Examination of the relationship between the attitudes of teacher candidates towards technology and their opinions of distance education

Raziye Sancar [a] * (ID) ,

[a] Kirsehir Ahi Evran University, Türkiye.

| Highlights	Abstract
• TCs tend to have positive opinions of distance education. • The attitudes of TCs regarding technology are statistically correlated to their opinions of distance education. • TCs are generally more positive in their evaluations of accessibility and usability than other sub-dimensions of the distance education process. **Article Info:** Research Article **Keywords:** *Distance education, Teacher candidates, Learning management systems*	The study aims to determine possible relationships between the opinions of teacher candidates regarding distance education, and their attitudes toward the technology used in distance education courses. A quantitative research approach structured in a descriptive and relational survey model was used in the research. 81 teacher candidates studying in three different departments participated in the study. Non-parametric statistics were used to analyze the data, and Descriptive statistics, Kruskal-Wallis and Spearman-Brown correlation analysis were employed. The results revealed that there is a positive and moderately significant relationship between the attitudes of pre-service teachers towards technology and their opinions of the distance education process. It has also been determined that there is a positive and moderate relationship between the opinions of teacher candidates in regard to the sub-dimensions of the scale of the distance education process evaluation (levels of accessibility, usability, attitude, technological facilities, and self-efficacy) and their attitudes towards technology. These findings implicate that educators teaching online learners should consider the characteristics of their learners and make decisions regarding the teaching and learning process to create the optimal learning environment.

1. Introduction

"Online learning" should not be labelled as the "new normal". Rather than merely online learning, it is the use of online technologies that will eventually become standard practice. In the future, "new" normal should be distinguished from the technology currently being used, or the present "old" normal, through the addition of "new" technologies to the invisible educational toolset (such as paper and pencil). In other words, rather than a process of replacement, all types of learning in the future "new" normal, whether it is enhanced, supported, facilitated, or assisted by other "invisible" technologies, will continue to exist side by side with online learning (Xiao, 2021).

Although the use of online learning was forced by COVID 19 making face-to-face in-class teaching and learning impossible, online learning is not new. Statistics show that around 34% of more than three million postgraduate students were enrolled on distance education courses in 2015 (Miller et al, 2017, p. 18). Moreover, about a third (5.5 million) of undergraduates participated in distance education in the fall of 2017, and 2.2 million students, or 13% of all undergraduate enrollments, only took distance education courses (McFarland et al, 2019, p. 159). These statistics clearly show that even before the pandemic there was already increasing interest in distance education due to the flexible learning opportunities offered by such programs. According to Inman et al. (1999), many students are satisfied with distance education as a means of educational delivery. Although it may not be ideal for every student, distance learning does provide many students with access to education. It should be underlined that after two decades; educators and researchers are also becoming increasing positive about online education. While it is clearly not suitable for the teaching of every subject to all students, distance learning does provide opportunities for effective teaching practice. It would therefore be inappropriate to consider online education as being an unavoidable evil, or as a brand new method, but to evaluate it fairly by examining the history of the relevant concepts and the contribution of these concepts to the teaching and learning process.

As emphasized by Singh and Thurman (2019), when it is understood how the development and change of technology affect our definitions of learning, it is also possible to minimize the conceptual confusion regarding online learning. In the figure below (Fig 1.), a detailed breakdown of the concepts used to define the concept of online learning are given.
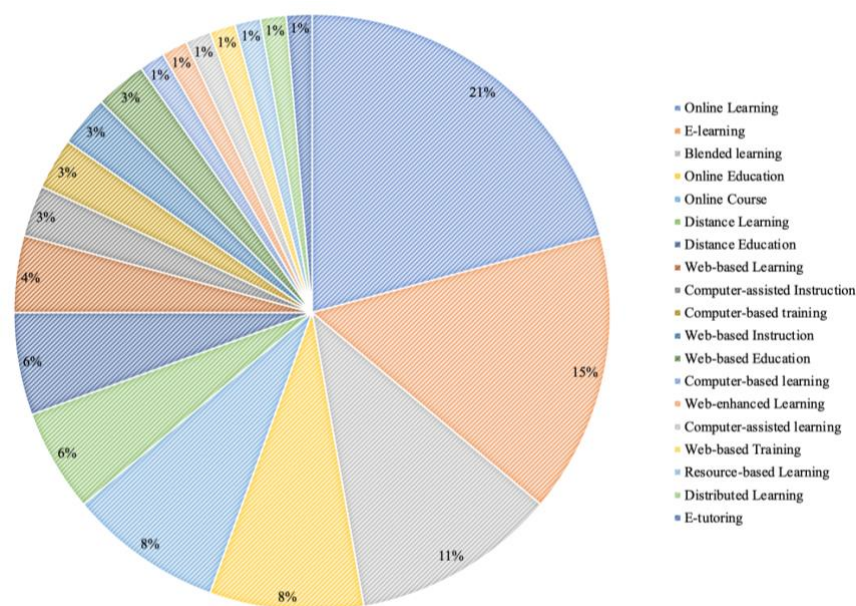
Fig 1. Terms used to define online learning (Singh & Thurman, 2019).

