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TENDENCY SCALE FOR TECHNOLOGY USE IN CLASS: DEVELOPMENT, RELIABILITY AND VALIDITY*

(DERSTE TEKNOLOJİ KULLANIMINA YÖNELİK EĞİLİM ÖLÇEĞİ: GELİŞTİRME, GÜVENİRLİK ve GEÇERLİK)

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ABSTRACT

In related literature, there is a need for a measurement tool to examine students' tendencies towards technology. For this reason, the present study aimed at developing a scale for the tendency towards technology use in class. As there is limited research in literature, the item pool was developed mostly based on the data collected via the interviews and the written compositions. The participants of the study were 796 student teachers attending the Education Faculty at Anadolu University in Turkey in the Spring Term of the academic year of 2013-2014. EFA and CFA were conducted with different samples, and a five-point Likert-type scale made up of 16 items and two factors (emotional and behavioral tendencies) was developed. The total explained variance for the two factors of TSTUC was calculated as around 60%. The Cronbach's Alpha (α) internal consistency reliability coefficient of the total scale was calculated as .93 as a result of EFA and .953 as a result of CFA. Higher scores to be produced by TSTUC refer to the fact that there is a higher tendency towards technology use in classes or that technology use is favored more by students in classes.

Key Words: Tendency; Technology; Scale Development; Higher education.

ÖZET

Alanyazında, öğrencilerin teknolojiye yönelik eğilimlerini incelemek için bir ölçme aracına ihtiyaç duyulmaktadır. Bu nedenle, bu çalışmada derste teknoloji kullanımına yönelik eğilim ölçeğinin geliştirilmesi amaçlanmıştır. Alanyazındaki sınırlı araşmalar nedeniyle, madde havuzu önemli ölçüde katılımcılarla yapılan görüşme ve yazdırılan kompozisyonlardan elde edilen verilerle geliştirilmiştir. Araştırmanın katılımcılarını 2013-2014 öğretim yılı bahar döneminde Anadolu Üniversitesi Eğitim Fakültesi'nde öğrenim gören 796 öğretmen adayı oluşturmuştur. AFA ve DFA farklı örneklem gruplarla gerçekleştirilmiştir. Analizler sonucunda, iki faktör (duyuşşal ve davranışsal eğilim) ve toplam 16 maddeden oluşsan beşli likert tipinde bir ölçek geliştirilmiştir. İki faktöre ilişkin toplam açıklanan varyans %60 olarak hesaplanmıştır. Ölçeğe ilişkin Cronbach Alfa iç tutarlılık güvenirlik katsayısı AFA sonucunda .93 ve DFA sonucunda .953 olarak hesaplanmıştır. Ölçekten alınan yüksek puan, derste teknoloji kullanımına yönelik yüksek eğilime ya da derste teknoloji kullanımının daha çok tercih edildiğine işaret etmektedir.

Anahtar kelimeler: Eğilim; Teknoloji; Ölçek geliştirme; Yüksek öğretim.

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INTRODUCTION

Today, while technology continues its rapid development, its effects are still a matter of debate. Especially between different generations, there are various usages and preferences regarding technology. It is seen that this situation occurs between teachers and students in educational environments and that these generations are against each other regarding a number of issues (Naish, 2008; Sheard, Carbone and Hurst, 2010; Waycott, Bennett, Kennedy, Dalgarno and Gray, 2010; Weiß and Bader, 2010). Prensky (2001) refers to children and adolescents born into technology culture as digital natives. In this respect, teachers could be regarded as digital immigrants. According to Palfrey and Gasser (2008), digital immigrants constitute the generation born in the analog World but shaped with the digital culture. Digital natives own and use technological devices more than digital immigrants (Kvavik, Caruso and Morgan, 2004; Margaryan, Littlejohn and Vojt, 2011). It could be stated that digital natives have different life styles and behavior when compared to previous generations and that the most important difference is more apparent in technology use (Brown, 2000; Frand, 2000; Jukes and Dosaj, 2003; McMahon and Pospisil, 2005; Oblinger and Oblinger, 2005; Prensky, 2004). For this reason, it should be remembered that individuals grown up in two different cultures (teachers and students) are likely to have different perceptions and preferences regarding technology use in education.

