An Analysis of the Relationship between University Students' Views on Distance Education and their Computer Self-Efficacy

A. Aslan Sendogdu (iD)
Necmettin Erbakan University, Turkey

Ozdal Koyuncuoglu (iD)
Necmettin Erbakan University, Turkey

To cite this article:

An Analysis of the Relationship between University Students' Views on Distance Education and their Computer Self-Efficacy

A. Aslan Sendogdu, Ozdal Koyuncuoglu

Article Info	Abstract
	This study aims to examine the relationship between university students' views of distance education system and their computer self-efficacy in terms of some variables using Information Systems Success Model (ISSM) and Technology Acceptance Model (TAM). The study is important since the studies on the distance education system made with Unified Learning Style Model (ULSM) are limited in the COVID-19 pandemic period when distance education has become widespread. The views of university students on distance education and computer self-efficacy were examined in the study in accordance with the causal-comparative design, taking into account the variables of gender, year of study and academic achievement. Then, the correlation between the Technology Acceptance Model, participants' achievement levels and computer self-efficacy was explained. 895 students attending Necmettin Erbakan University Faculty of Applied Sciences undergraduate program participated in the study. While gathering data, previously tested Technology Acceptance and Information Systems Success Model Integration and Computer Self-efficacy scales were used by combining the components from both models.

Introduction

Studying how distance education technologies, which have an important place in educational activities, are evaluated by students has become more and more important for higher education institutions, especially in the current COVID-19 pandemic period. Under the pressure of the COVID-19 pandemic, it is commonly seen that educational institutions are reproducing and replacing the content of traditional lectures with online all around the world. Due to the limited face-to-face education, innovative technologies that will actively engage students through interactive lectures, tests, presentations and open discussions on online platforms seem to dominate the system. In all these aspects, the COVID-19 crisis has had a serious impact on traditional education. Therefore, universities can take advantage of this unexpected opportunity to discover shortcomings and activate online education practices through active strategies (Daniel, 2020; UNESCO, 2020a; UNESCO, 2020b). Universities in World and Turkey have never experienced any outbreaks that need to be rebuilt with it so far (Klaiman, Kraemer, & Stoto, 2011). It is important to examine the students' perceptions of computer self-efficacy levels as

well as students' views on internet-based distance education systems put into practice by higher education institutions.

In this study, it was aimed to find an answer to the question of the relationship between the views of university students on distance education system and their perceptions of computer self-efficacy during the COVID-19 pandemic period in the context of Technology Acceptance and Information Systems Success Models. In the study, the relationships between university students' perceptions of computers self-efficacy and the technology acceptance-system success level of the distance education were examined through a comparative approach. Although there have been studies in the literature, the study is important regarding the limited number of studies examining the views of university students on distance education system on the basis of the Technology Acceptance Model and Information Systems Success Model during the pandemic period when distance education is intense. Thus, with this effort, this study aims to fill this gap in the literature.

Conceptual Framework

Technology Acceptance Model

Acceptance has been the subject of many scientific studies. One of the best known models of explaining technology user acceptance is the Technology Acceptance Model (TAM) (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). TAM is a widely used tool to investigate the use of technology in the field of information systems (King, 2006). The model explains how the user accepts the new information technology, in other words, it tries to examine the reaction of people to the system (Altındağ & Üzümcü, 2020). Since the introduction of TAM, it has been tested for 30 years and been developed many times.

Research examining human behavior has been found mostly in the psychology literature. Later, it has been examined by other academic disciplines (Turan & Çolakoğlu, 2008). There are many theoretical models in the literature related to the use of distance education technologies by students. In studies (Huang, Hsinchu, & Chuang, 2007; Zhang, Guo, & Chen, 2007; Liu, Chen, Sun, Wible, & Kuo, 2008; Zhang, Zhao, & Tan, 2008; Lee, Hsieh & Ma, 2011), the Technology Acceptance Model has been the most used model (Çelik, 2018; Eren & Kaya, 2017; Kalyoncuoğlu, 2018).

The first studies on the Technology Acceptance Model were conducted by Davis (1989). According to Davis (1989), the Theory of Planned Behaviors and the Theory of Reasoned Action are based on psychology-based behavioral theories and aim to understand and explain individuals' acceptance and use of technological developments (Turan & Çolakoğlu, 2008). The first model was completed in 1989 with some additions by Davis, Bagozzi and Warshaw (Mai, Takahashi, & Tuan, 2013).

Technology Acceptance Model (TAM) has an effective theoretical background. The model is highly preferred in issues such as the acceptance of technology by the user and determining whether he or she uses it adequately (Legris, Ingham, & Collerette, 2003; Martinez-Torres, Toral Marin, Garcia, Vazquez, Oliva et al., 2006; McCoy, Galetta, & King, 2007; Venkatesh & Davis, 2000). TAM has been developed as a theoretical structure

that measures the intention and desire of individuals to use technology based on two basic elements. In the Technology Acceptance Model, it is suggested that the user's technology acceptance is shaped according to perceived ease of use and perceived usefulness variables (Çelik, Yılmaz, & Pazarlıoğlu, 2010; Turan & Çolakoğlu, 2008). Perceived usefulness, according to Davis (1989), refers to people's beliefs that using a certain system will enhance their job performance. In other words, it is defined as the extent to which people tend to perform better if they use technology (Herrero & Martin, 2012).

The second important component in TAM is perceived ease of use. The term, first coined by Davis in 1989, has been the subject of many studies in the literature (Chau 2001; Ma, Anderson, & Streith 2005; King & He 2006; Teo 2009). According to behavioral decision-making theory, it is suggested that a system with high perceived ease of use will be easier to accept by users, as individuals have a desire and tendency to minimize effort in behavior (Akour, Alshare, Miller & Dwairi, 2006; Davis, 1989). In addition to these two basic elements, it is thought that external factors (such as demographic characteristics, perceived service quality) will have significant effects on users' adoption of technology in Technology Acceptance Model (Kalyoncuoğlu, 2018). The Technology Acceptance Model has been criticized for some of its limitations (Leps, 2016). For this reason, it is seen that the researchers examine the research topics by adding different variables to the Technology Acceptance Model (Elifoğlu-Kurt, 2015; Uğur & Türkmen, 2014). Models created by adding new variables to the Technology Acceptance Model are called the Extended Technology Acceptance Model (Yılmaz & Tümtürk, 2015).

