Analyzing Preservice Teachers' Attitudes towards Technology

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Abstract—Rapid developments in technology in the present age have made it necessary for communities to follow technological developments and adapt themselves to these developments. One of the fields that are most rapidly affected by these developments is undoubtedly education. Determination of the attitudes of preservice teachers, who live in an age of technology and get ready to raise future individuals, is of paramount importance both educationally and professionally. The purpose of this study was to analyze attitudes of preservice teachers towards technology and some variables that predict these attitudes (gender, daily duration of internet use, and the number of technical devices owned). 329 preservice teachers attending the education faculty of a large university in central Turkey participated, on a volunteer basis, in this study, where relational survey model was used as the research method. Research findings reveal that preservice teachers' attitudes towards technology are positive and at the same time, the attitudes of male preservice teachers towards technology are more positive than their female counterparts. As a result of the stepwise multiple regression analysis where factors predicting preservice teachers' attitudes towards technology, it was found that duration of daily internet use was the strongest predictor of attitudes towards technology.

Keywords—Attitudes towards technology, preservice teachers, gender, stepwise multiple regression analysis.

I. INTRODUCTION

TODAY, rapid developments in information and technology have made it necessary for communities to adapt these new technologies and information to themselves. Thanks to rapid developments in technology, new ones are constantly being added to technological tools and devices that can be used in educational processes and it is becoming obligatory that these technologies should be integrated into educational environments [1]. In developed countries, almost all schools have been equipped with necessary infrastructure in order to provide information and communication technologies (ICT) supported teaching and learning by integrating these technologies into educational environments [2]. Likewise, in Turkey, too, Ministry of National Education has conducted similar projects to implement this integration. One of the most important of these projects is the FATIH

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project (Movement of Enhancing Opportunities and Improving Technology), which has been conducted by the Turkish Ministry of National Education and is intended to enable individuals to use information and technology effectively in their daily and business lives and transform Turkey into an information society [3]. The Project aims at installing boards with LCD panels and internet infrastructure in classrooms of all schools affiliated with the Ministry of National Education [4]. However, only providing individuals with access to ICT will not, by themselves, serve as a guarantee to use them. Moreover, it is also necessary that individuals should have a tendency to use these technologies [5].

Attitude is defined as positive or negative emotional tendencies of individuals towards objects, people, places, events and ideas [6]-[8]. Teo and Noyes [9], on the other hand, describe attitude as positive and negative emotions about an object (e.g., technology) or performing a target behavior (e.g., using technology). According to [10], attitudes have three components, namely cognitive, emotional, and behavioral. The emotional component formed by relatively continuous positive and negative emotions about an object is at the center of these three components. The other two components involve the cognitive component, which is composed of beliefs about the attitude object, and the behavioral component, which includes the tendency to act in accordance with emotions and beliefs. Elias, Smith and Barney [8], on the other hand, stated that attitude object could be abstract (e.g. technology) or concrete (e.g. the Internet). Considering the concept of technology as composing of knowing, thinking, and doing [11] it can be said that technology and attitude consist of similar structures and therefore they should be investigated together.

Although technological innovations that have entered into education systems are new to teachers, what is important in this regard is that teachers should develop positive attitudes towards these innovations, adopt, and put them into practice. Attitudes of teachers and preservice teachers towards technology were investigated extensively in several studies in the past [9], [12]-[17]. Researchers stated that teachers' attitudes towards technology significantly influence the integration of technology into learning and teaching environments as well as the success of teaching processes [18]-[24]. For example, researchers like [25]-[27] point out that the success of students' learning through computer technologies depends predominantly on teachers' attitudes and their willingness to adopt technology. Rohaan, Taconis and Jochems [28], on the other hand, argue that teachers'

information, attitude towards and confidence levels about technology are a very important factor for students to develop positive attitude towards technology.