Students of the 21st century claim that schools should be arranged in line with their demands and needs (Kolikant, 2010). When educational environments are not arranged considering students’ demands and needs and when technology is not effectively integrated into educational environments, several situations can be seen: the attractiveness of schools decreases; students get bored in courses at school; students’ absenteeism in class increases; and their interest in learning decreases (Pedró, 2006; Yazzie-Mintz, 2010). In this respect, students’ interests, perceptions and demands are quite important for such outcomes as academic achievement, attendance in classes and attitudes towards learning and school (Fredricks, Blumenfeld and Paris, 2004). Regarding this, the contributions of technology into the education process could be said to include effective and permanent learning, student engagement, motivation, participation, interaction, communication, cooperation and so on (DeWitt and Siraj, 2010; Gibbs and Poskitt, 2010; Golubski, 2012; Hussain and Safdar, 2008; Liburd and Christensen, 2013; Nelson Laird and Kuh, 2005; (Parker, Bianchi ve Cheah, 2008). However, students' perceptions and attitudes towards technology are very important to increase the contribution of technology to the educational settings and learning.

Technology-related positive experiences are likely to lead to positive perceptions regarding technology; on the other hand, lack of experience in technology or having negative experiences may cause negative attitudes towards technology (Reynolds and Rucker, 2002). In other words, even if they demonstrate positive attitudes towards the use of technology in instructional activities, students may develop negative perceptions and attitudes towards the use of technology in class due to lecturers' wrong or ineffective use of technology. In some studies, it was revealed that there were differences between the perceptions of students and faculty members regarding the influence of technology use in class (Doppelt, 2006; Parker, Bianchi and Cheah, 2008). Students' lack of tendency towards technology use in class may lead to their disengagement with class. In other words, while effective use of technology will bring about benefits, it may also result in an adverse effect due to the deficiency in the infrastructure or incompetent faculty members (Gunuc, 2013). Previous studies revealed that both primary/secondary and higher education students have positive attitudes towards the use of technology in education (Adifib, 2007; Gunuc, 2013). On the other hand, students reported that they did not favor the use of all kinds of technology in educational settings (DeWitt and Siraj, 2010). For the purpose of helping students make efficient use of school and gain positive school outcomes, it is quite important to make class environments attractive using technology and to arrange the class environments considering students' preferences.

Especially in higher education, it is quite difficult to say that all students are digital natives (Kolikant, 2009). It is important to determine whether digital native students prefer technology usage in classes because the tendency towards the use of technology in class is also related to such factors as effective integration of technology, teacher competency, teacher's technology attitude and technological infrastructure (Marzilli et al. 2014). Especially digital native students may not prefer technology use in class in cases of incompetent faculty members or deficiencies in the infrastructure (Gunuc, 2013). Determining whether students have a tendency towards the use of technology in class is also important not only to organize educational environments accordingly but also to revise technological competencies of faculty members. It will be possible to investigate the underlying reasons why students who do not tend to use technology in class lack such tendency. For whatever reason, students' attitudes and perceptions are influenced by all of these factors and problems, and it may cause a change in the tendency towards technology use in class (Teo and Zhou, 2014; Wong, Teo and Russo, 2013). Even if students in a class are assumed to be digital natives, their tendencies towards technology should be determined by using a measurement tool, and the teaching process should be planned accordingly. In this respect, in related literature, there is a need for a measurement tool to examine students' tendencies towards technology. For this reason, the present study aimed at developing a scale for the tendency towards technology use in class.

In this study, technology is referred to as instructional hardware and software technologies such as laptop, Internet, tablet PC, interactive whiteboard, smart phone, projector and slideware presentations utilized in class and in instructional activities in higher education institutions in Turkey. Also, what technology use refers to is especially the faculty member's use of this technology in class. However, the scale items were determined not only by taking the faculty member's technology use into account but also by considering the students' technology use in class during the instructional activities as well as their out-of-class communication with the faculty member and their fulfilling the task-related responsibilities (e.g. homework, research, project, etc.).