Information Systems Success Model

When the studies on technology acceptance are examined, it is seen that the Technology Acceptance Model (Davis, 1989), Unified Theory of Acceptance and Use of Technology (Vekatesh et al., 2003) and Diffusion of Innovation Theory (Rogers, 1962) are generally used in the literature for information systems success. However, it can be argued that DeLone and McLean's (1992) Information Systems Success Model is the most commonly used. In studies trying to explain what makes information system more successful, it is stated that although the acceptance of the information system is a prerequisite for success, it is not equivalent to success (Elifoğlu-Kurt, 2015).

The Information Systems Success Model (IS Success Model) provides a comprehensive framework for measuring the performance of information systems (DeLone & McLean, 2004). This model explains how factors affect the success of the information system (Petter, DeLone, & McLean, 2012). DeLone and McLean (2003) review their models and explain that the six interrelated components of the model are system quality, information quality, technical service quality, use, user satisfaction and net benefit. In the Information Systems Success Model proposed by DeLone and McLean (2003), the system quality refers to comprehensiveness, flexibility, reliability, ease of learning, ease of use (Elifoğlu-Kurt, 2016), the accuracy and efficiency of the information produced by the system (Petter , DeLone, & McLean, 2008) as well as the presence and absence of an error in the system (Rabaa'i, 2009).

Information quality represents popular features such as intelligibility and usability of system outputs such as, administrative reports and web pages (Petter & McLean, 2009). In other words, it includes measurements focusing on the quality and usefulness of the information produced by the system (Mohammadi, 2015). The other component of the model is the technical service quality, the quality of the support system users receive from their system (system usage training, help desk, etc.) (Petter et al., 2008). Although it is thought that this variable can be addressed under the quality of education, many researchers argue that it will be more appropriate to consider it as an independent variable due to the changing role of distance education systems in recent years (Wang & Liao, 2008).

System usage refers to the degree to which users use an information system, such as the amount, frequency and purpose of use. User satisfaction is expressed as the degree to which users believe that their needs, goals and desires are fully met when they use an education system, and the level of satisfaction they have with the system support and services (Sanchez-Franco, 2009). Net benefit refers to the perception that the education system contributes to individual or organizational success or the benefit it provides (productivity increase, cost reduction, etc.) (Petter et al., 2008). The quality of education, which is accepted as a new component of the model, is defined as to what extent the education system has provided an effective learning environment for students (Hassanzadeh et al., 2012). Although the Technology Acceptance Model and the Information Systems Success Model are often used alone in studies aimed at evaluating Internet-based distance education systems, it can be argued that there are very few studies using a combined model (Efiloğlu-Kurt, 2015).

Computer Self-efficacy

Higher education institutions should use and develop educational technologies and use innovative technologies in educational activities in order to provide quality education to their students (Brown, 2006; Doğru, 2020; Stosic, 2015). In addition, distance and online education approaches require the use of innovative methods in interactive education practices, the reduction of traditional education methods, the use of information and communication technologies and modern methods such as project-based learning and problem-based learning (Robinson, Neergaard, Tanggaard, & Krueger, 2016; Suciu & Platis, 2009). Learners' attitudes, intentions and self-efficacy towards computers emerge as an important factor in the use of all these versatile technologies (Hong, Chai, Tan, Hasbee, & Ting, 2014; Kara, 2020; Kaleli, 2020).

DiGregorio and Liston (2018) found that an important component for educators to successfully use technologies in their classroom in 'productive' and constructive ways is effective beliefs in computer technologies. Hong et al. (2014) supported this view and found positive and significant relationships between students' computer self-efficacy and their use of computers in learning processes. ICT self-efficacy (sometimes referred to as computer self-efficacy) is defined as self-confidence beliefs about the effective use of computers / ICTs in relation to a person's ability to perform a specific task (Hong et al., 2014). Since the conceptualization of computer self-efficacy is based on self-efficacy beliefs (Bandura, 1997), computer self-efficacy can be defined as the ability of an individual to perceive their own abilities and use computer technologies effectively to perform academic tasks (DiGregorio & Liston, 2018).

Self-efficacy is a psychological construct based on Bandura's social cognitive theory, particularly on the cognitive component influenced by thought processes affecting human motivation, attitudes and actions. It serves as a self-belief structure for educators that determines students' levels of confidence in participating in technology-supported teaching. Bandura (1997) defines perceived self-efficacy beliefs as a person's personal judgment of capabilities to organize and carry out a set of actions to achieve a desired goal. Most students today have unprecedented digital skills, and ICT self-efficacy is not learning or searching skills for hardware and software related terms. ICT self-efficacy can be a broader structure consisting of Internet usage behaviors that contribute to individuals' perceptions of their control in cyberspace. Thus, efforts were made to develop new measures compatible with the evolving and rapidly changing characteristics of technology (Musharraf, Bauman, Anis-Ul-Haque, & Malik, 2018).

According to Social Cognitive Theory, Perceived Self-efficacy is a key mechanism in human cognitive processes within a causal structure that includes the triple reciprocal causality between person, environment and behavior (Bandura, 1986). Self-efficacy beliefs are the beliefs individuals have about their capability to achieve desired results, overcome obstacles, resist the pressure of adverse situations, self-regulate in the face of challenging conditions, discern many rival alternatives, and negotiate important life transitions (Bandura, 1997; Basili, Gomez Plata, Paba, Barbosa, Gerbino, Thartori et al., 2020).

