that interactive whiteboard is highly relevant to English language teaching) with mean score (M=4.28) and standard deviation (SD=0.86) is high for language teaching according to the control group. On the other hand, student teachers state that they have little or no insight about the applicability of some technologies to language teaching such as "mashups" (100% of the student teachers reported that they have little or

no insight about the applicability of mashups to language teaching) with mean score (M=1.10) and standard deviation (SD=0.31), "edmodo" (100% of the student teachers reported that they have little or no insight about the applicability of edmodo to language teaching with mean score (M=1.10) and standard deviation (SD=0.31) and "clickers" (98% of the student teachers reported that they have little or no insight about the applicability of clickers to language teaching) with mean score (M=1.26) and standard deviation (SD=0.64). Results indicate that student teachers report high level of applicability about some technologies to be used in language teaching such as the Internet, computers/laptop/tablets, smartphones/cellphones, and the Interactive whiteboard. However, student teachers express little or no insight about the applicability of some technologies such as mashups, software development, clickers, edmodo, web page development tools , databases, tutorials, social networks, mp3player/iPod, excel, blogs, TV/DVR, smartphones/cell phones, forums, wikis, simulations and podcasts to language teaching. Results also show that the overall mean score of the student teachers' ideas about the applicability of technology tools to ELT is (M=2.73) which indicates that student teachers have little or no insight about the applicability of the majority of different types of technologies to language teaching.

Table 37

Preparedness Level of the Treatment Group about Using Different Types of Technologies for Instructional Purposes before the Intervention Process

	Not at all		Very little		Fairly Well		Quite Well		Perfectly		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	-	-	3	7	9	22	23	56	6	15	3.78	.79
Interactive whiteboard	-	-	5	12	13	32	20	49	3	7	3.51	.81
TV/DVR	1	2	9	22	10	24	14	34	7	17	3.41	1.09
Smartphones/Cell phones	1	2	4	10	6	15	19	46	11	27	3.85	1.01
Projectors	8	20	7	17	15	37	9	22	2	5	2.76	1.16
Mp3player/ipod	3	7	4	10	21	51	7	17	6	15	3.22	1.06
Podcasts	16	39	6	15	9	22	9	22	1	2	2.34	1.28
Audio/Video Production	11	27	7	17	15	37	5	12	3	7	2.56	1.23
Clickers	21	51	11	27	8	20	1	2	-	-	1.73	.87
Databases	20	49	11	27	10	24	-	-	-	-	1.76	.83
Drill and Practice Programs	12	29	9	22	15	37	4	10	1	2	2.34	1.09
Internet	2	5	7	17	6	15	17	42	9	22	3.59	1.16
Word processors	1	2	6	15	9	22	15	37	10	24	3.66	1.09
Spreadsheets (i.e. Excel)	5	12	10	24	15	37	8	20	3	7	2.85	1.11
Presentation software	-	-	6	15	9	22	20	49	6	15	3.63	.92
Simulations	24	59	9	22	5	12	2	5	1	2	1.71	1.03
Webpagedevelopment tools	20	49	11	27	4	10	6	15	-	-	1.90	1.09
Mashup	27	66	6	15	7	17	1	2	-	-	1.56	.87
Tutorials	22	54	7	17	6	15	6	15	-	-	1.90	1.14
Blogs	12	29	13	32	8	20	6	15	2	5	2.34	1.20
Wikis	17	42	8	20	6	15	8	20	2	5	2.27	1.32
Forums	15	37	9	22	10	24	5	12	2	5	2.27	1.23
Videosharing sites	1	2	2	5	7	17	19	46	12	29	3.95	.95
SocialNetworks	5	12	1	2	6	15	15	37	14	34	3.78	1.29
Edmodo	10	24	11	27	8	20	6	15	6	15	2.68	1.39
Developing software	20	49	11	27	7	17	2	5	1	2	1.85	1.04
								Overall mean score			2.74	

Table 37 demonstrates the preparedness level of the treatment group in terms of using different types of technologies in language teaching. The treatment group reported that they feel prepared to use "video-sharing sites" (75% of the student teachers reported that they feel well prepared to use video-sharing sites for instructional purposes) with mean score (M= 3.95) and standard deviation (SD= 0.95), "smartphones/cell phones" (73% of the student teachers reported that they feel well prepared to use smartphones/cell phones for instructional purposes) with mean score (M= 3.85) and standard deviation (SD=1.01), and "computers/laptops/tablets" (71% of the student teachers reported that they feel well prepared to use computers/laptops/tablets for instructional purposes) with mean score (M=3.78) and standard deviation (SD= 0.79). Student teachers do not feel adequately prepared with some technologies such as "mashups" (81% of the student teachers reported that they are not adequately prepared to use mashups in teaching) with mean score (M=1.56) and standard deviation (SD=0.87), "simulations" (81% of the student teachers

reported that they are not adequately prepared to use simulations for instructional purposes) with mean score (M= 1.71) and standard deviation (SD= 1.03) and "clickers" (78% of the student teachers reported that they are not adequately prepared to use clickers in teaching) with mean score (M= 1.73) and standard deviation (SD=0.87).

As it is seen, student teachers are well prepared to use some technology tools such as Internet, computers/laptop/tablets, video-sharing sites, presentation software, Word processors, smartphones/cell phones, social networks and Interactive whiteboard. On the other hand, student teachers express low level of preparedness with technology tools such as mashups, software development, clickers, edmodo, web page development tools, databases, tutorials, simulations, podcasts audio/video production, drill and practice programs, spreadsheets, blogs, wikis forums and edmodo. Results show that the overall mean score of the student teachers' preparedness level of different technology tools is (M=2.74) which indicates that student teachers' preparedness level of using different technologies for instructional purposes is at a low level. It can also be said that student teachers in the treatment group do not feel properly prepared with the majority of the technology tools that can be used in English language teaching.

Table 38

Control Group's Preparedness Level of Using Different Types of Technologies for Instructional Purposes before the Intervention Process

	Not at all		Very little		Fairly Well		Quite Well		Perfectly		M	SD
	f	%	f	%	f	%	f	%	f	%		
Computers/laptops/tablets	1	3	-	-	4	10	20	51	14	36	4.18	0.82
Interactive whiteboard	-	-	3	8	10	26	18	46	8	21	3.79	0.86
TV/DVR	-	-	2	5	9	23	16	41	12	31	3.97	0.87
Smartphones/Cell phones	2	5	1	3	4	10	13	33	19	49	4.18	1.07
Projectors	2	5	9	23	12	31	13	33	3	8	3.15	1.04
Mp3player/iPod	4	10	4	10	12	31	12	31	7	18	3.36	1.20
Podcasts	21	54	13	33	2	5	3	8	-	-	1.67	0.90
Audio/Video Production	9	23	12	31	12	31	6	15	-	-	2.38	1.02
Clickers	34	87	4	10	1	3	-	-	-	-	1.15	0.43
Databases	31	80	6	15	2	5	-	-	-	-	1.26	0.55
Drill and Practice Programs	19	49	10	26	6	15	3	8	1	3	1.90	1.10
Internet	3	8	1	3	6	15	17	44	12	31	3.87	1.13
Word processors	4	10	6	15	10	26	16	41	3	8	3.21	1.13
Spreadsheets (i.e. Excel)	9	23	17	44	8	21	4	10	1	3	2.26	1.02
Presentation software	2	5	4	10	10	26	16	41	7	18	3.56	1.07
Simulations	29	74	7	18	1	3	2	5	-	-	1.38	0.78
Webpage development tools	29	74	6	15	2	5	2	5	-	-	1.41	0.82
Mashup	35	90	2	5	1	3	1	3	-	-	1.18	0.60
Tutorials	30	77	5	13	2	5	2	5	-	-	1.38	0.81
Blogs	16	41	10	26	6	15	4	10	3	8	2.18	1.30
Wikis	16	41	7	18	7	18	6	15	3	8	2.31	1.36
Forums	18	46	6	15	8	21	4	10	3	8	2.18	1.34
Video sharing sites	2	5	6	15	7	18	12	31	12	31	3.67	1.22
Social Networks	7	18	3	8	5	13	11	28	13	33	3.51	1.48
Edmodo	37	95	2	5	-	-	-	-	-	-	1.05	0.22
Developing software	32	82	6	15	-	-	-	-	1	3	1.26	0.72
										Overall mean score	2.52	

Table 38 demonstrates the preparedness level of the control group in terms of using different types of technologies in language teaching. The control group reported that they feel well prepared to use "computers/laptops/tablets" (87% of the student teachers reported that they feel well prepared to use computers/laptops/tablets for instructional purposes) with mean score (M= 4.18) and standard deviation (SD= 0.82) and smartphones/cell phones" (82% of the student teachers reported that they feel well prepared to use smartphones/cell phones for instructional purposes) with mean score (M= 4.18) and standard deviation (SD= 1.07). Student teachers do not feel adequately prepared to use some technologies such as "edmodo" (100% of the student teachers reported that they are not adequately prepared to use edmodo for instructional purposes) with mean score (M= 1.05) and standard deviation (SD= 0.22), "clickers" (97% of the student teachers reported that they are not adequately prepared to use clickers in teaching) with mean score (M= 1.15) and standard deviation (SD= 0.43) and "mashups" (95% of the student teachers

reported that they are not adequately prepared to use mashups in teaching) with mean score (M=1.18) and standard deviation (SD=0.60).

As can be seen, student teachers are well prepared to use some technology tools such as Internet and smartphones/cell phones for instructional purposes. However, student teachers express low level of preparedness with technology tools such as mashups, software development, clickers, edmodo, web page development tools, databases, tutorials, simulations, podcasts, audio/video production, drill and practice programs, spreadsheets, blogs, wikis forums and edmodo. Results show that the overall mean score of the student teachers' preparedness level of different technology tools is (M= 2.52) which indicates that student teachers' preparedness level of using different technologies for instructional purposes is at a low level. It can also be said that student teachers in the control group do not feel properly prepared with the majority of the technology tools that can be used in English language teaching.

Table 39

Technology Knowledge of the Treatment and Control Group Before the Intervention Process

	Treatment		Control	
Technology Knowledge	M	SD	M	SD
I know how to save data into/from a digital device (i.e. Flash disk, USB, stick, CD).	4.02	.91	4.23	.90
I know how to play audio and video files on my computer.	3.98	.99	4.26	.82
I know how to use computer mediated communication (CMC) technologies(e.g. email, chat)	3.90	.83	4.00	.83
I know how to record video files (i.e. using a video camera)	3.59	.74	4.10	.88
I know how to create images on my computer (i.e. using Windows Paint).	3.51	.98	3.82	1.00
I know how to record audio files (i.e. using a Dictaphone)	2.88	1.03	3.21	1.22
I know about basic computer hardware (i.e. CD-ROM, mother-board, RAM) and their functions.	2.41	1.09	2.85	1.16
I know how to use generic office applications (i.e. Word, PowerPoint, Excel).	3.39	.74	3.41	1.02
I know how to edit images on my computer (i.e. using Photoshop).	2.78	1.08	2.97	1.09
I know how to use electronic / online dictionaries.	3.98	.76	3.90	1.10
I know how to use web 2.0 technologies (e.g. blogs, social networks, and wikis)	2.95	1.12	3.05	1.19
Overall Mean Score	3.40		3.62	

The descriptive statistics for technological knowledge indicates that both the treatment group (M=3.40) and the control group (M=3.62) have similar mean scores which indicates that both groups have moderate level of technology knowledge.

Table 40

Technological Content Knowledge of the Treatment and Control Groups before the Intervention Process

	Treatment		Control	
Technological Content Knowledge	M	SD	M	SD
I know about technologies that I can use to teach English language grammar	3.17	.74	3.54	1.00
I know about technologies that I can use to teach reading in English.	3.41	.77	3.54	.85
I know about technologies that I can use to teach writing in English.	3.20	.71	3.26	1.14
I know about technologies that I can use to teach English vocabulary.	3.56	.78	3.69	.83
I know about technologies that I can use to teach pronunciation of English words.	3.59	.87	3.59	1.07
I know about technologies that I can use to teach listening in English.	3.59	.95	3.69	1.00
I know about technologies that I can use to teach about the differences between cultures.	2.90	.86	3.18	1.00
Overall Mean Score	3.34		3.50	

When Table 40 is examined, it is seen that both the treatment group (M=3.35) and the control group (M=3.50) are moderately aware of the technologies that can used in their content area.

Table 41

Technological Pedagogical Knowledge of the Treatment and Control Groups before the Intervention Process

	Treatment		Control	
Technological Pedagogical Knowledge	M	SD	M	SD
I can adapt the use of the technologies that I am learning about to different teaching activities	3.32	.76	3.18	.82
I can choose technologies that enhance students' learning for a lesson.	3.37	.70	3.05	.76
I can choose technologies that enhance the teaching approaches for a lesson.	3.15	.76	3	.97
I can design, using technology, relevant learning experiences to promote student learning.	3.02	.69	3.07	.74
I think critically about how to use technology in my classroom.	3.37	.89	3.05	.86
I can engage students in solving authentic problems using digital technologies and resources	2.95	.92	3.05	.69
I can choose technologies to be used in assessment	3.27	.90	2.95	.94
Overall Mean Score	3.21		3.05	

The results show that technological pedagogical knowledge is the second lowest scored construct of the TPACK framework both by the treatment group (M=3.21) and the control group (M=3.05) which indicates that student teachers feel somewhat confident about whether they can integrate technology and pedagogy in an efficient way.

Table 42

Technological Pedagogical Content Knowledge of the Treatment and Control Groups before the Intervention Process

	Treatment		Control	
Technological Pedagogical Content Knowledge	M	SD	M	SD
I can use a range of technologies that enable students to become active participants	3.12	.78	3.15	.96
I can use a range of technologies to help students pursue their individual curiosities.	3.00	.71	3.10	1.05
I can use technology effectively to communicate relevant information to students and peers.	3.07	.69	3.33	.90
I can facilitate intercultural understanding by using technology to engage students with different cultures.	2.95	.77	3.05	.94
I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.	3.27	.90	3.46	1.02
I can provide equitable access to digital language learning tools and resources.	3.05	.89	3.31	.89
I can teach lessons that appropriately combine English linguistic concepts, technologies, and teaching approaches.	2.95	.84	3.28	1.02
Overall Mean Score	3.06		3.24	

Table 42 illustrates that technological pedagogical knowledge is the lowest scored construct of the TPACK framework both by the treatment group (M=3.06) and the control group (M=3.24). Results indicate that student teachers are moderately to be able to integrate content, technology and pedagogy effectively.

Table 43

Independent Sample T-Test Showing the Differences between Control and Treatment Groups in terms of the Subscales of the Survey before the Intervention Process

Pre-Intervention		n	M	SD	t	p
Frequency of using different types of technologies	Treatment	41	2.75	.64	.609	.544
	Control	39	2.67	.49		
Competency level with different types of technologies	Treatment	41	2.88	.63	1.659	.101
	Control	39	2.67	.53		
Views on the Applicability of different types of technologies to language teaching	Treatment	41	2.96	.68	1.766	.082
	Control	39	2.73	.49		
Preparedness level of using different types of technologies in language teaching	Treatment	41	2.74	.69	1.652	.103
	Control	39	2.52	.51		
Technology Knowledge	Treatment	41	3.40	.63	-1.420	.160
	Control	39	3.62	.74		
Technological Content Knowledge	Treatment	41	3.34	.64	-.920	.361
	Control	39	3.50	.83		
Technological Pedagogical Knowledge	Treatment	41	3.21	.62	1.074	.286
	Control	39	3.05	.66		
Technological Pedagogical Content Knowledge	Treatment	41	3.06	.65	-1.128	.263
	Control	39	3.24	.79		

Table 43 shows that there is no significant difference between the treatment and control groups in terms of frequency of using different types of technologies, their competency level with different types of technologies, their views on the applicability of different types of technologies to language teaching, their preparedness level for using different types of technologies for instructional purpose, and their TK, TCK, TPK and TPCK before the intervention process ($p>.05$).

Together these results provide important insights into student teachers' technology knowledge and skills. Overall mean scores obtained from the responses to the constructs of frequency of using different types of technologies, competency level with different types of technologies, views on the applicability of different types of technologies to language teaching, preparedness level for using different types of technologies for instructional purpose show that both groups have low level of knowledge and skills about different types of technologies. In addition, mean scores obtained from the EFL-TPACK Questionnaire show that both groups have moderate level of knowledge with each construct.

4.2.1.1.2. Results Obtained from Pre-test Metaphors

The typological analysis of the metaphor papers resulted in the identification of what value beliefs student teachers hold about technology. Using the inherent value beliefs and exherent value beliefs as our guide, we developed the theme of "Types of Technology Users" from the data. We generated three categories from the metaphors of the experimental group and four categories from the metaphors of the control group. The categories of *Indifferent Users, Middle-of-the-roaders* and *Embracers* are similar in both of the treatment and control groups. However, the category of *Resisters* was developed from the metaphors of the control group. Below is the definition of each category.

Resisters: This category refers to student teachers who are aware of the advantages of technology but oppose the unconscious use of it. They view technology as an obstacle in the path of teachers' and students' creativity, imagination and productivity due to its misuse. These student teachers hold instrumental views and exherent value beliefs about technology since they believe that technology is a neutral tool controlled by people.

Indifferent Users: These student teachers view technology as an extra tool. Using technology or not using it doesn't matter for them. These student teachers hold instrumental views and exherent value beliefs about technology since technology doesn't have an inherent value for them.

Middle-of the-roaders: These student teachers are typical users of technology who view technology as a supplementary tool. These student teachers have instrumental views and exherent value beliefs about technology because technology has a subservient role for them and it serves to promote some end in the teaching and learning process.

Embracers: This category refers to student teachers who view technology as an indispensable part of normal classes. Technology acts as a *smooth partner* that helps improving the quality of learning and teaching process. These student teachers take a closer stance to substantivist views and hold inherent value beliefs about technology because they believe that technology is an essential part of classrooms and there is an interaction between people and technology.

Table 44

Categories and Frequencies Showing the Types of Technology Users in The Treatment Group (N=41)

Theme	Types of Technology Users	Frequency	%
Category 1	Indifferent Users	4	10
Category 2	Middle-of-the-roaders	32	78
Category 3	Embracers	5	12

The results gathered from the metaphors of the treatment group have shown that majority of the student teachers (88%) have exherent value beliefs about technology and only 12% of them implied that they have inherent values.

The use of technology in language teaching doesn't matter for *indifferent users* (10%). For example, one of the student teachers stated, "Technology is like a knife we use while eating. It is extra. We can go on eating without it as well". Similarly, another student teacher said:

> Technology in English language teaching is like the tomatoes we have at breakfast. We eat tomatoes if available or if we want to eat. Similar to this, we can use technology in our classrooms if they are available in our classrooms.

Middle-of-the-roaders (78%) view technology as a helpful tool that can contribute to the learning and teaching processes. For example, one of the student teachers stated, "Technology in English language teaching is like a robot for me. It makes our lives easier. Similarly, technology makes learning and teaching easier, more joyful and better." Likewise, another student teacher stated that, "Technology in English language teaching is like watching a movie with subtitles. It helps me understand courses better."

Embracers (12%), on the other hand, believe that technology is a smooth partner for learners and teachers. Technology is seen as an indispensable part of classrooms. One of the participants, for example, said "Technology in English Language teaching is like gas for a car. Just as a car cannot move without gas, language teaching won't succeed without technology". Another participant expressed similar views:

> Technology in English language teaching is like the personal bag of someone. When you go out without your bag, you always feel that something is missing. Today's children grow up with technology. If we do not use technology in our classrooms, something will be always missing.

Table 45

Categories and Frequencies Showing the Types of Technology Users in the Control Group (N=39)

Theme	Types of Technology Users	Frequency	%
Category 1	Resisters	3	8
Category 2	Indifferent Users	10	26
Category 3	Middle-of-the-roaders	15	38
Category 4	Embracers	11	28

The results gathered from the metaphors of student teachers in the control group have shown that most of the student teachers (72%) hold exherent value beliefs about technology. They subscribe to instrumental views about technology. The findings also display that only 28% of the student teachers have inherent value beliefs.

The resisters (8%) in the group are against using technology. Because, they think that people misuse technology and thus, it stands a barrier in the path of their creativity and productivity. For example, one of the student teachers stated:

> Using technology in ELT is like keeping a lion in the cage in a circus because the lion is not a cage animal. It must be in the forest and hunt for itself. But in a circus, everything is given readily given and this is against its nature. Technology use is exaggerated by everyone. Although technology is a useful tool, it is over-used.. People do not prefer producing something but takes from the Internet readily. This behavior causes them to jail their true powers.

In a similar vein, another student teacher wrote:

> Using technology in ELT is like clouds covering the sun because it is a barrier that prevents students from showing their real potential. Although it can provide authentic materials and can be very useful, students, teachers and their own ideas should be at the center.

For *indifferent users* (26%), technology can be used if it is available and it is extra. For example, one of the respondents explained her views as follows:

> Technology in English language teaching is like sugar in coffee because some may add it, others may not. Some love mildly-sweetened. One thing doesn't change in these examples, the teacher. Teacher is like coffee. He/she sometimes prefers using it. Without technology, the lessons can run. It is not a necessity.

Another respondent shared similar views stating that:

> Technology in English language teaching is like a Barbie doll because in order to bring color to your play house, you can have one. However, you already have rag dolls and you can play happily with them as well. Technology is similar to this. If it is used, it brings color to classes but if it is not used you already have alternative methods.

The majority of the student teachers in the control group are *middle of the roaders* (38%). Technology is a useful tool which enhances the teaching and learning process. For example, one the student teachers said, "Technology in English language teaching is like a remote control because it makes learning process faster and easier." Similarly, another student teacher wrote that:

> Technology in English language teaching is like a rose because it changes the environment it is used. It brings color and fun. It motivates learners and makes learning more enjoyable. Students can learn songs, watch videos and practice what they learn.

Only 11 of the 39 student teachers (28%) stand more close to the substantive view. These *embracers* see technology as part of language classrooms. For example, one of the student teachers stated that:

> Technology is like baby food of a baby in education for me because if a baby doesn't eat her food, they do not live. Technology is like this. In English language teaching, technology is very necessary. Teacher can teach a lot of things through technology. Videos can be watched and listening and vocabulary activities can be done.

Another participant wrote that, "Technology in English language teaching is like flour of a cake because we cannot make a cake without flour and English classrooms cannot be thought without technology.

As it can be seen from the tables above most of the student teachers in the ELT program of NEU have exherent value beliefs about technology.

As to the technology awareness of student teachers, results gained from the survey show that student teachers have low level of awareness about the variety of technology tools that can be used effectively both in daily life and in educational contexts. More precisely, the mean scores of *frequency of technology use* (M=2.75/2.67), *applicability to language teaching* (M=2.96/2.73), *technology skills* (M=2.88/2.69) and *preparedness for instructional use* (M=2.74/2.52) suggest that student teachers both in the treatment and control groups are not aware of the rich diversity of technology tools that can be used. The findings obtained from the metaphors have illustrated that the majority of the student teachers both in the treatment group (78%) and the control group (72%) are not aware of the inherent value technology has in essence.

4.2.1.1.3. Results Obtained from Pre-test Interviews

To provide further clarification for the survey results and metaphors, we had also conducted entry interviews with the treatment group (n=6) and the control group (n=6). Results obtained from the interviews were consistent with the metaphor and survey results. Using the research questions of the present study as a guide, we identified 6 categories that

emerged from the data and we developed two themes in the pre-test process. One of the categories was related to the first theme and the remainder 5 categories were concerned with the second theme. Results showed that all of the interview participants (n=12) had similar opinions about the use of technology in their prior learning experiences by indicating the inadequate use of it in their previous learning experiences.

Table 46

Themes and Categories Related to the Use of Technology in Student Teachers' Prior Learning Experiences

Themes	Categories	Frequency (N=12)
Inefficiency of student teachers' prior learning experiences with respect to the use of technology in language teaching	Inadequate use of technology	12
Inefficiency of teacher education programs in enhancing student teachers' instructional technological competence	Inadequate training on developing student teachers' technology knowledge	12
	Inadequate training on developing student teachers' technology skills	12
	Inadequate training on developing inherent value beliefs about technology in student teachers	12
	Inadequate training on developing technology awareness in student teachers	12
	Teacher educators' lack of technology knowledge and skills	8

Theme 1- Inefficiency of student teachers' prior learning experiences with respect to the use of technology in language teaching: When student teachers were asked to express their opinions about the use of technology in their prior learning experiences, student teachers both in the treatment (n=6) and control group (n=6) reported that they made no or little use of technology in their primary and secondary education. For example, one of the student teachers from the treatment group said,

> In high school, there was a program called Vitamin. Our science teacher would use it. The questions were ready, the topics were ready and I was wondering whether he would use it all the time. It was like there was no necessity for the teacher. He was showing a question and we were answering. But in our language classrooms we never used technology. We did not do listening activities. In high school, we had no technological tools at first but a projector was installed later. However, none of our teachers used it.