Teachers are pioneers of change in schools and play a crucial role in the integration of technology into schools and classrooms [2]-[14]. Since attitudes are closely related to usage and intentions for usage, teachers' having positive attitude towards technology seems important. Therefore, understanding preservice teachers' attitude towards technology emerges as a vital issue in helping us to predict their behaviors in the future concerning technology. In addition, when the matter is viewed from the perspective of teacher education, understanding the dimensions affecting preservice teachers' attitudes towards technology seems necessary in developing effective teacher training programs which aim to prepare teachers who can overcome challenges posed by the information age. In conclusion, this study will contribute to other studies investigating factors affecting preservice teachers' attitudes towards technology, and unlike them enable us to be informed about other potential factors influencing preservice teachers' attitudes towards technology (for example, gender, duration of daily internet use and the number of technological devices owned).

This study aimed to investigate preservice teachers' attitudes towards technology and some variables that predicted these attitudes (gender, duration of daily internet use and the number of technological devices owned). In addition, it also investigated whether preservice teachers' attitudes towards technology varied by the gender factor or not.

II. METHODOLOGY

A. Research Model

Relational survey model was used in this study. Relational survey models are research models that aim to identify the presence and/or degree of variation among two or more variables. Although the relational survey model does not yield a true cause and effect relationship, if the situation in a variable is known, then it enables prediction of the other [29].

B. Study Group

Due to the lack of a reliable sampling framework, it is hard to perform random sampling for all potential preservice teachers in Turkey. Therefore, the convenience sampling method was adopted in determining the study group. 329 preservice teachers attending the Collage of Education at a large public university in central Turkey participated in the study on a volunteer basis. Necessary permissions were received from school authorities before the surveys were administered to the preservice teachers. The surveys were administered to the preservice teachers in the period specified by the school authorities. Although the time which the preservice teachers spent in completing the surveys was about 15 minutes, administration of the surveys in sessions to all of the participants took about a week. Descriptive information about the study group was given in Table I.

As can be seen from Table I, 37.7% of the study group consists of male preservice teachers whereas 62.3% is composed of female preservice teachers. 81.8% of the preservice teachers stated that they owned a computer. Moreover, 79.6% of the preservice teachers who participated in the study pointed out that they had internet access. When the participants were examined in terms of their years at university, it was found that the highest participation was from among the freshman students with 84 preservice teachers. However, it was seen that in general adequate and almost equal numbers of preservice teachers from all classes participated in the study.

TABLE I
DEMOGRAPHIC FEATURES OF THE PRESERVICE TEACHERS

Variable	Option	n	f (%)
Gender	Male	124	37.7
	Female	205	62.3
Computer ownership	Yes	269	81.8
	No	60	18.2
Internet access	Yes	262	79.6
	No	67	20.4
Class	Freshman	84	25.5
	Sophomore	83	25.2
	Junior	79	24.1
	Senior	83	25.2

C. Data Collection Tools

"The Scale for Attitude towards Technology" and "Personal Information Form" were used to collect the research data.

1. The Scale for Attitude towards Technology

In order to determine the preservice teachers' attitudes towards technology, the Scale for Attitude towards Technology, which was developed by [30] and tested for reliability and validity on preservice teachers, was used. The scale is unidimensional and consists of 17 attitude items, 15 positive and 2 negative. The Scale for Attitude towards Technology contains items such as "I enjoy using technology," "I enjoy technology helping me in everyday life," and "I believe that technology is necessary for a better quality life.". Answers are given, through a 5-point Likert type scale, to the survey items consisting of separate sentences varying between 1=I totally disagree and 5= I totally agree. The lowest score that can be obtained from the scale is 17 while the highest score is 85. A high score obtained from the scale indicates that positive attitude towards technology has increased [30]. The 17 items in the scale are joined together under a single factor and this sole factor accounts for 34.75% of the total variance. Factor loads of the items vary between .34 and .73. Cronbach's Alpha internal consistency coefficient calculated for the whole of the scale was .87 and split-half reliability coefficient was found to be .87.

2. Personal Information Form

In order to determine the participants' genders, their levels of education, their ownerships of computer and internet, the number of technological devices they possessed and durations of their daily internet use, a personal information form developed by the researchers was used. Close-ended questions

were asked in the personal information form concerning the variables.

