SELF EFFICACY BELIEFS OF PRE-SERVICE TEACHERS ON TECHNOLOGY INTEGRATION

Dr. Mustafa CANER
ORCID: 0000-0001-5741-5037
Faculty of Education
Akdeniz University
Antalya, TURKEY

Dr. Sinan AYDIN
ORCID: 0000-0003-3014-1384
Open Education Faculty
Anadolu University
Eskisehir, TURKEY

Received: 13/11/2019 **Accepted:** 12/03/2020

ABSTRACT

The great use of technology in every part of life eventually forced educators to integrate up-to-date technologies into the teaching environments concerning the increased demands of millennial learners. Thus the teachers' efficacy of technology integration into the teaching environments becomes a considerably vital issue besides the potential and positive roles of using the technology in the educational settings. The studies in the literature emphasize that increasing self-efficacy beliefs of pre-service teachers on technology integration during their education process will ultimately lead to successful technology integration in the future. Thus, it is believed that the studies examining the self-efficacy beliefs of pre-service teachers are worth conducting. Regarding this tenet, the present study intended to explore the self-efficacy beliefs of pre-service teachers enrolled in four different teacher education programs of a state university in Turkey. A total of 439 pre-service teachers (male= 145, female= 291, missing value=3) who enrolled in 1st, 2nd, 3rd and 4th grades of English language teacher education (n=115), Primary school teacher education (n=115), Turkish language teacher education (n=92) and Science teacher education (n=117) programs have participated in the study on voluntary bases. The present study, which adopted a non-experimental quantitative research design, gathered its data through a self-administered Likert-type survey accompanied by some demographic questions. The statistical analysis of the quantitative data revealed that pre-service teachers have high self-efficacy in technology integration in general. Additionally, it is found that while technology integration self-efficacy of pre-service teachers show a significant difference in line with some majors and grade level variables, there found no difference in terms of the gender variable.

Keywords: Technology integration, self-efficacy, technology readiness, teacher education.

INTRODUCTION

The omnipresence of social digital and educational technologies, as well as their extensive influence on the daily lives of individuals, lead to fundamental changes in all aspects of education, including the ways of teaching and learning. The millennial learners, who are generally labeled with a widely recognized metaphor -"digital natives" (Prensky, 2001)-, usually prefer born-digital materials and contents as appropriate means to support their learning processes. Moreover, as some studies (Bennett, Maton & Kervin, 2008; Brown & Czerniewicz, 2010; Kennedy, Judd, Churchward, Gray & Krause, 2008; Li & Ranieri, 2010) highlighted, the digital natives are good at using new technologies, and have enhanced information-seeking and analysis skills. As for the teachers, most of whom are so-called "digital immigrants" (Prensky, 2001), have to meet the demands of their digital-born learners. Thus, intellectuals all over the world commonly agree that practitioners in the field of teaching should have specific knowledge and skills to incorporate educational technologies into their lessons successfully. Besides, the teachers should dedicate themselves to integrate

cutting-edge technologies to create overwhelming teaching environments. Likewise, the technology is very pleasing and innovative in the classroom when there are dedicated teachers who use it effectively.

Moreover, the enthusiasm in the integration of recent technology into teaching ought to contemplate the essential mission of education -improving the quality of education for all students (Earle, 2002). As Fullan (2013) states, the teacher must be the change agent who utilizes the pedagogy as the driving force and technology as the accelerator. Similarly, Fisher (2006) emphasizes that the mere presence of technology might not support learning unless teachers utilize it as an integrated pedagogical tool, yet not as a sole source of instruction.

When the related literature is reviewed, it is observed that scholars have their unique ways of understanding the gist of the technology; accordingly, they defined it from different perspectives (Wahap, Rose & Osman, 2012). While some scholars defined it as the knowledge of techniques, process, and the like, some others considered it as a means to fulfill any personal purpose. For instance, Bain (1937, p. 860) found the technology as the combination of the instruments or tools and the skills by which people produce and use them. Similarly, while defining the technology as a system, Volti (2009, p. 6) highlighted the importance of knowledge in creating the objects and techniques used for achieving specific objectives. As for educational technology, it has various definitions as well; however, their common point is that educational or instructional technology- which often used interchangeably- is used to enhance the learning and teaching processes. For instance, Richey, Silber, & Ely (2008) defined educational technology as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources." Similarly, Spector (2015) claimed that educational technology involves the disciplined application of knowledge to improve learning, instruction, and/or performance. In other words, instructional technology is concerned with the content and effective instructional practices instead of the technology itself (Earle, 2002, p. 10); therefore, the technologies used in the classroom must improve the pedagogy and go beyond information retrieval.

The use of pedagogically comprehensive technology in the teaching environments will undoubtedly contribute to flourish the courses and enable learners to grasp the content in a better way. However, the vital point here is the appropriateness of the technology with the content and the knowledge and skill of using proper technologies in the teaching environments. Thus, teachers, who are the direct agents of technology-integrated classrooms, should be endowed with the required abilities to use the recent educational technologies in their classrooms. The review of available literature revealed that plenty of studies all around the world dealt with the issue from various dimensions and reached some conclusions. For instance, some studies (Sandholtz, Ringstaff, & Dwyer, 1997; Wozney, Venkatesh & Abrami, 2006; Zhao & Frank, 2003) consented that teachers must possess a positive attitude toward technology to integrate it effectively into their instruction. Because, as Pierson (2001) claims, teachers' perceptions of technology can determine whether technology has an integral role in student learning or as a subsidiary tool for supplemental use only. Likewise, Liu (2011) stated that teachers' pedagogical beliefs about technology integration could influence their teaching methods when using technology. The grounds of such beliefs originated from the assumption that "technology-mediated learning environments provide opportunities for students to search for and analyze information, solve problems, communicate and collaborate, hence equipping them with a set of competencies to be competitive in the 21st-century marketplace" (Lim, Zhao, Tondeur, Chai, & Tsai, 2013).