Another student teacher from the treatment group stated the inadequate use of technology in her prior learning experiences writing that, "Actually, technology was not used in my primary school, but some power point presentations were used in my

secondary education." Student teachers (n=6) in the control group expressed similar views. One of the student teachers in the control group stated:

> I cannot say that technology was used during my primary and secondary education. In state schools, there are not adequate facilities in terms of technology. At private schools or at schools abroad, students do listening activities with headphones and computers but at state schools in Turkey, students are not at the center. I improved my English by reading books and watching movies. Technology tools were not among the materials that were used for teaching English. I improved my English without technology being used at the schools I went to.

Another participant from the control group said, "In primary school, technology was not used by our teachers. In high school, smart boards were sometimes used. In high school, we focused on the university entrance examinations and we used the smart boards for entertainment."

Theme 2- Inefficiency of teacher education programs in enhancing student teachers' instructional technological competence: When student teachers were asked whether the technology-related courses they received have enhanced their knowledge with respect to the use of technology for language teaching, all of the interview participants (N=12) stressed the inadequacy of their program in enhancing their technology knowledge. 7 of the participants stated that they just learnt basic things about technology For example, one of the student teachers in the treatment group stated, "It was just general things. Word, power point, excel." One of the student teachers in the control group said, "

> We learnt about some basic things like excel or make presentations. Although, we learnt such things then, we are still having problems with them. While doing our presentations, we are using songs, games etc. but I do not think they are adequate.

2 of the student teachers said, they were always using the technologies that they already knew. One of the student teachers in the treatment group said, "We just learnt in our courses what we are already using." One of the student teachers in the control group said "Our teacher education programs did not contribute us much. We have already known the programs we are using in our presentations." 3 of the student teachers stressed their own personal efforts in learning new technologies. For example, one of the student teachers in the treatment group said, "Even, we do not have much knowledge about the use of technology in education. We are trying to find out new technologies with our own personal efforts." Another student teacher stated, "Our teacher education program did not contribute us much. For example, I learnt a program called prezi and I learnt it from a seminar. We sometimes search for new things by ourselves."

When student teachers were asked whether the technology-related courses they received have enhanced their skills with respect to the use of technology for language teaching, all of the interview participants (N=12) stressed the inadequacy of their program in enhancing their technology skills. For example, one of the student teachers in the treatment group said, "I really liked it (smart board) and I know that it can be used but I am not exactly sure how to adapt it to language classroom." Another student in the experimental group stated:

> At university, we learnt again about power point, excel in the first grade. But I do not think it is necessary because we do not know how to use technology in ELT. We will be teachers and we should know how to use it… In our instructional technology and material development courses we formed groups and chose an area of language skills and the group members just came out and they made some presentations but it did not work because the one who is supposed to show us how that skill was taught let's say with a program, did not have the talent to use that program effectively.

One of the student teachers in the control group stated, "... as we do not know how to use them efficiently, they just stand over there." Another student teacher said, "I cannot say that I have learnt how to use different technologies effectively in language teaching."

When student teachers were asked whether the technology-related courses they received have enhanced their awareness with respect to the use of technology for language teaching, all of the interview participants (N=12) pointed out the failure of their program in raising their technology awareness. For example, one of the student teachers in the treatment group said, "I do not think that our courses were enough to raise awareness in us about technology because we did not see much about technology use. We always used and were introduced some presentation programs and nothing further." One of the student teachers in the control group stated "We were already using Facebook, YouTube, excel, Word and power point. Except them, we did not see anything new related to technology."

When student teachers were asked about their beliefs in relation to the use of technology in language teaching, it can be seen that all of them have (N=12) exherent value beliefs about technology. They see it either as an extra tool (n=3) or supplementary tool (n=9) for teaching and learning processes. For example, one of the student teachers in the treatment group who see technology as an extra tool stated that:

> Technology is an extra resource. If you use it all the time, it won't influence language teaching to a large extent. Students will get accustomed to it. But if you sometimes use it, you will be able to draw attention and the learning will be more permanent.

Another student teacher in the treatment group said:

> It is a tool for me because we have not used technology and it is not a big problem because there are libraries books and tape recorders. I think it is not necessary. When I was in the primary school there was a library and I used to go there to search something and it was exciting for me but now I sit on the chair and type and I reach lots of information in a few seconds. This makes teaching and learning easier.

One of the student teachers in the control group who see technology as an extra tool stated, "Language teaching can go on without technology as we have done so far. "

Since we were open to emerging categories from the data gathered, one more category was developed. It was about teacher educators' lack of technology knowledge and skills. 3 student teachers in the treatment group and 5 student teachers in the control group also drew attention to teacher educators' knowledge and ability about using technology tools. For example, one of the student teachers in the treatment group said, "Our professor who had offered the instructional technologies and material development courses also did not have enough knowledge about computers and technology ….Therefore, she could not offer us anything new about technology." Another student teacher stated that "They cannot prepare us for the students that we are going to meet … They come and tell us that this is not the students that you gonna meet, this is not … Ok, we got that but then do something about that. Similarly, one of the student teachers in the control group stated, "A teacher educator must be a model. Students grasp not what teachers say but what they do. Smart boards are very common and our professor at least should know how to use them." Another student teacher in the control group stated, "Although our professors suggest us to make effective use of technology tools, they only read from their power point presentations."

As can be seen, all of the interview participants share similar views about their prior learning experiences and undergraduate experiences in terms of the use of technology in language teaching. Results display that student teachers find the experiences and the training they had inadequate and ineffective regarding the infusion of technology into language teaching.

4.2.1.2. Findings Demonstrating Student Teachers' Instructional Technological Competence Level after the Intervention Process

4.2.1.2.1. Hypothesis 12

One of the key concerns of the study was to find out whether the courses offered with S-TECHNO model would improve student teachers' technological knowledge and skills. The alternative hypothesis to be tested was "Student teachers who participate in courses offered through S-TECHNO model will have higher scores on the frequency of using different types of technologies, technology skills, the applicability of different technologies to ELT, the preparedness for instructional use, TK, TCK, TPK and TPCK compared to student teachers who received regular courses." Independent samples t-test was conducted to find whether there was a significant difference between the treatment and control groups after the intervention process. The results has confirmed the alternative hypothesis indicating that the difference is statistically significant for each of the subscales ($p<.05$) since the treatment group scored higher on the frequency of using different types of technologies, technology skills, the applicability of different technologies to ELT, the preparedness for instructional use, TK, CK, PCK, TCK, TPK and TPCK compared to the control group. According to Huck (2012), a result that seems to be statistically significant may have no practical significance. Therefore, he suggests calculating effect size which goes beyond statistical significance. Kline (2004) points out that effect size gives information about the impact of independent variable on the dependent variable. There are a number of ways of calculating effect size. Larsen-Hall (2010) suggests using d family of effect sizes to examine the difference between two groups. Accordingly, we calculated Cohen's d to identify and verify the effectiveness of the treatment. Cohen (1988) classifies effect sizes as small ($d= 0.2$), medium ($d = 0.5$), and large ($d \geq 0.8$). Our results represented a large effect size ($d>.80$) as can be seen in table below.

Table 47

Independent Sample T-Test Showing the Difference between Treatment and Control Groups After the Intervention Process

	Groups	n	M	SD	t	p	d
Frequency of Technology use	Treatment	41	3.32	0.63	5.326	**.000**	1.17
	Control	39	2.68	0.44			
Applicability to Language Teaching	Treatment	41	3.78	0.61	8.722	**.000**	1.95
	Control	39	2.77	0.40			
Technology Skills	Treatment	41	3.57	0.61	7.123	**.000**	1.58
	Control	39	2.67	0.52			
Preparedness for Instructional Use	Treatment	41	3.61	0.67	7.598	**.000**	1.68
	Control	39	2.54	0.60			
Technology knowledge	Treatment	41	4.19	0.43	4.974	**.000**	1.11
	Control	39	3.66	0.52			
Technological Content Knowledge	Treatment	41	4.22	0.61	4.702	**.000**	1.05
	Control	39	3.55	0.66			
Technological Pedagogical Knowledge	Treatment	41	3.99	0.55	6.353	**.000**	1.42
	Control	39	3.08	0.72			
Technological Pedagogical Content Knowledge	Treatment	41	3.91	0.58	4.066	**.000**	0.92
	Control	39	3.26	0.82			

4.2.1.2.2. Hypothesis 13

H_1: There will be an increase in post-test scores on (a) the frequency of using different types of technologies, (b) technology skills, (c) relating technology tools to language teaching, (d) preparedness level to use technology for language teaching, (e) technology knowledge, (f) content knowledge, (g) pedagogical content knowledge (h) technological content knowledge, (i) technological pedagogical knowledge and (j) technological pedagogical content knowledge for student teachers who participated in courses offered through S-TECHNO model.

Table 48

Paired-Samples T-Test for Comparing Pre-Test and Post-Test Scores of the Treatment Group

	Treatment	n	M	SD	t	p	d
Frequency of Technology use	Pre-test	41	2.75	.643	-5.571	**.000**	-.87
	Post-test	41	3.32	.634			
Applicability to Language Teaching	Pre-test	41	2.96	.676	-7.048	**.000**	-1.10
	Post-test	41	3.78	.607			
Technology Skills	Pre-test	41	2.88	.629	-6.229	**.000**	-0.97
	Post-test	41	3.57	.609			
Preparedness for Instructional Use	Pre-test	41	2.74	.688	-7.645	**.000**	-1.19
	Post-test	41	3.61	.666			
Technology knowledge	Pre-test	41	3.40	.627	-7.506	**.000**	-1.17
	Post-test	41	4.19	.428			
Technological Content Knowledge	Pre-test	41	3.34	.638	-7.938	**.000**	-1.24
	Post-test	41	4.22	.609			
Technological Pedagogical Knowledge	Pre-test	41	3.21	.624	-6.605	**.000**	1.03
	Post-test	41	3.99	.553			
Technological Pedagogical Content Knowledge	Pre-test	41	3.06	.651	-6.479	**.000**	1.01
	Post-test	41	3.91	.580			

In order to determine whether there was an increase between the pre-test and post-test scores of the treatment group, paired sample t-test was carried out. According to Table 48 there is a gain between the pre-test and post-test scores of the treatment group ($p<.05$). In order to establish effect size, we calculated Cohen's d which showed that all of the subscales have a large effect size.

Table 49

Paired-Samples T-test for comparing Pre-Test and Post-Test Scores of the Control Group

	Control	n	M	SD	t	p
Frequency of Technology use	Pre-test	39	2.67	0.49	-.036	.972
	Post-test	39	2.68	0.44		
Applicability to Language Teaching	Pre-test	39	2.73	0.49	-.395	.695
	Post-test	39	2.77	0.40		
Technology Skills	Pre-test	39	2.67	0.53	-.008	.994
	Post-test	39	2.67	0.52		
Preparedness for Instructional Use	Pre-test	39	2.52	0.51	-.175	.862
	Post-test	39	2.54	0.60		
Technology knowledge	Pre-test	39	3.62	0.74	-.279	.782
	Post-test	39	3.66	0.52		
Technological Content Knowledge	Pre-test	39	3.50	0.83	-.301	.765
	Post-test	39	3.55	0.66		
Technological Pedagogical Knowledge	Pre-test	39	3.05	0.74	-.148	.883
	Post-test	39	3.08	0.72		
Technological Pedagogical Content Knowledge	Pre-test	39	3.24	0.79	-.093	.926
	Post-test	39	3.26	0.82		

Table 49 shows that there is no significant difference between the pre-test and posttest scores of the control group in terms of frequency of using different types of technologies, technology skills, the applicability of different technologies to ELT, the preparedness for instructional use, TK, TCK, TPK and TPCK who went on receiving their regular courses. The results obtained from the responses of the control group confirm the null hypothesis which is "There is no significant difference between the pre-test and post-test scores of the control group."

4.2.1.2.3. Results Obtained from the Post-test Metaphors

The typological analysis of the post-test metaphor papers enabled us to identify whether the S-TECHNO model had an impact on the beliefs of treatment group. In addition, we expected no change in the beliefs of student teachers in the control group.

Table 50

Number of Updated Metaphors, Category Changes and Post-Test Results of the Treatment Group

Types of Technology Users	Pre-test	%	Update on Metaphors	No Update on Metaphors	Category Change			Post-test	%
					Indifferent Users	Middle-of-the-Roaders	Embracers		
Indifferent Users	4	10	3	1	---	1	2	1	2
Middle-of-the-roaders	32	78	28	4	---	---	18	15	37
Embracers	5	12	3	2	---	---	---	25	61

Examination of post-test metaphors has shown that the majority of the student teachers provided an update on their metaphors (n=34). Three of the indifferent users wrote different metaphors at the end of the intervention process. While two of these metaphors show that there is a change towards inherent value beliefs, 1 of them still points to exherent value beliefs despite a category change. Before the intervention process, one of the student teachers in the treatment group, for example, had said:

> Technology in English language teaching is like tomatoes in the salad. It is just one of the ingredients in the salad. Without tomatoes, it is salad again. Likewise, technology is one of the instructional tools that can be used in teaching and learning.

After the intervention process, the same student stated, “Technology in English language teaching is like the pedal of a bicycle. If you do not have pedals, you cannot move the bicycle. Similarly, technology has a vital part in language teaching.”

Likewise; before the intervention process, another student had written, “Technology is like a knife we use while eating. We can go on eating without it as well.”

After the intervention process, the same student stated,

> Technology in English language teaching is like grape. Knowing what to do with it totally depends on you. You can either make only grape-juice or wine. After your courses, we learnt how to make wine from grapes. I have understood that it is actually and should be a part of classes in which students grow up with technology will study.

28 of the middle-of-the-roaders also provided an update on their metaphors. 18 of the middle-of-the roaders showed changes in their metaphors which indicated a considerable increase in the proportion of metaphors placed under inherent value beliefs.

Before the intervention process, one of the student teachers in the treatment group had said, “Technology in English language teaching is like a library because you use it for learning new things.”

After the intervention process, the same student stated:

> Technology in English language teaching is like TEA because tea is an indispensible part of my daily life. We can find tea almost in every house. Everybody drinks tea. Some of them like it as light or some of them like dark tea. But almost every people like drinking tea. Technology is also used by every people because all of the materials and tools are a product of technology. I am now more aware that technology develops continually and we are naturally dependent on it. Just as we use technology in every part of our lives, we must use technology in language classrooms. Now that new generation is growing up with technology, technology must be a natural part of classrooms.

Another student teacher also expressed similar views. Before the intervention process; she said, “Technology in English language teaching is like a guide for me because technology makes learning easier. Technology has got advantages. It provides visuals and motivates learners.”

After the intervention process, she stated:

> Technology in English language teaching is like pen and paper because we need technology in every classroom and all the students and teachers must have it. It is the pen and paper of our time and it is the lens through which we experience much of our World.
>
> Teaching in the internet age means we must teach tomorrow’s skills today. New technology is common, new thinking is rare. Teachers need to integrate technology seamlessly into the curriculum. We need to embrace technology to make learning more engaging. Because when students are engaged and they are interested, that’s where learning take place. Technology can become the wings that will allow the educational World to fly farther and faster than ever before.

The findings also displayed that three of the embracers updated their metaphors. In addition, it can be seen that five of the embracers keep their ideas about the essential role of technology for language teaching. Before the intervention process, one of the embracers had said,

"Technology in English language teaching is like soil and water that a plant needs. We are surrounded by technology and it is seen everywhere. It has become an indispensable part of our lives and our students' lives." After the intervention process, the same embracer expressed similar views by stressing the importance of technology in language teaching,

> "Technology in English language teaching is like petrol of car because without this, car doesn't work and it doesn't carry out its function. Like this, technology in English language teaching is very important. Without technology, lessons cannot be taught effectively."

Likewise; before the intervention process, another embracer had said:

> Technology in English language teaching is like being near a waterfall because it provides language teaching with limitless opportunities. I see it as part of language classrooms and it must be like a close friend for all teachers for teaching English in a better way.

After the intervention process, the same embracer kept emphasizing the importance of technology for language teaching as follows:

> Technology in English language teaching is like water. We cannot live if we do not drink water for three days and if we drink less, we have a low-quality life. In our language classrooms, we did not make much use of technology. However, this must change. Just as we drink water every day, technology must be integrated into language classrooms. In countries like Turkey where almost no opportunity exist for face to face communication or materials in the target language, technology has a complementary role I think.

Overall, examination of both pre-test and post-test displays a rise in the number of embracers. As can be seen, inherent value beliefs about technology increased from 12% to 61% which indicates that the courses offered through S-TECHNO model had a considerable effect on student teachers' perception about the role of technology in language teaching.

Table 51

Number of Updated Metaphors, Category Changes and Post-Test Results of the Control Group

Types of Technology Users	Pre-test	%	Update on Metaphors	No Update on Metaphors	Category Change				Post-test	%
					Resisters	Indifferent Users	Middle-of-the-Roaders	Embracers		
Resisters	3	8	1	2	---	---	---	---	3	8
Indifferent Users	10	26	---	10	---	---	---	---	10	26
Middle-of-the-roaders	15	38	5	10	---	---	---	---	15	38
Embracers	11	28	---	11	---	---	---	---	11	28

Examination of Table 51 shows that only a minority of student teachers (n=6) provided an update on their metaphors. One of the resisters and five of the middle-of the-roaders constructed new metaphors in post-test. However, these updates refer to no changes in student teachers' views about the role of technology in language teaching. It is seen that they still keep their exherent value beliefs about technology. For example, the resister who constructed a new metaphor in the post-test had said in her previous metaphor, "Technology in ELT is like a barrier in front of students' and teachers' imagination because we tend to get everything from the internet and we do not produce." In the post-test metaphor construction, the same student teacher stated, "Technology is like eating fast food because instead of creating new dishes, we eat unhealthy food. It kills our imagination."

Similarly, one of the middle-of-the-roaders who said in her early metaphor, "Technology in ELT is like a book because it provides you with the knowledge that you need" updated her post-test metaphor and wrote that "Technology is like radiator. It gives heat in winter and we feel warm. Technology is like radiator in our classrooms. When we need it, we can use it to make learning funnier, easier and faster." Another middle-of-the-roader had said in her pre-test metaphor, Technology in English language teaching is like a washing machine because it facilitates learning and teaching and lightens the burden on teachers' shoulders. In the same sense, she stated in her later metaphor that "Technology in English

language teaching is like a dishwasher. It lightens the burden on teachers' and learners' shoulders."

Taken together, these results suggest that most of the student teachers (72%) have exherent value beliefs about technology. Even if technology was used in their regular classes, we cannot see any change on their perception about the role of technology in language teaching.

As to the question of whether the S-TECHNO model enhanced the technological awareness of student teachers in the ELT program of NEU with respect to the use of technology in language teaching, results gained from the paired sample t-test of the treatment group showed that student teachers' awareness level has increased from low to moderate or high about the variety of technology tools that can be used effectively both in daily life and in educational contexts. The post-test mean scores of *frequency of technology use* (M=3.32), *applicability to language teaching* (M=3.78), *technology skills* (M=3.57) and *preparedness for instructional use* (M=3.61) show significant differences when compared to pre-test scores. It implies that student teachers' awareness raised about the wide range of technology tools that can be used both in daily life and in language teaching/learning. The findings obtained from the metaphors have displayed that the number of embracers increased from 5 (12%) to 25 (61%) at the end of the intervention process. This indicates that the S-TECHNO model helped learners to build awareness about the inherent value of technology.

4.2.1.2.4. Results Obtained from the Post-test Interviews and Journals

To provide further clarification and support for survey and metaphor results, we held exit interviews with both the treatment (n=6) and control group (n=6). We also asked the treatment group to keep journals.

In parallel with the research questions of the present study, four main categories and nine sub-categories were generated from the interviews and journals kept by the treatment group. Since we were open to emerging categories, one more sub-category (confidence in technology use) was developed and the number of sub-categories increased to ten. Subsequently, one theme was developed out of the categories emerged. The table below illustrates the findings.

Table 52

Themes and Categories Obtained From the Interviews and Journals of the Treatment Group after the Intervention Process

Themes	Categories	Sub-categories	Frequency(n=6)	Frequency(n=41)
			Interview	Journal
Efficiency of S-TECHNO model in enhancing student teachers' instructional technological competence	Technological Awareness	Increase in awareness about the potential of technology	6	36
		Increase in awareness about the rationale of using technology	6	36
	Technological Knowledge	Increase in technological knowledge	6	36
	Technological Skills	Increase in technological skills	6	30
	Technological Beliefs	Inherent value beliefs about technology	6	25
		Confidence in technology use	3	3
		Dissatisfaction	6	25
		Intelligibility	6	36
		Plausibility	6	36
		Fruitfulness	6	36

Theme 1- Efficiency of S-TECHNO model in enhancing student teachers' instructional technological competence: When the participants in the treatment group were asked whether the intervention course has enhanced their technological awareness, a majority of them (n=36) stated that the course enabled them to comprehend not only the potential of technology for language teaching but also the rationale of using technology in language teaching. The sub-category of the *potential of technology* refers to the variety and facilities that technology can offer. For example, one interviewee stressed the potential of technology and put that:

> Before these classes, we knew about just a few technologies that we can use for language teaching. After these classes, we became aware of various technologies… and we know that there are lots of technologies that we couldn't touch on. Before your classes, I had never thought of searching other English teachers' blogs, wikis or websites and find out what they were doing in their classes

Another interviewee stated, “So far, we did not take any courses that encouraged us to use technology for language teaching. Your class was the only one that showed us there were so many different technologies that can contribute to language teaching.”

Alluding to potential of technology, one of the participants stated in one of her entries that:

> Technology enables us with various opportunities to run language classes … It can be adapted to every setting and every learning style. It presents a number of different ways of dealing with language problems. The thing I liked most about this course is that technology is not stable it is always changing and providing us with indefinite facilities.

The subcategory of the rationale of using technology points to coming to an understanding about why technology should be used in language classrooms. For example, one interviewee said:

> As Turkey is a foreign language country, we are not able to communicate with native speakers. Therefore, technology must be integrated into language classrooms since it can enable us and our students to reach beyond the boundaries of Turkey. Films, movies, podcasts are very important for teaching language skills.

Another interviewee stated:

> As I said before, I was against using technology although I know that we are surrounded by technology. This is because its use is exaggerated by people. However, your courses showed me that the new generation is born into technology and avoiding from using it will be nonsense.

In one of his entries, one of the participants wrote that:

> Now I understand what you mean by using technology effectively. The instructor should keep improving her knowledge, techniques, methods and she will use technology effectively in the classroom. Technology is not there us to make us lazy, instead it is there to discover new possibilities. (Aha moment:)

Another student teacher noted that:

> I have seen better that technology and ELT are close friends that are not distinct in reality but are separated by us. They go hand in hand… Today when you told us about applications, I realized that language teaching is actually very hard for everybody. However, it is an undeniable fact that technology makes this hardship easier for people over time.

When student teachers were asked whether the intervention process developed their technology knowledge, over half of them (n=36) indicated an increase in their knowledge.

For example, one interviewee said:

> Before your classes, technology meant YouTube or PowerPoint for me. I used to think that we could use technology only for listening activities but now I know various programs to teach language skills.

Sharing similar views, another interviewee stated, “We learnt lots of things… it was really nice to know about clickers. It is very useful for time management and assessment.”

In his reflection journal, one of the student teachers commented that:

> I have already known some technological tools but I have learnt much more than I knew beforehand. I learnt about the relationship between technology and language teaching and the rationale of using technology in ELT. We have also learnt lots of programs like plotagon, penzu, hotpotatoes, wikis, podcasts, autorap etc.

Another participant wrote that:

> I used to think that technology is just a smart board or a computer. But I now know that technology has a wide range of variety that can be used in language teaching since we learnt many tools. For example we learnt about Edmodo. Edmodo is a good computer program that teachers can communicate with their students. It helps teachers in several ways… We can inform our atudents about assignments, exam dates, content of the lesson via Edmodo. Students keep in touch outside the school on an educational platform. We also learnt about plotagon which is a very funny program which can be used with great joy by students…. Hotpotatoes is another useful program through which we can prepare some exercises and exams. Social media was another surprising tool for us to be able to use in language teaching… I found wordle really funny and beneficial…. I have also learnt about Wikis, blogs and podcasts… Mobile assisted language learning was another useful topic we focused on. We learnt so many different applications…. Mashup and tutorials can also be used in language teaching.

When student teachers were asked whether the intervention process developed their technological skills, most of them (n=36) indicated an increase in their knowledge. For example, one interviewee stated:

> Your classes also showed us how to use what we already use in our daily lives like Facebook, twitter or Instagram. For example, I was confused when I saw the program of hotpotatoes. I couldn't figure it out. But you showed us, we tried it at home for our assignment. Although I had difficulty at first, it was worth to see my product at the end. Audacity is another program that I can use now although it seemed complex at first.

Concurring with her peer, another interviewee said:

> In my previous presentations, I wanted to benefit from technology. I was typing on the Google but I really couldn't find these programs then. After this course, I learnt how to find different types of technologies that I can use for my students.

Referring to the improvement in his technological skills, one of the participants wrote in his journal that, "The most important thing was practicing the tools and learning how to adapt them to language teaching. The assignments you gave let us practice more and more. Now I feel more skillful than I was."

