Investigation of Pre-Service Social Studies Teachers' Perceptions of Technology Integration Self-Efficacy and Technology Acceptance Levels with Regard to Various Variables[1]

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Abstract
The aim of this study was to investigate pre-service social studies teachers' self-efficacy perceptions towards the integration of technology in education and their technology acceptance levels in terms of different variables (gender, grade, level of interest in technological innovations, training on the use of technology in education) and to reveal whether there was a significant relationship between them.181 pre-service social studies teachers studying at 3 different universities from 3 different regions in Turkey participated in the study which was designed in accordance with the relational survey and causal comparative models. The participation was on a voluntarily basis and the participants were selected using convenience sampling method. The data were collected through Computer Technology Integration Survey and Technology Acceptance Measure for Pre-service Teachers. SPSS 20 was used in data analysis. The results showed that gender had a significant effect on self-efficacy perceptions whereas it did not play a role in acceptance levels. In addition, it was found that although grade level did not have a significant effect on self-efficacy perception, it played a significant role in acceptance levels. Furthermore, the level of interest in technological innovations was found to have a significant effect on self-efficacy perceptions. It was also found that training on the use of technology in education had a significant impact on both self-efficacy perceptions and acceptance levels. Finally, this study revealed a positive moderate relationship between self-efficacy perceptions towards technology integration and technology acceptance levels of the participants

Keywords: Social Studies, Technology Integration, Education, Self-Efficacy Perception Technology Acceptance

Introduction

Nowadays, the concept of technology, which is directly or indirectly related to several fields and disciplines, is frequently associated with education. It can be put forward that integrating technology into all stages of education, from planning to implementation and evaluation, is now an obligation. Recent technological tools and software offer ground-breaking opportunities for educational activities. A number of factors play a role in obtaining maximum benefit of these opportunities in classrooms. Technology-related competencies of teachers, who are practitioners of educational activities, are among the most significant of these factors since the competencies of the teachers will be decisive in reaching the educational goals determined in curriculum.

1. This study is produced from the first author's PhD thesis.

The increase in nation-wide closures throughout the world, especially with the Covid-19 pandemic, has increased the use of digital technologies (Öztürk, 2021), and therefore individuals from all spheres of life have had their lives with these technologies. This situation has paved the way to the development of teaching and learning activities based on digital technologies in education process (Zakrzewski & Newton, 2022).Students and teachers at all educational stages have involved in online education, and accordingly, the role of technology in education has become more questioned (Tavil and Koşansu 2022).

In the last three decades, especially with the increase in the use of digital technologies in education, there has been an increase in the number of scientific studies, theses, educational practices, technology-supported education materials and distance education systems (Taş, 2022). These studies often examined the relationship between education and technology and focused on how technology would be used in education. The forms of technology integration into education has been another topic of interest. Sezer, Şanlı, Pınar, and Kara (2022), define the integration of technology into education and training processes as the student's interaction with technology at an advanced level, using technology, feeling it through sensory organs, performing operations through applications and receiving feedback. In addition, Maddux and Johnson (2006) put forward a classification-based definition and dealt with the use of technology in education in two dimensions. Accordingly, the situation in which teacher is at the center of the learning processes and technology is used by the teacher is called Type I. In contrast, Type II refers to a situation where the student performs the learning activity using technology and the learning activity cannot be done without that technology. Type II usage is defined as technology integration. Type II is defined as technology integration. In Type II, students actively manage their learning and reflect what they have learned with technology (Tezci, 2016). In this sense, Type II integration is desired in learning environments as it offers a high level of interaction between students, instructors and technology. Duttdoner, Allen, and Corcoran (2005) argues that the use and application of Type II integration in education improves learning.

Different integration models have also been developed in order to increase student success with the integration of technology into education (Mohebi, 2021).The examination of these models showed that teachers need to possess pedagogical knowledge, content knowledge, technological knowledge and infrastructure (Mazman & Usluel 2011).Undoubtedly, pre-service teachers, as future teachers, are expected to develop these skills and knowledge. The quality of training pre-service teachers receive in their undergraduate education will directly influence their competencies in the role of teacher during their in-service training period. In this context, it is important that pre-service teachers take part in the real learning environment in a qualified manner in terms of technological competencies. In this sense, pre-service teachers should be actively involved in the real learning environment in order to acquire technological competencies. In this context, Technological Pedagogical Content Knowledge (TPACK) Model is the most widely used teacher efficacy model in the literature (Çelik, Sahin, & Aktürk, 2014; Aktürk & Öztürk, 2019).The model, which consists of three main components: content knowledge, technological knowledge and pedagogical knowledge, aims to improve the effective use technology in teaching environments by combining it with content and pedagogical knowledge (Mutlu, Polat & Alan, 2019; Hill & Uribe-Florez, 2020).