The perspectives or beliefs are central predictors of behavior, which may even influence the knowledge of teachers in addressing specific tasks or issues and regarded as one of the most valuable constructs for teacher education (Kagan, 1992; Pajares, 1992). For instance, Cox's (2013) study exposed that perceived successes and failures -the beliefs of teachers- in integrating technology were the factors that influenced teachers most in the integration of technology in their classrooms. Similarly, Lee and Tsai's (2010) study, which examined technology self-efficacy of 558 K-12 teachers in Taiwan, found positive correlations between positive attitudes toward technology and the likelihood of integrating technology. Likewise, Paraskeva, Bouta and Papagianni (2008) claim that teachers' attitudes towards technology integration might influence the efficient use of these technologies in a school setting.

Incorporating the latest technologies in teaching plays a vital role in augmenting the course contents for millennial learners. For instance, Agodini, Dynarski, Honey, and Levin's (2003) study confirmed that student learning was improved where teachers demonstrated an interest in using technology. However, several studies (Chen, 2008; Caliskan, 2017; Hermans, Tondeur, van Braak & Valcke, 2008; Hew & Brush, 2007;

Ertmer, 1999; Palak and Walls, 2009) exposed that most of the teachers seem hesitant to undertake such a demanding mission in their professional lives though they impressively use the digital social technologies in their deeds. Even some studies (Caliskan, 2017; Picciano, 2006) revealed that teachers might not believe in the advantages of using computer technology in the classroom.

On the other hand, several studies (Hall & Trespalacios, 2019; Lawless & Pellegrino, 2007; Zmuda, Curtis & Ullman, 2015) shown that acceptance and success of ICT based educational technologies to augment the learning process generally rooted in the preparation of the teachers. As Greeno, Collins, & Resnick (1996) indicated, the teaching tendencies of teachers are almost similar to what they experienced as students. The review of available literature revealed that although some studies (Carle, Jaffee & Miller, 2009; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Liu, 2011) claim that there are plenty of studies on technology integration in classroom practices, the scantiness of studies on teacher self-efficacy in technology integration seems as a problem. Regardless of the intensity of studies dealing with self-efficacy of teachers in technology integration, the review of available literature revealed that studies on self-efficacy beliefs of pre-service teachers on technology integration are somewhat neglected beside the studies dealing with technological pedagogical content knowledge (TPACK) initiated with the pioneering research of Mishra and Koehler (2006).

Moreover, most of the studies on the teachers' technology use implied that before engaging their profession, teachers should be educated and encouraged to use technology in their classrooms. As Kirschner & De Bruyckere (2017) stated, twenty-first-century education requires seamless and proper integration of technologies in teaching environments. Thus, increasing self-efficacy beliefs during the pre-service teacher education programs will ultimately lead to successful technology integration in the future (Abbitt, 2011) and may increase teacher's acceptance and use of current technologies in the education system (Holden & Rada, 2011). Therefore, examining the perceptions of pre-service teachers' self-efficacy on technology integration in their classrooms seems contributive to teacher education. Bearing such facts in mind, we believe that the pre-service teachers' self-efficacy in integrating technologies in their classrooms is worth examining to shed light on the future of technology integrated teaching.

Additionally, teachers might have developed preconceived notions during their pre-service education, and such beliefs might avert the usage and integration of technology in their classroom. Therefore examining their perceived self-efficacy on technology integration might provide the lens through which teacher educators confidently benefitted while reframing the teacher education curricula. Besides, as most of the studies in the field suggested, the more studies deal with the perspective of pre-service teachers to integrate the educational technologies into their classroom lead the more appreciated grounds for the education of digital native learners in the millennium. As studies endeavored to define the current levels of the pre-service teachers' technology integration self efficacies and provide support to their growth concerning their needs, the acculturation of the pedagogical paradigm shift might achieve its goals.

As Bandura (1977, p. 3) acknowledged, personal efficacy beliefs play a vital role in the thoughts and actions taken by people. If people do not believe in their power to change the outcomes of anything, they might not attempt to make things happen. Accordingly, pre-service teachers' perceived self-efficacy, which focuses on judgments of personal capability (Bandura, 1997) on technology integration, is worth to blueprint and form the impending methods of teaching the millennial learners. Hence, a particular focus on how pre-service teachers perceive their use and integration of technology in their future classrooms helps to gain an understanding of the status quo from a new window. Thus, the present study aims to figure out the perspectives of pre-service teachers about their self-efficacy in integrating educational technologies in their future profession. In line with this broad aim, the present study sought answers to the following research question and its sub-questions;

- What is the technology integration self-efficacy level of the pre-service teachers?
    - Is there any relationship between pre-service teachers' technology integration self-efficacy beliefs and their majors?
    - Is there any relationship between pre-service teachers' technology integration self-efficacy beliefs and their grade levels?
    - Is there any relationship between pre-service teachers' technology integration self-efficacy beliefs and their genders?

REVIEW OF LITERATURE

Ample studies have examined the various aspects of teachers' beliefs (Kim, Kim, Lee, Spector & DeMeester, 2013); however, the present study focused it on a narrower sense and examined the pre-service teachers' beliefs only associated with technology integration in the teaching environments. In one of those studies, Wang, Ertmer and Newby (2004) examined the impact of technology-integrated learning experiences on preservice teachers' self-efficacy for technology integration. They found that pre-service teacher's self-efficacy for technology integration increased when they educated on computer use in the classroom through observing exemplary technology-using teachers. Their findings indicated that teacher educators should be models for preservice teachers to learn about technology integration as such experiences help future teachers to develop the confidence needed to integrate technology effectively.

In another study, Abbitt and Klett (2007) scrutinized the factors that influence pre-service teachers' self-efficacy in technology integration and their attitudes towards technology integration in their future professions. Their findings revealed that the perceived comfort level with computer technology was a significant predictor of self-efficacy beliefs in regards to technology integration. One of the implications of their study is the need to have a pre-service education course that focuses on issues relating to technology integration.

Similarly, in an experimental study Abbitt (2011) examined the self-efficacy beliefs of pre-service teachers in technology integration. The findings of his research revealed that there was a strong, positive correlation between self-efficacy and technology integration tendencies of pre-service teachers. Additionally, the findings of the study showed that educating the pre-service teachers on some specific domains in technology use ultimately increased the pre-service teachers' self-efficacy beliefs in technology integration in the future.