Another participant commented that,

> … We had the chance to try those programs, have them evaluated and finally get a feedback from the instructor about our work. So unlike other classes, we were given the chance to put down our theory based information into practice which gave us the chance to evaluate ourselves as well… It was good to see things in a real perspective… I learnt more about adapting technology tools to English learning during this course so I can say that it has developed our skills about technology.

In order to explore whether the S-TECHNO model had an impact on student teachers' beliefs about the role of technology in language teaching, we asked a number of questions both in the exit interview and reflection journal. Subsequently, we generated six sub-categories and placed them under the category of technological beliefs. Results show that

just over half of the student teachers (n=25) put forward inherent value beliefs about technology. Regarding the sub-category of *inherent value beliefs about technology,* one interviewee said,

> With your classes, the meaning of technology changed for me… Using technology was like preparing for a hard exam for me before your classes. However, the more I used it, the stronger my beliefs about its usefulness got…The more we used, the more understandable it became. We got accustomed to using it. Before taking this class, I did not use to think that technology will be a part of my classes but my ideas changed a lot and I am thinking of making great use of them in English classes… So, technology must be embraced by language teachers to teach language more effectively.

Similarly, another interviewee stated:

> Technology has always been used as an extra resource in our education life. We did not see our teachers using technology tools. We are student teachers and if we had not taken your classes, it is highly probable that we wouldn't use technology tools as we were not aware of its power for language teaching… I realized that technology can be embedded in language classrooms… I used to see it as a burden. Now I can see that, it can actually lift the burden on teachers.

One of the participants wrote in her journal that:

> … But firstly and most importantly this course changed our perception. I had a prejudice about technology. I did not know what to do with it and what technology meant for language teaching. Now that the opportunities technology offers as so reasonable, why do we miss it?. I see that technology means variety, it has many purposes. You can use the technological tools in different classroom situations. A computer provides a teacher with podcasts for listening and speaking; with blogs, wikis and forums for writing skills or you can convert all kinds of social networks like Facebook, twitter, instagram to useful tools for your teaching. They carry out all purposes. With technological tools, a teacher can ensure interaction and participation in the classroom. For example with the help of edmodo you can bring your students together. I believe that we can remove all ordinary and boring lessons by integrating technology into our classrooms… These programs gave me hope about the use of technology in ELT. I notice that technology inspires me for language teaching.

Another student commented that:

> I am wondering why our teachers did not use technology since it has many advantages and again I am wondering while we are always using technology in our lives, why do not we use technology in education? It is really confusing. After discussing on the articles we read, I saw technology and ELT can make a happy marriage. But why do not we allow? This is because teachers do not know its potential for language teaching, It is because teachers do not have adequate knowledge and skills. If we had not taken this course, technology would still stand outside my classrooms. But now, it won't since I will take it into my classrooms.

One of the emergent categories from our data was "Confidence in technology use". Three of the interviewees shared their ideas on this issue in their journal entries, as well. For example, one interviewee said:

> Since the same technology tools were always used, we were not familiar with other technologies. Even when we heard, if it seemed complicated, we did not bother to figure it out. But in your courses, we saw that if we tried, we could do.

Similarly, she commented in her journal, "I was avoiding from using technology but now I feel more comfortable at using it. I feel more equipped."

Another interviewee said:

I took notes during my friends' presentations and listed lots of different technologies. There were some difficult programs… Since we developed our technology skills in your courses, we are not worried or unsure whether we could use this program or use it in English language teaching. We learnt to give a try and search how it could be adapted to English language teaching.

Likewise, she commented in her entry:

At first, I had difficulty in using and understanding; this will be the same for my students. But it is not impossible to learn. When you start to learn you come to the technology world, this will be something like a habit and you will be able to use it.

In order to find out whether the S-TECHNO model had an influence on student teachers' beliefs, we asked 4 more questions which entail the implications of the conceptual change theory. Although 36 of the student teachers found the technologies that were learnt during the intervention process intelligible, plausible and fruitful, 20 of the participants reported that they experienced dissatisfaction with their existing conceptions. For example, one interviewee describes why she felt dissatisfied with her existing perceptions as follows:

> When I thought about my previous learning experiences, I saw that there were lots of unsolved problems and I began to think "Yeah I will become a teacher and how I will address to these problems. Actually, it was a challenging activity.

Another interviewee said, "Before learning these, I would probably read out loud a reading text and this would be very traditional but using audacity or natural readers will be more attractive for students."

In the same sense, one of the participants wrote in her journal that:

> If I had not taken this course, I probably would not use technology. Technology from my teacher training program was not sufficient and only included the use of PowerPoint. So, I was actually against technology. I blamed it for making the teachers lazy and also for distracting me during the lesson when I could not decide whether to read slide or listen to the teacher… I am leaning on technology more and more. I now understand that my feelings about technology were related to some of my previous instructors who used it as an excuse for not doing anything in class. Probably that is why I felt so against it.

Another participant commented that:

> When we discussed about our previous experiences and the relationship between language teaching and technology, I was disappointed. Our teachers did not attach importance to culture, pronunciation, writing, listening and speaking. We are still having problems with these problems. We focused on reading, grammar and vocabulary to prepare for university exams. But, what about other skills? Now that there are so many contributory tools, why were not they used? We may have been better at them now.

Regarding the intelligibility of using technology in language teaching, one of the interviewees articulated her ideas as follows:

> I found the technologies we focused on practical and intelligible. For example, it will be more intelligible and fun to ask students to write a dialogue between two people via plotagon rather than asking them to write down on a piece of paper. It will be boring for them.

Another interviewee stated. “Posing problems before the introduction of technologies and showing how technology tools can be used for handling these problems enabled us to see the intelligibility of using these tools.”

One of the participants wrote in her journal that:

> We tried them out in the class; mostly they were useful and understandable. Useful is if they help students learning and facilitate the teacher’s job. Understandable is figuring out how to use it in class. Maybe it takes time to understand how to use but a teacher has to prepare for a lesson anyway. Once you learn they do not seem so hard which is true for anything.

Similarly, another participant commented that:

> Although I was thinking that technological tools were hard to use in classrooms, I have seen that if you try they can be easily used and there are many advantages of using them. It can make my lessons more understandable and make me a better teacher.

36 of the participants reported that they found the technologies they learnt about plausible. For example, one interviewee said,

> Before your classes, technology was something that I would sometimes use. Now, I have seen that I can teach reading, writing, listening, speaking, vocabulary, grammar and culture with technology and teaching with technology can help us solve language problems better.

Another participant expressed similar views:

> I used to think that I would have problems while using technology like technical problems or it would distract students’ attention. But, I realize that we can draw our students’ attention by addressing to multiple senses of them with technology. I have seen that a teacher can use technology in various ways to overcome language problems.

One of the participants wrote in her journal that:

> I found those technologies reasonable and practical for my future career. We learnt so many technology tools which had many benefits. First, my favorite was clickers for time management in class. Clickers are tools used for student response in class whether for pools or answering questions. It is time-efficient and enables the teacher to observe the whole class’s progress, It is kind of a game for students and it is a good tool to prevent student anxiety. Hotpotatoes was a good tool for preparing different types of questions and again very useful. Plotagon and audacity were useful for students to write, to speak and produce a product of their own. Many apps on our phones were great tools for self-learning, providing good model and even feedback. Also using social media in creative ways was something we have learned which definitely made us realize that anything can be used for teaching/learning process. Edmodo is a tool which I personally liked very much because I believe communication is important in student-teacher relationship and the learning process. Instant communication for sure motivates learners.

Another participant stated, “In addressing to language learning problems technology can definitely help us. We can teach more practically and easily with technology. In addressing to different learner styles and learning problems they can be of great use.”

Finally, 36 participants reported that they found the technologies used fruitful. For example, one of the interviewees said:

> I used to think that I would have problems while using technology like technical problems or it would distract students’ attention. But I realize that we can draw our students’ attention by

> addressing to multiple senses of them with technology. I have seen that a teacher can use technology in various ways to overcome language problems.

Another participant stated, "We also began to think how these technological tools can be used for different purposes in different situations."

Similarly, one of the student teachers wrote in one of her entries that:

> A tool may seem to serve one purpose but actually it is not. We see the integration of skills in ELT classes, so any tool includes at least two skills. So, it is possible to use them in many different situations. . Blogs were a good idea to persuade the child to write about a subject they like, which may not seem so profitable. Vocabulary games may seem only as games but they have the power to teach at the same time. Having students prepare an audio record for homework is a tool which helps observing students' language use in a classroom where there is not enough time for everyone to speak.

Another participant commented that, "Technology is an all-embracing concept. It can be used for different purposes in different classrooms."

Turning now to the findings obtained from observations and lesson plans; we will provide further information about the experiences student teachers went through throughout the intervention process.

Student teachers were asked to prepare lesson plans and offer demo lessons for the implementation process. Two observers assessed student teachers' lesson plans and teaching by separately scoring the rows of Technology Integration Observation Instrument (Hofer et al., 2011). While the highest score student teachers would get from the instrument was 24, the lowest score was 6. Table 54 shows the scores groups received at the end of their first and second performance.

Table 53

Observation Scheme Results

Groups	Scores for the first performance	Scores for the second performance
Group 1	22	23
Group 2	22	24
Group 3	20	23
Group 4	20	24
Group 5	18	20
Group 6	24	24
Group 7	22	24
Group 8	24	24

The scores of the student teachers' first performance suggest that two of the groups did very well with regards to their lesson plans and presentations while six of the groups did well. When the scores of the second performance were examined, an increase can be seen compared to the previous ones. More precisely, an increase towards the "maximally well" degree can be seen both in their lesson plans and demo-lessons. This indicates that the more familiarity student teachers gain with technology and technology use, the better performance they display.

When examined, it can be seen that results obtained from the interviews, journals, observations and lesson plans were consistent with the metaphor and survey results suggesting that the S-TECHNO model has challenged student teachers' instructional technological competence.

If we now turn to the results gained from the exit interview held with the control group, we can see from the Table 54 that 4 categories emerged and we developed 1 theme.

Table 54

Themes and Categories Obtained From the Interviews of the Control Group after the Intervention Process

Themes	Categories	Sub-categories	Frequency(n=6)
			Interview
Inefficiency of teacher education programs in enhancing student teachers' instructional technological competence	Lack of Technological Awareness	Inadequate training on developing technology awareness in student teachers	6
	Lack of Technological Knowledge	Inadequate training on developing student teachers' technology knowledge	6
	Lack of Technological Skills	Inadequate training on developing student teachers' technology skills	6
	Lack of Technological Beliefs	Inadequate training on developing inherent value beliefs about	6

Theme 1- Inefficiency of teacher education programs in enhancing student teachers' instructional technological competence: When student teachers in the control group were asked whether the course of "Teaching Language Skills" has increased their technological awareness, 5 of the student teachers responded in a negative way. For example, one

interviewee said “It did not add new things.” Another interviewee stated, “No, we learnt ted talks as a different tool. Many of our teachers do not know how to use them. We are trying to use what we know already. On the other hand, one of the interviewees pointed to the modest contribution that the course offered by stating that, “Yes, to some extent because I do not know much about technology use in language teaching. The things I see here are different things for me.”

When student teachers were asked whether their knowledge with respect to the use of technology in language teaching improved, all of the interview participants (N=6) pointed out the inadequacy of their program in enhancing their technology knowledge. For example, one of the student teachers said, “No, I cannot say that it helped me improve my technology knowledge. We couldn’t add new things to our technology knowledge. I know some basic things and if I use technology in my classrooms I will use them.” Another student stated, “There were lots of technology names on the survey you distributed to us and we know only five or six of them and this is again with our own efforts.”

With respect to the technology skills, all of the interviewees (n=6) indicated no change in their technology skills. For example, one interviewee said. “As to the use of it, how much we use it is questionable. We are telling it is important but we are not using it. We do not know how to use it appropriately”. Similarly, another interviewee stated, “Integrating technology is hard for me because knowing something doesn’t ensure that you can do it. We know how to use Facebook or twitter for example but we do not know how to adapt them to language teaching.” With regards to the technology beliefs, it can be seen that all of the student teachers (n=6) still hold exherent value beliefs. For example, one of the student teachers said:

> … As technology was not used throughout our education lives, we cannot perceive its position as firm in language teaching or education in general. As we do not know how to use it, we have some concerns so I think we say I can manage without technology.

In like manner, another interviewee said,

> Technology is not a must for me. I can prepare materials for my students… Since we did not see how it was used, we avoid from using it. We do not know how to use it, what websites are available for what skills. We know PowerPoint and searching on the Google. We do not know different technologies. Since we do not have knowledge about the use of technology in language teaching, technology doesn’t appeal to us.

To summarize, it can be clearly seen that the interview data is congruent with the results obtained from surveys and metaphors. Together these results suggest that the regular

course student teachers in the treatment group received had almost no impact on student teachers' instructional technological competence.

CHAPTER 5

DISCUSSION AND CONCLUSION

The main purpose of this study was to find-out whether there were more underlying reasons in depth to be explored regarding the low-level use of technology in classrooms because the problem still continues to exist despite all the insights gained about the obstacles in the path of effective technology integration. The second purpose of the study was to evaluate the impact of the S-TECHNO instructional model on enhancing student teachers' instructional technological competence (ITC). The following section will provide a discussion of the results related to each research question of the present study.

5.1. Phase One

In this section, I discuss the survey and interview results that elucidate the place of technology in student teachers' prior learning experiences, needs and current state of student teachers' knowledge, skills and beliefs in relation to technology.

Research Question 1: *What perceptions do student teachers in ELT programs in Turkey hold about their primary and secondary education experiences related to technology?*

Student teachers' schooling experiences as learners influence their conceptualization about teaching and learning, and what the role of technology is for these processes. In order to understand how these experiences have had an impact on student teachers' perception about the position of technology in language teaching, we formulated the first research question. Descriptive statistics for this question has shown that the majority of the student teachers reported that technology tools were used in their early learning experiences. However, over half of the student teachers reported that their previous learning experiences were unable to show them the relationship between teaching, learning and technology thus failing to be exemplary for their future career.

T-test results for the first hypothesis which suggest that there is a difference between Student teachers who said technological tools were used in their early learning experiences and who said technological tools were not used in their prior learning experiences have shown that there is no difference between the groups in terms of the factors of relating technology tools to language teaching, preparedness level for instructional use, technology knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge. This result indicates that the way how technology is used more important than whether it is used or not given that the quality use of technology can help learners develop an understanding about the relationship between technology and the teaching/learning process. This finding further supports previous research (e.g. Luschei, 2014; Thornburg, 1999) which implied that what matters in the use of technology for instructional purposes is how well it is used rather than if it is used at all.

T-test results also have shown that student teachers who think (a) their early learning experiences helped them understand the relationship between teaching, learning and technology and (b) their early learning experiences with technology will help them incorporate technology in their future career had higher mean scores in the subscales of relating technology tools to language teaching, preparedness level to use technology for language teaching, technology knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge compared to the student teachers who do not think. Consistent with survey results, interview data also revealed that student teachers also touched upon the incompetency and unwillingness of their previous teachers in using technology as well as its inappropriate and unexemplary use of technology. Taken together, these findings support previous studies (e.g. Borg, 2006; Darling-Hammond, 2006; Johnson, 1994; Lortie, 1975; Nespor, 1987; Pajares, 1992; Reeves, 2009; Richardson, 1996) which stress the crucial role of schooling experiences as a key factor in shaping student teachers' perceptions about the teaching process. Results display that student teachers who agree on the effectiveness of their prior learning experiences had higher means scores for the variables of technology knowledge and technology skills. Hence, we affirm that inappropriate, inadequate and ineffective use of technology in student teachers' schooling experiences can be suggested as one reason of low level use of technology in classrooms. Given that these student teachers did not go through experiences which included technology, they see technology just as an add-on. Lee and Friedman (2009) summarizes this situation aptly by stating that student teachers

suppose the way a subject was experienced is the way it must be experienced. Thus, we suggest that student teachers should be provided with meaningful experiences about technology integration in which their incomplete images about the role of technology is challenged in agreement with many authors who contended that student teachers' pre-existing beliefs about teaching must be brought to a level of conscious awareness (Bailey et al., 1996; Farrell, 1999; Freeman & Johnson, 1998; Kagan, 1992; Minor et al., 2002; Raths, 2001; Yost et al., 2000) and their false assumptions must be eliminated (Darling-Hammond, 2006; Farrell, 2006; Zheng, 2009).

Research Question 2: *What perceptions do student teachers in ELT programs in Turkey hold about their undergraduate experiences related to technology?*

Descriptive statistics for the second research question has shown that most of the student teachers find the technology-related courses they received theory-based and for acquiring basic skills. Almost two-thirds of the participants said that these courses were not practice-based and contextualized for ELT. These results are in agreement with those of Göktaş, Yıldırım and Yıldırım (2009) who indicated that student teachers needed more opportunities for practicing with technology and integrating technology into teaching. Findings have also shown that over half of the student teachers studying in ELT programs find the technology training they received inadequate and ineffective in helping them understand the relationship between teaching, learning and technology and encouraging them to use technology in teaching and learning. Similarly, Brush et al. (2003) and Mishra and Koehler (2006) contended that teacher education programs fail to align technology with subject matter and pedagogy.

Overall, these findings imply that student teachers view the technology training they received insufficient and further support previous studies (e.g. Agyei, & Voogt, 2011; Blake, 2007; Brush et al., 2003; Drent & Meelissen, 2008; Gülbahar, 2008; Hu & McGrath, 2011; Kay, 2006; Kula, 2010; Ringstaff & Kelly, 2002; Şahin-Kızıl, 2011; Tınmaz, 2004; Tondeur et al., 2012) which indicated that student teachers do not feel adequately prepared to use technology in their classrooms.

T-test results have shown that student teachers who think (a) the technology training they received was adequate, (b) their teacher training experiences have helped them understand the relationship between teaching, learning and technology (c) their teacher training experiences have encouraged them to use technology effectively in teaching and learning,

(d) the technology-related courses they received were not theory-based, (e) the technology-related courses they received were practice-based and (g) the technology-related courses they received were contextualized for ELT had higher mean scores in the variables of relating technology tools to ELT, preparedness level to use technology for language teaching, technology knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge compared to student teachers who do not think. However, student teachers who said and who did not say the technology-related courses they received were for acquiring basic skills did not show a significant difference in their technology knowledge. One possible explanation for this might be that since these student teachers are digital natives (Prensky, 2001), they already have basic skills at using technology for general purposes.

Overall, these results corroborate the ideas of Hersh (2013), who suggested that the more knowledge, practice and exposure to technology in teacher education programs, the more prepared student teachers feel about integrating technology into teaching and learning. These findings further support the idea that the quality of a teacher is directly proportionate to the quality of a teacher education program (Darling-Hammond, 2006).

Research Question 3: *What knowledge and skills do student teachers in ELT programs in Turkey have about the use of technology in language teaching?*

There are a number of barriers listed by several authors (e.g. Ertmer, 2005; Hew & Brush, 2003; Kay, 2006; Kula, 2010)that prevent successful implementation of technology by teachers. Ertmer (1999) refers to some of those obstacles as second order barriers which include teachers' lack of technological knowledge and skills among others. In order to get a comprehensive picture of student teachers' technological knowledge and skills, the second research question was posed. Descriptive statistics for the subscales of frequency of using different types of technologies, competency level with using different types of technologies, relating different technologies to ELT and preparedness level for using different types of technologies in ELT have shown that student teachers rated themselves slightly above average in each of the subscales. When the results are examined in detail, it can be clearly seen that student teachers know and use simpler software programs (e.g. Powerpoint, Word etc.) and instructional tools (computers, smartphones etc.) very often. These findings indicate that student teachers do not know how to make instructional use of different types of technologies and they use technology for low-level tasks. These results

match those observed in earlier studies (e.g. Cuban, 2001; Ertmer, 2005; Pelgrum, 2001; Yalin, Karadeniz & Sahin, 2007).

Results of the TPACK survey have shown that student teachers rated their technology knowledge higher than the other constructs. This result can be explained by the fact that these student teachers are the representatives of the Net Generation as suggested by Oblinger and Oblinger (2005). On the other hand, student teachers rated themselves above average in the constructs of technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge. However, these outcomes are not in alignment with the results obtained from the factors of competency level with different types of technologies, relating technology tools to ELT, preparedness level to use technology for language teaching, all of which can provide further insight into student teachers' technological knowledge. A possible explanation for this might be that student teachers evaluate themselves about TPACK based on the technologies they know without being aware of the numerous technologies available that can be used in language teaching. This finding corroborates with the ideas of Wu and Wang (2015) who implied the insufficiency of using only one tool in measuring student teachers' TPACK. Consequently, one of the issues emerging from these findings is that measuring student teachers' technological knowledge only with one tool might be misleading. Therefore, more than one tool should be used in order to have more accurate findings about student teachers' technological knowledge. Overall, these findings corroborate the ideas of Horzum (2013) who stated that student teachers generally rate themselves above average in TPACK constructs.

In a similar vein, interview data revealed that student teachers did not learn much about different types of technologies and they generally use what they already know in their courses. It was also found out that student teachers reproach about the mundane uses of technology by teacher educators. This finding supports previous research (e.g. Bai & Ertmer, 2008; Çetin-Berber, 2015; Hall, 2006; Kırkgöz, 2014; Tondeur et al., 2012) which stresses the crucial role of teacher educators in modeling effective use of technology.

Research Question 4: *What beliefs do student teachers in ELT programs in Turkey hold about the use of technology in language teaching?*

The fourth research question was formulated to find out what beliefs student teachers hold about technology since teachers' beliefs are referred as one of the major barriers in the path

of technology integration given that beliefs are strong predictors of teachers' behaviors (Ertmer, 2005; Ottenbreit-Leftwich et al., 2010). The results have shown that while the majority of the student teachers view technology as an *add-on* (Brush & Saye, 2009), only a minority of them view technology as an integral part of classrooms. Interview results also revealed that most of the participants regard technology as a supplementary tool. Referring to the requirements of the 21st century, only a few of the participants stressed the integral role of technology in language teaching. These results provide further support for the ideas of Feenberg (2002) who suggested that there are two established perspectives of technology: instrumental view and substantive view. While technology is viewed as a means to ends in the instrumental view, technology is perceived as value-laden in the substantive view. These results are also in agreement with Chen's (2011) findings which showed that most of the pre-service student teachers subscribe to instrumental views. These results indicate that teacher education programs fail to provide student teachers with meaningful experiences through which they can discover the inherent value technology has for language teaching.

Research Question 5: *What are the needs of student teachers in ELT programs in Turkey with regards to technology-related courses?*

Analysis of the interviews and open-ended questions provided us with a detailed insight into student teachers' needs about technology education. The need for understanding the rationale and potential of using technology was one of the emergent themes. Some of the participants stressed their need to understand the true potential of technology for language teaching. This finding is consistent with the prior studies (e.g. Al-Ghazo, 2008; Becta, 2004; Cox et al., 1999; Mumtaz, 2000) that noted the importance of raising student teachers' awareness about the rationale and benefits of using technology. Other emerging themes which were the need for learning about different types of technologies, need for developing technology knowledge and skills, need for grasping the inherent value of technology, need for teacher educators' modeling in technology use, need for increase in the number of technology-related courses and need for enhanced infrastructure capacity are also in line with those of previous studies (e.g. Buabeng-Andoh, 2012; Ertmer, 1999; Göktaş, Yıldırım & Yıldırım, 2009; Hew & Brush, 2003; Kay, 2006; Kula, 2010). One of the interesting points emerged from the interview data was about the emphasis on the "material development" part of the instructional technology and material development

courses which indicates that teacher educators focused more on old technologies (e.g. colorful papers) and required handiworks from student teachers. Taken together, these results indicate that barriers mentioned in this study have long been a matter of concern and they still stand in path of high level technology use in classrooms. However, they must be overcome soon if the effective integration of technology is aspired in the 21st century classrooms.

Overall, all these findings obtained in this study revealed that teacher education programs fail to offer effective technology education. Therefore, student teachers cannot see technology as part of classrooms and most of them keep having the traditional idea that technology is useful but not essential. Moreover, these results and the ensuing review of literature enabled us to offer three original constructs that can help break through the barriers in the way of technology integration.