Academic self-efficacy is an important form of self-efficacy during adolescent development and adaptation (Pajares, 1996). Previous research has shown that self-efficacy beliefs are perceived as important contributions to students' academic and personal achievement. In particular, academic self-efficacy beliefs affect the perception of skills in scholastic issues as well as in self-regulation processes that aid learning (Balcı, Şanal, & Üğüten, 2019; Basili et al., 2020; Fernandez-Rio, Cecchini, Méndez-Gimenez, Mendez-Alonso, & Prieto, 2017). Students with higher self-efficacy beliefs are better at managing their own learning, are more likely to be more academically successful, use their performance as a guide to assess their self-efficacy and finally complete their education (Bandura, Caprara, Barbaranelli, Pastorelli, & Regalia, 2001; Schunk, 1994). Academic self-efficacy beliefs also influence technology acceptance and use, career paths, and job gain, as higher levels of self-efficacy enables individuals to evaluate a wider range of career options (Carroll, Houghton, Wood, Unsworth, Hattie, Gordon, & Bower, 2009). The school is an important source of competence information (Pajares & Urdan, 2006) and contributes to students' formation of the intellectual activity (Gaskill & Hoy, 2002).

In current studies on students' use of information and communication technologies, self-efficacy appears as students' confidence in their ability to choose appropriate technological solutions and use selected technologies effectively to meet their learning needs (An, Wang, Li, Gan, & Li, 2021; Lai & Gu, 2011). Because a person's self-efficacy is fundamental when a skill is first learned, the development of current and future computer self-efficacy beliefs will be shaped on this basis (Connoly et al, 2018; Woolfolk Hoy, 2004). Although there are many reasons for the use of ineffective pedagogical technology in today's classrooms, it can be argued that students' low computer self-efficacy levels are among the main reasons for limited ICT use (DiGregorio & Liston, 2018). For example, Thongsri et al. (2019) found that students' computer self-efficacy had the highest

effect on technology acceptance. Likewise, it was suggested that the lack of self-efficacy affects the acceptance and use of computer technologies directly or indirectly in relation to the use of ICT in classrooms (Alt, 2018). However, educators' high level of computer self-efficacy increases the use of ICT in classrooms (Hong et al., 2014; Siyam, 2019). Therefore, computer self-efficacy of both students and educators are important predictors of ICT use in schools (Li, Garza, Keicher, & Popov, 2019). Sang, Valcke, van Braak, and Tondeur (2010) argue that the level at which educators and students find themselves competent and confident in integrating computer technologies is an important determinant of their use of these technologies. Baydaş and Göktaş (2017) also found that perceived ease of use and computer self-efficacy had a direct effect on students' and educators' intention to use ICT.

In this study, the following research questions are answered:
   • What are the university students' perceptions of technology acceptance and information systems success model integration?
   • What are the computer self-efficacy levels of the participants?
   • Do participants' perceptions of technology acceptance and information systems success model integration differ based on gender, year of study and level of academic achievement?
   • Does participants' computer self-efficacy differ based on gender, year of study and level of academic achievement?
   • What level of a relationship is there between the participants' perceptions of technology acceptance and information systems success model integration and computer self-efficacy?

Method

In this study, it was aimed to investigate the relationship between university students' views on distance education system and computer self-efficacy in terms of some variables using Technology Acceptance and Information Systems Success Model Integration. The research was designed and carried out according to causal comparison and correlational survey design. In the research design, the reasons and consequences of the differences found among the participants are emphasized. Research is carried out without any intervention on the conditions that may affect the dependent variables of the research.

In correlational research designs, it is aimed to investigate the level of correlations between two or more variables (Creswell, 2003). In this study, in accordance with the causal comparison pattern, university students' technology acceptance levels and computer self-efficacy were examined by considering the variables of gender, year of study and academic achievement. Then, the relationships between the participants' technology acceptance levels of and computer self-efficacy were analyzed.

Participants

The population of this study is undergraduate students studying at universities in Turkey. Since reaching all of the students requires serious time, effort, economy and team, convenience sampling method was chosen and the

research consists of 895 undergraduate students of Necmettin Erbakan University, Faculty of Applied Sciences in the 2020-2021 academic year. This number constitutes 40% of all students enrolled in the program. The distribution of students according to their class, gender and socio-economic status is shown in Table 1.

Table 1. The Distribution of Students according to their Class, Gender and Socio-economic Status

Gender	Frequency	Percent
Male	424	47.4
Female	471	52.6
Year of Study	**Frequency**	**Percent**
1	186	20.8
2	242	27.0
3	231	25.8
4	236	26.4
Socio-economic Status	**Frequency**	**Percent**
NA	8	.9
Low	91	10.2
Moderate	753	84.1
High	43	4.8
Total	895	100.0

97% of the university students who answered the research questions were between the ages of 18-21. These young people, who grew up in similar environments and did not have much difference in age, attended their programs following high school education. As can be seen in Table 1, considering the structure seen in most developed countries, the proportion of girls studying in the field of social sciences in Turkey seems to be quite high, in fact, it is 53% for the sample students who answered the research questions. Considering the socio-economic status of the research sample, it was seen that 10.2% of them had low, 84.1% had moderate and 4.8% had high socio-economic status.

Measuring Tools

Extended Technology Acceptance Scale

In the study, a questionnaire form consisting of 7 sub-dimensions was used to measure students' perceptions of technology acceptance levels. Thus, items expressing the information quality were taken from the study of Petter et al. (2008), items expressing the intention to use the technological system from the study of Lin (2011), items related to satisfaction and using technology from the study of DeLone and McLean (2003), items related to quality of education from the studies of Kim et al. (2012) and Hassanzadeh et al. (2012), ease of use and perceived usefulness from the study of Davis (1989). Then, they were adapted into Turkish. Confirmatory factor analysis was performed on the raw data of the scale, which is a 5-item Likert-type. The Cronbach Alpha reliability coefficient of the sub-dimensions of the Technology Acceptance Scale varies between .76 and .88.

Computer Self-Efficacy Scale

The measurement tool developed by Aşkar and Umay (2001) was used to measure university students' computer self-efficacy. The computer self-efficacy scale consists of 18 items and in Likert form. Exploratory and confirmatory factor analyses were conducted for the construct validity of the scale. In the reliability analysis of the scale, the Cronbach Alpha Internal Consistency coefficient was calculated and found as 0.91. Item-total correlations of the scale vary between 0.40 and 0.72. As a result of the analysis, it was determined that Computer Self-Efficacy Scale is a valid and reliable measurement tool in the sample of university students and Turkish culture.