According to Çırak and Demir (2014), teachers are expected to possess these competencies and be aware of them in order to develop digital competencies in students. Accordingly, a number digital competencies that should be acquired by students were defined under the title of competencies in Social Studies Curriculum developed and put into practice in Turkey in 2018 (MEB, 2018).However, Zabolotska, Zhyliak, Hevchuk, Petrenko, and Alieko (2021)argued that digital competencies do not play an important role in education. The studies on the integration of instructional technologies into social studies courses in Turkey have revealed thatmostly Type I level of technology is used in social studies classrooms (Sezer & Koluman, 2015; Şanlı, Sezer & Pınar, 2016; Sezer, İnel, & Gökalp, 2020). Therefore,technology integration competencies of

teachers and pre-service teachers in Turkey should be examined. Especially, investigating the self-efficacy for technology integration of pre-service teachers who received education based on 2018 social studies curriculum is of crucial importance. In addition, it is also important to determine the level of technology acceptance in terms of self-efficacy regarding technology integration in education for the social studies course. In this context, this study dealt with teachers' use of technology and the factors affecting their usage behaviors as well as technology acceptance levels, which were developed to explain the voluntary behaviors of individuals regarding technology and which were also discussed in different studies in the literature (Davis, 1985; Davis, Bogazzi ve Warshaw 1989; Ursavaş, Şahin & McIlroy 2014).The aim of this study was to examine pre-service social studies teachers' perceptions of technology integration self-efficacy in education and their level of technology acceptance in terms of different variables (gender, grade, level of interest in technological innovations, getting training for the use of technology in education) and to reveal whether there was a relationship between them.

Method

Research Model

Relational survey model and causal comparative design, among the quantitative research approaches, was adopted in the study. Relational survey model was used to investigate the relationship between technology acceptance levels and technology integration perceptions of pre-service Social Studies teachers. According to Johnson (2001), in the relational survey model, the situation or event under investigation is examined in its current conditions and whether there is a relationship between the variables in the research is tested. In addition, causal comparative procedures were used to determine whether pre-service Social Studies teachers' self-efficacy perception levels towards technology integration and technology acceptance levels changed with regard to gender, grade, level of interest in technological innovations, and training on the use of technology in education. Karasar (2016) states that in causal comparison studies, groups are formed between at least two variables with regard to the independent variable and whether there is a difference between the groups in terms of the dependent variable is investigated.

Study Group

181 pre-service Social Studies teachers studying at 3 different universities in Turkey participated in the study. Participants was on a voluntary basis and the convenience sampling method, one of the non-random sampling methods, was used in sample selection. Büyüköztürk et al., (2009) defined the convenience sampling method as the selection of the sample from easily accessible and applicable units due to time, money and labor restrictions. Demographic characteristics of the participants is presented in Table 1.

Table 1 Demographic Characteristics of the Participants

Demographics		F	%
Gender	Male	56	30.9
	Female	125	69.1
Grade	1st Grade	68	37.6
	2nd Grade	30	16.6
	3rd Grade	23	12.7
	4th Grade	60	33.1
Level of Interest in Technological Innovations	Low	9	5
	Moderate	66	36.5
	High	78	43.1
	Very High	28	15.5
Training on the Use of Technology in Education	Yes	104	57.5
	No	77	42.5

Data Collection Tools

Two different tools were used in data collection. In this context, necessary permissions were obtained from the developers of the tools. The data were collected through Google Surveys. The first part of both scales consisted of the demographic information of the participants. The features of the scales are as follows:

Computer Technology Integration Survey

Computer Technology Integration Survey was developed by Wang, Ertmer and Newby (2004)

and adapted into Turkish by Ünal and Teker (2018).A 5-point Likert-style scale was developed to measure pre-service teachers' self-efficacy beliefs for technology integration. It is graded from 1 (strongly disagree) to 5 (strongly agree). The 19-item scale consists of two sub-dimensions: Computer Technology Capabilities and Strategies (13 items) and External Influences of Computer Technology Use (6 Items).The reliability of the scale was calculated using the Cronbach's Alpha internal consistency coefficient which was found as 0.94. A high score on the scale indicates that the pre-service teacher has a high self-efficacy perception towards technology integration.