Introduction to New Belief Constructs: Exherent Value Beliefs and Inherent Value Beliefs

When the literature with regard to teacher beliefs and technology is reviewed, it can be realized that there is no consensus about teacher beliefs concerning technology integration. One can come up with various types of beliefs in relation to teachers' views associated with technology such as teacher expectation of learner success, self-efficacy in their own ability to teach, beliefs about the value of specific teaching strategies or materials and content-specific beliefs (Kim et al., 2013). However, it can be found out that much research pertinent to teachers' beliefs and technology focuses on teachers' self-efficacy beliefs (e.g. e.g. Abbitt, 2011; Albion, 1999; Brinkerhoff, 2006; Çelik & Yeşilyurt, 2013; Lee & Lee, 2014; Lee & Tsai, 2010; Wang, Ertmer & Newby, 2004) and teachers' epistemological beliefs in relation to technology (e.g. Bråten & Strømsø, 2005; Ertmer, 2005; Kim et al., 2013; Levin & Wadmany, 2006; Liu, 2011). Although these studies have contributed considerably to our conceptualization about the intersection between technology and teacher beliefs, they have not displayed the direct relationship between technology and beliefs. For this reason, we contend that teachers' *beliefs about technology for technology's sake* should come to the fore. On this matter, we refer to Feenberg (2002) who suggested that there are two established perspectives of technology: instrumental view and substantive view. In instrumental view, technology is viewed as a means to ends which is the dominant view in today's modern society. Technologies are seen only as tools ready to serve to its users' and they are neutral. In a similar vein, Brooks (2011) states that there

are two basic assumptions of the instrumental theory: "1) technology is non-mediating and 2) humans control ends" (p.37). According to Chen (2011), learners who have instrumental view separate themselves from the technologies they use. In other words, technology just assists learners in gaining knowledge and skills and it has an external role in learners' cognitive processes. On the other hand, concerns about how society is shaped by technology refer to substantive view. According to Feenberg (2002), substantive theory argues that technology constitutes a new cultural system that restructures the entire social world as an object of control" (p. 6-7). Here, technology is perceived as value-laden. Two major conceptions grounding this perspective are (1) technology shapes society more than society shapes it; and (2) technology holds some inherent values" (Brooks, 2011, p. 46). Substantivists assume that technology has a constant presence in today's world and we are unaware of how it shapes our experiences (Chen, 2011). Concurring with Chen (2011), we suggest student teachers should not be purists about instrumental or substantive views. They should redress the balance between two perspectives so that they can be aware of the mediating and transformative nature of technology. More precisely, having such a balance can help student teachers see learning can be mediated and structured by technology. Technology tools are internalized by learners in such a way that they are no longer considered as external; rather they become an integral part of learners' thinking (Chen, 2011).

Drawing on the implications of two fundamental philosophical perspectives, we suggest the bidimensional construct of "perceived value of technology" to point to teacher beliefs about technology. We can see that the concept of perceived value is a commonplace term which is used by different fields (e.g. marketing, tourism, business etc.) and it means having an internal feeling about the worth of a product. Even, the concept of perceived value about technology has been articulated by several researchers (e.g. Miller et al., 2003; Park & Ertmer, 2007). However, we have used it in a different sense in our context. By perceived value, we refer to the position of technology in language classrooms in the eyes of student teachers. And it consists of two sub-constructs: exherent value beliefs and inherent value beliefs with respect to technology.

Exherent value beliefs about technology indicate that technology is just a supplementary tool to increase the efficiency of instruction. Technology is regarded performing separately from learners' mental processes and as an add-on that teachers utilize from at will. On the

other hand, inherent value beliefs about technology refer to the integrity of technology with the teaching process. Technology is seen as an integral part of language classrooms. It accompanies teachers and learners as a *smooth partner* in the teaching and learning process. More precisely, it is used by teachers in a manner that contributes to planned and deliberate ways of instruction. As to the learners, they develop new ways of thinking through technology. They think, explore, plan, create, produce and reflect. The use of technology is internalized by teachers and learners in such a way that it becomes an indispensable and also an invisible part of language classrooms. Chen (2011) pointed out that learners who hold more substantive views develop tool-mediated thoughts and actions. They embody with technology since technology withdraws from learners' conciousness when they are truly engaged in the learning task. In like manner, Rivera (2007) posited that individuals use tools in such a way that their practices emerge as a result of adapting to tools.

Consequently, we suggest that technology education must start with investigating whether student teachers hold exherent value beliefs or inherent value beliefs pertinent to technology since these beliefs determine how integrally student teachers relate technology to language teaching and learning. Kruse (2013) pointed out that understanding technology-related beliefs of learners enables educators to structure technology use more effectively in their classrooms. However, a number of researchers have noted that technological hardware has often been overemphasized and crucial components of technology education have been overlooked (e.g. Amiel & Reeves, 2008; Chen, 2011; Jonassen, 1995; Luppicini, 2005; Sulla, 1999). Sulla (1999) stated that the focus in technology education has been on developing teachers' technology skills and not on instructional strategies that can enhance student teachers' understanding of how to infuse technology into the learning process. She further added that seeing technology as a convenient side-product of the lesson hinders teachers from integrating technology into classrooms. Therefore, we argue that the tradition of using technologies as knowledge conveyance and knowledge transmission tools must be broken with an insight of knowledge construction. In other words, technologies must "actively engage learners in creation of knowledge that reflects their comprehension and conception of the information rather than focusing on the presentation of objective knowledge" (Jonassen, 2005, p.3). Student teachers must distinguish learning with technology from learning from technology (Jonassen, 2005). Therefore, teacher education programs must inspire student teachers with

such insights to enhance their inherent value beliefs about technology so that they can discover the unfulfilled potential of technology for language teaching. Moreover, we suggest the bi-dimensional construct of perceived value as complementary to two significant beliefs of Technology Acceptance Model (TAM) (Davis, 1989) which are perceived usefulness and perceived ease of use.

The TAM was introduced by Fred Davis in 1989 in order to predict users' intention to use technology in work place. Teo (2011) noted that although much research on technology acceptance has been carried out in business contexts, increasing interest in instructional technologies has led researchers to examine technology acceptance in educational contexts. Subsequently, several models of technology acceptance have been proposed and TAM has become one of the widely-used models in technology acceptance studies (Fagan et. al. 2008). Teo (2011) attributes the popularity of TAM to the "empirical support it received for being robust and parsimonious in predicting technology acceptance and adoption in various contexts and using a variety of technologies" (p.79). Likewise, Straub (2009) asserts that TAM has had a long-standing history because it has pioneered in highlighting the importance of individual perceptions of a technology.

TAM was developed based on the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980) and Theory of Planned Behavior (TPB) (Ajzen, 1985). Both theories suggest that beliefs influence attitudes which in turn affect behavioral intention and eventually the actual behaviour (Chen et. al., 2011). TAM explains how external variables influence beliefs, attitudes, and intention to use. According to TAM, actual use is determined by behavioral intention to use and behavioral intention is directly influenced by perceived usefulness and attitudes. Attitude is affected by the beliefs of perceived usefulness and perceived ease of use. Perceived ease of use also influences perceived usefulness and both types of beliefs are affected by external variables (Davis et. al., 1989).

TAM suggests two types of beliefs in relation to technology acceptance: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which a technology increases an individual's job performance. Perceived ease of use is defined as the degree to which the use of a technology is considered to be free of effort (Davis et. al., 1989). According to TAM, beliefs of perceived usefulness and perceived ease of use are the fundamental determinates of actual behaviors.

If we are to think belief constructs of TAM in terms of our context, perceived usefulness can be defined as the degree to which pre-service teachers think technology can improve

their instruction. Perceived ease of use refers to the degree to which pre-service teachers believe using instructional technologies will be free from effort. Here, we propose the bidimensional construct of perceived value with its two subconstructs- inherent value beliefs and exherent value beliefs- as a complementary construct to Davis's TAM model.

Introduction to a More Overarching Technology Framework: Instructional Technological Competence

TPACK has been widely embraced as a framework of technology integration since it has drawn attention to bridging the gap between content knowledge, pedagogy knowledge and technology knowledge. However, despite growing in popularity within a short time, it has some limitations to be considered as an overarching framework of technology integration because of its ill-defined definition. Unclarity with its scope-whether it is about knowledge, skills or both- (Brantley-Dias & Ertmer, 2014) and its ignorance to the constructs of beliefs (Angeli & Valanides, 2009; Brantley-Dias & Ertmer, 2014; Graham, 2011; Niess, 2005) and awareness urged us to argue for a more holistic framework of technology integration which we name as Instructional Technological Competence.

The word competence has a long history dating back to the Code of Hammurabi (1792-1750 B.C.) (Mulder, Weigel & Collins, 2006). It has been used in different fields such as law, public administration, organizational structure, management and education and training since the 1970s (Mulder & Collins, 2007) with differing meanings such as outcomes, capabilities, tasks or personal traits/characteristics (Lans et al., 2008) in various countries (Boon & van der Klink 2002). It has become a popular concept in European education since the 1990s and institutionalized in education since 2000s as it can be seen through the educational reports of European Commission (Mulder et al., 2009). Although there have been some attempts to define it, no clear consensus exists over the definition of the concept of competence (Kennedy, Hyland & Ryan, 2006; Stoof, 2005).

Likewise Stoof (2005) stated and further suggested that looking for a unique meaning for competence is a dead-end road. Therefore, the most important thing when using the term competence is to ensure whether it meets the needs of the context in which it is used. Nevertheless, despite the fuzzy nature of the word competence, Boon and van der Klink (as cited in Kennedy et al., 2009) proposed it as a beneficial concept which bridges the gap between education and profession. Subsequently, it has maintained its popularity to date and it has been subjected to various interpretations in the field of education in general and

in teacher education in particular. According to Mulder et al. (2009), there have been two main perspectives about the use of the term competence in teacher education which are "old" and "new" competence approaches. The old concept of competence originated from behavioristic view and it formed the basis of competency-based teacher education programs of the 1970s and 1980s (Mulder, 2007). Here, it referred to discrete, observable, assessable, trainable and fragmented skills which are described in long lists (Wesselink, 2010; Mulder, 2011) to be performed by teachers. Boon and van der Klink (2002) commented that the most salient feature of the competency-based teacher education is to imitate the behaviours of professionals. Accordingly, the role of the teacher education programs was to train student teachers to gain those competencies. However, behavioristic conceptualization of the term fell out of favor because the approach was criticized for "reducing teachers to "technicians" and ultimately "deprofessionalizing" and "deskilling" them" (Pantic et al. 2011, p. 5). Critics argued that teachers' conceptions and personal theories have a more powerful effect on their behavior than the training of discrete skills in teacher preparation programs (Mulder, 2006). The shift from behavioristic paradigm to cognitivistic one has highlighted that teachers' actions result from what teachers think and believe. Consequently, the concept of competence has gained a more comprehensive, integrative and holistic meaning. Many authors (e.g. Ananniadou & Claro, 2009; Bertoncelj, 2010; Boon & van der Klink, 2002; Stoof et al., 2002; Delamare-Le deist & Winterton, 2005; Hayton & Kelley, 2006; Lans et al., 2008; Mosha, 2012; Mulder, 2014; Mulder & Collins, 2007; Kennedy, Hyland & Ryan, 2009; Tigelaar et al. 2004; Winterton, Le deist & Stringfellow, 2005) pointed out that one-dimensional conceptualization of competence has given way to a multi-dimensional framework of competence which combines the constructs of knowledge, skills and attitudes in an integrated way.

In addition, the concept of competence has become the "defining characteristic of European policies on employment, education and training" (Mulder & Winterton, 2016, p. 6). Following are some of the definitions of competence that can be found in the education policy documents of EU:

"Competences are the sum of knowledge, skills and characteristics that allow a person to perform actions" (Council of Europe, 2001, p. 9).

"A competence is defined as the ability to successfully meet complex demands in a particular context. Competent performance or effective action implies the mobilization of

knowledge, cognitive and practical skills, as well as social and behavior components such as attitudes, emotions, and values and motivations. A competence – a holistic notion- is therefore not reducible to its cognitive dimension, and thus the terms competence and skill are not synonymous" (Rychen & Salganik, 2003, p.2).

"Key competences represent a transferable, multifunctional package of knowledge, skills and attitudes that all individuals need for personal fulfillment and development, inclusion and employment. These should have been developed by the end of initial education and training, and should act as a foundation for further learning as part of lifelong learning" (European Commission, 2004, p.6).

"An integrated set of skills, knowledge, and attitudes that enables one to effectively perform the activities of a given occupation or function to the standards expected in employment"

(International Board of Standards for Training, Performance and Instruction, 2006, cited in Sampson and Fyrtos, 2008, p.161).

"Competences are defined here as a combination of knowledge, skills and attitudes appropriate to the context" (European Communities, 2007, p.3).

"A competence is not limited to cognitive elements (involving the use of theory, concepts or tacit knowledge); it also encompasses functional aspects (involving technical skills) as well as interpersonal attributes (e.g. social or organizational skills) and ethical values. A competence is therefore a broader concept that may actually comprise skills (as well as attitudes, knowledge, etc)" (Ananiadou, & Claro, 2009, p.8).

Moreover, we find it wise to use the term competence in our context because the content of second language teacher education has expanded in the same direction with the term competence. More precisely, there have been many changes in the field of L2 teacher education over the past 40 years. The shifting conceptualizations about the practice of teaching, teachers and the role of teacher education programs have consequently led to a reconsideration of the models that shape the knowledge-base of L2 teacher education. Historically, three major models have been influential in the professional education of L2 teachers. They are the craft model, the applied science model and the reflective model (Wallace, 1991). Grounded in the positivist paradigm, early models of teacher education envisaged the process of learning to teach as imitating or modeling the practices of others.

However, changing trends have demonstrated that teachers construct their own knowledge of teaching through engagement in classrooms as students, as teacher learners in teacher education programs and as practitioners in classrooms (Johnson, 2009). Referring mainly to the studies of Schön (1983, 1987), it has thus been widely accepted that teacher education programs must go beyond equipping student teachers with prescribed skills and predetermined knowledge; rather professional preparation courses must provide them with opportunities to understand the reasons behind their actions. Based on the ideas of Schon (1983, 1987), the reflective model came to be widely adopted by teacher education programs (Wallace, 1991) since it puts emphasis not only on knowledge and skills but also on beliefs and awareness in teacher education.

Consequently; concurring with the reflective model, the definitions provided by numerous researchers (e.g. Ananniadou & Claro, 2009; Bertoncelj, 2010; Boon & van der Klink, 2002; Stoof et al., 2002; Delamare-Le deist & Winterton, 2005; Hayton & Kelley, 2006; Lans et al., 2008; Mosha, 2012; Mulder, 2014; Mulder & Collins, 2007; Kennedy, Hyland & Ryan, 2009; Tigelaar et al. 2004; Winterton, Le deist & Stringfellow, 2005) and EU documents, we conceptualize competence as a dynamic, integrative, holistic and multidimensional framework consisting of beliefs, knowledge and skills. We also include the construct of awareness in the proposed framework of Instructional Technological Competence since teachers can see what knowledge, skills and beliefs they have for something through awareness.

Finally; Kennedy, Hyland & Ryan (2009) suggest that the meaning of competence must be clearly defined for the context in which it will be used in order to avoid confusion. Henceforth, we define instructional technological competence (ITC) as an integrated set of technological awareness, beliefs, knowledge and skills required from teachers to have for the successful infusion of technology into the teaching and learning process. Figure one displays the relationship between instructional technological competence and its components.

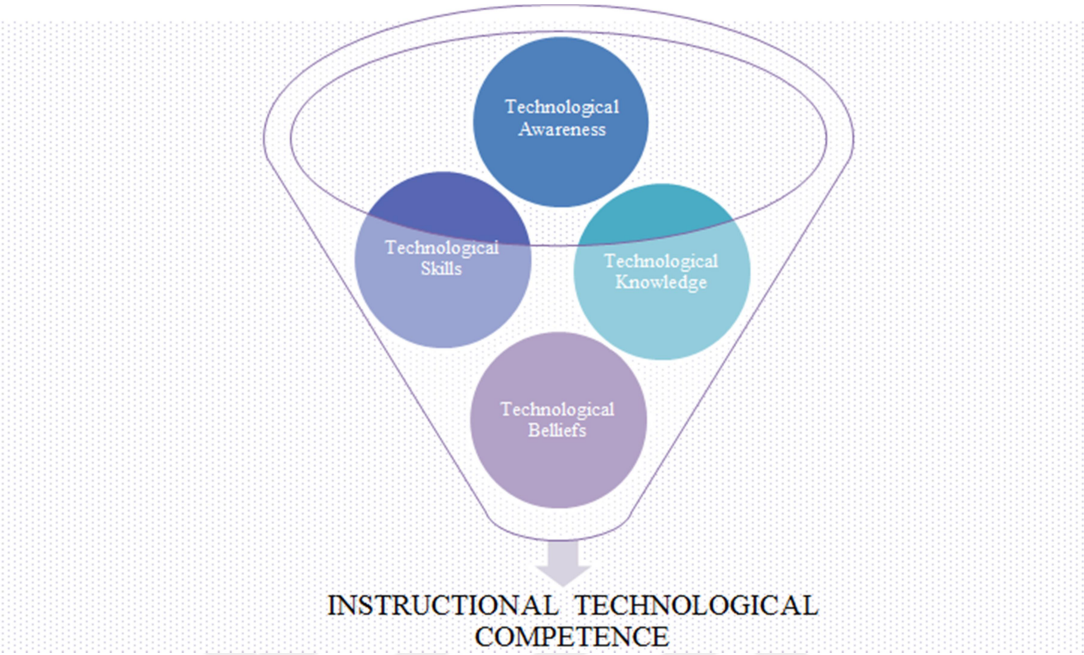

Figure 2. Instructional Technological Competence

Introduction to a new Instructional Model for Instructional Technology Courses: S-TECHNO Model

S-TECHNO Model has been proposed to enhance student teachers' instructional technological competence by promoting the idea of *technology as a smooth partner* in the teaching and learning process. S-TECHNO model derives the principles upon which it is founded from theories which are grounded in constructivist philosophies. One of these theories is the conceptual change theory (Posner et al., 1982) because this theory enables one to merge four independent but interrelated constructs (i.e. technological awareness, beliefs, knowledge and skills). The conceptual change theory suggests that creating cognitive dissonance is preliminary to change learners' existing conceptions and there are four conditions to be met for conceptual change to take place: becoming dissatisfied with current conceptions, finding the new conception intelligible, understanding the plausibility of the new conception and recognizing the fruitfulness of the new conception. However, providing student teachers with such challenging experiences depends on how instruction is designed and delivered.

Tillema and Knoll (1997) noted that adopting a knowledge transmission view of learning, which is the dominant perspective in most of the teacher education programs, won't be

adequate to provide student teachers with relevant knowledge. Instead, student teachers must be actively engaged in knowledge construction and their beliefs must be taken into consideration since they enter teacher education programs with personal theories that can influence on what they learn and accept as valid knowledge. They further maintained that inquiry-oriented activities and reflective reasoning on meaningful experiences improves their performance. Moreover, constructivist principles are referred as best practice by most teacher educators (e.g. Buchanan & Smith, 1998) and there are several researchers (e.g. Adams & Burns, 1999; Dunleavy et al., 2007; Harasim, 2012; Huffman, Goldberg & Michlin, 2003; Niederhauser & Lindstrom, 2006; Wenglinsky, 2005) who state that there is a complimentary link between constructivist propositions and the use of technology given that a technology-driven classroom inherently predicts a student-centred environment where learners are affectively, cognitively and behaviorally active in the process of knowledge construction. Therefore, we needed to refer to more constructivist theories to provide a sound basis for the S-TECHNO model. Accordingly, we synthesized the implications of cognitive constructivism, sociocultural theory, andragogy, teacher cognition research and ISTE standards, and identified 12 core tenets upon which to base our model. These tenets are as follows:

1. Providing the rationale behind learning new content
2. Providing opportunities for learners to experience cognitive conflict
3. Providing experiences which make use of learners' prior learning experiences
4. Providing experiences which require learners' active engagement
5. Providing experiences which have real-world relevance
6. Providing experiences which embed authentic contexts
7. Providing experiences which enhance learners' autonomy
8. Providing opportunities for students to collaborate
9. Providing teacher/peer support
10. Providing opportunities for students to negotiate
11. Providing opportunities for students to reflect
12. Providing experiences which allows for formative assessment

The model also paid particular attention to two concepts (a) the concept of *normalisation* proposed by Bax (2000, 2003, 2011) and further supported by Levy and Stockwell (2006) and (b) the concept of *technology-mediated tasks* proposed by Chapelle (2001) and further supported by Thomas and Reinders (2010) given that they considerably contributed to the development of the idea of *technology as a smooth partner* in the teaching and learning process.

Drawing on these implications, S-TECHNO model provides a sequence of instruction employed at the lesson level. It consists of two main units: set-up and operation. The unit of set-up (S) aims to put student teachers in readiness for operation. The unit of operation consists of six phases- think (T), explore (E), create (C), hone (H), negotiate (N), opine (O) and attempts to bridge the gap between theory and practice by interweaving lectures, readings, discussions, inquiry, design, presentations, applications, feedback, reflection and formative assessment. Each stage has a specific function but a single purpose which is helping students go through a conceptual change process culminating in the conceptualization of technology as a *smooth partner* in language teaching. The model has a linear structure; yet it may sometimes be essential to turn back to the previous phases before going forward. For example, after negotiate or opine phases, student teachers may need to go back to the "explore" phase and repeat the "create and hone" phases if they and their peers are not satisfied with activities done in the "hone" phase. The following figure displays how the S-TECHNO model operates.

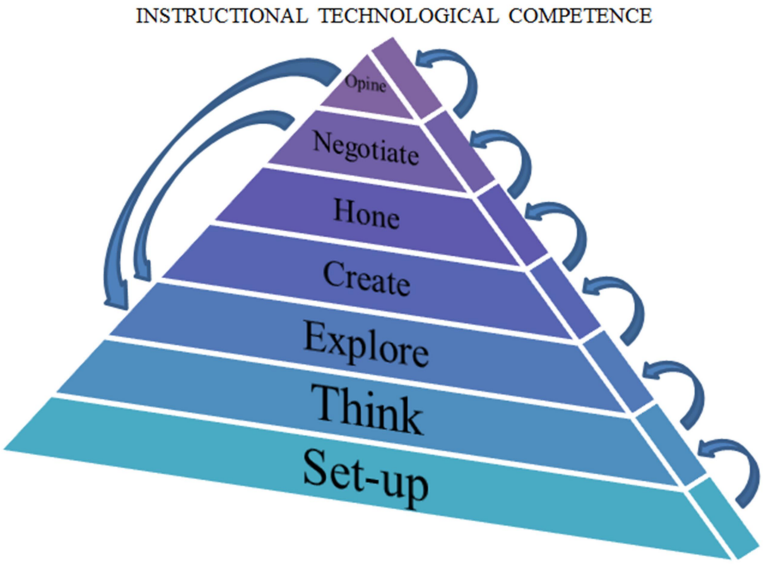

Figure 3. The S-TECHNO Model

Let us now discuss the phases of the model in detail.

Set-up: It is the fundamental phase of the S-TECHNO model as student teachers understand the rationale of using technology through moving from reflection on their prior learning experiences, to theoretical readings, to hands-on experiences, to the development of understanding. In other words, the goal of the set-up phase is to put student teachers in readiness for operation. First, the level of student teachers' instructional technological competence (ITC) is investigated through appropriate methods (e.g. questionnaires, mind-mapping, discussions, metaphors, drawings, essays etc.). This is intended for teacher educators to have a thorough acquaintance with student teachers' technological beliefs (i.e. exherent and inherent value beliefs), knowledge and skills, and design their courses accordingly. Another important aspect of this step is to build awareness in student teachers about their ITC since they are provided with opportunities to articulate their conceptions about technology use in language teaching. Second, student teachers are provided with key readings about the nature and potential of technology for language teaching and they engage in classroom discussions. This step is meant to set the scene for conceptual change process by activating student teachers' existing conceptions and enabling student teachers to compare them with alternative conceptions. The third step directly aims at initiating the conceptual change process. Here, student teachers are provided with a language learning problem. They are asked for brainstorming over the solutions. Having a general idea about student teachers' conceptions, the teacher educator offers a constructivist-based example of technology use which stands in strong contrast to student teachers' suggestions. This is done for creating a puzzlement and dissatisfaction in student teachers to create dissonance in their existing conceptions. After that, student teachers are encouraged to exchange their ideas about the alternative conception. The teacher educator asks questions about the intelligibility, plausibility and fruitfulness of the alternative conception in order to develop more profound understandings about alternative conceptions in student teachers. The last point of this phase is to maintain the conceptual change process. As a model, guide and facilitator, the teacher educator introduces different types of technologies to student teachers and presents them with language problems. Student teachers try to apply what they learn to solve authentic problems with the guidance of the teacher educator. This step is meant to provide student teachers with familiarity about various types of technologies and practicing opportunities.

To further the conceptual change process, the set-up phase paves the way to the cycle of TECHNO.

(T)hink: This phase is based on thinking over language learning problems presented either by student teachers reflecting on their previous language learning experiences or teacher educators. The main principle underlying this phase is creating dissatisfaction in student teachers to generate interest for upcoming experiences. The mental state of cognitive dissonance urges student teachers to question their pre-existing beliefs and conceptions in terms of adequacy and efficiency while proposing solutions to problems.

The teacher educator can use either cases presented by student teachers, videos, podcasts or images to present the problematic events. Student teachers are encouraged to discuss on solutions with the questions of "How can you solve this problem? and "What can be the role of technology in addressing this problem?". This step includes challenging student teachers' naive conceptions by eliciting their prior experiences and uncovering their beliefs and conceptions about the position of technology in language teaching and learning. In this way, they become aware of their current knowledge, skills and beliefs. Their answers are recorded through a mind mapping software program so as to be compared with their answers after the completion of the first cycle.