Data Analysis

Within the scope of the research, before analyzing university students' perception of technology acceptance and computer self-efficacy scores, the distribution of the data was examined. In determining the distribution, skewness, kurtosis values and Shapiro Wilk test results were taken as basis. According to Tabachnick and Fidell (2007), the values in the range of ± 1 indicate that the data do not deviate excessively from the normal distribution.

The values calculated in this study indicated that the attitude and self-efficacy scores were distributed quite close to the normal distribution. It was found that the data of the two scales belonging to the study sample were in the range of ± 1 and the Shapiro Wilk test results indicated a normal distribution. Therefore, parametric tests were used to analyze university students' technological acceptance and computer self-efficacy scores.

Findings

Descriptive information about the scores obtained from measurement tools is presented in Table 2.

Table 2. Participants' Scores on Technology Acceptance and Computer Self-Efficacy Scales

Technology Acceptance	N	Mean	Std. Deviation
Quality of Education	895	3.01	0.99
Information quality	895	3.00	1.06
Intention to use	895	3.48	1.12
Perceived ease of use	895	3.38	1.10
Perceived usefulness	895	2.84	1.10
Satisfaction	895	2.62	1.15
Use/usage behavior	895	3.65	1.15
Computer self-efficacy	895	3.16	0.89

When Table 2 is examined, the mean score of perception of the quality of education was 3.01 ± 0.99,

information quality was 3.00 ± 1.06, intention to use was 3.48 ± 1.12, perceived ease of use was 3.38 ± 1.10, perceived usefulness was 2.84 ± 1.10, satisfaction was 2.62 ± 1.15, and use / usage behavior was 3.65 ± 1.15 in the technology acceptance scale. According to these findings, the highest approval and adoption of the participants in terms of technology acceptance was given to use / usage behavior dimension. Computer self-efficacy mean score (3.16 ± 0.89) shows that the participants had a moderate level of competence.

As seen in Table 3, there was significant difference in the mean scores between only the information quality and use/usage behavior dimension of the technology acceptance scale and the computer self-efficacy based on gender variable since the p value in these three dimensions is less than 0.05. However, no significant difference was found in the other dimensions of the technology acceptance scale by gender variable. It was found that female participants' perceptions of information quality and use/usage behavior were significantly high, whereas male participants' perceptions of computer self-efficacy were high.

Table 3. Comparison of Participants' Technology Acceptance and Computer Self-Efficacy Scores Based on Gender

	Gender	N	Mean	Std. Deviation	t	P
Quality of Education	Female	471	3.05	1.00	1.25	0.21
	Male	424	2.96	0.98		
Information quality	Female	471	3.07	1.03	2.11	0.03
	Male	424	2.92	1.08		
Intention to use	Female	471	3.52	1.10	0.98	0.33
	Male	424	3.44	1.14		
Perceived ease of use	Female	471	3.43	1.08	1.17	0.24
	Male	424	3.34	1.11		
Perceived usefulness	Female	471	2.87	1.11	0.86	0.39
	Male	424	2.81	1.09		
Satisfaction	Female	471	2.65	1.16	0.56	0.58
	Male	424	2.60	1.15		
Use/usage behavior	Female	471	3.77	1.12	3.34	0.00
	Male	424	3.51	1.17		
Computer self-efficacy	Female	471	3.01	0.89	1.98	0.048
	Male	424	3.22	0.89		

In Table 4, it is seen that there was a significant difference in the mean scores of the technology acceptance scale only in the use / use behavior dimension based the year of study variable ($F = 3.09$; $p < 0.05$). According to the advanced analysis, it is seen that first year students had significantly higher technological acceptance in the usage dimension than the students in the fourth year. However, no significant difference was found between the other dimensions of the technology acceptance scale and the computer self-efficacy scores according to the variable of year of study ($p > 0.05$).

Table 4. Comparison of Participants' Technology Acceptance and Computer Self-Efficacy Scores Based on Year of Study

	Year of Study	N	Mean	Std. Deviation	F	P
Quality of Education	1	186	3.03	0.97	0.74	0.53
	2	242	3.00	0.95		
	3	231	2.94	1.02		
	4	236	3.07	1.02		
Information quality	1	186	3.06	1.05	0.26	0.85
	2	242	2.98	1.04		
	3	231	2.99	1.05		
	4	236	2.98	1.09		
Intention to use	1	186	3.50	1.06	0.39	0.76
	2	242	3.49	1.09		
	3	231	3.52	1.15		
	4	236	3.42	1.17		
Perceived ease of use	1	186	3.38	1.03	0.11	0.96
	2	242	3.40	1.06		
	3	231	3.41	1.13		
	4	236	3.35	1.16		
Perceived usefulness	1	186	2.87	1.04	0.22	0.88
	2	242	2.86	1.10		
	3	231	2.79	1.12		
	4	236	2.85	1.12		
Satisfaction	1	186	2.59	1.14	0.50	0.68
	2	242	2.65	1.11		
	3	231	2.57	1.16		
	4	236	2.69	1.21		
Use/usage behavior	1	186	3.87	1.09	3.09	0.04
	2	242	3.70	1.13		
	3	231	3.65	1.14		
	4	236	3.40	1.23		
Computer self-efficacy	1	186	3.21	0.87	0.26	0.85
	2	242	3.16	0.85		
	3	231	3.13	0.90		
	4	236	3.17	0.93		

When Table 5 is examined, it is seen that there was a significant difference between the variables of achievement level in all dimensions of the technology acceptance scale and the perception computer self-

efficacy according to the findings performed by one-way analysis of variance (p <0.05). According to the advanced analyses performed with the Tukey test, it is found that perceptions of technology acceptance and computer self-efficacy levels of the participants' with high and medium achievement levels were significantly higher than their low achieving peers.