Al-Awidi and Alghazo (2012) examined the role of pre-service teachers teaching experiences on their self-efficacy on technology integration and found that teaching experiences, especially mastery and vicarious experiences, significantly affected their self-efficacy in technology integration. That is, the teaching experiences of pre-service teachers help them foster their self-efficacy on technology integration since they were able to put into practice what they have learned during their teacher education. Similarly, Ozel and Arikan (2015) found that English language instructors reported that they used Web 2.0 tools, namely blogs, podcasts, wikis, and social networking in their personal lives. However, although they believed that these tools should be used in their classrooms as instructional tools, a vast majority of them stated that they were not used in their teaching environments efficiently.

In a similar vein, Niederhauser and Perkmen (2010) studied self-efficacy of teachers concerning technology integration and use, as well as technology outcome expectations regarding technology integration into teaching practice. Their findings revealed that teachers must become intrinsically motivated to use technology for its value in training students. Additionally, they found a balance between the self-efficacy of pre-service teachers and outcome expectations as long as teachers learn to gain new skills. That is, addressing outcome expectation issues help pre-service teachers provide the self-motivational force and self-efficacy that will help them seamlessly integrate technology.

As for the Turkish context, a review of the available literature revealed that there are plenty of studies dealing with teachers' technology integration attitudes besides the studies dealing with TPACK of teachers or pre-service teachers. However, it is observed that studies dealing with preservice teachers` self-efficacy on technology integration are rather scarce.

For instance, in one of those studies, the core focus of which is determining preservice teachers` techno-pedagogical knowledge competencies, Kabakci-Yurdakul (2011) found that the preservice teachers have high-level techno-pedagogical knowledge competencies which in turn indicates pre-service teachers have highly positive attitudes towards technology integration in their future classes.

Similarly, Unal's (2013) study, which examined the relationship between technology integration self-efficacy beliefs and techno-pedagogical competency of pre-service teachers, figured out a significant, positive, and high-level correlation between the technology integration self-efficacy beliefs and the techno-pedagogical competencies of the participants. Additionally, while the findings of the study show no significant difference in terms of department variable, gender and class variables depicted significant differences in preservice teachers' beliefs on technology integration self-efficacy.

In another study, Keser, Karaoglan-Yilmaz and Yilmaz (2015) investigated the technology integration self-efficacy perceptions and techno-pedagogical competency level of pre-service teachers and found that the pre-service teachers have high-level TPACK competence and self-efficacy perception about technology integration. Their study additionally showed that although there was a statistically significant difference in technology integration self-efficacy beliefs of pre-service teachers in terms of their grade levels, there was no statistically significant difference concerning the gender of the participants.

In a similar vein, **Isler** and Yildirim (2018) examined perceptions of pre-service EFL teachers on their technological pedagogical content knowledge and found that almost all of their participants found themselves as competent technology users and have an awareness of using technology in language teaching and learning conditions. As for technology integration, their findings revealed that almost all of the participants agree on the benefits of technology integration into English language teaching since they believed that technology integration enables individualized learning and makes learning enjoyable, engaging, and interactive.

Through examining pre-service teachers' views on technology integration, Bakac (2018) tried to determine the effect of self-directed learning tendencies of pre-service teachers on their self-efficacy beliefs of technology integration. The findings of the study revealed that pre-service teachers' self-directed learning tendencies are a significant predictor of their self-efficacy beliefs.

In their study, Birisci and Kul (2019) investigated the levels of techno-pedagogical competency and its relation with technology integration self-efficacy beliefs of teacher candidates enrolled at the pedagogical formation education program. The results of their study showed that participants had high levels of technology integration self-efficacy beliefs, with a high-level positive correlation with techno-pedagogical competency.

In brief, a review of the related literature revealed that self-efficacy beliefs influence preservice teachers' use and integration of technology. Nonetheless, some studies (Caliskan, 2017; Petko, Prasse, & Cantieni, 2018) pointed out that the teachers' readiness for technology integration has links to their knowledge and skills in their technology use. Additionally, while some studies (Abbitt & Klett, 2007; Gunduz & Odabasi, 2004) emphasized the role of technology courses in teacher education in increasing preservice teachers' self-efficacy in technology integration, some others (Al-Awidi and Alghazo, 2012; Arslan, 2012; Demir & Bozkurt, 2011; Niederhauser & Perkman, 2010; Paraskeva et al., 2008; Wang et al., 2004) highlighted that spending time using technology as well as having positive experience on technology use boosted pre-service teachers' self-efficacy in technology integration. Additionally, the studies dealt with the relationship between technology integration self-efficacy and TPACK of pre-service teachers found a significant correlation between these two aspects. On the whole, almost all of the studies in the related literature suggested that conducting new studies on the technology integration in the teaching environments, especially the studies with the participation of pre-service teachers will contribute to the growing body of the research on the field and shed light on the issue from different perspectives.

METHOD

Design of the Study

The present study adopted a non-experimental quantitative research design to illustrate the self-efficacy beliefs of pre-service teachers on technology integration. Primarily, the study was carried out in survey model, which is generally employed to "explore the characteristics of a situation, seek explanation and make deep inferences about a population" (Kelley, Clark, Brown, & Sitzia; 2003) through "questioning individuals on a topic or topics and then describing their responses" (Jackson, 2011, p. 17). The data of the study collected through a self-administered survey with Likert-type questions accompanied by some demographic questions. Additionally, to examine associative relationships among the variables and self-efficacy beliefs of pre-service teachers on technology integration, the correlation coefficient was computed.

Participants

The sample frame of the present study consisted of pre-service teachers studying four different teacher education programs in an education faculty of a state university in Turkey; nevertheless, the name of the university is not given here due to ethical concerns. The selection of the participants was based on

convenience sampling, which is a non-probabilistic sampling technique that depends on data collection from a population that is proximate to the researchers and conveniently available to participate in the study. The descriptive statistics for participants' demographic characteristics in line with their genders, grades, and programs are provided in Table 1.