(E)xplore: In this phase, student teachers are encouraged to discover alternative ways of dealing with the problem under discussion. It is the initial step in which student teachers build new understandings about the topic through self-directed inquiry opportunities. Here, the class is divided into groups and asked for exploring alternative ways of solving the problem by integrating technology. Later, they discuss about the solutions and the role of technology in this process. Here, they also report on solutions provided in their prior learning experiences and compare them with the alternative conceptions they come up with. This is intended for providing the rationale behind using technology and developing a strong understanding about the potential of it.

The explore phase has a considerable importance because student teachers start to explore the intelligibility, plausibility and fruitfulness of new conceptions as of this phase.

(C)reate: The purpose of create phase is to get students to apply and extend the alternative conceptions they have explored by providing them with opportunities to prepare lesson plans through which they can clarify their understanding of new conceptions. Through lesson planning activities students get directly engaged in the solution process.

(H)one: The hone phase can be thought as a continuation of the create step in terms of direct involvement in the solution process. This phase is based on the concept of microteaching. One of the groups is assigned to demonstrate a lesson to solve the problem in question.

At the hone phase, student teachers have the chance to transfer, practice, expand and improve their knowledge and skills via applying and presenting their lesson plans. Through concrete experiences, they develop growing understanding about alternative conceptions.

(N)egotiate: After the microteaching session, student teachers participate in discussions to talk about the methods, techniques, materials and technologies employed in solving the problem. At this phase, student teachers find an opportunity to refine their understanding about alternative conceptions. They give and receive feedback from their peers.

The phase of negotiate is critically important for the conceptual change process because student teachers exchange their ideas about the intelligibility, plausibility and fruitfulness of technology use at this point.

(O)pine: As a continuation of the negotiate phase, this phase is meant to further improve student teachers' understanding about alternative conceptions. They individually reflect on to what extent they have made sense of the new learning experiences. They assess the level of their understanding, beliefs, knowledge and skills concerning new alternative conceptions. They write down their opinions in their learning journals and share their entries with the teacher educator so that he/she can see whether the cycle has helped student teachers deepen their understanding about alternative conceptions and their thinking about the role of technology has been influenced by alternative experiences. They express their opinions about the role of technology and discuss about the intelligibility, plausibility and fruitfulness of technology and compare their old and new learning experiences at this stage.

5.2. Phase Two

Phase two refers to the phase in which the implementation process starts based on the findings obtained from phase one.

Research Question 6: What is the instructional technological competence level of student teachers in the ELT program of Necmettin Erbakan University (NEU)?

This research used two groups which are treatment group and control group in order to evaluate the effectiveness of S-TECHNO model to enhance student teachers' ITC.

Before the implementation process, independent sample t-test results displayed that there was no significant difference between the treatment and control groups in terms of frequency of using different types of technologies, their competency level with different types of technologies, their views on the applicability of different types of technologies to language teaching, their preparedness level for using different types of technologies for instructional purpose, and their TK, TCK, TPK and TPCK. These results indicate the homogeneity of two groups. Descriptive statistics for the subscales of frequency of using different types of technologies, competency level with using different types of technologies, relating different technologies to ELT and preparedness level for using different types of technologies in ELT have shown that student teachers both in the treatment group and the control group rated themselves below average in each of the subscales. A close examination on the results has revealed that they know simple software programs and use instructional tools for low level tasks. These results are in alignment with previous studies (e.g. Cuban, 2001; Ertmer, 2005; Lei, 2009; Pelgrum, 2001; Yalin, Karadeniz & Sahin, 2007) which indicated that teachers use instructional technologies for low-level tasks. Results of the TPACK survey have shown that rated themselves slightly above average in each construct of the TPACK. While these results corroborate the ideas of Horzum (2013) who stated that student teachers generally rate themselves above average in TPACK constructs, they show differences with the results obtained from the factors of competency level with different types of technologies, relating technology tools to ELT, preparedness level to use technology for language teaching given that student teachers had lower mean scores in these subscales. A possible explanation for this might be that student teachers evaluate themselves about TPACK based on the technologies they know without being aware of the numerous technologies available that can be used in language teaching. This finding is in line with the ideas of Wu and Wang (2015) that implied the insufficiency of using only one tool in measuring student teachers' TPACK. Consequently, we suggest that more than one tool should be used in order to have more accurate findings about student teachers' TPACK. Consistent with the survey results, interview data have shown that student teachers learnt about basic software programs in their programs and they generally use what they already know about technology in their courses. It was also found out that student teachers disapprove teacher educators'

incompetency in using technologies available in the classrooms. This finding supports previous research (e.g. Bai & Ertmer, 2008; Çetin-Berber, 2015; Hall, 2006; Kırkgöz, 2014; Tondeur et al., 2011) which stresses the crucial role of teacher educators in modeling effective use of technology.

Overall, these results indicate that student teachers find the experiences and the training they had ineffective regarding enhancing their technological knowledge and skills in teacher education programs and further support previous research studies (e.g. Ertmer, 1999; Göktaş, Yıldırım & Yıldırım, 2009) which point out the inadequacy of teacher education programs in developing teachers' knowledge and skills.

Results of the content analysis have revealed that the majority of the student teachers have exherent value beliefs about technology. The categories of resisters, indifferent users and middle-of-the-roaders have shown that most of the student teachers view technology as an additional tool in language teaching. On the other hand, it was seen that only a number of participants see technology as an integral part of classrooms. Consistently, only one category-embracers- was developed to refer to the student teachers who view technology as an integral part of classrooms. Interview results also revealed that most of the participants regard technology as a supplementary tool. Only a minority of the student teachers pointed to the essential role technology can play in language teaching. These results are in agreement with Chen's (2011) findings which showed that most of the pre-service student teachers subscribe to instrumental views. These results indicate that teacher education programs fail to provide student teachers with meaningful experiences through which they can discover the inherent value technology has for language teaching.

Content analysis of the interviews has revealed that all of the participants reported the inefficiency of their teacher education program in raising their awareness about the potential of technology. Since awareness is a unifying superordinate which integrates the constituents of knowledge, skills and beliefs (Freeman, 1989), results gained from the survey and interview can also provide us with an insight about student teachers' awareness in that survey and interview results imply that the majority of the student teachers are not aware of the rich diversity of technology tools that can be used in language teaching and the inherent value technology has in essence. These findings further support the previous studies (e.g. Al-Ghazo, 2008; Becta, 2004; Cox et al., 1999; Mumtaz, 2000;) that noted the

importance of raising student teachers' awareness about the rationale and benefits of using technology.

Research Question 9: Does the S-TECHNO model stimulate any development in the Instructional Technological Competence of student teachers in the ELT program of NEU with respect to the use of technology in language teaching?

The Independent sample t-test results showed that student teachers in the treatment group had higher mean scores in the subscales of the frequency of using different types of technologies, technology skills, relating technology tools to language teaching, preparedness level to use technology for language teaching, technology knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge compared to the student teachers in the control group.

While the paired sample t-test results illustrated no significant difference in the post-test mean scores of the control group, the results showed that there was a significant increase in the post-test scores of the treatment group with a large effect size in the subscales of frequency of using different types of technologies, competency level with using different types of technologies, relating different technologies to ELT and preparedness level for using different types of technologies in ELT as well as the constructs of TK, TCK, TPK and TPCK. Results obtained from the observations also confirm these findings showing that the more experience student teachers have with technology, the better performance they display.

Content analysis of the metaphors revealed that there was a considerable increase in the number of the embracers in the treatment group. Grasping the inherent value of technology for language teaching, almost half of the student teachers in the treatment group stated inherent value beliefs about technology. Nevertheless, some of the student teachers kept stating exherent value beliefs about technology. A possible explanation for this might be the limited time allocated for the implementation process and lack of opportunities for more practice. This result corroborates the ideas of Ertmer (2005) who emphasized the importance of experience in belief change.

Although there were some updates in the metaphors of the control group; these updates, however, referred no change in student teachers' views about the role of technology in language teaching. It was seen that most of them still kept their exherent value beliefs about technology. While the findings obtained from the survey and metaphor analysis have

implied an increase in the technological awareness of the student teachers in the treatment group, these findings showed no significant results for the control group.

The qualitative data also confirmed that while student teachers in the control group experienced no change, there occurred some changes in the treatment group in terms of their instructional technological competence. All of the student teachers mentioned an increase in technological awareness, technological knowledge and technological skills. Some of the student teachers showed in their metaphors that they came to grasp the inherent value of technology by insinuating for the cognitive dissonance they experienced during the implementation process as well as referring to the intelligibility, plausibility and fruitfulness of technology for language teaching. One of the interesting emergent themes from the qualitative data was about an increase in student teachers' confidence in using technology. Overall, these results confirm the complimentary link between constructivist propositions and the use of technology indicated by many researchers (e.g. Adams & Burns, 1999; Dunleavy et al., 2007; Harasim, 2012; Huffman, Goldberg & Michlin, 2003; Niederhauser & Lindstrom, 2006; Wenglinsky, 2005). This suggests that the increase in student teachers' Instructional Technological Competence could be due to the several elements of S-TECHNO model such as providing awareness-raising opportunities (Bransford et al., 2005; Kagan, 1992; Mattheoudakis, 2007; Murphy & Mason, 2006; Nespor, 1987; Pajares, 1992; Stuart & Thurlow, 2000;), creating cognitive dissonance (Kagan, 1992; Lee, 2004; Mezirow, 1997; Philippou & Christou, 2002; Posner, Strike, Hewson & Gertzog, 1982; Tillema & Knol, 1997; Thompson & Zeuli, 1999; Woolfolk Hoy et al., 2006;); providing experiences for practice (Albion & Ertmer, 2002; Doyle, 1997; Ertmer, 2005; Richardson, 1996, 2003;), providing meaningful experiences and inquiry-oriented activities (Tillema & Knoll, 1997), enhancing collaboration (Borko & Putnam, 1996; Ertmer et al., 2003), promoting reflection (Borg, 2011; Freeman, 1991; Mattheoudakis, 2007; Murphy & Mason, 2006; Richards & Lockhart, 1994; Richardson, 1996; Zheng, 2009), and texts and class discussions (Murphy & Mason, 2006) for understanding the rationale behind learning new content. Taken together, all these results showed that the S-TECHNO model had a considerable impact on developing student teachers' instructional technological competence.

5.3. Implications for Teacher Preparation Programs

The field of second language teacher education has long been responding to the challenges posed by ICT technologies (Wright, 2010). However, the quality of technology training offered by teacher preparation programs is still listed among the barriers in the path of effective technology integration in K-12 settings. In order to increase the efficiency of teacher preparation programs in terms of technology education, there are several implications from this study for preparing student teachers to view technology as a smooth partner of their future classrooms.

First, the results of this study have demonstrated that an initial focus on determining student teachers' instructional technological competence should be a required step before providing technology courses. Because, it will help teacher educators teach technology classes in accordance with student teachers' needs. More precisely, as student teachers enter teacher preparation programs with a vast number of implicit theories about teaching and learning, and the role of technology on these processes, a close investigation into student teachers' beliefs-whether student teachers have exherent value beliefs or inherent value beliefs about technology- must be carried out. Moreover, a focus on student teachers' technological awareness, knowledge and skills can further shape teacher educators' roadmap to run technology courses.

Second, the results have shown that student teachers' prior learning experiences are rather influential on student teachers' perceptions about technology. In this respect, teacher educators should surface and challenge student teachers' incomplete images about the potential of technology for language teaching since it would help student teachers recognize the shortfalls of the past and become more open to alternative conceptions.

Finally, this study found that the S-TECHNO model can have an impact on student teachers' instructional technological competence. Given that there is a lack of a deliberately designed instructional model to guide teacher educators and student teachers for technology integration, this model can be used in the technology courses of similar higher education settings. Even, the ideas and principles of the model can be applied in other courses as a guide.

5.4. Implications for Further Research

Considering the impact of the S-TECHNO model on student teachers' instructional technological competence, it is recommended that the implementation of the S-TECHNO model deserves further study to test its effectiveness with other student teachers in the ELT programs of different universities.

Second, one question worthy of further research was about the model's influence on student teachers' views about the place of technology in language teaching. On one hand, some of the student teachers indicated an increase in their technological awareness, knowledge and skills, and a change in their beliefs about the place of technology in language teaching. On the other hand, some other student teachers kept stating exherent value beliefs about technology despite indicating an increase in their awareness, knowledge and skills. This issue requires further exploration.

Finally, this study lasted for 14 weeks. A longer implementation time would provide us with further insight about the impact of the model on student teachers' instructional technological competence. It would be more illuminating to see whether the student teachers who indicated a development in their ITC would integrate technology into their courses in their internship experiences that will take place in the fourth grade. Hence, we suggest that investigating the influence of the model on student teachers' technology integration in K-12 settings will be another beneficial avenue of research to test its efficiency on student teachers' instructional technological competence.

5.5 Summary of the Study

The current study set out with a broad exploratory question to investigate whether there were more underlying reasons in depth to be explored about the long-lasting problem of low-level use of technology in K-12 schools given that despite all the insights gained about the obstacles resulting in ineffective technology integration into instruction and suggested solutions to overcome these barriers, the problem continues to exist. Since teachers are the gatekeepers of classrooms, we decided to focus on barriers concerned with teachers among other obstacles. Moreover, the research sample consisted of student teachers rather than in-service teachers because we think that experiences student teachers have in teacher education programs form the basis of their future career as in-service teachers.

We adopted a multiphase mixed-method research design for the present study. Because our aim was to gain a new perspective about the problem at issue, we adopted the method of grounded theory to demystify what was really going on about this enduring problem. We formulated the initial research questions of the study to delve into student teachers' prior learning experiences, needs and familiarity level with respect to the role of technology in language teaching and learning. Subsequently, we prepared a comprehensive survey to be distributed to as many student teachers as possible throughout the country to obtain an overall image of student teachers' experiences with technology. The survey consisted of likert items, yes/no questions and open-ended questions and attempted to reach all 47 universities to be carried out. However, 18 universities volunteered to participate in the survey. Analysis of the data gathered from 814 student teachers and the following face to face interviews conducted in four different universities with 20 student teachers resulted in a number of emerging themes. All these themes referred to the unexemplary nature of student teachers' early learning experiences and the professional preparation experiences in enabling student teachers to discover the true potential of technology for language teaching. However, the major finding that took our research one step further was related to student teachers' beliefs about technology. Although there was a widespread belief among student teachers reporting that technology could enhance the teaching/learning process, they did not view technology as an integral part of language classrooms. According to most of the student teachers, technology was just a supplementary tool that teachers utilize from at will. Subsequently, we reviewed the literature and found out that beliefs are the most oft-ignored component of teaching in implementing innovations. Thus, we carried out a detailed investigation into the construct of beliefs and more specifically into technological beliefs and we came up with the idea that teachers' beliefs about technology for technology's sake should come to the fore. Concomitantly, we have suggested the new bidimensional construct of perceived value of technology which consists of two sub-constructs: exherent value beliefs and inherent value beliefs with respect to technology. The second emergent theme was about technological awareness since student teachers needed to understand the position of technology, rationale of using technology, and potential and capabilities of using technology in language teaching. These results stimulated us to dig more into the literature and we came to recognize that TPACK has some limitations to be considered as an overarching framework despite growing in popularity within a short time. Unclarity with its scope-whether it is about knowledge,

skills or both- (Brantley-Dias & Ertmer, 2014) and its ignorance to the constructs of beliefs (Niess, 2005; Angeli & Valanides, 2009; Graham, 2011; Brantley-Dias & Ertmer, 2014) and awareness urged us to argue for a more holistic framework of technology integration which we named as Instructional Technological Competence (ITC). Moreover, we also realized that there was lack of a deliberately designed instructional model for technology training. In order to fulfill this need, we have designed the S-TECHNO model to enhance the ITC of student teachers. S-TECHNO model was based on the 12 principles synthesized form the theories of cognitive constructivism, sociocultural theory, andragogy, and teacher cognition research and ISTE standards In order to determine whether S-TECHNO model could be used as an effective instructional model to guide teacher educators in instructional technology courses and to enhance student teachers' ITC, we initiated the second phase. Accordingly, we adopted a quasi-experimental research design. Both qualitative and quantitative data were collected through various tools (e.g. surveys, interviews, documents and observations). 80 student teachers took part in the study. 41 of them were in the experimental group and the remainder 39 was in the control group. A 14-week treatment was initiated with the administration of pre-test survey, face-to-face interviews and a study on metaphor construction. In accordance with the steps of the model, the first five weeks aimed to help the treatment group understand the rationale of using technology through moving from reflection on their prior learning experiences, to theoretical readings, to hands-on experiences and to the development of understanding. The remaining nine weeks allowed student teachers to contextualize and implement what they learnt and would learn as a result of their self-initiated research to solve the problems posed. The student teachers started to prepare lesson plans in relation to specific language skills to be developed in their students and they offered demo lessons. Here, the researcher and the instructor of the course kept an observation scheme to evaluate the performance of student teachers. The intervention process ended with the administration of the post-test survey, face-to-face interviews and a study on metaphor construction by both groups.

The results obtained from the quantitative and qualitative data have shown that the S-TECHNO model had an impact on the instructional technological competence of the treatment group in general. To specify, student teachers have experienced an increase in their technological awareness, technological knowledge and technological skills. Moreover, their beliefs about the position of technology in language teaching have been

challenged and most of them have come to grasp the inherent value technology has in essence.

REFERENCES

Abbitt, J. T. (2011). An investigation of the relationship between self-efficacy beliefs about technology integration and technological pedagogical content knowledge (TPACK) among student teachers. *Journal of Digital Learning in Teacher Education, 27*(4), 134-143.

Abdal-Haqq, I. (1998). *Constructivism in teacher education: considerations for those who would link practice to theory.* Retrieved from https://www.ericdigests.org/1999-3/theory.htm.

Adams, S., & Burns, M. (1999). *Connecting student learning and technology. Southwest Educational Development Laboratory.* Retrieved from http://www.sedl.org/pubs/tec26/nonflash.html.

Agyei, D. D., & Voogt, J. M. (2011). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers & Education, 56*(1), 91-100.

Ajzen, I. (1985). From intention to actions: A theory of planned behavior. In J. Kuhl & J. Bechmann (Eds), *Action Control: From Cognitions to Behavior* (pp. 11-39). New York: Springer-Verlag.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Akcaoglu, M. (2008). *Exploring technology integration approaches and practices of preservice and in-service English language teachers.* Master's Thesis, Middle East Technical University, Ankara.

Albion, P. R. (1999). *Self-efficacy beliefs as an indicator of teachers' preparedness for teaching with technology.* Retrieved from https://eprints.usq.edu.au/6973/1/Albion_SITE_1999_AV.pdf.

Albion, P., & Ertmer, P. A. (2002). Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology. *TechTrends, 46*(5), 34-38.

Al-Ghazo, A. M. (2008). *Technology Integration in University Instructors' Education Program in Jordan: Comparisons of Competencies, Attitudes and Perceptions Toward Integrating Technology in the Classroom.* Doctoral dissertation, Southern Illinois University Carbondale, Illinois, United States.

Almarza, G. (1996). Student foreign language teachers' knowledge growth. In D. Freeman & J. C. Richards (Eds.), *Teacher learning in language teaching* (pp. 50-78). Cambridge: CUP.

Amiel, T., & Reeves, T. C. (2008). Design-Based Research and Educational Technology: Rethinking Technology and the Research Agenda. *Educational Technology & Society, 11*(4), 29–40.

An, Y. J., & Reigeluth, C. M. (2011). Creating technology-enhanced, learner centered classrooms: K-12 teacher beliefs, perceptions, barriers, and support needs. *Journal of Digital Learning in Teacher Education, 28* (2), 54-62.

Ananiadou, K., & Claro, M. (2009). *21st century skills and competences for new millennium learners in OECD countries.* (Report No: 41.) Paris: OECD.

Anderson, L. M., Evertson, C. M., & Brophy, J. (1979). An experimental study of effective teaching in first grade reading group. *Elementary School Journal, 79*(4), 193-223.

Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptualization, development, and assessment of ICT-TPCK: Advances in Technological Pedagogical Content Knowledge (TPCK). *Computers & Education, 52*(1), 154-168.

Applefield, J. M., Huber, R., & Moallem, M. (2001). Constructivism in theory and practice: Toward a better understanding. *The High School Journal, 84*(2), 35-53.

Appleton, K. (1997). Analysis and description of students' learning during science classes using a constructivist-based model. *Journal of Research in Science Teaching 34*(3), 303- 318.

Archambault, L., & Crippen, K. (2009). Examining TPACK among k-12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education, 9*(1), 71-88.

Archambault, L. M., & Barnett, J. H. (2010). Revisiting technological pedagogical content knowledge: Exploring the TPACK framework. *Computers & Education, 55*(4), 1656-1662.

Archambault, L., Wetzel, K., Foulger, T. S., & Williams, M. (2010). Professional development 2.0: Transforming teacher education pedagogy with 21st century tools. *Journal of Digital Learning in Teacher Education, 27*(1), 4-11.

Aydin, S. (2013). Teachers' perceptions about the use of computers in EFL teaching and learning: the case of Turkey. *Computer Assisted Language Learning, 26*(3), 214-233.

Aypay, A., Çelik, H. C., Aypay, A., & Sever, M. (2012). Technology acceptance in education: a study of student teachers in Turkey. *The Turkish Online Journal of Educational Technology, 11*(4), 264-272.

Bai, H., & Ertmer, P. (2008). Teacher educators' beliefs and technology uses as predictors of student teachers' beliefs and technology attitudes. *Journal of Technology and Teacher Education, 16*(1), 93-112.

Bailey, K. M., Bergthold, B., Braunstein, B., Fleischman, J. N., Holbrook, M. P., Tuman, … Zambo, L. J. (1996). The language learner's autobiography: Examining the "apprenticeship of observation." In D. Freeman & J. Richards (Eds.), *Teacher learning in language teaching* (pp. 11-29). New York: Cambridge University Press.

Bax, S. (2000). Putting technology in its place: ICT in modern foreign language teaching. In K. Field (Ed.), *Issues in modern foreign languages teaching* (pp. 208-219). London: Routledge/Falmer.

Bax, S. (2003). *CALL: Past, present and future. System, 31*(4), 13-28.

Bax, S.(2011). Normalization revisited: The effective use of technology in language education. *International Journal of Computer Assisted Language Learning and Teaching, 1*(2). 1-15

Beatty, K. (2010). *Teaching and researching: Computer-assisted language learning.* Great Britain: Pearson Education Limited.

Beck, C., & Kosnik, C.M. (2006). *Innovations in teacher education: a social constructivist approach.* Albany: State University of New York Press.

Beilin, H., & Fireman, G. (2000). The foundation of Piaget's theories: mental and physical action. *Advances in Child Development and Behaviour, 27*(1), 221-46.

Berk, L. E., & Winsler, A. (1995). *Scaffolding children's learning: Vygotsky and early childhood education.* Washington: National Association for the Education of Young Children.

Bertoncelj, A. (2010). Managers' competencies framework: A study of conative component. *Ekonomska istraživanja, 23*(4), 91-101.

Blake, R. (2007). New trends in using technology in the language curriculum. *Annual Review of Applied Linguistics, 27*, 76-97.

Boon, J., & van der Klink, M. (2002). Competencies: the triumph of a fuzzy concept. *Academy of Human Resource Development Annual Conference 1*, 327 – 334.

Borg, M. (2001). Key concepts in ELT: Teachers' beliefs. *English Language Teaching Journal, 55*(2), 186–188.

Borg M. (2004). The apprenticeship of observation. *English Language Teaching Journal, 58*(3), 274-276.

Borg, S. (2003). Teacher cognition in language teaching: A review of research on what language teachers think, know, believe, and do. *Language Teaching, 36*(2), 81-109.

Borg, S. (2006). *Teacher cognition and language education: Research and practice*. London: Continuum.

Borg, S. (2011). The impact of in-service teacher education on language teachers' beliefs. *System, 39*(3), 370-380.

Borko, H., & Putnam, R. (1996). Learning to teach. In D. Berliner & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 673-708). New York: Macmillan.

Bostancıoğlu, A. (2014, May). *EFL-TPACK: The development of a questionnaire to measure technology pedagogy and content knowledge (TPACK) of English as a foreign language (EFL) Teachers.* Paper presented at the EUROCALL Teacher Ed SIG, Nice.

Boychuk-Duchscher, J. E., & Morgan, D. (2004). Grounded theory: Reflections on the emerging vs. forcing debate. *Journal of Advanced Nursing, 48*(6), 605–612.

Bransford, J., Darling-Hammond, L., & LePage, P. (2005). Introduction. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 1-39). San Francisco: Jossey-Bass

Brantley-Dias, L., & Ertmer, P. (2014). Goldilocks and TPACK: is the construct "just right?" *Journal of Research on Technology in Education, 46*(2), 103-128.