Table 5. Comparison of Participants' Technology Acceptance and Computer Self-Efficacy Scores based on Achievement Level

	Academic Achievement	N	Mean	Std. Deviation	F	P
Quality of Education	High	142	3.03	1.01	5.95	0.00
	Moderate	711	3.02	0.98		
	Low	42	2.50	1.03		
Information quality	High	142	3.04	1.06	6.35	0.00
	Moderate	711	2.95	1.05		
	Low	42	2.45	0.99		
Intention to use	High	142	3.62	1.21	3.63	0.03
	Moderate	711	3.48	1.09		
	Low	42	3.10	1.24		
Perceived ease of use	High	142	3.51	1.14	3.77	0.02
	Moderate	711	3.38	1.08		
	Low	42	2.99	1.15		
Perceived usefulness	High	142	2.95	1.08	4.59	0.01
	Moderate	711	2.85	1.10		
	Low	42	2.37	1.03		
Satisfaction	High	142	2.67	1.13	3.01	0.05
	Moderate	711	2.64	1.16		
	Low	42	2.20	1.13		
Use/usage behavior	High	142	3.92	1.13	10.87	0.00
	Moderate	711	3.63	1.13		
	Low	42	3.01	1.30		
Computer self-efficacy	High	142	3.25	0.91	7.80	0.00
	Moderate	711	3.18	0.87		
	Low	42	2.65	0.96		

Table 6 shows the Pearson correlation coefficients calculated between university students' technology acceptance scale scores and computer self-efficacy scores. According to the analysis, there were significant and positive relationships between participants' technology acceptance and computer self-efficacy. The highest correlation between the variable of computer self-efficacy and technology acceptance was found in the dimension of use/usage behavior.

Table 6. Correlation Analysis Results between Participants' Technology Acceptance and Computer Self-Efficacy Scores

Technology acceptance	Computer self-efficacy	
	R	P
Quality of education	.688[**]	0.00
Information quality	.668[**]	0.00
Intention to use	.691[**]	0.00
Perceived ease of use	.623[**]	0.00
Perceived usefulness	.666[**]	0.00
Satisfaction	.614[**]	0.00
Use / usage behavior	.710[**]	0.00

**: $p < 0.01$

As seen in Table 7, the regression model developed to determine the effect of perception of technology acceptance on computer self-efficacy was significant (R = 0.587; F = 195.46; p <0.00). Approximately 36.5% of the change in computer self-efficacy could be explained by perception of technology acceptance. University students' perception of technology acceptance had a high positive effect on computer self-efficacy (p <0.00).

Table 7. Regression Analysis Results between Participants' Technology Acceptance and Computer Self-Efficacy Scores

Model [a]	R	R Square	F	P
1	.587a	.365	195.464	0.000

a. Dependent variable: Computer self-efficacy

Discussion

Technology acceptance and university students' computer self-efficacy are extremely important for their future professions. Considering that there will be a close relationship with technology in all professions in the future, knowing the perceptions of individuals' technology acceptance and computer self-efficacy will improve the quality of the education. For this purpose, university students' technology acceptance levels and perceptions of computer self-efficacy were discussed in terms of various variables. In the study examining university students' technology acceptance and perceptions of computer self-efficacy, significant differences were found based on gender and participants' levels of achievement. Findings revealed that the mean scores of university students had high levels of use/usage in the technology acceptance scale, whereas in other dimensions they had moderate scores. In general, it was found that university students had moderate perceptions of technology acceptance. In addition, the participants in the study had a moderate perception computer self-efficacy level.

In the research conducted in this aspect, it was shown that university students' beliefs in their own competence in computer were not high. Various research results reveal that the perception of self-efficacy is affected by the individual's own lives and the models around him or her, and this affects the quality and continuity of computer

use. This process works in both directions (Doğru, 2020; Kaleli, 2020). In Turkey, most of the studies conducted on university students show that students have low computer self-efficacy (Arslan, 2008; Doğru, 2020). Computer and technology training at universities in Turkey is generally limited to low skills and knowledge and are usually held with less than one semester credit courses and sessions. Therefore, university students' ability to use technologies related to their field of study remains limited and they do not develop an understanding of where and how technology will be used (Öksüz, Ak, & Uça, 2009).

Another finding reached in the study is about the comparison of technology acceptance and the participants' perceptions of computer self-efficacy based on their gender. In the technology acceptance scale, it was found that female participants' perceptions of information quality were significantly high. However, no significant difference was found in other dimensions of technology acceptance according to gender. However, it was found that male participants' perceptions of computer self-efficacy were high. These findings corroborate the results of the studies of Chang et al. (2015) and Vandercruysse et al. (2013). In these studies, it was seen that male students had higher technological and e-learning expectations, academic self-efficacy and self-efficacy beliefs than their female peers. It was found that male students showed more entrepreneurial characteristics especially in new computer-assisted learning technologies. The literature suggests that males are more active in learning tasks involving new technologies and they are more self-confident than females in this area (Else-Quest, Hyde, & Linn, 2010). In all these aspects, both the findings of the study and other studies conducted in the literature support the findings of the study on gender.

Another finding of the study is about the comparison of university students' technology acceptance and perceptions of computer self-efficacy according to their year of study and academic achievement. The analysis showed that there were differences according to year of study only in the use/usage behavior dimension of the technology acceptance scale. First year students use technology more than the students in the upper years. The findings of this study are similar to the research findings of Blanchflower, Oswald and Stutzer (2001), Koyuncuoğlu (2021), Lévesque and Minniti, (2006) and Salthouse (2009). According to the common results of these studies, there was an inverse relationship between year of study, age and the use and acceptance of innovative technologies. Similarly, according to Lindberg, Hyde, Petersen, and Linn (2010), characteristics such as self-perception, self-efficacy and will that accompany the development processes such as age and year of study were important in educational success not only by tendencies and skills. It was also found in the study that students with high levels of achievement have high self-efficacy and technology acceptance levels. These findings are similar to the research results of Schunk and Pajares (2009), Stankov, Lee, Luo, and Hogan (2012). Schunk and Pajares (2009), Stankov et al. (2012) argue that self-efficacy correlates with a high level of academic engagement and is in a close and positive relationship with academic achievement.