Technology Acceptance Measure for Pre-service Teachers:

The "Technology Acceptance Measure for Pre-service Teachers"was developed by Ursavaş, Şahin and McIlroy (2014) and consists of 38 items. The aim of the 5-point Likert-style scale is to examine pre-service teachers' technology use and acceptance. The scale is graded from 1 (strongly disagree) to 5 (strongly agree)and has 11 sub-dimension: perceived usefulness, perceived ease of use, perceived enjoyment, anxiety, intention, compatibility,technological complexity, subjective norms, facilitating conditions, attitude towards use and self-efficacy. The reliability of the scale was calculated through the Cronbach's Alpha internal consistency coefficient which was found to be 0.92.A high score on the scale indicates that the pre-service teacher has technology acceptance.

Data Analysis

Skewness and kurtosis coefficients were used to examine whether the data had a normal distribution or not.Huck (2012) stated that a skewness and kurtosis value between -1 and +1, indicates that the data is normally distributed. Skewness and kurtosis values are shown in Table 2.

As shown in Table 2, the skewness and kurtosis values of the scales were between -1 and +1, which proved that the data had a normal distribution. Therefore, in addition to descriptive statistics, parametric tests were used in data analysis. Accordingly, independent sample t-test and one-way analysis of variance (One-Way ANOVA) was used to examine whether there was a significant difference between the groups. Furthermore, in order to reveal the source of difference Post-Hoc tests were performed. Finally, the Pearson product-moment correlation was also performed in order to examine the relationship between technology integration perceptions and technology acceptance levels of the participants.

Table 2 Skewness and Kurtosis Values of Scales

	Computer Technology Integration Survey	Technology Acceptance Measure for Pre-service Teachers
Skewness	.181	.181
Kurtosis	.359	.359

Findings

In this section, the findings are presented in tables and explanations for each table are provided. The results were presented in relation to the gender, grade, level of interest in technological innovations, and training on the use of technology in education Technology Acceptance Levels and Perceptions of Self-Efficacy towards Integration of Technology into Education by Gender

Table 3 T-test results of Computer Technology Integration Survey with regard to gender

Gender	N	X	S	sd	t	p
Male	56	4.14	.60	179	2.29	.02
Female	125	3.89	.72			

An independent sample t-test was conducted to examine the self-efficacy perceptions of the participants towards the integration of technology into education by gender. The results revealed a significant difference in favor of male participants [$t(179)=2.29$, $p<.05$]. It was found that male participants' self-efficacy perceptions towards integration of technology into education [X=4.14] were higher than those of female participants [X=3.89].

Table 4 T-test results of Technology Acceptance Measure for Pre-service Teachers with Regard to Gender

Gender	N	X	S	sd	t	p
Male	56	3.77	.57	179	.38	.7
Female	125	3.80	.44			

An Independent sample t-test was performed to investigate the technology acceptance levels of the participants by gender. The results showed that technology acceptance levels did not differ by gender [t(179)=.38, p>.05]. In other words, the technology acceptance levels of male and female participants were comparable.

Technology Acceptance Levels and Perceptions of Self-Efficacy towards Integration of Technology into Education by Grade

Table 5 ANOVA results of Computer Technology Integration Survey with Regard to Grade

Source of the variance	Sum of Squares	sd	Mean Squares	F	p	Difference
Between Groups	.666	3	.222	0.453	.715	-
Within Group	86.647	177	.490			
Total	87.312	180				

One-Way ANOVA test was performed to investigate the self-efficacy perceptions of the participants towards the integration of technology into education by grade level. The findings showed that there was no difference between Computer Technology Integration Survey scores of the participants in terms of grade [F(3, 177)=.7, p>.05]. In other words, the technology integration self-efficacy of the participants studying at different grades was quite similar.

Table 6 ANOVA results of Technology Acceptance Measure for Pre-service Teachers with Regard to Grade

Source of the variance	Sum of Squares	sd	Mean Squares	F	p	Difference
Between Groups	5.826	3	1.942	9.383	.00	[2]>[3], [2]>[4], [3]>[4]
Within Group	36.633	177	.207			
Total	42.459	180				

A One-Way ANOVA analysis was conducted to examine the technology acceptance levels of the participants by grade levels. The results showed that there was a significant difference between the technology acceptance scores of the participants in terms of grade level [F(3, 177)= 9.383, p<.05]. In order to identify the source of this difference, Scheffe Post-Hoc test was performed. It was found that the participants in 2nd Grade had significantly more technology acceptance that those in 3rd and 4th Grades. In addition, technology acceptance levels of participants in 3rd Grade were significantly higher than those in 4th Grade.