Table 1. Descriptive statistics for participants' demographic characteristics

	Variable	Category	Frequency	Percent	Total
Participants' demographic information	Gender	Male	145	33	439
		Female	291	66	
		Missing Values	3	.7	
	Department	English Language Teacher Education	115	26.2	
		Primary School Teacher Education	115	26.2	
		Turkish Language Teacher Education	92	21	
		Science Teacher Education	117	26.7	
	Class	1st grade	114	26	
		2nd grade	104	23.7	
		3rd grade	110	25.1	
		4th grade	111	25.3	

As seen in the Table 1, a total of 439 pre-service teachers (male= 145, female= 291, missing value=3) who enrolled in 1st, 2nd, 3rd and 4th grades of English language teacher education (n=115), Primary school teacher education (n=115), Turkish language teacher education (n=92) and Science teacher education (117) programs have participated in the study on voluntary bases. As for their grade levels, while 114 participants were freshmen (1st grade), 104 of them were sophomore (2nd grade), 110 of them were junior (3rd grade), and 111 of them were senior (4th grade) pre-service teachers.

Data Collection Instruments

The data of the present study is collected using the *Technology Integration Self-Efficacy Scale* (TISES), which was initially developed by Wang, Ertmer and Newby (2004) and adopted into Turkish by Unal (2013). The Turkish version of TISES is a 5-point Likert scale which has 19 items inquiring technology integration self-efficacy of pre-service teachers in two factors, namely, *self-efficacy in using computer technologies* and *self-efficacy in making others use computer technology.* The adaptation of the original scale into Turkish was also studied by Unal and Teker (2018) in an article where the Cronbach alpha reliability coefficient was calculated as .936, and the item-total correlations coefficients of the scale was founded as ranged from .60 to .707. That is, Unal and Teker (2018) re-confirmed that the Turkish version of the *Technology Integration Self-Efficacy Scale* (T-TISES) is a valid and reliable instrument.

Although the reliability and validity estimations of the T-TISES were confirmed in two studies (Unal, 2013; Unal & Teker, 2018), the Cronbach's alpha internal consistency coefficient of the T-TISES should be re-computed for the present study, since the scale is administered to a different study group. Thus, an exploratory factor analysis (EFA) is run to obtain evidence about the construct of the scale.

As a result of the principal components factorization technique and varimax vertical rotation method in EFA, the two-factor structure explaining 56.89% of the total variance was found appropriate to the theoretical basis. The analysis revealed that while the factor loadings of the first Factor, which consisted of 13 items, ranged from .49 to .73, the factor loadings of the second Factor, which covered six items, ranged between .61 and .84. Upon collecting evidence for construct validity, the Cronbach alpha reliability coefficient was calculated as well. Consequently, the Cronbach's alpha reliability coefficients of the measures were found as .92 for Factor 1; .87 for Factor 2 and .945 for overall scale. Since the reliability coefficient of .70 and above is accepted as reliable (Domino & Domino, 2006), the reliability coefficients of the scale are considered as sufficient. In other words, the analysis revealed that the answers given by the participants are consistent, and the instrument is valid and reliable to gather the data since the scale holds the required psychometric features

for being used in the present study. The result of the exploratory factor analysis (EFA) run for the T-TISES that used in the present study is illustrated in Table 2.

Table 2. Exploratory factor analysis and reliability results

Factor	Items	Factor Loadings		Communalities	Cronbach Alpha Reliability
		Factor 1	Factor 2		
Self-efficacy in using computer technologies	19	.73		.65	.92
	17	.72		.65	
	12	.71		.78	
	11	.70		.73	
	18	.69		.66	
	14	.69		.72	
	15	.67		.67	
	13	.64		.72	
	16	.62		.74	
	8	.60		.75	
	10	.56		.75	
	9	.55		.72	
	7	.49		.61	
Variance Explained: 32.13 %					
Self-efficacy in making others use computer technologies	2		.84	.73	.87
	1		.82	.57	
	3		.69	.71	
	5		.63	.75	
	4		.63	.61	
	6		.61	.72	
Variance Explained: 23.76 %					
TOTAL VARIANCE EXPLAINED: 56.89 %					
Scale Overall Reliability: .945					

Data Analysis

As for figuring out the answer to the main research question, the mean score and standard deviation of the total scores gathered through T-*TISES* calculated using a statistical software program, and the results were employed to determine the overall technology integration self-efficacy levels of the participants. The technology integration self-efficacy levels of the participants were assessed in line with the criteria defined in Unal's (2013) study. That is, if mean scores obtained from the scale were below 48, the technology integration self-efficacy perceived as low; if they were ranging from 48 to 66, the self-efficacy regarded as undecided, and if the scores were above 66, then the technology integration self-efficacy level is considered to be high.

To answer the first sub-research question, which inquires the relationship between pre-service teachers' technology integration self-efficacy beliefs and their majors; and the second sub-research question, which probes the relationship between pre-service teachers' technology integration self-efficacy beliefs and their grade levels, the One-way ANOVA was run respectively, and their results are presented in the findings section. Finally, as for the third sub-research question, which sought the relationship between pre-service teachers' technology integration self-efficacy beliefs and their genders, an independent samples t-test was run, and its results are presented in the findings.

FINDINGS

The findings based on the statistical analysis of the data are presented in line with the research questions of the study. Since the answer to the main research question, which inquired the technology integration self-efficacy level of the pre-service teachers, depends on the responses of the succeeding sub-research questions, the layout of the presentations of the findings started with the answers of the sub-research questions.

As the first phase in the analysis of data related to the first sub-research question, the homogeneity of variances for the majors (departments) of the participants was computed, and its findings are illustrated in Table 3.

Table 3. Test of homogeneity of variances (majors)

	Levene Statistic	df1	df2	P
Factor 1	2.384	3	435	.069
Factor 2	3.780	3	435	.011
TISES	2.748	3	435	.042

As seen in Table 3, the Levene test results revealed that the p-value of Factor 1 was higher than .05; thus, the assumption of homogeneity of variances was provided. Therefore, Tukey posthoc multiple comparison test results are taken into account. As for Factor 2 and overall scale score (TISES), the p values were found lower than .05, which indicates that the assumption of homogeneity of variances is not provided. Hence, Games-Howell posthoc multiple comparison test results are considered for further analyses. The results of one-way ANOVA for the majors of the participants are displayed in Table 4.