Bråten I., & Strømsø H. I. (2005).The relationship between epistemological beliefs, implicit theories of intelligence, and self-regulated learning among Norwegian postsecondary students. *British Journal of Educational Psychology, 75*(4), 539–565.

Brinkerhoff, J. (2006). Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices. *Journal of Research on Technology in Education, 39*(1), 22-43.

Brooks, C. D. (2011). *Education and technology policy discourse in Alberta: A critical analysis.* Doctoral dissertation, University of Alberta, Edmonton, Alberta.

Brooks, J., & Brooks, M. (1993). *In search of understanding: The case for constructivist classrooms.* Alexandria, VA: Association for Supervision and Curriculum Development.

Brush, T., Glazewski, K., Rutowski, K., Berg, K., Stromfors, C., Van-Nest, M. H., ... Sutton, J. (2003). Integrating technology into a field-based teacher training program: the PT3@ASU project. *Educational Technology Research and Development, 51*(1) 57–72

Brush, T., & Saye, J. W. (2009). Strategies for preparing preservice social studies teachers to integrate technology effectively: Models and practices. *Contemporary Issues in Technology & Teacher Education, 9*(1), 46-59.

Bryant, A., & Charmaz, K. (2007). Grounded theory in historical perspective: An epistemological account. In A. Bryant & K. Charmaz (Eds.), *The SAGE Handbook of Grounded Theory* (pp. 31–57). Los Angeles: Sage.

Buabeng-Andoh, C. (2012). An exploration of teachers' skills, perceptions and practices of ICT in teaching and learning in the Ghanaian secondcycle schools. *Contemporary Educational Technology, 3*(1), 36-49.

Buchanan, T. K., & Smith, R. M. (1998). Restructuring courses in higher education to model constructivist practice. *Action in Teacher Education, 20*(3), 62–72.

Burke, B. M. (2006). Theory meets practice: A case study of preservice world language teachers in U.S. Secondary schools. *Foreign Language Annals, 39*(1), 148-164.

Cabaroglu, N., & Roberts, J. (2000). Development in student teachers' pre-existing beliefs during a 1-year PGCE programme. *System, 28*(3), 387-402.

Calderhead, J. (1987). The quality of reflection in student teachers' professional learning. *European Journal of Teaching Education, 10*(3), 269–278.

Celik, V., & Yesilyurt, E. (2013). Attitudes to technology, perceived computer selfefficacy and computer anxiety as predictors of computer supported education. *Computers & Education, 60*(1), 148-158.

Cetin-Berber, D., & Erdem, A. R. (2015). An Investigation of Turkish Student teachers' Technological, Pedagogical and Content Knowledge. *Computers, 4*(3), 234-250.

Chapelle, C. A. (2001). *Computer applications in second language acquisition*. Cambridge: Cambridge University Press

Chapelle, C. (2003). *English language learning and technology: Lectures on teaching and research in the age of information and communication*. Amsterdam: John Benjamin's Publishing.

Chapelle, C. (2010). The spread of computer-assisted language learning. *Language Teaching, 43*(1), 66-74.

Charmaz, K. (2000). Grounded theory: Objectivist and constructivist methods. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 509-535). Thousand Oaks, CA: Sage.

Charmaz, K. (2002). Grounded theory analysis. In J. F. Gubrium & J. A. Holstein (Eds.), *Handbook of interview research* (pp. 675–694). Thousand Oaks, CA: Sage

Charmaz, K. (2003). Grounded theory. In J. A. Smith (Ed.), *Qualitative psychology: A practical guide to research methods* (pp. 81–110). London: Sage.

Charmaz, K. (2003). Grounded theory. In Dans M. S. Lewis-Beck, A. Bryman, & T. F. Liao (Eds.), *The sage encyclopedia of social science research methods* (pp. 440-444). Thousand Oaks, CA: Sage

Charmaz, K. (2004). Grounded theory. In Dans S. N. Hesse-Biber & P. Leavy (Eds.), *Approaches to qualitative research* (pp. 496-521). New York: Oxford University Press

Charmaz, K. (2006). Constructing grounded theory. Thousand Oaks, CA: Sage.

Charmaz K. (2008). The legacy of Anselm Strauss for constructivist grounded theory. In Denzin N. (Ed.), *Studies in symbolic interaction* (pp. 127-141). Bingley, UK: Emerald Group.

Charmaz K. (2009). Shifting the grounds: Constructivist grounded theory methods for the twenty-first century. In Morse J., Stern P., Corbin J., Bowers B., Charmaz K., Clarke A., *Developing grounded theory: The second generation* (pp. 127-154). Walnut Creek, CA: Left Coast Press.

Chen, R. (2011). Preservice mathematics teachers' ambiguous views of technology. *School Science and Mathematics, 111*(2), 56-67.

Chong, S., Ling, L. E., & Chuan, G. K. (2011). Developing student teachers' professional identities: An exploratory study. *International Education Studies. 4*(1), 30-38.

Clandinin, D. J. & Connelly, F. M. (1991). Narrative story in practice and research. In D.A. Schon (Ed.). *The Reflective turn: Case studies in and on educational practice* (pp. 258-283) New York: Teachers College Press.

Clark, C. M., & Peterson, P. L. (1986). Teachers' thought processes. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 255-296). New York: Macmillan.

Cobb, P. (2005). *Constructivism: Theory, Perspectives and Practice.* New York: Teachers College Press.

Cochran, K. F., DeRuiter, J. A., & King, R. A. (1993). Pedagogical content knowing: An integrative model for teacher preparation. *Journal of Teacher Education, 44*(4), 263-272.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Newbury Park, CA: Sage.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education.* London: Routledge.

Council of Europe, (2001). *Common European framework of reference for languages: Learning, teaching, assessment.* Cambridge: Press Syndicate of the University of Cambridge.

Cox, M., Preston, C., & Cox, C. (1999). *What factors support or prevent teachers from using ICT in the primary classroom.* Paper presented at the British Educational Research Association Annual Conference, University of Sussex, Brighton.

Cox, S. (2008). *A conceptual analysis of technological pedagogical content knowledge* (Doctoral dissertation). Retrieved from http://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=2481&context=etd.

Cox, S., & Graham, C. R. (2009). Diagramming TPACK in practice: Using an elaborated model of the TPACK framework to analyze and depict teacher knowledge. *TechTrends: Linking Research and Practice to Improve Learning, 53*(5), 60-69.

Cradler J., McNabb M., Freeman M., Burchett R. (2002). How does technology influence student learning?. *Learning and Leading With Technology, 29*(8), 46-50.

Crandall, J. A. (2000). Language teacher education. *Annual Review of Applied Linguistics, 20*, 34-55.

Crandall, J., & Christison, M. A. (2016). An overview of research in English language teacher education and professional development. In J. Crandall & M. A. Christison (Eds.) *Global research on teacher education and professional development in TESOL* (pp. 3 – 34). New York, NY: Routledge/Taylor & Francis.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Boston: Pearson.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. London: Harvard University Press.

Cuban, L. (2013). Why so many structural changes in schools and so little reform in teaching practice? *Journal of Educational Administration, 51*(2), 109–125.

Cutcliffe, J. R. (2005). Adapt or adopt: developing and transgressing the methodological boundaries of grounded theory. *Journal of Advanced Nursing, 51*(4), 421-428.

Darling-Hammond, L. (2006). Assessing teacher education: The usefulness of multiple measures for assessing program outcomes. *Journal of Teacher Education, 57*(2), 120-138.

Davies, G. (2002). ICT and modern foreign languages: Opportunities and training needs. *International Journal of English Studies, 2*(1), 1-18.

Davies, R. S., Dean, D. L. & Ball, N. (2013). Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course. *Educational Technology Research and Development, 61*(4), 563-580.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

Day, C. (1993). Reflection: A Necessary but Not Sufficient Condition for Professional Development. *British Educational Research Journal, 19*(1), 83-93.

Debreli, E. (2011). Use of diaries to investigate and track student teachers' beliefs about teaching and learning English as a foreign language throughout a pre-service training program. *Procedia: Social and Behavioral Sciences*, *15*, 60-65.

Decker, L. E., & Rimm-Kaufman, S. E. (2008). Personality characteristics and teacher beliefs among student teachers. *Teacher Education Quarterly, 35*(2), 45-60.

Delamare-Le Deist, F., & Winterton, J. (2005). What is competence?. *Human Resource Development International, 8*(1), 27–46.

Doering, A., Koseoglu, S., Scharber, C., Henrickson, J., & Lanegran, D. (2014). Technology Integration in K–12 Geography Education Using TPACK as a Conceptual Model. *Journal of Geography, 113*(6), 223-237.

Doolittle, P. E. (1999). Constructivism: The Career and Technical Education Perspective. *Journal of Vocational and Technical Education, 16*(1), 23-46.

Doolitle, P. E. (2001). The need to leverage theory in the development of guidelines for using technology in social studies teacher education. *Contemporary Issues in Technology and Teacher Education, 4*(1), 501-516.

Doolittle, P. E., & Hicks, D. (2003). Constructivism as a theoretical foundation for the use of technology in social studies. *Theory and Research in Social Education, 31*(1), 72-104.

Dornyei, Z. (2007). *Research methods in applied linguistics.* New York: Oxford University. Press.

Doyle, M. (1997). Beyond life history as a student: Student teachers' beliefs about teaching and learning. *College Student Journal, 31*(4), 519–531.

Drent, M., & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education, 51* (1), 187-199.

Driscoll, M. (2000). *Psychology of Learning for Instruction.* Boston: Allyn & Bacon.

Duit, R., & Treagust, D. (2003). Conceptual change: a powerful framework for improving science teaching and learning. *International Journal of Science Education, 25*(6), 671-688.

Dunleavy M., Dexter S., & Heinecke W. F. (2007). What added value does a 1:1 student to laptop ratio bring to technology-supported teaching and learning? *Journal of Computer Assisted Learning, 23*(5), 440–452.

Dwyer, D. (1996). Learning in the age of technology. In C. Fisher, D. Dwyer, and K. Yocam (Eds.), *Education and technology: Reflections on computing in classrooms* (pp. 15–34). San Francisco: Apple Press.

Eggen, P., & Kauchak, D. (2013). *Educational psychology: Windows on classrooms.* New Jersey: Pearson Education.

Ellis, R. (2000). Task-based research and language pedagogy. *Language teaching research, 4*(3), 193-220.

Ellis, R. (2006). Current issues in the teaching of grammar: An SLA perspective. *TESOL Quarterly, 40*(1), 83-107.

Erben, T., Ban, R., & Castañeda, M. (2009). *Teaching English language learners through technology.* New York: Routledge.

Ernest, P. (1995). The one and the many. In L. Steffe & J. Gale (Eds.), *Constructivism in Education* (pp. 459-486), New Jersey: Lawrence Erlbaum.

Ertmer, P. A., & Newby, T. J. (1993). *Behaviorism, Cognitivism, Constructivism: Comparing Critical Features from an Instructional Design Perspective. Performance Improvement Quarterly*, 6(4), 50-72.

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47-61.

Ertmer, P. A., Conklin, D., Lewandowski, J., Osika, E., Selo, M., & Wignall, E. (2003). Increasing student teachers' capacity for technology integration through use of electronic models. *Teacher Education Quarterly, 30*(1), 95-112.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25–39.

Ertmer, P. A., Ottenbreit-Leftwich, A., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: a critical relationship. *Computers & Education, 59*(2), 423–435.

European Commission, (2004). *Key Competences for Lifelong Learning a European Framework.* Luxembourg: Publications Office.

Fagan, M. H., Neill, S., & Wooldridge, B. R. (2008). Exploring the intention to use computers: An empirical investigation of the role of intrinsic motivation, extrinsic motivation, and perceived ease of use. *Journal of Computer Information Systems, 48*(3), 31–37.

Fang, Z. (1996). A review of research on teacher beliefs and practices. *Educational Research, 38*(1), 47-65.

Farrell, T. S. C. (1999). The reflective assignment: unlocking student teachers' beliefs on grammar teaching. *RELC Journal, 30*(2), 1−17.

Farrell, T. C., & Lim, P. C. P. (2005). Conceptions of grammar teaching: A case study of teachers' beliefs and classroom practices. *TESL-EJ, 9*(2), 1-13.

Farrell, T. S. C. (2006). 'The teacher is an octopus': Uncovering preservice English language teachers' prior beliefs through metaphor analysis. *RELC Journal, 37*(2), 239-251.

Feenberg, A. (2002). *Transforming technology: A critical theory revisited.* New York: Oxford University Press.

Fenstermacher, G. (1979). A philosophical consideration of recent research on teacher effectiveness. In L. S. Shulman (Ed.), *Review of Research in Education* (pp. 157-185). Itasca, IL: Peacock.

Fives, H. , & Buehl, M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers knowledge and ability. *Contemporary Educational Psychology*, *33*(2), 134–176.

Forman J. & Damschroder L. (2008). Qualitative content analysis. *Advances in Bioethics, 11*(9), 39–63.

Fosnot, C. T. (1996). Constructivism: A psychological theory of learning. In C. T. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice* (pp. 8-33). New York: Teachers College Press.

Fosnot, C. T., & Perry, R. (2005). Constructivism: A psychological theory of learning. In Fosnot, C. T. (Ed.). *Constructivism: theory, perspectives, and practice.* New York: Teacher's College, Columbia University.

Freeman, D. (1989) Teacher training, development, and decision making: A model of teaching and related strategies for language teacher education. *TESOL Quarterly, 23*(1), 27-46.

Freeman, D. (1991). To make the tacit explicit: Teacher education, emerging discourse, and conceptions of teaching. *Teaching and Teacher Education, 7*(5-6), 439-454.

Freeman, D. (1992). Language teacher education, emerging discourse, and change in classroom practice. In J. Flowerdew, M. Brock, & S. Hsia,. (Eds.), *Perspectives on Language Teacher Education* (pp. 1-21). Hong Kong: Hong Kong City Polytechnic.

Freeman, D., & Johnson, K. (1998). Reconceptualizing the knowledge-base of language teacher education. *TESOL Quarterly, 32*(3), 397-417.

Freeman, D. (2002). The hidden side of the work: Teacher knowledge and learning to teach. *Language Teaching, 35*(1), 1-13.

Funkhouser, B., & Mouza, C. (2013). Drawing on technology: An investment of preservice teacher beliefs in the context of an introductory educational technology course. *Computers & Education, 6(*2), 271-285.

Gagnon, Jr. G. W., & Collay, M. (2001). *Designing for learning: Six elements in constructivist classrooms.* Thousand Oaks: Corwin Press

Gay, L., Mills, G., & Airasian, P. (2006). *Educational research: Competencies for analysis and application.* New York: Prentice Hall.

Goktas, Y., Yildirim, S., & Yildirim, Z. (2009). Main Barriers and Possible Enablers of ICTs Integration into Preservice Teacher Education Programs. *Educational Technology & Society, 12*(1), 193-204.

Goktas, Y., Gedik, N., & Baydas, O. (2013). Enablers and barriers to the use of ICT in primary schools in Turkey: A comparative study of 2005–2011. *Computers & Education, 68*, 211-222.

Goodman, J. (1988). Constructing a practical philosophy of teaching: A study of student teachers' professional perspectives. *Teaching and Teacher Education, 4*(2), 121–37.

Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education, 57*(3), 1953–1960.

Graham, C. R., Borup, J., & Smith, N. B. (2012). Using TPACK as a framework to understand teacher candidates' technology integration decisions. *Journal of Computer Assisted Learning, 28*(6), 530–546.

Graves, K. (2009). The curriculum of second language teacher education. In A. Burns & J. C. Richards (Eds.), *The Cambridge guide to second language teacher education* (pp. 115-124). New York: Cambridge University Press.

Gray, L., Thomas, N., & Lewis, L. (2010). *Teachers' use of educational technology in U.S. public schools: 2009* (Report No: NCES 2010-040). Washington, DC: U.S. Program of Education.

Gruba, P. (2004). Understanding Digitized Second Language Videotext. *Computer Assisted Language Learning, 17*(1), 51-82.

Gülbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools. *Computers & Education, 49*(4), 943-956.

Gülbahar, Y. (2008). ICT usage in higher education: A case study on student teachers and instructors. *The Turkish Online Journal of Educational Technology, 7*(1), 32-37.

Hall, L. (2006). Modeling technology integration for student teachers: A PT3 case study. *Contemporary Issues in Technology and Teacher Education, 6*(4), 436–455.

Hall, G. (2011). The language classroom in theory and practice: complex, diverse and local. In R. Carter & G. Cook (Eds), *Exploring English language teaching in action* (pp. 38-57). London: Routledge.

Hammond, T. C., & Manfra, M. (2009). Giving, prompting, making: Aligning technology and pedagogy within TPACK for social studies instruction. *Contemporary Issues in Technology and Teacher Education, 9*(2), 160-185.

Hancock, E. S. & Gallard, A. J. (2004). Pre-service science teachers' beliefs about teaching and learning: The influence of K-12 field experiences. *Journal of Science Teacher Education, 15*(4), 281-291.

Harasim, L. (2012). Learning Theory and Online Technologies. New York: Routledge Taylor & Francis Group.

Harrington, R. A. (2008). *The development of student teachers' technology specific pedagogy.* Doctoral dissertation, Corvallis, OR: Oregon State University.

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' Technological Pedagogical Content Knowledge and Learning Activity Types: Curriculum-based Technology

Integration Reframed. *Journal of Research on Technology in Education, 41*(4), 393-416.

Hatch, J. A. (2002). Doing Qualitative Research in Education Settings. Albany: SUNY Press

Hayton, J. C., & Kelley, D. J. (2006). Competency-based framework for promoting corporate entrepreneurship. *Human Resource Management, 45*(3), 407-427.

Hersh, E. C. (2013). *Change and challenge: The influence of technology integration in teacher preparation programs*. Doctoral Dissertation, Manhattanville College, New York.

Hew, K. F. (2004). Past Technologies, Practice and Applications: A Discussion on How the Major Developments in Instructional Technology in the 20th Century Affect the Following Qualities? Access, Efficiency, Effectiveness, and Humaneness. *Association for Educational Communications and Technology, 27*, 19-23.

Hew, K. F., & Brush, T. (2007). Integrating technology into K–12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252.

Ho, A., Watkins D., & Kelly, M. (2001). The conceptual change approach to improving teaching and learning: An evaluation of a Hong Kong staff development programme. *Higher Education 42*(2), 143-69.

Hofer, M., Grandgenett, N., Harris, J., & Swan, K. (2011). Testing a TPACK-based technology integration observation instrument. In C. D. Maddux (Ed.), *Research highlights in technology and teacher education 2011* (pp. 39-46). Chesapeake, VA: Society for Information Technology & Teacher Education (SITE).

Holt-Reynolds, D. (1992). Personal history-based beliefs as relevant prior knowledge in course work. *American Educational Research Journal, 29* (2), 325-49.

Holt-Reynolds, D. (2000). What does the teacher do? Constructivist pedagogies and prospective teachers' beliefs about the role of a teacher. *Teaching and Teacher Education, 16*(1), 21–32.

Honebein, P. (1996). Seven goals for the design of constructivist learning environments. In B. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp.11-24). New Jersey: Educational Technology Publications.

Hong, P. & Pawan, H. (2015). *The pedagogy and practice of Western-trained Chinese English language teachers.* Newyork: Routledge.

Horzum, M. B. (2013). The investigation of technological pedagogical content knowledge of student teachers. *Technology, Pedagogy and Education, 22*(3), 303-317.

Hsieh, H. F., & Shannon, S.E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277-1288.

Hu, Z. W., & McGrath, I. (2011). Innovation in higher education in China: are teachers ready to integrate ICT in English language teaching?. *Technology Pedagogy and Education 20*(1), 41–59.

Hubbard, P., & Levy, M. (2006). The scope of CALL education. In P. Hubbard & M. Levy (Eds.), *Teacher education in CALL* (pp. 3–20). Amsterdam: John Benjamins.

Huck, S. J. (2012). *Reading statistics and research*. Boston: Allyn & Bacon.

Huffman, D., Goldberg, F., & Michlin, M. (2003). Using computers to create constructivist learning environments: Impact on pedagogy and achievement. *Journal of computers in Mathematics and Science Teaching, 22*(2), 151-168.

Humphreys, K., & Susak, Z. (2000). Learning how to fish: Issues for teachers engaging in self-evaluation and reflective enquiry in school. *Research in Education, 64*(1), 32-50.

International Society for Technology in Education (2008). National Educational Technology Standards for Teachers. Retrieved from http://www.iste.org/docs/pdfs/20-14_ISTE_Standards-T_PDF.pdf

International Society for Technology in Education (n.d.). ISTE standards. Retrieved from https://www.iste.org/standards/standards.

Jacobsen, D. A., Eggen, P., & Kauchak, D. (2009). *Methods for teaching: Promoting student learning in K-12 classrooms.* Boston, MA: Pearson Education.

Jimoyiannis, A. (2010). Designing and implementing an integrated technological pedagogical science knowledge framework for science teachers professional development. *Computers & Education, 55*(3), 1259-1269.

Johnson, K. E. (1994). The emerging beliefs and instructional practices of preservice English as a second language teachers. *Teaching and Teacher Education, 10*(4), 439-452.

Johnson, K. E. (1999). *Understanding language teaching: Reasoning in action.* Boston: Heinle & Heinle Publishers.

Johnson, K. E., & Golombek, P. R. (2003). 'Seeing' teacher learning. *TESOL Quarterly, 37*(4), 729–737.

Johnson, K. E. (2006). The sociocultural turn and its challenges for second language teacher education. *TESOL Quarterly, 40*(1), 235–257.

Johnson, K. E. (2009). *Second language teacher education: A sociocultural perspective.* London: Routledge.

Jonassen, D. H. (1991). Objectivism versus constructivism: do we need a new philosophical paradigm? *Educational Technology Research and Development, 39*(3), 5-14.

Jonassen, D. H. (1995). Supporting communities of learners with technology: A vision for integrating technology with learning in schools. *Educational Technology, 35*(4), 60–63.

Jonassen, D. H. (2000). Toward a design theory of problem solving. Educational Technology: *Research and Development, 48*(4), 63-85.

Jonassen, D. H. (2005). Tools for representing problems and the knowledge required to solve them. In S. O. Tergan & T. Keller (Eds.), *Knowledge visualization and information visualization - Searching for synergies* (pp. 82-94). Heidelberg: Springer-Verlag

Kagan, D. (1992). Implications of research on teacher beliefs. *Educational Psychologist, 27*(1), 65-90.

Kagan, D. M. (1992). Professional growth among preservice and beginning teachers. *Review of Educational Research, 62*(2), 129-169.

Karabacak, K. (2016). Evaluation of Fatih Project in the Frame of Digital Divide. *The Turkish Online Journal of Educational Technology,15*(2), 61-72.

Kay, R. (2006). Addressing gender differences in computer ability, attitudes and use: The laptop effect. *Journal of Educational Computing Research, 34*(2), 187-211.

Keengwe, J., Onchwari, G., & Wachira, P. (2008). The use of computer tools to support meaningful learning. *AACE Journal, 16*(1), 77-92.

Kennedy, M. (1999). The role of preservice teacher education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 54-85). San Francisco: Jossey-Bass.

Kennedy, D., Hyland, A. & Ryan, N. (2006). *Writing and using learning outcomes: a practical guide.* Bologna Handbook: European University Association.

Kennedy, D., Hyland, A. & Ryan, N. (2009). *Learning Outcomes and Competences.* Retrieved from: https://www.um.si/kakovost/usposabljanjeaposlenih/Documents/Article%20Competences%20Bologna%20Handbook%202009.pdf

Kenny, M., & Fourie, R. (2014). Tracing the History of Grounded Theory Methodology: From Formation to Fragmentation. *The Qualitative Report, 19*(52), 1-9.

Kırkgöz, Y. (2014). Students' perceptions of English language versus Turkish language used as the medium of instruction in higher education in Turkey. *Turkish Studies, 9*(12), 443-59.

Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education, 29,* 76-85.

Kimmons, R. (2015). Examining TPACK's theoretical future. *Journal of Technology and Teacher Education, 23*(1), 53-77.

Kline, R. (2004). Beyond significance testing: Reforming data analysis methods in behavioral research. Washington, DC: American Psychological Association

Knowles, M. (1973). *The adult learner: A neglected species*. Houston, TX: Gulf.

Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy*. Chicago: Follett.

Knowles, M. S. (1984). *Andragogy in action.* San Francisco: Jossey-Bass.

Knowles, J. G. & Holt-Reynolds, D. (1991). *Shaping pedagogies through personal histories in preservice teacher education. Teachers College Record, 93*(1), 87-113.

Knowles, M. S., Holton, E. G., & Swanson, R. A. (1998). *The adult learner: The definitive classic in adult education and human resources development.* Houston, TX: Gulf Publishing Company.

Koch, S. A., & Kusch, J. C. (2015). The infusion of technology into teacher education programs. In Information Resources Management Association (Ed.), *STEM Education: Concepts, Methodologies, Tools, and Applications* (pp.167-206). Hershey, PA: IGI Global.

Koehler, M. J., & Mishra, P. (2008). Introducing TPACK. In AACTE Committee on Innovation & Technology (Eds.), *Handbook of technological pedagogical content knowledge for educators* (pp. 3–29). New York: Routledge.