D. Analysis and Interpretation of the Data

Whether or not the data exhibited a normal distribution was tested before the analysis. To this end, skewness and kurtosis values were examined on the distributions of the total scores obtained from the scales. As a result of the study, skewness value was found to be -0.586 (SE=0.134) while kurtosis value was determined to be 0.489 (SE=0.268). Moreover, it was concluded as a result of the applied Shapiro-Wilk's Test *(p>*.05) that the data displayed a normal distribution and parametric statistics were decided to be used [31]. Based on this, descriptive statistics and correlation analysis were used in the analytical procedures while independent sample t-test was used in the comparison of the pairs (gender). In addition, Cohen's method was used to statistically determine the effect of the gender variable on attitudes towards technology [32], [33]. Furthermore, the predictive effects of some variables (gender, duration of daily internet use and the number of technological devices owned) with regard to technology were investigated by using the stepwise regression analysis. Of the research data, the gender variable, which is a type of classification scale, was subjected to analysis after it was turned into a new artificial variable called dummy variable [34]. Gender variable was encoded as girls=1 and boys=0 during the formation of the dummy variable.

III. FINDINGS

A. Preservice Teachers' Levels of Attitude towards Technology

First, the preservice teachers' levels of attitude towards technology were investigated in the study. Results of the analysis are given in Table II.

TABLE II
PRESERVICE TEACHERS' LEVELS OF ATTITUDE TOWARDS TECHNOLOGY

Scale	N	Min. Score	Max. Score	$\overline{X}$	SD
Attitude towards Technology	329	25	85	63.14	11.114

The findings obtained from the analysis conducted revealed that the arithmetic means of the scores which the preservice teachers obtained from the attitude towards technology scale were between "neutral" to "I agree" as $\overline{X}$ =63.14 (51< $\overline{X}$ <68). According to this result, it can be claimed that preservice teachers' attitudes towards technology are more leaning towards "I agree" from "neutral" interval scale.

B. Attitude towards Technology with Respect to Gender

Whether the preservice teachers' attitudes towards technology varied by gender or not was analyzed using the independent t-test and the results of the analysis are given in Table III.

When the values given in Table III are examined, a significant difference is seen in terms of gender between the score of the male and female preservice teachers with regard

to their attitudes towards technology (t=3.678; *p*<0.001). This result indicates that the attitudes of male preservice teachers towards technology are more positive than the female preservice teachers. Moreover, the value calculated using Cohen's method reveals that the gender variable is statistically effective on preservice teachers' attitudes towards technology. This value indicates that the level of effect size is medium (see Table III).

TABLE III
ATTITUDES TOWARDS TECHNOLOGY WITH RESPECT TO GENDER

Scale	Gender	N	$\overline{X}$	SD	t	p	Cohen's d
Attitude towards Technology	Male	124	65.98	11.800	3.678	<0.001	0.42
	Female	205	61.42	10.333			

C. Relationships among the Variables

Pearson Product-Moment Correlation Coefficient was used to analyze the relationships among preservice teachers' attitude towards technology scores, durations of their daily internet use and the numbers of technological devices they owned. All the relationships among the attitude towards technology, which was the dependent variable of the study, and the predictive variables (duration of daily internet use and the number of technological devices owned) are positive and statistically significant.

TABLE IV
RELATIONSHIPS AMONG THE VARIABLES

Variable	1	2	3
1. Attitude towards Technology	–		
2. Duration of Daily Internet Use	.223**	–	
3. Number of Technological Devices Owned	.206**	.115*	–

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The predictive factors concerning preservice teachers' attitudes towards technology were investigated using stepwise regression analysis. In this way, variables which provided significant contribution to the prediction of attitudes towards technology were analyzed. Also, the contribution of each of these variables to the total variance explained in the prediction of attitudes towards technology were determined. In the implementation of this method, the total variance explained with regard to the attitude towards technology was reached as a result of three stages (models) (see Table V).