Table 4. One-way ANOVA results by major

		Sum of Squares	df	$\bar{X}$	F	P	Significant relationships
Self-efficacy in using computer technologies (Factor 1)	Between Groups	712.175	3	237.392	3.374	.018	Science T.E. > Turkish L.T. E
	Within Groups	30610.628	435	70.369			
	Total	31322.802	438				
Self-efficacy in making others use computer technologies (Factor 2)	Between Groups	200.809	3	66.936	3.681	.012	Science T.E. > Turkish L.T.E.
	Within Groups	7910.299	435	18.185			
	Total	8111.108	438				
TISES (Scale total)	Between Groups	1467.237	3	489.079	3.465	.016	Science T.E. > Turkish L.T.E.
	Within Groups	61392.422	435	141.132			
	Total	62589.658	438				

According to one-way ANOVA analysis results -presented in Table 4-, there was a statistically significant difference across the majors in terms of *self-efficacy in using computer technologies, self-efficacy in making others use computer technology* and *technology integration self-efficacy (TISES)* since the significance values were below .05 for these groups. Additionally, to find out the majors that have a significant relationship, the posthoc test was computed. Concerning the results of the posthoc test, a meaningful relationship observed between the *Science Teacher Education program* and the *Turkish Language Teacher Education programs* ($p<.05$). The results of the descriptive statistics of one-way ANOVA in line with the majors of the participants are depicted in Table 5.

Table 5. Descriptive statistics of one-way ANOVA analysis by major

		N	$\bar{X}$	Sd	SE
Self-efficacy in using computer technologies (Factor 1)	English Language Teacher Education	115	48.9248	9.23936	.86157
	Primary School Teacher Education	115	49.6255	8.42675	.78580
	Turkish Language Teacher Education	92	48.3322	9.11742	.95056
	Science Teacher Education	117	51.7055	6.70769	.62013
	Total	439	49.7253	8.45655	.40361
Self-efficacy in making others use computer technologies (Factor 2)	English Language Teacher Education	115	22.4909	4.44364	.41437
	Primary School Teacher Education	115	21.8862	4.08197	.38065
	Turkish Language Teacher Education	92	20.9650	4.99096	.52034
	Science Teacher Education	117	22.8130	3.58752	.33167
	Total	439	22.0986	4.30331	.20539
TISES (Overall Scale)	English Language Teacher Education	115	71.4157	12.94078	1.20673
	Primary School Teacher Education	115	71.5117	11.75145	1.09583
	Turkish Language Teacher Education	92	69.2972	13.14204	1.37015
	Science Teacher Education	117	74.5185	9.66760	.89377
	Total	439	71.8238	11.97978	.57176

When the descriptive statistics in Table 5 were examined, it is seen that the significant difference between *the Science teacher education* and *the Turkish language teacher education* programs was in favor of the *Science teacher education program* in all of the variables. In other words, the pre-service teachers in the *Science teacher education program* outperformed than others in terms of *self-efficacy in using computer technologies, self-efficacy in making others use computer technology* and *the overall technology integration self-efficacy (TISES).* Consequently, the findings revealed that the pre-service teachers studying in the Turkish language teacher education program showed the lowest scores in all factors.

The present study sought answers to whether there is a meaningful relationship between the pre-service teachers' technology integration self-efficacy beliefs and their grade levels as well. Thus, the homogeneity of variances for the grade levels of the participants was tested initially, and its findings are illustrated in Table 6.

Table 6 Test of homogeneity of variances (grade)

	Levene Statistic	df1	df2	P
Factor 1	5.722	3	435	.001
Factor 2	7.088	3	435	.000
TISES	5.504	3	435	.001

As seen in Table 6, the Levene test results revealed that the p values of all the groups were lower than .05, and the assumption of homogeneity of variances was not provided. Therefore, Games-Howell post hoc multiple comparison test results were considered. The results of one-way ANOVA for the grade levels of the participants are displayed in Table 7.

Table 7. One-way ANOVA results by grade

		Sum of Squares	df	$\bar{X}$	F	P	Significant relationships
Self-efficacy in using computer technologies (Factor 1)	Between Groups	973.486	3	324.495	4.651	.003	1<4, 3<4
	Within Groups	30349.316	435	69.769			
	Total	31322.802	438				
Self-efficacy in making others use computer technology (Factor 2)	Between Groups	229.396	3	76.465	4.220	.006	1<4
	Within Groups	7881.712	435	18.119			
	Total	8111.108	438				
T-TISES (Scale total)	Between Groups	2123.151	3	707.717	5.069	.002	1<4, 3<4
	Within Groups	60736.507	435	139.624			
	Total	62859.658	438				

According to one-way ANOVA analysis results, presented in Table 7, the significance values were below .05 for the groups, which in turn indicates that there is a statistically significant difference across grade levels in terms of *self-efficacy in using computer technologies, self-efficacy in making others use computer technology* and *overall technology integration self-efficacy (TISES)*. Additionally, the posthoc test was computed for further analysis to figure out the grade levels that have significant relationships. The posthoc test results revealed that there were meaningful relationships between *1st grade and 4th grade, and 3rd grade and 4th grade* ($p<.05$) in Factor 1 and overall score. However, the only significant difference was observed between 1st grade and 4th grade in Factor 2.

The results of the descriptive statistics of one-way ANOVA in line with the grade levels of the participants are illustrated in Table 8.

Table 8. Descriptive statistics of one-way ANOVA analysis by grade

		N	$\bar{X}$	Sd	SE
Self-efficacy in using computer technologies	1st Grade	114	48,2471	8,87549	,83127
	2nd Grade	104	49,7830	8,65685	,84887
	3rd Grade	110	48,7991	9,62948	,91814
	4th Grade	111	52,1071	5,73795	,54462
	Total	439	49,7253	8,45655	,40361
Self-efficacy in making others use computer technologies	1st Grade	114	21,3206	4,14631	,38834
	2nd Grade	104	21,9124	4,90666	,48114
	3rd Grade	110	21,8985	4,74233	,45216
	4th Grade	111	23,2703	3,02699	,28731
	Total	439	22,0986	4,30331	,20539
TISES	1st Grade	114	69,5677	12,32269	1,15413
	2nd Grade	104	71,6954	12,55220	1,23084
	3rd Grade	110	70,6976	13,64463	1,30096
	4th Grade	111	75,3774	8,00909	,76019
	Total	439	71,8238	11,97978	,57176

When the descriptive statistics in Table 8 are examined, a significant difference between 1-4 and 3-4 grade levels, which was in favor of the 4th grades in all the variables, is seen. That is, the senior pre-service teachers showed firmer self-efficacy beliefs than others in terms of using computer technologies, making others use computer technology, and integrating computer technologies.