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education, 59*(4), 1109–1121.

Kruse, J. W. (2013). Implications of The Nature of Technology for Teaching and Teacher Education. In M. P. Clough, J. K. Olson, & D. S. Niederhauser (Eds.), *The Nature of Technology* (pp.345-369). US: Sense publishers.

Kula, A. (2010). *Barriers for ICT Integration, Strategies Developed against Them and Cases in Turkey*. Retrieved from https://www.academia.edu/294212/Barriers_For_ICT_Integration_Strategies_Developed_Against_Them_and_and_Cases_in_Turkey.

Kunt, N., & Özdemir, Ç. (2010). Impact of methodology courses on pre-service EFL teachers' beliefs. *Procedia Social and Behavioral Sciences, 2*(2), 3938–3944.

Kurt, G., Mishra, P., & Kocoglu, Z. (March, 2013). *Technological pedagogical content knowledge development of Turkish student teachers of English.* Paper presented at the 24th Society for Information and Teacher Education (SITE) International Conference, New Orleans.

Lans, T., Hulsink, W., Baert, H., & Mulder, M. (2008). Entrepreneurship education and training in a small business context: Insights from the competence-based approach. *Journal of Enterprising Culture, 16*(4), 363-383.

Lantolf, J. P. (2000). *Sociocultural theory and second language learning.* Oxford University Press.

Lantolf, J. P., & Poehner, M. E. (Eds.). (2008). *Sociocultural theory and the teaching of second languages.* London: Equinox Publishing.

Larsen-Freeman, D. (1983). Training teachers or educating a teacher. In J. E. Alatis, H. H. Stern, & P. Strevens (Eds.), *Georgetown University Round Table on Language and Linguistics: Applied Linguistics and the Preparation of Second Language Teachers: Toward a Rationale* (pp. 68-81). Washington, DC: Georgetown University Press.

Larsen-Freeman, D., & Anderson, M. (2011). *Techniques and principles in language teaching.* New York: Oxford University Press.

Larson-Hall, J. (2010). *A guide to doing statistics in second language research using SPSS.* New York: Routledge.

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research, 77*(4), 575–614.

Leavy, A. M., McSorley, F. A. & Boté, L. A. (2007). An Examination of What Metaphor Construction Reveals about the Evolution of Student teachers' Beliefs about Teaching and Learning. *Teaching and Teacher Education 23*(7), 1217-1233.

Lebow, D. (1993). Constructivist values for instructional systems design: Five principles toward a new mindset. *Educational Technology Research and Development, 41*(3), 4-16.

Lee, O. (2004). Teacher change in beliefs and practices in science and literacy instruction with English language learners. *Journal of Research in Science Teaching, 41*(1), 65–93.

Lee, J., & Friedman, A. M. (2009). *Research on technology in social studies education*. Charlotte, NC: Information Age Pub.

Lee, Y., & Lee, J. (2014). Enhancing student teachers' self-efficacy beliefs for technology integration through lesson planning practice. *Computers & Education, 73*, 121-128.

Lee, C. D., & Smagorinsky, P. (2000). Introduction: Constructing meaning through collaborative inquiry. In C. D. Lee & P. Smagorinsky (Eds.), *Vygotskian perspectives on literacy research* (pp. 1-18). Cambridge, UK: Cambridge University Press.

Lee, M., & Tsai, C. (2010). Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the world wide web. *Instructional Science: An International Journal of the Learning Sciences, 38*(1), 1-21.

Lee, I. (2015). Student Teachers' Changing Beliefs on a Pre-service Teacher Education Course in Hong Kong. In T. Wright & M. Beaumont (Eds), *Experiences of Second Language Teacher Education* (15-41). UK: Palgrave Macmillan

Lei, J. (2009). Digital natives as preservice teachers: What technology preparation is needed? *Journal of Computing in Teacher Education, 25*(3), 87-95.

Leont'ev, A. A. (1981). *Psychology and the language learning process*. London: Pergamon

Levin, T. & Wadmany, R. (2006) Listening to students' voices on learning with information technologies in a rich technology-based classroom. *Journal of Educational Computing Research, 34*(3), 295–331.

Levy, M. (1997). *Computer-assisted language learning: Context and conceptualization*. Oxford: Oxford University Press.

Levy, M. (2009). Technology in use for second language learning. *The Modern Language Journal, 93*(1), 769782.

Levy, M., & Stockwell, G. (2006). *CALL dimensions: Options and issues in computer assisted language learning.* Mahwah, NJ: Lawrence Erlbaum.

Liljedahl, P. (2010). Noticing rapid and profound mathematics teacher change. *Journal of Mathematics Teacher Education, 13*(5), 411-423.

Lortie, D. (1975). Schoolteacher: A sociological study. Chicago: University of Chicago Press.

Liu, S. H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers & Education, 56*(4), 1012-1022.

Luppicini, R. 2005. A Systems Definition of Educational Technology in Society. *Educational Technology & Society, 8*(3), 103-109.

Luschei, T. F. (2014). Assessing the Costs and Benefits of Educational Technology. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of Research on Educational Communications and Technology* (pp. 239–248). New York, NY: Springer.

MacCormac, E. (1990). *A cognitive theory of metaphor.* Cambridge: MIT Press.

MacDonald, M., Badger, R. & White, G. (2001). Changing values: what use are theories of language learning and teaching?. *Teaching and Teacher Education, 17*(8), 949-963.

Mackey, A., & Gass, S. M. (2005). *Second language research: Methodology and design.* Mahwah, NJ: Lawrence Erlbaum.

Markey, K., Tilki, M., & Taylor, G. (2012). Strategies to surmount the potential barriers to providing anti-discriminatory care in Irish healthcare settings. *Contemporary Nurse, 40*(2), 256–263.

Mattheoudakis, M. (2007). Tracking changes in pre-service EFL teacher beliefs in Greece: A longitudinal study. *Teaching and Teacher Education, 23*(8), 1272-1288.

Mayring, P. (2000). Qualitative content analysis. *Forum: Qualitative Social Research, 1*(2). Retrieved from http://www.qualitative-research.net/fqs-texte/2-00/02-00mayring-e.htm

McGhee G., Marland G. R. & Atkinson J. (2007) Grounded theory research: literature reviewing and reflexivity. *Journal of Advanced Nursing 60*(3), 334–342.

Merriam, S.B. (2001). Andragogy and self-directed learning: Pillars of adult learning theory. In S. B. Merriam (Ed.), *The new update on adult learning theory* (pp. 3-13). San Francisco: Jossey-Bass.

Merriam, S. B., Bierema, L. (2014). *Adult learning: Linking theory and practice*. San Francisco: Jossey-Bass.

Mezirow, J. (1997) Transformative Learning: Theory to Practice. *New Directions for Adult and Continuing Education, 74,* 5-12.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook.* Thousand Oaks: Sage Publications.

Miller, S., Meier, E., Payne-Bourcy, L., Shablak, S., Newman, D., Wan, T. W., ….Pack, G. (2003, April). *Technology as a catalyst for change: A leadership model for transforming urban teacher programs.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Milliken, P. (2010). Grounded Theory. In N. Salkind (Ed.), *Encyclopedia of Research Design* (pp.549-554). Thousand Oaks, CA: SAGE Publications.

Minor, L. C., Onwuegbuzie, A. J.,Witcher, A. E., & James,T. L. (2002). Student teachers' educational beliefs and their perceptions of characteristics of effective teachers. *The Journal of Educational Research, 96*(2), 116-127.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.

Molebash, P. (2001). *Becoming an Effective Technology Integration Teacher: The Effects of a Technology Enriched Elementary Social Studies Methods Course.* Doctoral dissertation, University of Virginia, Charlottesville.

Mosha, H. J. (2012). *Common core skills for lifelong learning and sustainable development in Africa: A case study of learning materials used to deliver knowledge and skills-or competency-based curricula in Tanzania.* Paper presented at the Triennale on education and training, Africa.

Muijs, D. (2004). *Doing quantitative research in education with SPSS.* London: Sage Publications.

Mulder, M., T. Weigel & K. Collins (2006). The concept of competence concept in the development of vocational education and training in selected EU member states. A critical analysis. *Journal of Vocational Education and Training, 59*(1), 65-85.

Mulder, M. & Collins, K. (2007). *Competence development in organisations: Its use in practice.* Paper presented at the Annual Meeting of the AERA, Chicago.

Mulder, M., Gulikers, J., Biemans, H., & Wesselink, R. (2009). The new competence concept in higher education: error or enrichment? *Journal of European Industrial Training, 33*(8-9), 755-770.

Mulder, M. (2011). The Concept of Competence: Blessing or Curse?. In I. Torniainen, S. Mahlamäki-Kultanen, S. P. Nokelainen, & P. Ilsley (Eds.), *Innovations for Competence Management. Conference Proceedings* (pp.11-24). Lahti: Lahti University of Applied Sciences.

Mulder, M. (2014). Conceptions of Professional Competence. In S. Billett, C. Harteis, & H. Gruber (Eds.), *International Handbook of Research in Professional and Practice-based Learning* (pp.107–137). Dordrecht: Springer.

Mulder, M., & Winterton, J. (2016). Introduction. In Mulder, M. (Ed.), *Competence-Based Vocational and Professional Education. Bridging the Worlds of Work and Education* (pp.1-43). Switzerland: Springer.

Mumtaz, S. (2000) Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of Information Technology for Teacher Education, 9*(3), 319-341.

Munby H. (1982). The place of teachers' beliefs in research on teacher thinking and decision making, and an alternative methodology. *Instructional Science, 11*(3), 201–225.

Murphy, P. K., & Mason, L. (2006). Changing knowledge and changing beliefs. In P. A. Alexander & P. Winne (Eds*.), Handbook of educational psychology* (pp. 305-326). Mahwah, NJ: Erlbaum.

Murray, T. & Arroyo, I. (2002). Toward measuring and maintaining the zone of proximal development in adaptive instructional systems. In S. A., Cerri, G. Gouardères, & F. Paraguaçu (Eds.), *Intelligent Tutoring Systems* (pp.749–758). Verlag, Berlin: Springer.

Nelson, J., Christopher, A. & Mims, C. (2009). TPACK and Web 2.0: Transformation of Teaching and Learning. *TechTrends, 53*(5), 80-85.

Nespor, J. (1987). The role of beliefs in the practice of teaching. *Journal of Curriculum Studies, 19*(4), 317−28.

Newby, P. (2010). *Research Methods for Education.* Essex: Pearson Education Limited.

Niederhauser, D. S., & Lindstrom, D. L. (2006). Addressing the nets for students through constructivist technology use in K-12 classrooms. *Journal of Educational Computing Research, 34*(1), 91-128.

Niess, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and Teacher Education, 21*(5), 509-523.

Nisbett, R. E., & L. Ross (1980). *Human Inference: Strategies and Shortcoming of Social Judgment.* Englewood Cliff, NJ: Prentice Hall.

Numrich, C. (1996). On becoming a language teacher: Insights from diary studies. *TESOL Quarterly, 30*(1), 131−53.

Nunan, D. (2004). *Task-based language teaching.* Cambridge: Cambridge University Press.

Nunan, D., & Bailey, K. (2009). *Exploring second language classroom research*. Boston: Heinle.

Oblinger, D. G., & Oblinger, J. (2005). *Educating the Net Generation*. Retrieved from: http://www.educause.edu/ir/library/pdf/pub7101.pdf

Office of Technology Assessment U.S. Congress. (1995). *Teachers and technology: Making the connection, OTA-EHR-616.* Washington, DC: U.S. Government Printing Office

Okojie, M. & Olinzock, A. (2006). Developing a positive mind-set toward the use of technology for classroom instruction. *International Journal of Instructional Media, 33*(1), 33-41.

Okojie, M. C .P. O., Okojie-Boulder, T. C., & Boulder, J. (2008). Constructivist learning framework and technological application. In L. A. Tomei (Ed.), *Encyclopedia of information technology curriculum integration* (pp. 150-156). New York: IGI Global.

Ottenbreit-Leftwich, A. T., Glazewski, K. D., Newby, T. J., & Ertmer, P. A. (2010). Teacher value beliefs associated with using technology: addressing professional and student needs. *Computers and Education, 55*(3), 1321–1335.

Ottenbreit-Leftwich, A. T., Brush, T. A., Strycker, J., Gronseth, S., Roman, T., Abaci, S., . . . Plucker, J. (2012). Preparation versus practice: How do teacher education programs and practicing teachers align in their use of technology to support teaching and learning? *Computers & Education, 59*(2), 399–411.

Ozkan, Y., & Bada, E. (2012). Procedure of an EFL course enhanced by blogging. *Pamukkale University Journal of Education, 32*(2), 47-55.

Pajares, M. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research, 62*(3), 307-332.

Pantić, N., Wubbels, T., & Mainhard, T. (2011). Teacher competence as a basis for teacher education: Comparing views of teachers and teacher educators in five western Balkan countries. *Comparative Education Review, 55*(2), 165–188.

Park, S. H. & Ertmer, P. A. (2007). Implementation of a technology-enhanced problem-based learning curriculum: supporting teachers' effort. *Educational Technology International, 8*(1), 91–100.

Parlak-Yilmaz, N. (2011). Evaluation of the Technology Integration Process in the Turkish Education System. *Contemporary Educational Technology,2*(1), 37-54.

Payne, S. (2007). Grounded Theory. In E. Lyons & A. Coyle (eds), *Analysing Qualitative Data in Psychology* (pp. 65-86) London: SAGE.

Peacock, M. (2001). Pre-service ESL teachers' beliefs about second language learning: a longitudinal study. *System, 29*(2), 177-195.

Pelgrum, W. J. (2001). Obstacles to the Integration of ICT in Education: Results from a Worldwide Educational Assessment. *Computers & Education, 37*(2), 163-178.

Petko, D. (2012).Teachers' pedagogical beliefs and their use of digital media in classrooms: Sharpening the focus of the 'will, skill, tool' model and integrating teachers' constructivist orientations. *Computers & Education, 58*(4), 1351-1359.

Phillipou, G., & Christou, C. (2002). A study of the mathematics teaching efficacy beliefs of primary teachers. In G. C. Leger, E. Pehkonen, & G. Törner (Eds.), *Beliefs: A hidden variable in mathematics education?* (pp. 233–246). Norwell, MA: Kluwer.

Phipps, S., & Borg, S. (2009). Exploring tensions between teachers' grammar teaching beliefs and practices. *System, 37*(3), 380-390.

Pintrich, P. R. (1990). Implications of psychological research on student learning and college teaching for teacher education. In W. R. Houston (Ed.), *Handbook of research on teacher education* (pp. 826-857). New York: Macmillan

Polly, D., Mims, C., Shepherd, C. E., & Inan, F. (2010). Evidence of impact: Transforming teacher education with preparing tomorrow's teachers to teach with technology (PT3) grants. *Teaching and Teacher Education: An International Journal of Research and Studies, 26*(4), 863-870.

Posner, G. J., Strike, K. A., Hewson, P. W., & Gertzog, W. A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education, 66*(2), 211-227.

Powell, K. C., & Kalina, C. J. (2009). Cognitive and Social Constructivism: Developing Tools for an Effective Classroom. *Education, 130*(2), 241-250.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-2.

Project Tomorrow (2013). *From chalkboards to tablets: the emergence of the K-12 digital learner-Project Tomorrow.* Retrieved from www.tomorrow.org/speakup/pdfs/SU13StudentsReport.pdf

Raths, J. (2001). *Teachers' beliefs and teaching beliefs. Early Childhood: Research and Practice.* Retrieved from: http://ecrp:uniuc.edu/v3n1/raths.html.

Reeves, J. (2009). A sociocultural perspective on ESOL teachers' linguistic knowledge for teaching. *Linguistics and Education, 20*(2), 109-125.

Richards, J. C. & Nunan, D. (Eds.). (1990). *Second language teacher education.* New York: Cambridge University Press.

Richards, J. C., & Lockhart, C. (1994). *Reflective teaching in second language classroo*ms. Cambridge: Cambridge University Press.

Richards, J. C., Ho, B., & Giblin, K. (1996). Learning how to teach in the RSA Cert. In D. Freeman & J. C. Richards (Eds.), *Teacher Learning and Teacher teaching* (pp. 242-259). Cambridge: Cambridge University Press.

Richards, J. C. 1998. *Beyond training.* Cambridge: Cambridge University Press.

Richards, J. C. (2008). *Second language teacher education today. RELC Journal, 39*(2), 158- 177.

Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. In J.Sikula (Ed.), *Handbook of Research on Teacher Education.* New York: Macmillan.

Richardson, V. (2005). *Constructivist teacher education: Building a world of new understandings.* London: Falmer Press.

Ringstaff, C., & Kelley, L. (2002). *The learning return on our educational technology investment: A review of findings from research*. San Francisco, CA: WestEd RTEC

Rivera, F. D. (2005). An anthropological account of the emergence of mathematical proof and related processes in technology-based environments. In W. J. Masalski, & P. C. Elliott (Eds.), *Technology supposed mathematics learning environment: NCTM sixty-seven yearbook* (pp. 125–136). Reston, VA: National Council of Teachers of Mathematics.

Roblyer, M. D. (2006). *Integrating. Educational Technology into Teaching.* Upper Saddle River, NJ: Pearson.

Rokeach, M. (1968). *Beliefs, attitudes, and values: A theory of organization and change.* San Francisco: Jossey-Bass.

Rolka, K., Rösken, B. & Liljedahl, P. (2006). Challenging the mathematical beliefs of preservice elementary school teachers. *Proceedings of the 30th international conference for Psychology of Mathematics Education, 4*, 441–448.

Rolka, K. & Rosken, B. & Liljedahl, P. (2007). In Woo, J. H., Lew, H. C., Park, K. S. & Seo, D. Y. (Eds.). *Proceedings of the 31st Conference of the International Group for the Psychology of Mathematics Education* (pp. 121-128). Seoul: PME.

Rost, M. (2002). *New technologies in language education: Opportunities for professional growth.* Retrieved from http://www.longmanhomeusa.com/content/new_tech_lang_ed.pdf

Rychen, D. S., & Salganik, L. H. (Eds.). (2003). *Key Competencies for a Successful Life and a Well Functioning Society.* Göttingen, Germany: Hogrefe & Huber

Saban, A. (2010). Prospective teachers' metaphorical conceptualizations of learner. *Teaching and Teacher Education, 26*(2), 290-305.

Sampson, D., Fytros, D. (2008). Competence Models in Technology-Enhanced Competence-Based Learning. *In Handbook on information technologies for education and training* (pp. 155-177). Berlin: Springer.

Sandelowski M. (2000). Combining qualitative and quantitative sampling, data collection and analysis techniques in mixed-method studies. *Research in Nursing & Health, 23*(3), 246–255.

Savery, J. R., & Duffy, T. M. (1995). Problem based learning: An instructional model and its constructivist framework. *Educational Technology, 35*(5), 31-37.

Savery, J. R., & Duffy, T. M. (2001). *Problem Based Learning: An instructional model and its constructivist framework* (Report No: 16–01). Bloomington: Center for Research on Learning and Technology.

Shin, T. S., Koehler, M. J., Mishra, P., Schmidt, D. A., Baran, E., & Thompson, A. D. (2009). Changing Technological Pedagogical Content Knowledge (TPACK) through course experiences. In I. Gibson, R. Weber, K. McFerrin, R. Carlsen, & D. A. Willis (Eds.), *Society for Information Technology and Teacher Education International Conference book* (pp. 4152–4156). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Schön, D. (1983). *The Reflective Practitioner: How professionals think in actio*n. London: Temple Smith.

Schön, D. (1987). *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.

Schunk, D. H. (2008). *Learning theories: an educational perspective.* NJ: Merrill Prentice Hall.

Shavelson, R. J., & Stern, P. (1981). Research on teachers' pedagogical thoughts, judgements, decisions, and behaviour. *Review of Educational Research, 51*(4), 455-498.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Smarkola, C. (2008). Efficacy of a planned behavior model: Beliefs that contribute to computer usage intentions of student teachers and experienced teachers. *Computers in Human Behavior, 24*(3), 1196-1215.

Somekh, B. (2007). *Pedagogy and Learning with ICT: Researching the Art of Innovation.* London: Routledge.

Stern, P.N. (1980) Grounded theory methodology: Its uses and processes, *Image, 12*(1), 20-23.

Stoof, A. (2005). *Tools for the identification and description of competencies*. Doctoral Dissertation, Open Universiteit, Nederland.

Stoof, A., Martens, R. L., van Merriënboer, J. J. G., & Bastiaens, T. J. (2002). The Boundary Approach of Competence: A Constructivist Aid for Understanding and Using the Concept of Competence. *Human Resource Development Review, 1*(3), 345-365.

Straub, E. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research, 79*(2), 625-649.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques.* Newbury Park, CA: Sage.

Strauss, A., & Corbin, J. (1994). Grounded theory methodology. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 273-285). Thousand Oaks, CA: Sage.

Strike, K. A., & Posner, G. J. (1992). A revisionist theory of conceptual change. In R. Duschl & R. Hamilton (Eds.), *Philosophy of science, cognitive psychology, and educational theory and practice* (pp. 147-176). Albany, NY: SUNY Press.

Stuart, C. & Thurlow, D. (2000). Making it their own: Student teachers' experiences, beliefs, and classroom practices. *Journal of Teacher Education, 51*(2), 113-121.

Sulla, N. (1999). *Technology: To use or infuse.* Retrieved from http://technologysource.org/article/technology

Şahin-Kizil, A. (2011, September). *EFL teachers attitudes towards information and communication technologies (ICT).* Paper presented at the 5th International Computer & Instructional Technologies Symposium, Firat University, Elazığ.

Tarman, B. (2010). Global Perspectives and Challenges on Teacher Education in Turkey, *International Journal of Arts & Sciences, 3*(17), 78-96.

Teo, T. (2011). *Technology Acceptance in Education, Research and Issues.* Rotterdam: Sense Publishers.

Thomas, M. & Reinders, H. (eds.) (2010). *Task-Based Language Teaching and Technology.* New York: Continuum.

Thompson, A. G. (1992). Teachers' beliefs and conceptions: A synthesis of the research. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp.127-146). New York: Macmillan

Thompson, C. L., & Zeuli, J. S. (1999). The frame and tapestry; Standards-based reform and professional development. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 341-375). San Francisco: Jossey-Bass.

Thornberg, R., & Charmaz, K. (2014). Grounded theory and theoretical coding. In U. Flick (Ed.) *SAGE Handbook of qualitative analysis* (pp. 153-69). London: Sage.

Thornburg, D. D. (1999, December). *Technology in K-12 education: Envisioning a new future.* Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.472.7536&rep=rep1&type=pdf.

Tınmaz, H. (2004). *An assessment of student teachers' technology perception in relation to their subject area.* Master's Thesis, Middle East Technical University, Ankara.

Tigelaar, D. E., Dolmans, D., Wolfhagen, I., & van der Vleuten, C. (2002). The development and validation of a framework for teaching competencies in higher education. *Higher Education, 48*(2), 253-268.

Tillema, H. H. & Knol, W. E. (1997). Promoting student teacher learning through conceptual change or direct instruction. *Teacher and Teacher Education, 13*(6), 579-595.

Tillema, H. H. (2000). Belief change towards self-directed learning in student teachers: immersion in practice or reflection on action. *Teaching and Teacher Education, 16*(5-6), 575-591.

Tillema, H. H., & Knol, W. E. (1997). Collaborative planning by teacher educators to promote belief change in their students. *Teachers and Teaching: theory and practice, 3*(1), 29-45.

Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing student teachers to integrate technology in education: a synthesis of qualitative evidence. *Computers & Education, 59*(1), 134-144.

Turuk, M. C. (2008). The relevance and implications of Vygotsky's sociocultural theory in the second language classroom. *Annual Review of Education, Communication, and Language Sciences, 5*, 244-262.

Uluyol, C. (2013). ICT integration in Turkish schools: recall where you are coming from to recognize where you are going to. *British Journal of Educational Technology, 44*(1), E10-E13.

Urmston, A. (2003). Learning to teach English in Hong Kong: The opinions of teachers in training. *Language and Education, 17*(2), 112-137.

Vadeboncoeur, J. A. (1997). Child development and the purpose of education: a historical context for constructivism in teacher education. In V. Richardson (Ed.), *Constructivist Teacher Education: Building New Understandings* (pp. 15-37). London: Routledge Falmer.

Varank, I. (2003). *The Effects of Computer Training on Turkish Teachers' Attitudes Toward Computers and The Effects of Computer-Supported Lessons on Turkish Students' Reported Motivation to Lessons.* Doctoral Thesis, Florida State University, USA.

Varol, F. (2013). Elementary school teachers and teaching with technology. *Turkish Online Journal of Educational Technology, 12*(3), 85-90.

Vélez-Rendón, G. (2002). Second language teacher education: A review of the literature. *Foreign Language Annals, 35*(4), 457-467.