The last finding obtained in the study is about the relationship between university students' technology acceptance and computer self-efficacy. A significant and positive relationship was found between all dimensions of the technology acceptance scale and students' computer self-efficacy. These findings are similar to the research findings of Aktürk and Delen (2020), Jegede (2007), Doğru (2020) and Lanngford and Reeves (1998). According to Lanngford and Reeves (1998), the behavior of being interested in, adopting and using

tools, especially modern technologies and computers, shows a unity. Furthermore, it was found that individuals with a high level computer self-efficacy perceptions are more successful in using computer are more confident, willing to take responsibility and more successful in fulfilling their responsibilities (Langford & Reeves, 1998). The main purpose of the Technology Acceptance Model is to reveal the tendency of the end users of technologies, especially computer technologies, explain the user behavior and reveal the decisions that explain the computer acceptance in general (Venkatesh & Davis, 2000, Wu & Wang, 2004). In this respect, it can be argued that there is a linear relationship between perceptions regarding technology acceptance and computer self-efficacy (Spreeuwenberg, 2016). According to Aktürk and Delen (2020), as the individuals' technology acceptance levels increase, their academic, professional, social and intellectual self-efficacy levels also increase.

Conclusion

The important result reached in this study is that there is a significant relationship between university students' personal and academic characteristics, technology acceptance and computer self-efficacy. In addition, it can be mentioned that there is a directly proportional and high correlation between all dimensions of the technology acceptance scale and students' computer self-efficacy. As a result, it is an important step to increase the education quality of universities and provide similar technological information despite the different faculties and departments and increase self-efficacy in this regard. All faculties and fields are required to use technological tools and equipment in accordance with the modern age and add them into their curriculum. In accordance with the information obtained, it is necessary to increase technology-based studies in order to increase students' technological awareness and computer self-efficacy. In this regard, universities need to re-examine the course curricula and adapt to the technological age. Although the innovations in the education system are new, it is important that university students develop a positive attitude and accept innovation and turn it into practice. Successful implementation of distance education and computer-assisted education activities is only possible if university students, who are at the center of this process, have positive self-efficacy in computer-assisted education.

As a result, it is seen that in an application-oriented field such as computer technologies, studies aimed at measuring real use in terms of adoption, diffusion and acceptance of innovations are limited. However, the contribution of understanding how innovations spread in the field of educational technology on a scientific basis to both the field and application is obvious. Therefore, based on the results, the following recommendations can be presented: 1) This research conducted with university students can be conducted with graduate students and university academic staff. 2) Studies can be carried out with experimental and qualitative research models on the basis of variables that are thought to have a positive effect on technological acceptance and perceptions of computer self-efficacy.

References

Aktürk, A. O., & Delen, A. (2020). Öğretmenlerin teknoloji kabul düzeyleri ile öz-yeterlik inançları arasındaki ilişki. Bilim, Eğitim, Sanat ve Teknoloji Dergisi *(BEST Dergi), 4*(2), 67-80.

Alt, D. (2018). Science teachers' conceptions of teaching and learning, ICT efficacy, ICT professional development and ICT practices enacted in their classrooms. *Teach. Teach. Educ.* 73, 141–150.

An, Z., Wang, C., Li, S., Gan, Z., & Li, H. (2021). Technology-assisted self-regulated english language learning: associations with english language self-efficacy, english enjoyment, and learning outcomes. *Frontiers in psychology*, *11*, 558466. Retrieved from https://doi.org/10.3389/fpsyg.2020.558466

Arslan, A. (2006). Bilgisayar Destekli Eğitime İlişkin Öz yeterlik Algısı Ölçeği. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 6*(1), 191-198.

Aşkar, P, & Umay, A . (2001). Perceived computer self-efficacy of the students in the elementary mathematics teaching programme. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 21, 1-8.

Balcı, Ö , Şanal, F, & Üğüten, S . (2019). An investigation of pre-service English language teachers' self-efficacy beliefs. *International Journal of Modern Education Studies, 3*(1), 41-53.

Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development, 67*(3), 1206–1222.

Bandura, A., Caprara, G. V., Barbaranelli, C., Pastorelli, C., & Regalia, C. (2001). Sociocognitive self-regulatory mechanisms governing transgressive behavior. *Journal of Personality and Social Psychology, 80*(1), 125–135.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY US: Freeman.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Basili, E., Gomez Plata, M., Paba Barbosa, C., Gerbino, M., Thartori, E., Lunetti, C., Uribe Tirado, L. M., Ruiz García, M., Luengo Kanacri, B. P., Tamayo Giraldo, G., Narvaez Marin, M., Laghi, F., & Pastorelli, C. (2020). Multidimensional scales of perceived self-efficacy (mspse): Measurement invariance across italian and colombian adolescents. *PloS one*, *15*(1), e0227756.

Baydas, O., & Goktas, Y. (2017). A model for preservice teachers' intentions to use ICT in future lessons. *Interactive Learning Environments, 25*(7), 930–945.

Blanchflower D. G., Oswald A., & Stutzer A. (2001). Latent entrepreneurship across nations. *European Economic Review*, *45*(4-6), 680–691.

Brown, D. (2006). Can instructional technology enhance the way we teach students and teachers*? Journal of Computer in Higher Education,* 17, 121.

Carroll, A., Houghton, S., Wood, R., Unsworth, K., Hattie, J., Gordon, L., & Bower, J. (2009). Self-efficacy and academic achievement in Australian high school students: The mediating effects of academic aspirations and delinquency. *Journal of Adolescence, 32*(4), 797–817.

Chang, M., Evans, M. A., Kim, S., Norton, A., & Samur, S. (2015). Differential effects of learning games on mathematics proficiency. *Educational Media International, 52*(1), 47-57.

Connolly, M. R., Lee, Y. G., & Savoy, J. N. (2018). The effects of doctoral teaching development on early-career stem scholars' college teaching self-efficacy. *CBE life sciences education*, *17*(1), 1-15.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative and mixed method approaches* (2nd ed.). California: Sage.