Technology Acceptance Levels and Self-Efficacy Perceptions towards Integration of Technology into Education by Level of Interest in Technological Innovations

Table 7 ANOVA results of Computer Technology Integration Survey with Regard to level of Interest in Technological Innovations

Source of the variance	Sum of Squares	sd	Mean Squares	F	p	Difference
Between Groups	24.727	3	8.242	23.310	.00	[VH]>[H]>[M]>[L]
Within Group	62.585	177	.354			
Total	87.312	180				

One-Way ANOVA test was performed to investigate the self-efficacy perceptions of the participants towards the integration of technology into education with regard to level of interest in technological innovations. The results showed a significant difference between the Computer Technology Integration Survey scores of the participants in terms of level of interest in technological

innovations [F(3, 177)=23.310, p>.05].The results of Scheffe Post-Hoc test, which was performed to identify the source of the difference, revealed that the difference was in favor of participants with high level of interest in technological innovations.

Table 8 ANOVA results of Technology Acceptance Measure for Pre-service Teachers with Regard to level of Interest in Technological Innovations

Source of the variance	Sum of Squares	sd	Mean Squares	F	p	Difference
Between Groups	1.130	3	.377	1.612	.18	-
Within Group	41.330	177	.234			
Total	42.459	180				

One-Way ANOVA analysis was conducted to examine the technology acceptance levels of the participants with regard to level of interest in technological innovations. The results showed that technology acceptance scores of the participants did not differ by level of interest in technological innovations [F(3, 177)= 1.612, p>.05]. In other words, technology acceptance of the participants did not change according to their level of interest in technological innovations.

Technology Acceptance Levels and Self-Efficacy Perceptions towards Integration of Technology into Education by Training on the Use of Technology in Education

Table 9 T-test results of Computer Technology Integration Survey with regard to Training on the use of Technology in Education

Training	N	X	S	sd	t	p
Yes	104	4.08	.71	179	2.46	.015
No	77	3.82	.64			

An independent sample t-test was conducted to examine the self-efficacy perceptions of the participants towards the integration of technology into education in terms of training on the use of technology in education. The results showed a significant difference between the participants [t(179)=2.46, p<.05]. It was found that the participants with training on the use of technology in education had significantly higher scores than those who did not receive any training.

An Independent sample t-test was performed to investigate the technology acceptance levels of the participants with regard to training on the use of technology in education. The results showed that there was a significant difference between the participants [t(179)=.3.95, p<.05]. It was found that the participants with training on the use of technology in education had significantly higher technology acceptance than those who did not receive any training.

Table 10 T-test results of Technology Acceptance Measure for Pre-service Teachers with Regard to Training on the Use of Technology in Education

Training	N	X	S	sd	t	p
Yes	104	3.91	.44	179	3.95	.00
No	77	3.63	.49			

The Relationship between Technology Acceptance Levels and Self-Efficacy Perceptions towards Integration of Technology into Education

Table 11 The Correlation Between Self-Efficacy Perceptions towards Technology Integration into Education and Technology Acceptance of the Participant

		Self-Efficacy	Acceptance
Self-Efficacy	Pearson Correlation	1	.331**
	N	181	181
Acceptance	Pearson Correlation	.331**	1
	N	181	181

**. Correlation is significant at the 0.01 level (2-tailed).

As shown in Table 11, there was a moderate and significant positive correlation between the participants perceptions of self-efficacy towards technology integration and technology acceptance, [r=.331,p<.05]. This result indicated that as the participants' self-efficacy increased,their acceptance also increased or vice versa.

Discussion and Conclusions

In this study, pre-service social studies teachers' self-efficacy perceptions towards the integration of technology into education and their technology acceptance levels were investigated with regard toa number of variables. In addition, the relationship between technology integration self-efficacy perceptions and technology acceptance levels was examined.

The findings showed that the male participants' self-efficacy perceptions to integrate technology in education were higher than those of female participants. Studies in the literature have reported similar findings (Şimşek & Yazar, 2018; Kaymak, E. & Titrek, O. 2021; Topal Altındiş, Z. & Yaman, Y. 2021). On the other hand, Keser et al. (2015) reported that gender did not have a significant effect on the self-efficacy of pre-service teachers in integrating technology into education. One of the possible reasons for this result of the study may be the unequal reflection of gender roles in favor of men in technology-based technical competencies. In particular, the perception that technology-based professions and competencies can be acquired better by men and women's competencies in technology-related fields are limited may also play a role (Savcı, 1999; Kocabıçak, 2004).On the other hand, the possible reason for the conflicting findings indicating that the gender does not have an effect on the self-efficacy perceptions of technology integration into education may be due to the increased use of technology-related equipment by women in recent years, and their more frequent involvement in technology-based occupations.