Confusion clearly exists in the field of online learning due to the use of overly diverse concepts (such as e-learning, blended education, online education, and web-based learning). This study therefore emphasizes the learning experience itself to define online learning: a form of learning that employs the internet/online computers in a synchronous/asynchronous classroom in which students interact with teachers and other students, and participation is independent of physical locations (Singh & Thurman, 2019).

In the literature related to online learning, one common issue is the characteristics of the learners, of which learner attitude is of particular importance. Although attitude is a complex concept, it can be said to contain

affective, cognitive, and behavioral features (Triandis, 1971). It is noteworthy that learner attitude is the basis of many conceptual models in the literature, the most widely known of which is the Technology Acceptance Model (TAM), which has been tested for e-learning (Masrom, 2007). An additional conceptual model is the Three-Tier Technology Use Model (3-TUM) (Liaw, 2007).

The importance of learner attitude in the online learning process has been extensively tested with various research processes that employ a range of variables (Chou & Chou, 2021; Liaw et al., 2007; Sarıbaş & Meydan, 2020; Şahin et al., 2017; Usta et al., 2016). Research was conducted by Baber (2021) to examine the emergency distance education process conducted in Korea after the outbreak of Covid-19. This research consisted of a consideration of multiple variables relating to learner and teacher characteristics, as well as acceptance of technology (Baber, 2021). As a result of the research, it was determined that not only did the students accept that the epidemic meant traditional classroom learning was impossible, they also were generally positive about e-learning. Moreover, the effect of learner characteristics on the process was found to be statistically significant (Baber, 2021). It is obvious that online learning students are more responsible for their learning than traditional in-class learners (Simonson et al., 2019). Shearer et al. (2020) emphasize the importance of optimizing the online learning experiences for learners and instructors due to rapid changes in online distance education, and it is for this reason that research which focuses on learner-centered pedagogical strategies should be promoted.

Although there are many process evaluations of online learning in the literature, especially during the Covid 19 pandemic (Fiş Erümit, 2021; Author, 2022; Kuzu Demir et al., 2022; Öngören, 2022; Shearer et al., 2020), it is seen that research data is usually collected through interviews or semi-structured online surveys. However, the current study helps to readdress this balance by evaluating the process using learner characteristics and quantitative data. The aim of this study is to determine whether or not a positive attitude toward using technology is likely to be reflected in attitudes to the distance education process.

2. Methodology

2.1. Research Questions (RQ)

Participants in this study were asked the following questions:

RQ1.   How do the teacher candidates evaluate the distance education process and the five aspects of accessibility, usability, attitude, technological facilities, and self-efficacy?

RQ2.   What are the attitudes of the teacher candidates towards technology?

RQ3.   Do the attitudes of the teacher candidates towards technology significantly affect their opinions of the distance education process and the five aspects of accessibility, usability, attitude, technological facilities, and self-efficacy?

RQ4.   Do the attitudes of the teacher candidates towards distance education differ significantly according to department?

RQ5.   Do the attitudes of the teacher candidates towards technology differ significantly according to department?

2.2. Research Model/Design

This study was conducted as a descriptive, correlational survey, designed using a quantitative perspective, to explore the opinions of the participants regarding the distance education process, as well as better measure any correlation between these opinions and attitudes towards technology.

2.3. Data Collecting Tools

The Distance Education Process Evaluation Scale (DEPES) and the Attitude towards Technology Scale (ATS) were both utilized in data collection. DEPES was developed to measure the experiences of learners and instructors of distance education, including the features of the learning management system (Gökçe, Önal & Çalışkan, 2021). The scale used include twenty-five items rated on a five-point Likert scale, (ranging from 1: strongly disagree, to 5: strongly agree), that are organised within five-factor structures (Factor 1: Accessibility, Factor 2: Usability, Factor 3: Attitude, Factor 4: Technological Facilities and Factor 5: Self-efficacy). The scale developer reported Cronbach alpha for both the whole scale (0.95) and each subscale (0.88, 0.91, 0.90, 0.91, and 0.92), as well as determining that the five-factor structure of the scale can explain 70.5% of the total variance. In accordance with the confirmatory factor analysis of the scale, the accepted model fit index of the scale was a RMSEA value of 0.05, a GFI value of 0.93, a AGFI value of 0.92, a SRMR value of 0.04, a TLI value of 0.96, a CFI value of 0.96 and a NFI value of 0.95. The reliability coefficients of the whole scale were set as 0.96 in the context of this research.