Verloop, N. J., Driel, V., & Meijer, P. C. (2001) Teacher knowledge and the knowledge base of teaching. *International Journal of Educational Research, 35*(5), 441-461.

von Glasersfeld, E. (1993). Learning and adaptation in the theory of constructivism. *Communication and Cognition, 26*(3-4), 393–402.

Vygotsky, L. (1962). *Thought and Language.* Cambridge: MIT Press.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes.* Cambridge: Harvard University Press.

Vygotsky, L. (1986). *Thought and language.* Cambridge: The Massachusetts Institute of Technology.

Wall, C. R. G. (2016). From student to teacher: changes in preservice teacher educational beliefs throughout the learning-to-teach journey. *Teacher Development, 20*(3), 364-379.

Wallace, M. J. (1991). *Training foreign language teachers: A reflective approach.* Cambridge: Cambridge University Press.

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing student teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education, 36*(3), 231-250.

Warschauer, M. (1996). Computer-assisted language learning: an introduction. In Fotos, S. (Ed.). *Multimedia language teaching* (pp.3-20). Tokyo: Logos International

Warschauer, M., & D. Healey. (1998). Computers and language learning: An overview. *Language Teaching, 31*(2), 57-71.

Warschauer, M. (2000) On-Line Learning in Second Language Classroom: An Ethnographic Study. In Warschauer, M. and Kern, R., (Eds), *Network-Based Language Teaching: Concepts and Practice* (pp. 41-58), Cambridge: Cambridge University Press.

Warschauer, M., & Kern, R. G. (2000). *Network-based language teaching: Concepts and practice.* New York: Cambridge University Press.

Warschauer, M., & Meskill, C. (2000). Technology and second language learning. In J. Rosenthal (Ed.), *Handbook of undergraduate second language education* (pp. 303-318). Mahwah, New Jersey: Lawrence Erlbaum.

Warschauer, M. (2004). Technological change and the future of CALL. In S. Fotos & C. Brown (Eds.), *New perspectives on CALL for second and foreign language classrooms* (pp. 15-25). Mahwah, NJ: Lawrence Erlbaum Associates.

Wenglinsky, H. (2005*). Using technology wisely: The keys to success in schools.* New York: Teachers College Press.

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.

Wesselink, R., Dekker-Groen, A., Biemans, H. J. A. & Mulder, M. (2010). Using an ınstrument to analyse competence-based study programmes; experiences of teachers in dutch vocational education and training. *Journal of Curriculum Studies, 42*(6), 813-829.

Wilkins, J., & Brand, B. (2004). Change in student teachers' beliefs: An evaluation of a mathematics methods course. *School Science & Mathematics, 104*(5), 226-232.

Windschitl, M. (2002) Framing constructivism in practice as the negotiation of dilemmas: An analysis of the conceptual, pedagogical, cultural, and political challenges facing teachers. *Review of Educational Research, 72*(2), 131–175.

Winterton, J., Delamare-Le, D. F., & Stringfellow, E. (2006). *Typology of knowledge, skills and competences: Clarification of the concept and prototype.* Luxembourg: Office for Official Publications of the European Communities.

Wolfer, J. (1993). Aspects of "Reality" and Ways of Knowing in Nursing: In Search of an Integrating Paradigm. *Image: the Journal of Nursing Scholarship, 25*(2), 141–146.

Woods, D. (1996). *Teacher Cognition in Language Teaching: Beliefs, Decision-making and Classroom Practice.* Cambridge: Cambridge University Press.

Woolfolk-Hoy, A., Davis, H., & Pape, S. J. (2006). Teacher knowledge and beliefs. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (pp. 715-737). Mahwah, NJ: Erlbaum Associates, Inc.

Wright, T. (2010). Second language teacher education: Review of recent research on practice. *Language Teaching, 43*(3), 259-296.

Wright, V. H., & Wilson, E. K. (2011). Teachers' use of technology: Lessons learned from the teacher education program to the classroom. *SRATE Journal, 20*(2), 48–60.

Yalın, H. İ., Karadeniz, Ş., & Şahin, S. (2007). Barries to information and communication technologies integration into elementary schools in Turkey. *Journal of Applied Sciences, 70*(24), 4036-4039.

Yaman, S. (2010). Conceptual change of student teachers: A longitudinal action research study in ELT. *Procedia Social and Behavioral Sciences, 3*, 227–236.

Yavuz, A., & Zehir-Topkaya, E. (2013). Teacher educators' evaluation of the English language teaching program: A Turkish case. *Novitas-ROYAL, 7*(1), 64-83.

Yigit, N. (2012). The latest reform in initial teacher education (ITE) in Turkey. *Energy Education Science and Technology Part B: Social and Educational Studies, 4*(1), 523-536.

Yildirim, S. (2000). Effects of an educational computing course on preservice and ınservice teachers: A discussion and analysis of attitudes and use. *Journal of Research on Computing in Education, 32*(4), 479–95.

Young, S. S. C. (2003). Integrating ICT into second language education in a vocational high school. *Journal of Computer Assisted Learning, 19*(4), 447-461.

Yost, D. S., Sentner, S. M., & Forlenza-Bailey, A. (2000). An examination of the construct of critical reflection: Implications for teacher education programming in the 21st century. *Journal of Teacher Education, 51*(1), 39-49.

YÖK. (1998). *Egitim fakülteleri öğretmen yetistirme programlarinin yeniden düzenlenmesi.* Ankara: YÖK Yayınları

YÖK. (2007). *Ögretmen yetistirme ve egitim fakülteleri.* Ankara: YÖK Yayınları

Winterton, J., Le Deist, F. & Stringfellow, E. (2006). *Typology of knowledge, skills and competences: Clarification of the concept and prototype.* Luxembourg: Office for Official Publications of the European Communities.

Wu, Y. T., & Wang, A. Y. (2015). Technological Pedagogical and Content Knowledge in English language: Representation of primary teachers of English in Taiwan. *The Asia-Pacific Education Researcher, 24*(3), 525-533.

Zheng, H. (2009). A review of research on EFL student teachers' beliefs and practices. *Journal of Cambridge Studies, 4*(1), 73-81.

APPENDICES

APPENDIX 1. Course Outline

1	17.02.2016	**Data Collection** Conducting the pre-intervention surveys Conducting the pre-intervention written interview (metaphor-writing) Conducting face-to-face interviews	
WEEK	**DATE**	**COURSE OUTLINE**	**REQUIRED READINGS**
1	19.02.2016	●Creating cognitive dissonance (Posing a problem and providing an alternative solution) ●Brainstorming (How can STs can solve the problem posed?, What do STs know about instructional technologies?) Bubbl.us ●Introducing the study, its aims and significance (Prezi) ●Introduction to Penzu (personal online journal)	
2	26.02.2016	●Discussion on instructional technologies, its contributions to language teaching and learning, edmodo and digital storytelling in ELT (Prezi). ●Edmodo ●Digital Storytelling (Presentation of a problematic situation) Using Plotagon to solve the problem Introduction to photo story 3, windows movie Maker, toonboom studio,pencil, 2D pencil, stickman, crazy talk anime studio, frames etc. *All of the sessions will include hands-on experiences.	●Chen, R. J. (2011). Preservice Mathematics Teachers' Ambiguous Views of Technology. School Science and Mathematics, 111(2), 56-67 ●Butler-Pascoe, M. (2011). 'The history of CALL: The intertwining paths of technology and second/ foreign language teaching'. International Journal of Computer-Assisted Language Learning and Teaching 1 (1), 16–32. ●Golonka, E. M., Bowles, A. R., Frank, V. M., Richardson, D. L., & Freynik, S. (2014). Technologies for foreign language learning: a review of technology types and their effectiveness. Computer Assisted Language Learning, 27(1), 70–105. ●Sadik, A. (2008). Digital storytelling: A meaningful technology-integrated approach for engaged student learning. Educational Technology Research and Development, 56,487-506.
3	04.03.2016	●Discussion on Mobile Technologies and Hotpotatoes in ELT ●Mobile Technologies in ELT (Apps for all skills: Autorap, Yakit, Story Creator, SpeakingPal, Converational ESL Lesson, Speak English-Listen,Repeat, Compare, LearnEnglish Podcasts; LearnEnglish Audio& Video, ESL podcast, LearnEnglish Grammar, Grammar Up, Grammarapolis, MyWordBook2, Fun Easy Learn English, Rosetta Stone, Flashcards, Flashcards Machine, Phonetics Focus, Sounds Right, Sounds, Reading Comprehension Prep ●Hot Potatoes in ELT	●Kukulska-Hulme, A., & Shield, L. (2008). An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction. ReCALL, 20, 271-289. ●A Step-by-Step Guide to getting started with Hot Potatoes
4	11.03.2016	●Discussion on Social Media and Databases Mashups and Tutorials in ELT ●Social Media in ELT (Facebook, Youtube, Instagram)	●Wang, S. & C. Vasquez. 2012. "Web 2.0 and second language learning: What does the research tell us?". CALICO, 29, 3: 412-430. ●Chartrand, R. (2012). Social networking for language learners: Creating meaningful output with web 2.0 tools. Knowledge Management and E-Learning: An International Journal, 4(1), 97–101.

5	**18.03.2016**	●Discussion on Blogs, Wikis, Podcasts in ELT	●Aydın, S. (2014). The use of blogs in learning English as a foreign language. Mevlana International Journal of Education (MIJE), 4(1), 244-259. ●Elola, I., & Oskoz, A. (2010). Collaborative writing: Fostering foreign language and writing conventions development. Language Learning & Technology, 14(3), 51–71 ●Jain, S., & Hashmi, F. (2013). Advantages of podcasts in English language classroom. Journal of Indian Research, 1(2), 158-163.
At the end of the lesson, student teachers watched a video in which elementary and secondary level learners hold signs up to state their eagerness for the use of technology in the classroom. They were asked to imagine that these learners were their students.Considering their learners' interest in technology, they started to prepare their lesson plans for microteaching sessions that would start the next week.			
6	**25.03.2016**	**Problem 1:** As Turkey is a foreign language country, there is almost no opportunity for face to face conversations with native speakers. Therefore, one of the major problems confronted in language teaching is incompetency in listening skills. However, you are aware that your students are really keen on using technology. On this matter, what would you do to improve your students' listening skills? **Group 1 (4 Sts)** **Group 2 (4 Sts)**	
7	**29.03.2015**	**Problem 2:** AsTurkey is a foreign language country, there is almost no opportunity for face to face conversations with native speakers. Therefore, one of the major problems confronted in language teaching is incompetency in speaking skills. However, you know that your students are really keen on using technology. On this matter, what would you do to improve your students' speaking skills? **Group 3 (5 Sts)** **Group 4 (6 Sts)**	
8	**05.04.2016**	**Problem 3:** In order to develop your students reading and writing skills, you assign them some story books to read and make a summary of them. However you see that they are rather unmotivated to do their homework. However, you are aware that your students are really keen on using technology. How would you enhance your students' reading skills ? **Group 5 (5 Sts)** **Group 6 (6 Sts)** How would you enhance your students' writing skills? **Group 7 (6Sts)** **Group 8 (5 Sts)**	
		MID-TERM EXAM	
9	**19.04.2016**	**Discussion on the first part of the implementation**	

10	**26.04.2016**	**Problem4:** Having completed Unit 4 (A.1.2), you wanted your students to talk about their daily routines and free time activities. However, they were making pronunciation mistakes. What would you do? (You are aware of the fact that they are really keen on using technology) **Group 1 (6 Sts)** **Group 2 (6 Sts)**	
11	**03.05.2016**	**Problem :** In unit 3(level B1.1), your students were expected to master the present perfect tense. Although you thought that you did your best, your students got very low marks in the quiz that they took at the end of the class? What would you do ?(Grammar) (You are aware of the fact that they are really keen on using technology) **Group 3 (4 Sts)** **Group 4 (5 Sts)**	
12	**10.05.2016**	Having completed Unit 4(A.1.2), you wanted your students to talk about their daily routines and free time activities. However. you saw that they were having difficulties while retrieving the target vocabulary of that unit. (vocabulary) (You are aware of the fact that they are really keen on using technology) **Group 5 (4 Sts)** **Group 6 (5 Sts)**	
13	**17.05.2016**	**Problem :** In this increasingly globalized world, you are aware of the fact that teaching the target language in isolation without teaching culture can not make a learner of the language competent in that language. You also want tomake your learners aware of the target culture. How can you integrate culture into your courses? (You are aware of the fact that they are really keen on using technology) **Group 7 (6 Sts)** **Group 8 (5 Sts)**	
14	**24.05.2016**	**Data Collection** Conducting the post-intervention surveys Conducting the post-intervention written interview (metaphor-writing) Conducting face-to-face interviews	

APPENDIX 2. Survey of Student Teachers' Beliefs, Knowledge and Skills Regarding the Use of Technology in English Language Teaching

Dear Participant,

I am a doctoral student at Gazi University and conducting my dissertation research to find out student teachers' level of awareness, knowledge, skills and beliefs about the use of technology for instructional purposes with the aim of identifying the barriers in the path of effective technology integration. I am requesting your participation, which will involve filling out the survey items and responding to the interview questions. It is expected that it will take you no more than 20 minutes to complete the survey. Your participation in this study is voluntary and will be kept private. I am interested in your personal opinion so your candid and sincere answers will guarantee the success of the study. Technology can mean different things to different people. For the purpose of this survey, we are referring to digital technologies (e.g. computers, laptops, smart phones, interactive whiteboards, Internet, social networks, software programs, etc.).

The information gained from this survey will be used to fulfill my dissertation requirements.

Thanks for your cooperation.

Authorization to participate in the research study:
□ I have read the information in this consent form, had any questions answered, and I voluntarily agree to take part in this study.

Saadet KORUCU KIŞ
Research Assistant/NEU School of Foreign Languages
Doctoral Student at Gazi University
e-mail: saadetkorucu@yahoo.com

Gender:	Male □	Female □			
Technology Knowledge	**Strongly Disagree**	**Disagree**	**Somewhat Agree**	**Agree**	**Strongly Agree**
I know how to save data into/from a digital device (i.e.flash disk,USB, stick,CD)					
I know how to play audio and video files on my computer.					
I know how to use computer mediated communication (CMC) technologies(e.g. email, chat)					
I know how to record video files (i.e. using a video camera)					
I know how to create images on my computer (i.e. using Windows Paint)					
I know how to record audio files (i.e. using a dictaphone)					
I know about basic computer hardware (i.e. CD-Rom, mother-board,RAM) and their functions.					
I know how to use generic office applications (i.e. Word, Powerpoint, Excel)					
I know how to edit images on my computer (i.e. using Photoshop)					
I know how to use electronic / online dictionaries					
I know how to use web 2.0 technologies (e.g. blogs, social networks, and wikis)					
Content Knowledge					
I can monitor my own writing for accuracy					
I can comprehend English speech accurately					
I can monitor my own speech for accuracy					
I can comprehend English texts accurately					
I am familiar with the culture(s) of target language communities					
I am familiar with the differences between spoken and written English					
Pedagogical Content Knowledge					
I can assess student learning in multiple ways					
I can select teaching materials appropriate to the needs of learners					
I can choose an appropriate approach to teach learners (i.e.communicative approach, direct method)					
I can adapt my teaching style to different learners					
I can facilitate learning through individual, partner, group, and whole class activities					
I can plan when and how to use the target language, including meta-language I may need in the classroom					
I can keep students on task					
I can identify linguistic problems experienced by learners (i.e. phonological, lexical or grammatical problems)					
I can design language courses around the requirements of the curriculum					
I can facilitate learning by creating a comfortable environment in which learners are willing to take risks					
I can react supportively to learners' interaction					
I am aware of the contextual factors that could inhibit/promote English teaching					
Technological Content Knowledge					
I know about technologies that I can use to teach English language grammar					
I know about technologies that I can use to teach reading in English					
I know about technologies that I can use to teach writing in English					
I know about technologies that I can use to teach English vocabulary					
I know about technologies that I can use to teach pronunciation of English words					
I know about technologies that I can use to teach listening in English					
I know about technologies that I can use to teach about the differences between cultures					
Technological Pedagogical Knowledge					
I can adapt the use of the technologies that I am learning about to different teaching activities					
I can choose technologies that enhance students' learning for a lesson					
I can choose technologies that enhance the teaching approaches for a lesson					
I can design, using technology, relevant learning experiences to promote student learning					
I think critically about how to use technology in my classroom					
I can engage students in solving authentic problems using digital technologies and resources					
I can choose technologies to be used in assessment					
Technological Pedagogical Content Knowledge					
I can use a range of technologies that enable students to become active participants					
I can use a range of technologies to help students pursue their individual curiosities					
I can use technology effectively to communicate relevant information to students and peers					
I can facilitate intercultural understanding by using technology to engage students with different cultures					
I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn					
I can provide equitable access to digital language learning tools and resources					
I can teach lessons that appropriately combine English linguistic concepts, technologies, and teaching approaches					

Direction: Please indicate how often do you use the following technologies?					TECHNOLOGY USE IN DAILY LIFE	Direction: Please rate how good you are at using the following technologies				
Frequency of Use						Skills				
Never	Rarely	Sometimes	Usually	Always		Very Poor	Poor	Fair	Good	Excellent
					Computers/laptops/tablets					
					Interactive whiteboard					
					TV/DVR					
					Smartphones/Cell phones					
					Projectors					
					Mp3player/ipod					
					Podcasts					
					Audio/Video Production(e.g. moviemaker, audacity)					
					Clickers					
					Databases					
					Drill and Practice Programs					
					Internet (email,websites, google tool)					
					Word processors					
					Spreadsheets					
					Presentation software					
					Simulations					
					Webpage development tools					
					Mashup					
					Tutorials					
					Blogs					
					Wikis					
					Forums					
					Videosharing sites(e.g.Youtube)					
					Social Networks(i.e.Facebook,twitter)					
					Edmodo					
					Developing software					

Direction: Which of the following technologies you find applicable to ELT? Please indicate your level of agreement.					TECHNOLOGY USE FOR INSTRUCTIONAL PURPOSES	Direction: Which of the following technologies do you feel prepared to use in language teaching? Please indicate your level of agreement.				
Applicability to ELT						Preparedness for Instructional Use				
No opinion	Very low	Low	Moderate	High		Not at all	Very little	Fairly well	Quite well	Perfectly
					Computers/laptops/tablets					
					Interactive whiteboard					
					TV/DVR					
					Smartphones/Cell phones					
					Projectors					
					Mp3player/ipod					
					Podcasts					
					Audio/Video Production(e.g. moviemaker, audacity)					
					Clickers					
					Databases					
					Drill and Practice Programs					
					Internet (e.g. email,websites,google tools)					
					Word processors					
					Spreadsheets					
					Presentation software					
					Simulations					
					Webpage development tools					
					Mashup					
					Tutorials					
					Blogs					
					Wikis					
					Forums					
					Videosharing sites(e.g. Youtube)					
					Social Networks (e.g. Facebook, twitter)					
					Edmodo					
					Developing software					

PRIOR LEARNING EXPERIENCES RELATED TO TECHNOLOGY USE

Direction: Please read the following statements and put a tick(√) to the response that best reflects your level of agreement and respond to the questions.		
How long have you been using technology for educational purposes?	I don't use □ Less than 1 year □ 1-5 years □ 5-8 years □ More than 8 years □	
Direction: **What are your early learning experiences (during primary and secondary education) with respect to the use of technology? Please indicate your level of agreement with the following statements.**	**Yes**	**No**
Technological tools were used.		
My early learning experiences helped me understand the relationship between teaching, learning and technology.		
My early learning experiences with technology will help me incorporate technology in my future career.		
Direction: How do you describe the technology–related courses you have received as part of your undergraduate coursework? Please indicate your level of agreement with the following statements.		
theory-based		
for acquiring basic skills		
practice-based		
contextualized for ELT		
I have received adequate training in the use of technology for teaching		
My teacher training experiences have helped me understand the relationship between teaching, learning and technology		
My teacher training experiences encouraged me to use technology effectively in teaching and learning		

Direction: Please complete this section by writing your responses.

1. What is the role of technology in education?
2. How do you describe technology based on your early learning experiences?
3. How do you describe technology based on your teacher training experiences?
4. What do you need to be able to integrate technology effectively into instruction? How do you think technology-related courses should be offered in ELT programs?

APPENDIX 3. Face-to-face Interview Questions (Countrywide)

A. General Questions related to Technology Use

1. How long have you been using technology tools for personal and professional purposes?

B. Questions related to Prior Learning Experiences

2. Were technology tools employed during your primary and secondary education?
3. Do you think that technology was used effectively and adequately during your primary and secondary education?
4. Do you think that your early learning experiences with technology will help you incorporate technology in your future career? If yes, how? If no, why?
5. How do you describe "technology" based on your early learning experiences?
6. For what purposes were technology tools used during your primary and secondary education?

C. Questions related to Undergraduate Experiences

7. Were the technology-related courses you received as part of your undergraduate program theoretical, for acquiring basic skills, practice-oriented or contextualized for ELT?
8. Has your undergraduate program encouraged you to use technology effectively in teaching and learning?
9. Do you think that you have got adequate training for using technology for teaching?
10. Have your teacher training experiences helped you understand the relationship between teaching, learning and technology?
11. How do you describe technology, based on your teacher training experiences?
12. For what purposes were technology tools used in your teacher education programs?

C1. Question related to Technology Knowledge

13. Do you think that technology-related courses you have received have enhanced your knowledge with respect to the use of technology for instructional purposes? If yes, how? If no, why?

C2. Questions related to Technology Skills

14. Do you think that your teacher education program has helped you learn how to work with technology you will need for your future career?

C3. Questions related to Beliefs about the use of Technology

15. Do you think that technology-related courses you have received have helped you gain positive perceptions about the use of technology for educational purposes? If yes, how? If no, why?
16. What is the role of technology in education?
17. Do you think that technology is an important part of teaching and learning?
18. Do you think that technology can enhance classroom instruction?
19. Do you think that technology can increase student motivation?
20. Do you think that technology can enhance student learning?
21. Do you think that technology distracts learners' attention?
22. Do you think that technology can solve learning problems more efficiently than traditional ways?
23. Technology doesn't have much to offer for learning? Do you agree or not?
24. Do you think that using technology is time efficient or time consuming?
25. Do you think that infusing technology into courses is extra workload?
26. How often are you planning to use technology in your classrooms?
27. Do you always want to see technology in classrooms?

D. Questions related to Needs about Technology Education

How do you think technology-related courses should be offered? Are there things you think your program should alter?

APPENDIX 4. Entry Interview Questions

A. Question Related to Technological Knowledge

1. Do you think that technology-related courses you have received in your teacher education program have enhanced your knowledge with respect to the use of technology for language teaching? If yes, how? If no, why?

B. Question Related to Technological Skills

2. Do you think that technology-related courses you have received in your teacher education program have enhanced your skills with respect to the use of technology for language teaching? If yes, how? If no, why?

C. Question Related to Technological Awareness

3. Has your teacher education program raised your awareness about the use of technology in ELT?

D. Question Related to Technological Beliefs

4. How can you describe technology based on your primary and secondary education learning experiences?
5. What is the role of technology in English language teaching?
6. Do you think that using technology is important in ELT?

APPENDIX 5. Exit Interview Questions

A. Question Related to Technological Awareness

1. Has your teacher education program raised your awareness about technology use in ELT?

B. Question Related to Technological Knowledge

2. Do you think that technology-related courses you have received in your teacher education program have enhanced your knowledge with respect to the use of technology for language teaching? If yes, how? If no, why?

C. Question Related to Technological Skills

3. Do you think that technology-related courses you have received in your teacher education program have enhanced your skills with respect to the use of technology for language teaching? If yes, how? If no, why?

D. Questions Related to Technological Beliefs

4. What is the role of technology in English language teaching?
5. Do you think integrating technology is extra workload?
6. Do you think that using technology is important in ELT?
7. Did you find the technologies used intelligible?
8. Did you find the technologies used plausible?
9. Did you find the technologies used fruitful?
10. The thing I liked most about the course is….

P.s. The first six questions were asked both to treatment and control groups. The remaining four questions were only responded by the treatment group.

APPENDIX 6. Reflection Questions

1. How do you evaluate and feel about today's lesson?
2. The thing I liked most/less about today's lesson is….
3. Will you use these technological tools in your classrooms in addressing to language learning problems?

A. Question Related to Technological Knowledge

4. Do you think that you have learnt something new?

B. **Questions Related to Technological Skills**

5. Do you think that you have had the chance to practice what you have learnt?
6. Do you think that you had the chance to relate what you have learnt to ELT?

C. Question Related to Technological Awareness

7. How do you feel when the instructor asks you to remember your prior learning experiences?
8. Have you understood the rationale of using these technology tools in ELT?

D. Questions Related to Technological Beliefs

9. Do you find your instructor's suggestions for problems reasonable and practical for your future career?
10. Have you found the pertinent technology tool(s) useful and understandable? Please specify your answer.
11. Do you think that the pertinent technology tool(s) can solve the problems more effectively and be put into practice in language classrooms? Please specify your answer.
12. Do you think that the pertinent technology tool(s) can be used in different classroom situations? Please specify your answer.
13. I think technology in ELT is…

GAZİ GELECEKTİR…