As for the relationship between pre-service teachers' technology integration self-efficacy beliefs and their genders, independent samples t-test was run, and its results are presented in Table 9.

Table 9. Independent samples t-test results by gender

	Group Statistics				Independent Samples t-test		
	Gender	N	$\bar{X}$	Sd	t	df	P
Self-efficacy in using computer technologies	Female	291	49.48	8.25	-,752	434	.452
	Male	145	50.13	8.92			
Self-efficacy in making others use computer technology	Female	291	21.83	4.24	-1,838	434	.067
	Male	145	22.63	4.42			
TISES	Female	291	71.31	11.7	-1,190	434	.235
	Male	145	72.76	12.58			

As depicted in Table 9, the independent-samples t-test results based on the gender of the participants revealed that there was not any significant difference between groups for all factors and the overall scores of the scale ($p > .05$). That is, the participants' gender does not have any impact on their self-efficacy beliefs in using computer technologies and making others use computer technologies or on their technology integration self-efficacy beliefs. On the other hand, the analysis revealed that male participants possessed slightly higher mean values in sub-scales and the total scores of the scale. Nevertheless, since the significance value was higher than .05, the difference was not statistically meaningful.

CONCLUSION AND DISCUSSION

The analysis of the gathered data for the present study, which questioned the technology integration self-efficacy of pre-service teachers, revealed that pre-service teachers enrolled in different teacher education programs of a state university have a high degree of self-efficacy in technology integration into their teaching environments. As for the independent variables of the present study, which are majors, grade levels, and gender of the participants, the findings revealed that while majors and grade levels show a significant difference on the technology integration self-efficacy level of the pre-service teachers, the gender variable did not show any significant difference.

When the findings examined in detail, although the overall scores of pre-service teachers on their *technology integration self-efficacy* seem considerably high, their self-efficacies in *using computer technologies* found slightly around average levels, and *their self-efficacy in making others use computer technologies* is rather in low degrees. These findings show somehow similarities with previous studies conducted in a similar context. For instance, as for having a high degree of technology self-efficacy the results of the present study show similarities with the findings of Kabakci-Yurdakul (2011), Unal (2013), Keser, Karaoglan-Yilmaz and Yilmaz (2015), **Isler** and Yildirim (2018) and Birisci and Kul (2019).

The findings of the present study additionally revealed that the majors (departments) of the participants play a significant role in the technology integration self-efficacy of the participants. For instance, the pre-service teachers enrolled in the Science teacher education program ($\bar{x}$=74.51) outperformed than others, the pre-service teachers in the Primary school teacher education ($\bar{x}$=71.51), the English language teacher education ($\bar{x}$=71.41) and the Turkish language teacher education ($\bar{x}$=69.29). This finding, which revealed that majors of the pre-service teachers play a significant role in their technology integration self-efficacy, shows dissimilarity with the findings of Unal's (2013) study in which it is found that majors of the participants have not a significant role in the technology integration self-efficacy of pre-service teachers.

Although the courses related to technology use and other teaching profession-oriented courses have more or less parallel curriculums in all the majors within the study group, the findings depicted that there are significant differences concerning the majors of the participants. Thus, further studies should examine the possible reasons behind the significant difference found in line with the majors of the participants in detail.

When the findings concerning the grade levels of the participants were examined, the results of the analysis revealed that there is a statistically significant difference across grade levels in terms of *self-efficacy in using computer technologies, self-efficacy in making others use computer technology* and *overall technology integration self-efficacy.* That is, the descriptive statistics exposed that there is a significant difference between 1-4 and 3-4 grade levels, which was in favor of the 4th grades in all the variables. In other words, the senior pre-service teachers showed firmer self-efficacy beliefs than others in terms of *using computer technologies*, *making others use computer technology*, and *integrating computer technologies*. The reason behind such a finding might stem from the experience of the pre-service teachers in using and making others use the computer technologies throughout their teaching practice courses in which pre-service teachers were practicing the teaching in real environments. This finding of the present study show similarities with the results of studies conducted by Unal (2013) and Keser, Karaoglan-Yilmaz and Yilmaz (2015). Likewise, this finding of the present study confirms the inferences of Wang, Ertmer and Newby (2004), who claimed that pre-service teacher's self-efficacy for technology integration increased when they observe exemplary technology-using teachers and Al-Awidi and Alghazo (2012), who claimed that teaching experiences especially mastery and vicarious experiences significantly affected the pre-service teachers' self-efficacy in technology integration.

As for the role of gender in pre-service teachers' technology integration self-efficacy beliefs, the findings of the present study found that there was not any significant difference between groups for all factors and the overall scores of the scale ($p>.05$). In other words, the participants' gender does not have any impact on their self-efficacy beliefs in using computer technologies and making others use computer technologies or on their technology integration self-efficacy beliefs. Although the further analysis of gender depicted that male participants possessed slightly higher mean values in sub-scales and the overall scores, the difference was not statistically meaningful. The findings of the present study concerning the gender variable show similarities with results of Keser, Karaoglan-Yilmaz and Yilmaz (2015) who found no statistically significant difference, whereas, there seem a dissimilarity with the findings of Unal (2013) who found significant differences in preservice teachers' beliefs on technology integration self-efficacy concerning the gender of the participants.

All in all, the present study revealed in general that pre-service teachers have technology integration self-efficacy to some extent, and this self-efficacy progressively amplified through the advancement in the grade levels of the pre-service teachers. Moreover, the majors and the grade levels of the participants seem to have some effects on the technology integration self-efficacy of the pre-service teachers. Concerning the overall findings of the present study, we can claim that pre-service teachers are ready to integrate the technology into their future classrooms, although they have some downsides in making others use the technology. Thus, it can be suggested that the pre-service teacher education institutions should schedule some further initiatives to enhance the pre-service teachers' technology integration skills, especially in making others use the technology in the teaching environments.