ATS was developed to measure the attitudes of teacher candidates towards technology (Aydın & Kara, 2013). The scale, which was designed as a five-point Likert scale ranging from 1: strongly disagree to 5: strongly agree, consists of 17 items relating to attitude, 15 of which are positive and 2 of which are negative. This scale is unidimensional. The Cronbach alpha value of the scale was 0.87. In addition, based on the confirmatory factor analyses of the scale, it was reported that the model fit index had an acceptable RMSEA value of 0.097, a GFI value of 0.86, a AGFI value of 0.81, a SRMR value of 0.066, a CFI value of 0.94 and a NFI value of 0.93. The reliability coefficients of the whole scale were calculated as being 0.95 for this research context. The reliability values of the data collection tools are provided below (Table 1).

Table 1.

Reliability values of the data collection tools.

Scale and sub-dimensions	Cronbach Alfa
DEPES	0.96
Accessibility	0.92
Usability	0.94
Attitude	0.93
Technological Facilities	0.88
Self-efficacy	0.96
ATS	0.95

2.4. Participants

Eighty-one teacher candidates (64 female, 17 male), from three different departments of the Faculty of Education at Kirsehir Ahi Evran University, participated in the study after being selected using the criterion sampling method. Criteria for inclusion were attending the online and compulsory Information Technology course, and declaring full voluntarily participation in the research process. A breakdown of the departments attended by the participants is provided below (Table 2).

Table 2.

Participants by Department

Departments	Frequency	Percentage
Classroom Instruction Education (CIE)	32	40%
Social Science Education (SSE)	26	32%
Mathematics Education (ME)	23	28%

2.5. *Data Analysis*

Before the data analysis procedure was conducted, the normality of the data based on the whole scale and sub-dimensions was tested. Skewness and Kurtosis values were examined to check the normality assumptions, and the findings are summarized in Table 3. According to Büyüköztürk (2011), these values should be in the range of ±1 to ensure normality assumption. A further method of testing normality assumptions in cases where the sample size is less than 50 were examined using the results of a Shapiro-Wilks test. Although p>0.05 was interpreted as the normality assumption being met (Büyüköztürk, 2011), the normality assumption of the data was not met for almost all sub-dimensions (p<0.05). Despite the fact that the normality assumption was not met for both the whole scale and most of the sub-dimensions (See in Table 3), non-parametric statistics were employed to analyze the data. In order to do this and answer the first and second RQ, descriptive statistics were employed. The relationship between the research variables, which is the third RQ, was analyzed through the use of the Spearman-Brown correlation coefficient. The Kruskal-Wallis test was also used to answer the 4th and 5th RQ, and to determine whether the differences in the dependent variables (DEPES and ATS) created by the department studied were significant. Furthermore, since both of the scales were of five-point Likert, the results were interpreted according to the values obtained from the division of the calculated arithmetic mean by the total number of items, based on the (n-1)/n formula in the summing of the mean scores. More specifically, 1.00 to 1.80 were rated as being Very Low, 1.81 to 2.60 as being Low, 2.61 to 3.40 as being Moderate, 3.41 to 4.20 as being High, and 4.21 to 5.00 as being Very High. Jamovi, an open-source software, was employed to analyze the research data.

Table 3.

Skewness and Kurtosis values for the data collection tools.