Çelik, K. (2018). *Genişletilmiş teknoloji kabul modeli: uzaktan eğitim öğrencileri üzerine bir araştırma*. Yayımlanmamış doktora tezi, Gazi Üniversitesi, Ankara.

Çelik, H. E., Yılmaz, V., & Pazarlıoğlu, V. (2010). Teknoloji kabul modeli ve bir uygulama. *Finans Politik & Ekonomik Yorumlar, 47*(540), 35-44.

Daniel, S. J. (2020). Education and the COVID-19 pandemic. *Prospects*, 1–6. Advance online publication.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*, *19*(4), 9-30.

Delone, W., & McLean, E (2004). Measuring e-commerce success: Applying the Delone & Mclean information systems success model. *International Journal of Electronic Commerce, 9*(1), 31-47.

DiGregorio, N., & Liston, D. D. (2018). Experiencing technical difficulties: teacher self-efficacy and instructional technology. In: C. B. Hodges (Ed.), *Self-efficacy in ınstructional technology contexts* (pp. 103-117). Springer International Publishing; Cham: 2018.

Doğru, O. (2020). An investigation of pre-service visual arts teachers' perceptions of computer self-efficacy and attitudes towards web-based instruction. *International Journal of Research in Education and Science (IJRES), 6*(4), 629-637.

Elifoğlu-Kurt, Ö. (2015). Üniversite öğrencilerinin uzaktan eğitime bakış açılarının teknoloji kabul modeli ve bilgi sistemleri başarı modeli entegrasyonu ile belirlenmesi. *Uluslararası Alanya İşletme Fakültesi Dergisi, 7*(3), 255-266.

Elifoğlu-Kurt, Ö. (2016). Bilgi Sistemleri Başarı Modeli İle Bir e-öğrenme sistemi değerlendirmesi. *Yönetim Bilişim Sistemleri Dergisi, 1*(3), 140-149.

Else-Quest, N., Hyde, J., & Linn, M. (2010). Cross-national patterns of gender differences in mathematics: a meta-analysis. *Psychological bulletin, 136,* 103-27. 10.1037/a0018053.

Eren, A., Kaya, M. D. (2017). Üniversite öğrencilerinin uzaktan eğitim sistemine bakiş açilarinin teknoloji kabul modeli ile incelenmesi. *Sosyal Bilimler Enstitüsü Dergisi*. 1-16.

Fernandez-Rio, J., Cecchini, J. A., Méndez-Gimenez, A., Mendez-Alonso, D., & Prieto, J. A. (2017). Self-regulation, cooperative learning, and academic self-efficacy: Interactions to prevent school failure. *Frontiers in Psychology*, 8, 22.

Gaskill, P. J., & Hoy A. W. (2002). Self-efficacy and self-regulated learning: The dynamic duo in school performance. In: J. Aronson (Ed.), *Improving academic achievement: Impact of psychological factors on education (*pp. 185–208). San Diego, CA, US: Academic Press.

Hassanzadeh, A., Kanaani, F., & Elahi, S. (2012). A model for measuring e-learning systems success in universities. *Expert Systems with Applications*, *39*(12), 10959-10966.

Herrero, Á., & San Martín, H. (2012). Developing and testing a global model to explain the adoption of websites by users in rural tourism accommodations. *International Journal of Hospitality Management, 31*(4), 1178-1186.

Hong, K. S., Chai, M. L., Tan, K. W., Hasbee, U., & Ting, L. N. (2014). ESL teachers' computer self-efficacy, attitudes toward computer & classroom computer use. *Pertanika Journal of Social Science and Humanities, 22*(2), 369–385.

Huang, J., Hsinchu, Y., & Chuang, S. (2007). Elucidating User Behavior of Mobile Learning-A Perspective of The Extended Technology Acceptance Model. *The Electronic Library, 25*(5), 585-598.

Jegede, P. O. (2007). Computer attitude as correlates of computer self-efficacy among south western Nigerian higher education teachers. The Proceedings of Sixth International Internet Education Conference & Exhibition, 2-4 September 2007, 271-284. Cairo, Egypt.

Kaleli, Y. S. (2020). The effect of computer-assisted instruction on piano education: An experimental study with pre-service music teachers. *International Journal of Technology in Education and Science (IJTES), 4*(3), 235-246.

Kalyoncuoğlu, S. (2018). Tüketicilerin online alışverişlerindeki sanal kart kullanımlarının teknoloji kabul modeli ile incelenmesi. *Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi, 20*(2), 193-213.

Kara, S. (2020). Prospective visual arts teachers' innovation skills and attitudes towards computer assisted instruction. *International Journal of Technology in Education and Science, 4*(2), 98-107.

Klaiman, T., Kraemer, J. D., & Stoto, M. A. (2011). Variability in school closure decisions in response to 2009 H1N1: A qualitative systems improvement analysis. *BMC Public Healthy, 11*(1),1–10. doi: 10.1186/1471-2458-11-73.

Kim, J., Song, J., & Jones, D. R. (2011). The cognitive selection framework for knowledge acquisition strategies in virtual communities. *International Journal of Information Management, 31*(2), 111–120.

Koyuncuoğlu, O. (2021). An investigation of graduate students' Technological Pedagogical and Content Knowledge (TPACK). *International Journal of Education in Mathematics, Science, and Technology, 9*(2), 299-313.

Lai, C., & Gu, M. (2011). Self-regulated out-of-class language learning with technology. *Computer Assisted Language Learning*, *24*(4), 317–335.

Lee, Y. H., Hsieh, Y. C., & Ma, C. Y. 2011. A model of Organizational Employees' E-Learning Systems Acceptance. *Knowledge-Based Systems, 24*(3), 355-366.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management. 40*(3), 191- 204.

Lévesque, M., & Minniti, M. (2006). The effect of aging on entrepreneurial behavior. *J. Bus. Ventur,* 21, 177–194.

Li, Y., Garza, V., Keicher, A., & Popov, V. (2019). Predicting high school teacher use of technology: pedagogical beliefs, technological beliefs and attitudes, and teacher training. *Technology, Knowledge and Learning, 24*(3), 501–518.