BIODATA and CONTACT ADDRESSES of AUTHORS

Dr. Mustafa CANER is an Associate Professor on Open and Distance Education in Higher Education and currently working at English Language Teacher Education department at Akdeniz University, Turkey. Dr. Caner holds bachelor's and master's degrees in ELT from Ondokuz Mayis University, Turkey, and a Ph.D. degree in ELT from Anadolu University, Turkey. His areas of research include issues concerning foreign language teacher education and technology use in foreign language education. He has various research articles published in international refereed journals and book chapters covering topics such as blended learning, distance education, and teacher education.

Mustafa CANER
Akdeniz University, Faculty of Education
Address: English Language Teacher Education Program,
07070 Antalya, Turkey
Phone: +90 242 3102082
E-mail: mcaner@akdeniz.edu.tr

Dr. Sinan AYDIN is an Associate Professor of Open and Distance Education at Open Education Faculty, Anadolu University. Dr. Aydin, who completed his bachelors and masters education in Industrial Engineering gained his Ph.D. in Quantitative Methods at January, 2008. He has been teaching database management systems, computer programming and business analytics courses. He is working on applications of AI and ML in open education system.

Sinan AYDIN
Anadolu University
Address: Open Education Faculty,
26470, Eskisehir, Turkey
Phone: +90 222 335 05 80 #2599
E-mail: snaydin@anadolu.edu.tr

REFERENCES

Abbitt, J. T., & Klett, M. D. (2007). Identifying influences on attitudes and self-efficacy beliefs towards technology integration among pre-service educators. *Electronic Journal for the integration of technology in Education, 6*(1), 28-42.

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

Al-Awidi, H. M., & Alghazo, I. M. (2012). The effect of student teaching experience on preservice elementary teachers' self-efficacy beliefs for technology integration in the UAE. *Educational Technology Research and Development, 60*(5), 923-941. doi: 10.1007/s11423-012-9239-4

Agodini, R., Dynarski, M., Honey, M., & Levin, D. (2003). The effectiveness of educational technology: Issues and recommendations for the national study. Princeton, NJ: Mathematica Policy Research.

Arslan, A. (2012). Predictive power of the sources of primary school students' self-efficacy beliefs on their self-efficacy beliefs for learning and performance. *Educational Sciences: Theory & Practice, 12*(3), 1907-1920.

Bain, R. (1937). Technology and state government. *American Sociological Review, 2*(6), 860-874. doi: 10.2307/2084365

Bakac, E. (2018). The impact on technology integration self-efficacy beliefs of prospective teachers' self-directed learning trends with technology. *European Journal of Education Studies, 4*(12), 72-86. doi: 10.5281/zenodo.1341050

Bandura, A. (1997). Self-efficacy: The exercise of control. New York, NY: W.H. Freeman and Company.

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology*, *39*(5), 775–786. doi: 10.1111/j.1467-8535.2007.00793.x

Birisci, S., & Kul, U. (2019). Predictors of technology integration self-efficacy beliefs of preservice teachers. *Contemporary Educational Technology, 10*(1), 75-93. doi: 10.30935/cet.512537

Brown, C., & Czerniewicz, L. (2010). Debunking the 'digital natives': Beyond digital apartheid, towards digital democracy. *Journal of Computer Assisted Learning*, *26*(5), 357-369. doi: 10.1111/j.1365-2729.2010.00369.x

Carle, A.C., Jaffee, D. & Miller, D. (2009). Engaging college science students and changing academic achievement with technology: a quasi-experimental preliminary investigation. *Computers & Education, 52*(2), 376- 380. doi: 10.1016/j.compedu.2008.09.005

Chen, C.-H. (2008). Why do teachers not practice what they believe regarding technology integration? *The Journal of Educational Research, 102*(1), 65-75. doi: 10.3200/JOER.102.1.65-75

Caliskan, E. (2017). *A Study on E-Readiness of Teachers in Language Classroom*s. (Unpublished master's thesis) Graduate School of Educational Sciences, Akdeniz University: Antalya.

Demir, S. & Bozkurt, A. (2011). Primary mathematics teachers' views about their competencies concerning the integration of technology. *Elementary Education Online, 10*(3), 850-860.

Domino, G., & Domino, M. L. (2006). Psychological testing: An introduction. New York: Cambridge University Press.

Earle, R. S. (2002). The Integration of instructional technology into public education: promises and challenges. *Educational Technology*, *42*(1), 5-13.

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. doi: 10.1007/BF02299597

Ertmer, P.A., Ottenbreit-Leftwich, A.T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423–435. doi: 10.1016/j.compedu.2012.02.001

Fisher, T. (2006). Educational transformation: It is like "beauty" in the eye of the beholder, or will we know it when we see it? *Education and Information Technologies, 11*(3), 293-303. doi: 10.1007/s10639-006-9009-1

Fullan, M. (2013). Stratosphere: Integrating technology, pedagogy, and change knowledge. Toronto, Canada: Pearson Canada, Inc.

Greeno, J. G., Collins, A. M., & Resnick, L. (1996). Cognition and learning. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 15–46). New York, NY: Simon & Schuster Macmillan.

Gulbahar, Y. (2007). Technology planning: a roadmap to successful technology integration in schools. *Computers & Education, 49*(4), 943-956. doi: 10.1016/j.compedu.2005.12.002

Gunduz, S. & Odabasi, F. (2004). The importance of instructional technologies and material development course at pre-service teacher education in information age. *The Turkish Online Journal of Educational Technology, 3*(1), 43-48.

Hall, A. B. & Trespalacios, J. (2019). Personalized professional learning and teacher self-efficacy for integrating technology in K–12 classrooms. *Journal of Digital Learning in Teacher Education*, *35*(4), 221-235. doi: 10.1080/21532974.2019.1647579

Hermans, R., Tondeur, J., van Braak, J., & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & Education, 51*(4), 1499-1509. doi:10.1016/j.compedu.2008.02.001

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. doi:10.1007/s11423-006-9022-5

Holden, H. & Rada, R. (2011). Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance. *Journal of Research on Technology in Education, 43*(4), 343-367. doi: 10.1080/15391523.2011.10782576

Isler, C & Yildirim, O. (2018). Perceptions of Turkish pre-service EFL teachers on their technological pedagogical content knowledge. *Journal of Education and Future, 13*, 145-160.