Scale/sub-dimensions	Departments	N	Skewness	Kurtosis	Shapiro-Wilk W	p
DEPES		81	**-1.015**	**1.456**	0.936	**< .001**
	CIE	32	-0.924	0.828	0.928	**0.034**
	SSE	26	-0.889	0.683	0.943	0.157
	ME	23	0.124	0.263	0.969	0.668
Accessibility		81	**-1.085**	**1.417**	0.876	**< .001**
	CIE	32	**-1.144**	**1.456**	0.888	**0.003**
	SSE	26	-0.789	0.516	0.882	**0.006**
	ME	23	-0.806	-0.454	0.822	**< .001**
Usability		81	-0.598	-0.159	0.943	**0.001**
	CIE	32	-0.324	-0.678	0.961	0.294
	SSE	26	-0.644	-0.466	0.925	0.058
	ME	23	0.299	0.246	0.949	0.282
Attitude		81	-0.613	-0.463	0.929	**< .001**
	CIE	32	-0.228	-0.925	0.951	0.151
	SSE	26	-0.851	0.148	0.887	**0.008**
	ME	23	**-1.053**	**1.217**	0.923	0.077
Technological Facilities		81	-0.256	-0.636	0.963	**0.019**
	CIE	32	-0.142	-0.789	0.947	0.120
	SSE	26	-0.299	-0.718	0.961	0.419
	ME	23	-0.373	0.208	0.959	0.447
Self-efficacy		81	**-1.349**	**2.591**	0.839	**< .001**
	CIE	32	**-1.387**	**1.754**	0.837	**< .001**
	SSE	26	-0.969	**1.580**	0.849	**0.001**
	ME	23	-0.225	-0.789	0.831	**0.001**
ATS		81	**-1.191**	0.913	0.889	**< .001**
	CIE	32	-0.845	-0.280	0.904	**0.008**

SSE	26	-0.920	0.515	0.912	**0.030**
ME	23	-0.585	0.486	0.941	0.193

*p < 0.001

2.6. Findings

In this section, findings based on the research questions are presented. The section is initially concerned with the answers to the RQ1 questions, namely how do teacher candidates evaluate the distance education process, as well as the accessibility, usability, and opportunities in distance education, and what are the attitudes of the teacher candidates in relation to self-efficacy in the distance education process. This section then examines answers to the RQ2 questions, namely the attitudes of the teacher candidates towards technology (See Table 4).

Table 4.

Descriptive statistics for the research variables.

Scale and sub-dimensions	N	Mean	SD
DEPES	81	3.52	0.813
Accessibility	81	3.97	0.929
Usability	81	3.31	1.023
Attitude	81	3.27	1.107
Technological Facilities	81	3.12	1.059
Self-efficacy	81	3.91	0.862
ATS	81	3.55	0.838

The teacher candidates generally gave medium and high evaluations of the distance education processes (See Table 4), and it is noteworthy that the overall evaluation of the distance education process was at a high level, as were the evaluations of the accessibility and system usage self-efficacy sub-dimension components. However, the areas of usability, attitude towards using the system and technological facilities, were only evaluated moderately. A noteworthy finding was that teacher candidates were mainly positive in their evaluations of accessibility, and this reflects the fact that the distance education system supports the use of all technological tools (desktop/laptop, tablet, smartphone, etc.) and has a user-friendly interface. The teacher candidates generally gave high-level evaluations of the technology.

The purpose of the third RQ is to determine whether the attitudes of teacher candidates towards the technology significantly correlate with their opinions of the distance education process. This is done through analysis of the candidates' assessment of the accessibility and usability of distance education, attitudes and self-efficacy towards distance education, and the opportunities of teacher candidates in the distance education process (See Table 5).

Table 5.

Spearman-Brown correlation coefficient values for the research variables

		Accessibility	Usability	Attitude	Tech Facilities	Self-efficacy	DEPES	ATS
Accessibility	Spearman's rho	—						
	p-value	—						
Usability	Spearman's rho	0.460*	—					
	p-value	< .001	—					
Attitude	Spearman's rho	0.540*	0.613*	—				
	p-value	< .001	< .001	—				
	Spearman's rho	0.451*	0.464*	0.572*	—			

Tech	p-value	< .001	< .001	< .001	—		
Facilities	Spearman's rho	0.540*	0.473*	0.650*	0.568*	—	
Self-efficacy	p-value	< .001	< .001	< .001	< .001	—	
	Spearman's rho	0.705*	0.778*	0.862*	0.729*	0.798*	—
DEPES	p-value	< .001	< .001	< .001	< .001	< .001	—
	Spearman's rho	0.506*	0.459*	0.409*	0.342*	0.356*	0.505*	—
ATS	p-value	< .001	< .001	< .001	0.002	0.001	< .001	—

*$p < 0.001$, N = 81

It was observed that there was a positive, moderate and statistically significant ($r=0.505$, $p<0.001$) relationship between the attitudes of teacher candidates towards technology and their levels of evaluation of the distance education process (See Table 5). It was also noteworthy that the attitudes of teacher candidates towards technology showed a statistically significant and moderate relationship with all the sub-dimensions of the distance education process evaluation scale. Moreover, the highest correlations with the attitudes of teacher candidates towards technology can be respectively ranked as interaction, usefulness, attitude, possibilities, and self-efficacy. These findings were among the indicators that the positive attitudes of teacher candidates towards technology allow them to positively evaluate the distance education environment as being easily accessible or user-friendly.