Lin, H. F. (2011). An empirical investigation of mobile banking adoption: The effect of innovation attributes and knowledge-based trust. *International journal of information management*, *31*(3), 252-260.

Lindberg, S. M., Hyde, J. S., Petersen, J. L., & Linn, M. C. (2010). New trends in gender and mathematics performance: A meta-analysis. *Psychological bulletin*, *136*(6), 1123-29.

Liu, F., Chen, M. C., Sun Y., Wible, D., & Kuo, C. H. (2008). Assessment of an online learning community from technology acceptance model in education. Eighth IEEE International Conference on Advanced Learning Technologies.

McCoy, S., D. F. Galetta, & W. R. King (2007). Applying TAM Across Cultures: the Need for Caution. *European Journal of Information Systems, 16*, 81-90.

Mlambo, S., Rambe, P., & Schlebusch, L. (2020). Effects of Gauteng province's educators' ICT self-efficacy on their pedagogical use of ICTS in classrooms. *Heliyon*, *6*(4), doi: 10.1016/j.heliyon.2020.e03730

Musharraf, S., Bauman, S., Anis-Ul-Haque, M., & Malik, J. A. (2018). Development and validation of ıct self-efficacy scale: Exploring the relationship with cyberbullying and victimization. *International journal of environmental research and public health*, *15*(12), 2867, doi: 10.3390/ijerph15122867

Öksüz, C., Ak, Ş., & Uça, S. (2009). İlköğretım matematık öğretımınde teknolojı kullanımına ilişkın algı ölçeğı. *Yüzüncü Yıl Üniversitesi, Eğitim Fakültesi Dergisi, 6*(1), 270-287.

Pajares, F, & Urdan, T. (2006). *Self-efficacy beliefs of adolescents*. In Greenwich (Edts.). CT: Information Age Publishing.

Pajares F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543–578.

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17*, 236–263.

Rabaa'i, A. A. (2009). *Assessing information systems success models: empirical comparison (Research in Progress)*. 20th Australian Conference on Information Systems, 2–4 December 2009, Melbourne.

Robinson, S., Neergaard, H., Tanggaard, L. & Krueger, N. (2016). New horizons in entrepreneurship: from teacher-led to student-centered learning. *Education + Training*, 58 (7/8), 661-683.

Salthouse T. A. (2012). Consequences of age-related cognitive declines. *Annu. Rev. Psychol.,* 63, 201–226.

Sanchez-Franco, M. J. (2009). The moderating effects of involvement on the relationships between satisfaction, trust and commitment in e-banking. *Journal of Interactive Marketing, 23*(3), 247–258.

Sang, G., Valcke, M., van Braak, J., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: predictors of prospective teaching behaviors with educational technology. *Computer & Education,* 54(1), 103–112.

Schunk, D. H., & Pajares, F. (2009). Self-efficacy theory. In K. R. Wentzel and A. Wigfi eld (Eds.), Handbook of motivation at school (pp. 35-53). New York: Routledge.

Schunk, D. H. (1994). Self-regulation of self-efficacy and attributions in academic settings In: D. H. Schunk, & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 75–99). Hillsdale, NJ: Erlbaum.

Siyam, N. (2019). Factors impacting special education teachers' acceptance and actual use of technology. *Education and Information Technologies,* 24, 2035–2057.

Spreeuwenberg, M. (2016). Cloud Computing. (Unpublished Thesis), Radboud University, Faculty of Science, Computing Science, Nijmegen.

Stankov, L., Lee, J., Luo, W., & Hogan, D. J. (2012). Confidence: A better predictor of academic achievement than self-efficacy, self-concept and anxiety? *Learning and Individual Differences, 22*, 747–758.

Stosic, L. (2015). The importance of educational technology in teaching. *International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE), 3*, 111-114.

Suciu, C. M., & Platis, M. (2009). Entrepreneurial university in the new economy. *The Journal of the Faculty of Economics, 2*(1), 591-596.

Turan, A. H., & Çolakoğlu B. E. (2008). Yüksek öğrenimde öğretim elemanlarının teknoloji kabulü ve kullanımı: Adnan Menderes Üniversitesi'nde ampirik bir değerlendirme. *Doğuş Üniversitesi Dergisi, 9*(1), 106-121.

UNESCO, (2020a). *90 million students out of school due to COVID-19: UNESCO releases first global numbers and mobilizes response*. Retrieved from https://en.unesco.org/news/290-million-students-out-school-due-COVID-19-unesco-releases-first-global-numbers-and-mobilizes

UNESCO. (2020b). 10 recommendations to ensure that learning remains uninterrupted. Retrieved from https://en.unesco.org/news/COVID-19-10-recommendations-plan-distance-learningsolutions

Vandercruysse, S., Vandewaetere, M., Cornillie, F., & Clarebout, G. (2013). Competition and students' perceptions in a game-based language learning environment. *Educational Technology Research and Development, 61*, 927–950.

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science, 46*(2), 186-204.

Woolfolk Hoy, A. (2004). Self-efficacy in college teaching *Essays on teaching excellence: Toward the best in the academy*. Fort Collins, CO: POD Network; 8–11. Retrieved from https://podnetwork.org/content/uploads/V15-N8-Woolfolk-Hoy.pdf

Wu, J. H., & Wang, S. C. (2004). What Drives Mobile Commerce? An Empirical Evaluation of the Revised Technology Acceptance Model. *Information & Management, 42*(5), 719-729.

Zhang, N., Guo, X., & Chen, G. 2007. „Extended information technology initial acceptance model and its empirical test. *Systems Engineering- Theory & Practice, 27*(9), 123-130.

Zhang, S., Zhao, J., & Tan, W. 2008. Extending TAM for online learning systems: An intrinsic motivation perspective. *Thinghua Science and Technology, 13*(3), 312-317.

Author Information

A. Aslan Şendoğdu

https://orcid.org/0000-0002-9860-320X

Necmettin Erbakan University

Turkey

Contact e-mail: *asendogdu@gmail.com*

Özdal Koyuncuoğlu

https://orcid.org/0000-0002-0740-2702

Necmettin Erbakan University

Turkey