The findings of this study showed that that gender had no effect on technology acceptance of the participants. Reaching partially similar results to this result, Ayaz et al. (2019) concluded that although the gender played a significant role in a few cases in accepting technology, it did not have an effect in some cases. On the other hand, Aktürk and Delen (2020) found that gender had a significant effect on technology acceptance of teachers and that male teachers had a higher levels of technology acceptance than female teachers. Similarly, Sırakaya (2019) also found that technology acceptance of male teacherswas higher than female teachers. In this study, the reason why the gender variable did not have an effect on technology acceptance in this study may be due to the sample difference with other studies and the unequal numbers of men and women in these studies. In addition, higher rates of aggressive-bullying attitudes, behaviors and actions committed by technology-based communication tools may be a factor that makes technology acceptance difficult for women (Akça, Sayımer, & Ergül, 2015)

It was found in this study that the technology integration self-efficacy perceptions of the participants did not differ whereas there was a significant difference in technology acceptance levels according to the grade level. This difference was in favor of participants in the 2nd, 3rd and 4th Grade. It was found that the acceptance level was the highest in 2nd Grade and decreased gradually in 3rd and 4th Grade. This may be due to the fact that 2nd Grade courses involve Information Technologies in Social Studies, Science Technology and Society, and Material Design in Social Studies Education. In addition, the reason for the low acceptance level in the last year may be the future anxiety and the intensity of the practicum courses. Contrary to this study, Topkaya (2010) reported a relationship between pre-service teachers' computer self-efficacy perceptions and their grade levels. Baydaş Uzuner, Yurt, and Aktaş (2019) also stated that there were differences in technology acceptance of pre-service teachers in terms of grade, and the reason for this difference was the structure of the curriculum. On the other hand Yelkikalan et al (2019) found that Industry 4.0 technologies and technology acceptance model showed a significant difference in terms of perceived benefit level and usage behaviors of students according to the grade.

The findings of this study revealed that as the participants' interest in technological innovations increased, their self-efficacy perceptions of integrating technology into education also increased. Since the interest in technological innovations also means examining and learning new technologies or innovations in technologies, it can be considered as a phenomenon that increases self-efficacy. It was observed in this study that the participants' level of interest in technological innovations did not have an effect on technology acceptance levels. Similar

studies are rare in the literature and these studies were mostly carried out in the context of the acceptance of innovations and attitudes towards technology integration on the basis of diffusion of innovations theory. For example, Ardıç (2021) reported a positive and significant relationships between students' views and attitudes about using technological tools. In addition, Dikmen and Demirer (2016) found that teachers' interest in educational technologies and their positive intention to use educational technologies were not related to age.

It was also revealed in this study that participants who received training on the use of technology in education had higher self-efficacy perceptions. Similarly, Çetin (2017) found that students who had Instructional Technologies and Material Design course had high self-efficacy perceptions towards information and communication technologies. Furthermore, Şimşek and Yazar (2018) determined that the pre-service teachers who attended a computer course and successfully completed it had higher technological knowledge and Technological Pedagogical Content Knowledge-ISTE scale self-efficacy scores than those who did not take any computer course. When pre-service social studies teachers receive training on the integration of technology into education, they think that they can be successful in integrating technology into education in their own lessons and that they can achieve the integration, which is in line with the definition of self-efficacy perception. Similarly, it was found that having training on the use of technology in education affected technology acceptance levels of the participants. Supporting this result, Davis (1985) states that when pre-service teachers receive education in the context of technology integration into education, they adopt the appropriateness, perceived usefulness, and perceived usefulness levels of the Technology Acceptance Model, and therefore students' technology acceptance is high.

The findings of this study revealed a positive and moderate correlation between self-efficacy perceptions towards technology integration and technology acceptance of the participants. In other words, as the self-efficacy perceptions towards technology integration increased, technology acceptance also increased. There is a very limited number of similar studies in the literature. Among them, Aktürk and Delen (2020) found that as teachers' technology acceptance levels increased, their academic, professional, social and intellectual self-efficacy also increased.

The use of technology is spreading rapidly in all areas of life. Preservice social studies teachers need to have high technology integration self-efficacy and technology acceptance in order to perform their profession better in the future. For this reason, this study recommends to offer training on technology integration to pre-service social studies teachers during their undergraduate education. Each field of science has its own unique aspects. For this reason, content and discipline specific technology integration modules should be developed and implemented for pre-service social studies teachers.

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