Finally, the Kruskal-Wallis analysis was used to answer the fourth and fifth RQs, which questioned whether or not there were significant differences in research variables according to the departments (See Table 6).

Table 6.

Kruskal-Wallis analyses of the research variables.

Scale and sub-dimensions	X^2	df	p
DEPES	8.10	2	0.017*
Accessibility	7.96	2	0.019*
Usability	4.10	2	0.129
Attitude	6.84	2	0.033*
Technological Facilities	2.47	2	0.291
Self-efficacy	8.11	2	0.017*
ATS	3.92	2	0.141

*$p < 0.05$

Although no statistically significant differences can be seen between the three departments based on the attitudes of the teacher candidates towards technology, it was noticed that there were differences in how the teacher candidates evaluated the distance education process. Specifically, there were statistically significant differences between the departments in some of the sub-dimensions, namely: accessibility, attitude, and self-efficacy. Moreover, when pairwise comparisons were checked, it was seen that the main difference was that the Department of Classroom Instruction Education provided more positive evaluations than the Department of Mathematics Education (See Table 7).

Table 7.

Pairwise comparison analyses for the DEPES.

Departments		W	p
CIE	SSE	1.61	0.488
CIE	ME	4.07	0.011
SSE	ME	2.23	0.257

*$p < 0.05$

3. Discussion

The first finding of this study is that the attitudes of teacher candidates towards technology are moderate, and that they have a positive evaluation of the distance education process. In the students' online learning interactions model, while the discussions, formative assessments, and content activities comprised the online learning experience of students, the main component is seen to be how discussion interaction facilitated the construction of student knowledge (Keskin & Yurdugül, 2022). Accordingly, in this research case in which the AYDEP platform was employed, the course process was enriched with discussion sessions, as well as interactive interactions, both in the lecturers and content of the course. The AYDEP platform is considered to help facilitate the management and organization of the course process. It can therefore be seen that the students' positive evaluation of their online learning experiences seems to be related to both the AYDEP platform, and to the course design, through the employment of many process components. In parallel with research performed by Quansah and Essiam (2021), this can be interpreted as the positive evaluations of the students regarding the learning platform being effective in the acceptance process of the technology in question. Although there are numerous challenges, such as internet disconnection and lack of rapid feedback from lecturers, it was found that students evaluate the online learning platform as being both convenient and user-friendly, and thus tend to be accepting of the online learning platform. Similarly, there are many studies in the literature that have results which indicate that the distance education process is positively evaluated by students (Kan & Özmen, 2021; Muthuprasad et al., 2021).

The second finding of this study is related to the correlation between the attitudes of teacher candidates toward technology and the evaluation of the distance education process. This finding suggests that the positive attitudes of teacher candidates should be promoted since they support the evaluation of distance education. The findings indicate the significant, positive, and moderate link between these two variables. Similarly, when Li and Lee (2016) surveyed the computer literacy and online learning attitudes of the students, they found that computer literacy positively related to students' attitude to online learning. Moreover, Prior et al. (2016) found that the digital literacy abilities and attitudes of students affect their perceptions of online learning. In Ismaili's (2021) research, it is concluded that due to the positive attitudes and willingness of students to engage in the distance learning classes in the post-Covid 19, online learning has huge future potential for higher education institutions.

Based on the research findings, it can be seen that the online learning process is a complex and sophisticated process. Not only the course design, but also the characteristics of the students should be carefully taken into account, as well as learning management platforms. It is suggested in the online distance learning literature that there is a need to explore the complexities of the pedagogy of online distance education as an outcome of the interaction between instructional design, technological tools, and both features and demands of learners/instructors (Shearer et al., 2020). In this context, it should be considered that the need for human-oriented pedagogical designs is of primary importance (Bozkurt & Sharma 2021).

4. Conclusion and Suggestions

This study has discovered that the attitude of teacher candidates toward technology was generally at a medium level, while the overall evaluation of the distance education process was at a high level. It was also found that both the attitudes and evaluation of the distance education process by teacher candidates are positively correlated with each other. These findings are meaningful in the designing of an effective online learning procedure. The implications for practice are that online educators should take into account learner characteristics and the teaching and learning process while designing an effective learning environment. These educators should provide visual and collaborative materials to foster more positive learner attitudes

toward both the technology and the online learning process. Although the research has a positive and unique sense for both practice and theory, since the study surveyed an online questionnaire of teacher candidates in a bachelor's program with only 81 participants, this limits how valid such a generalizing of the findings can be. It is therefore important that the research findings given should be cautiously considered in their context, and there is clear scope for future research to extend the examination on a larger scale in more different contexts.

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