In the first model, (see Table V) duration of daily internet use was entered into the regression equation and explained 5.0% of the variance in the attitude towards technology. In other words, the strongest predictor of the attitude towards technology was found to be the variable of duration of daily internet use. It is seen that the relationship between the duration of daily internet use and attitude towards technology was positive (β=.223); as the duration of daily internet use increased, so did the positive attitude towards technology.

In the second model, the gender variable was added to the model after the variable of duration of daily internet use and with the addition of this variable to the model, the amount of variance explained in the score of attitude towards technology

rose from 5.0% to 9.3%. To put it in another way, the contribution of the gender variable to the variance explained seems to be at the level of 4.3%. The fact that the Beta value belonging to the gender variable, is $\beta=-.208$, indicates that male preservice teachers' positive attitudes towards technology are higher than female preservice teachers.

TABLE V
RESULTS OF STEPWISE REGRESSION ANALYSIS CONCERNING THE PREDICTORS OF THE ATTITUDE TOWARDS TECHNOLOGY

Model[a]	R	R^2	Adjusted R^2	SE	R^2 change	F change	df_1	df_2	p
1[b]	.223	.050	.047	10.850	.050	17.163	1	327	0.000
2[c]	.305	.093	.088	10.616	.043	15.571	1	326	0.000
3[d]	.348	.121	.113	10.466	.028	10.432	1	325	0.001

[a] Dependent Variable: Attitude towards Technology
[b] Predictors: (Constant), Duration of Daily Internet Use
[c] Predictors: (Constant), Duration of Daily Internet Use, Gender
[d] Predictors: (Constant), Duration of Daily Internet Use, Gender, Number of Technological Devices Owned

In the third model, the variable of the number of technological devices owned was added to the model in addition to the variables of duration of daily internet use and gender and after the addition of this variable to the model, the variance explained in the score of attitude towards technology increased from 9.3% to 12.1%. Here, a 2.8% contribution by the variable of the number of technological devices owned to the explained variance can be regarded as low compared with the contribution of the other variables. It is seen that the relationship between the number of the technological devices owned and attitude towards technology is positive ($\beta=.169$) and that as the number of technological devices owned increases, so does the positive attitude towards technology.

IV. DISCUSSION AND CONCLUSION

When studies investigating preservice teachers' attitudes towards technology are examined, it is seen that preservice teachers' attitudes towards technology are associated with factors such as gender, age, having a computer and previous experience with computers [2], [12], [18], [27], [35]-[40]. We, in our turn, aimed to analyze preservice teachers' attitudes towards technology and some variables (gender, duration of daily internet use and the number of technological devices owned), which predicted these attitudes and as a result of the study we arrived at conclusion that could be considered significant.

Firstly, when we looked at preservice teachers' attitudes towards technology, we found that preservice teachers' attitudes towards technology were positive. This result is consistent with the results of some studies that identified preservice teachers' attitudes towards technology [2], [12], [36]. In [2], it is conducted to identify the attitudes towards computer of some preservice teachers attending different departments in Singapore, preservice teachers' attitudes towards computer were found to be positive. In a study conducted by [36] on 642 preservice teachers in Turkey, on the other hand, it was revealed that preservice teachers' attitudes towards technology were positive. Likewise, it was found in another study conducted in Turkey that preservice teachers' attitudes towards technology were positive [12]. The fact that preservice teachers' attitudes towards technology are positive may be linked to the fact that young people of today spend a large part of daily lives using technological devices and engaging in different forms of the internet [41]. Indeed, In a Kaiser Family Foundation study, it was discovered that young people spent more than 6.5 hours of their lives, as if they worked in a full time job, using different forms of technology [42].