Jackson, S.L. (2011). Research methods and statistics: A critical approach. (4th edition). Cengage Learning.

Kabakci-Yurdakul, I. (2011). **Ogretmen** adaylarinin teknopedagojik egitim yeterliklerinin bilgi ve iletisim teknolojilerini kullanimlari acisindan incelenmesi. *Hacettepe* Universitesi *Egitim Fakultesi Dergisi, 40*, 397-408.

Kagan, D. M. (1992). Implications of research on teacher belief. *Educational Psychologist, 27*(1), 65-90. doi: 10.1207/s15326985ep2701_6

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care, 15*(3), 261-266. doi: 10.1093/intqhc/mzg031

Kennedy, G. E., Judd, T. S., Churchward, A., Gray, K., & Krause, K. D. (2008). First-year students' experiences with technology: Are they really digital natives? *Australasian Journal of Educational Technology*, *24*(1), 108-122. doi: 10.14742/ajet.1233

Keser, H., Karaoglan-Yilmaz, F. G. & Yilmaz, R. (2015). TPACK competencies and technology integration self-efficacy perceptions of pre-service teachers. *Elementary Education Online, 14*(4), 1193-1207. doi: 10.17051/io.2015.65067

Kim, C-M, Kim, M-K, Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education, 29*, 76-85. doi: 10.1016/j.tate.2012.08.005

Kirschner, P. A. & De Bruyckere, P. (2017). The myths of the digital native and the multitasker. *Teaching and Teacher Education, 67*, 135-142. doi: 10.1016/j.tate.2017.06.001

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. doi: 10.3102/0034654307309921

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, 38*(1), 1-21. doi: 10.1007/s11251-008-9075-4

Li, Y., & Ranieri, M. (2010). Are "digital natives" really digitally competent?-A study on Chinese teenagers. *British Journal of Educational Technology*, *41*(6), 1029–1042. doi: 10.1111/j.1467-8535.2009.01053.x

Lim, C.-P., Zhao, Y., Tondeur, J., Chai, C.-S., & Tsai, C.-C. (2013). Bridging the gap: Technology trends and use of technology in schools. *Educational Technology & Society, 16* (2), 59–68.

Liu, S.H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers & Education, 56,* 1012-1022. doi: 10.1016/j.compedu.2010.12.001

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teacher College Record, 108*, 1017-1054. doi: 10.1111/j.1467-9620.2006.00684.x

Niederhauser, D. S., & Perkmen, S. (2010). Beyond self-efficacy: Measuring pre-service teachers' instructional technology outcome expectations. C*omputers in Human Behavior, 26*(3), 436-442. doi: 10.1016/j.chb.2009.12.002

Ozel, A. G., & Arikan, A. (2015). The use of the Internet and web 2.0 tools among EFL instructors. *Mediterranean Journal of Humanities, 5*(1), 313-325. doi: 10.13114/MJH.2015111386

Pajares, M. F. (1992). Teachers' beliefs and educational research: cleaning up a messy construct. *Review of Educational Research, 62*(3), 307-332. doi: 10.3102/00346543062003307

Palak, D. & Walls, R.T. (2009). Teachers' beliefs and technology practices: a mixed-methods approach. *Journal of Research on Technology in Education, 41*(4), 417-441. doi: 10.1080/15391523.2009.10782537

Paraskeva, F., Bouta, H., & Papagianni, A. (2008). Individual characteristics and computer self-efficacy in secondary education teachers to integrate technology in educational practice. *Computers & Education*, *50*(3), 1084-1091. doi: 10.1016/j.compedu.2006.10.006

Petko, D., Prasse, D., & Cantieni, A. (2018). The interplay of school readiness and teacher readiness for educational technology integration: A structural equation model. *Computers in the Schools*, *35,* 1-18. doi: 10.1080/07380569.2018.1428007

Picciano, A. G. (2006). Online learning: Implications for higher education pedagogy and policy. *Journal of Thought, 41*(1), 75-94.

Prenksy, M. (2001). Digital natives, digital immigrants. *On the Horizon*, *9*(5), 1– 6. doi: 10.1108/10748120110424816

Richey, R. C., Silber, K., & Ely, D. P. (2008). Reflections on the 2008 AECT definitions of the field. *TechTrends, 52*(1), 24–25. doi: 10.1007/s11528-008-0108-2

Sandholtz, J. H., Ringstaff, D., & Dwyer, D. C. (1997). Teaching with technology: Creating student-centered classrooms. New York: Teachers College Press.

Spector, J. M. (2015). Foundations of educational technology: Integrative approaches and interdisciplinary perspectives. Routledge.

Unal, E. (2013). *An examination of the relationship between preservice teachers' perceptions of technology integration self-efficacy and technological pedagogical content knowledge competencies* (Unpublished master's dissertation). Graduate School of Educational Sciences, Ankara University, Ankara.

Unal, E & Teker, N. (2018). Teknoloji entegrasyonuna yonelik **oz-yeterlik** algisi **olceginin** Turkceye uyarlanmasi [The adaption of technology integration self-efficacy scale into Turkish]. *Anemon Mus Alparslan* Universitesi *Sosyal Bilimler Dergisi, 6*(6), 973–978.

Volti, R. (2009). Society and Technological Change (7th ed.). New York: Worth Publishers.

Wahab, S.A., Rose, R.C., & Osman, S. I. W. (2012). Defining the concepts of technology and technology transfer: A literature analysis. *International Business Research, 5*(1), 61-71. doi: 10.5539/ibr.v5n1p61

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education, 36*(3), 231-252. doi: 10.1080/15391523.2004.10782414

Wozney, L., Venkatesch, V., & Abrami, P. C. (2006). Implementing computer technologies: Teachers' perceptions and practices. *Journal of Technology and Teacher Education, 14*(1), 173-207.

Zhao, Y. & Frank, K. A. (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Research, 40*(4), 807-840. doi: 10.3102/00028312040004807

Zmuda, A., Curtis, G., & Ullman, D. (2015). Learning personalized: The evolution of the contemporary classroom. San Francisco, CA: Jossey-Bass.