Secondly, it was found that male preservice teachers' attitudes towards technology were more positive compared with female preservice teachers. This finding is consistent with the findings of a study by Arslan, Kutluca and Özpınar which directly dealt with preservice teachers' attitudes towards technology [43]. In a study where they investigated preservice teachers' views regarding ICT, [43] found that male preservice teachers' attitudes towards technology were more positive than the attitudes of female preservice teachers. The fact why male preservice teachers' attitudes towards technology are more positive may be due to the fact that female preservice teachers are more diffident concerning the use of technological devices and have lower self-confidence in this regard. However, there are also studies that suggest that there is no difference in the attitudes of male and female teachers towards technology [36]; indeed, there are also studies arguing that female preservice teachers' attitudes towards technology are more positive than the attitudes of male preservice teachers [37], [44].

Thirdly, all the relationships between the attitude towards technology, which was the dependent variable of the study, and the predictive variables were positive and statistically significant. According to this, as the preservice teachers' durations of daily internet use and the numbers of technological devices increased independently of one another, their attitudes towards technology also increased in a positive direction. When the correlation between daily internet use and attitude towards technology is considered, some studies state that duration of daily internet use and attitude towards technology are correlated [36], [45], [46]. In [36], it is found that as preservice teachers' frequencies of internet use increased, so did their technological proficiencies and their attitudes towards technology. On the other hand, when the correlation between the number of technological devices owned and attitude towards technology is examined, it is seen that studies conducted on attitudes towards technology do not directly include this variable. However, given the fact that as the number of technological devices which preservice teachers owned increased, so did their information about technology, our study is consistent with the results of some studies which found that preservice teachers' information about technology and their attitudes towards technology were highly correlated [1], [47].

Fourthly and lastly, factors that predict preservice teachers' attitudes towards technology were investigated using stepwise regression analysis and as a result of the three steps (models) a total explained variance of 12.1% was reached in attitudes

towards technology. In the first model, the strongest predictor of attitude towards technology was found to be the duration of daily internet use. There are various studies in the relevant literature supporting this finding. For example, [36] found that as preservice teachers' frequency of internet use increased, so did their positive attitude towards technology. Likewise, in a study they conducted to determine high school students' attitudes towards the internet, [48] revealed that students with more internet experience exhibited more positive attitudes towards the internet in comparison with the students who had less internet experience.

In the second model, the gender variable was added to the model and it made a significant contribution to the explained variance (5.6%). Given our finding that male preservice teachers' attitudes towards technology were more positive than the female preservice teachers, the fact that the gender variable predicted attitude towards technology is in conformity with the results of some studies [43], [49], [50], while it differs from the findings of other [36], [37], [44]. For example, it was found in a study conducted on Turkish and Czech preservice teachers that male preservice teachers had more positive attitudes towards technology than their female counterparts [50].

In the third, model, the variable of the number of technological devices was added to the model and the variable of the number of technological devices owned made a significant, though lower compared with the other variables, contribution to the explained variance (2.8%). It had already been stated that studies conducted on attitudes towards technology did not include this variable directly. However, given that as the number of technological devices which the preservice teachers owned increased, so did their interactions with technological devices, this finding of ours is in concordance with the suggestion made by [51] that teachers' attitudes towards technology depend on the frequency of their interactions at home or at school with technological devices like the computer. In addition, many studies have stated that teachers and preservice teachers tend to have negative attitudes towards technology due to a lack of experience and education regarding technology [39], [40], [52]-[55].

V. RECOMMENDATIONS

This study provides an insight into some selected variables (gender, duration of daily internet use and the number of technological devices owned) predicting preservice teachers' attitudes towards technology. In this section, some suggestions have been made in the light of the findings obtained from the study. First of all, in order to increase preservice teachers' attitudes towards technology in a positive direction, they should more engage using technologies such as the computer and the internet during their education. Secondly, educators working at teacher training programs should serve as models to preservice teachers by using effective and diverse technology in learning-teaching processes and create environments that will help preservice teachers to develop positive attitude towards technology. Thirdly and finally, since it is known from the findings of numerous studies that

students' positive attitudes towards the use of technological devices in the educational activities as a result of technology-assisted projects have further increased [17], [39], [56], attention should be paid to technology-assisted projects in preservice teachers' education.

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