METHOD

Sample

The participants of the study were 796 student teachers attending the Education Faculty at Anadolu University, a state university, in the Spring Term of the academic year of 2013-2014. The participants were determined with the convenience and stratified sampling methods, which are among sampling methods for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). In this respect, first, the data for EFA were collected. After determining the factor structure, for CFA, the data were collected from a different group of participants (Table 1), and the factor structure of the scale was confirmed.

Table 1. Samples for EFA and CFA

	EFA		CFA	
Variable	*f*	%	*f*	%
Gender				
Female	269	65,0	217	65,4
Male	145	35,0	115	34,6
Total	414	100,0	332	100,0
Department				
Computer Education and Instructional Technology	59	14,3	54	16,3
Special Education	69	16,7	35	10,5
Foreign Language Education	100	24,1	107	32,2
Primary Education	123	29,7	59	17,8
Fine Arts Education	28	6,8	46	13,9
Educational Sciences	35	8,4	31	9,3
Total	414	100,0	332	100,0
Grade				
1	127	30,7	51	15,4
2	109	26,3	145	43,7
3	109	26,3	86	25,9
4	69	16,7	50	15,1
Total	414	100,0	332	100,0

As shown in Table 1, when the distributions of the participants were examined for EFA, it was seen that the data were collected from 414 student teachers. For CFA, the data were collected from 382 student teachers. As CFA is quite sensitive to missing values, 50 participants with missing data were not included in the data set. Thus, as shown in Table 1, the analyses were conducted for 332 individuals.

Data Collection Tools

Semi-Structured Interview and Composition Form: While developing the item pool, besides, studies reported in literature, the composition data and semi-structured interviews were used. In this respect, semi-structured interviews were held with 25 students, and 20 students were asked to write down compositions regarding the subject given to them. The interview questions were directed to determine the role of technology in students' attendance and participation in classes. In addition, the students were asked to write down a composition regarding "their preferences and tendencies towards technology use in class".

Tendency Scale for Technology Use in Class (TSTUC) Initial Form: Prior to analysis, the items related to the initial form of "Tendency Scale for Technology Use in Class (TSTUC)" were developed. The scale aimed at measuring the extent of the students' tendency towards technology use in class. In other words, the purpose of this scale was to examine the extent to which the students preferred technology use in class. As shown in Table 2, the item pool made up of 21 items was developed with the help of the interviews held with the participants, the compositions they wrote down and the related literature. The items related to the students' tendencies and perceptions regarding technology were developed considering such themes as preferring technology use in class, using technology in course-related activities out of class, attending classes and participating in lessons more which involved technology use, learning better and becoming more successful in classes which involved technology use and preferring technology use in course-related tasks and responsibilities.

Table 2. Items, Sources and Scale Items

Item		Rationale/Source
1.	I learn better in classes which involve technology use.	• Interviews Compositions
2.	I pay more attention to classes when technology is used.	• Interviews
3.	Technology use in classes makes me feel as if I am a part of my school.	• Interviews
4.	I enjoy learning with technology.	• Interviews Compositions
5.	Classes involving technology use are more entertaining.	• Interviews Compositions
6.	I attend classes more which involve technology use.	• Compositions
7.	I am better prepared for classes which involve technology use.	• Compositions
8.	I give more importance to classes which involve technology use.	• Compositions

Item	Rationale/Source
9. Technology use in classes makes me give value the school.	• Interviews
10. I would like technology to be used in all classes.	• Interviews Compositions
11. I am more active in classes which involve technology use.	• (Nelson Laird and Kuh, 2005)
12. I am more willing to attend classes which involve technology use.	• Compositions
13. I do my course-related responsibilities/assignments better by using technology.	• (Nelson Laird and Kuh, 2005) Interviews Compositions
14. I want technology to be used more in classes.	• Interviews
15. Technology use in classes increases my interest.	• (Allison and Rehm, 2007)
16. I like communicating with faculty members via the Internet.	• (Krause and Coates, 2008; Nelson Laird and Kuh, 2005) Interviews
17. I want new/different technologies to be used in classes.	• Interviews Compositions
18. I like sharing with my classmates via the Internet.	• (Krause and Coates, 2008; Nelson Laird and Kuh, 2005) Interviews
19. Using technology makes it easier to do my course-related responsibilities/assignments.	• (Nelson Laird and Kuh, 2005) Interviews Compositions
20. I follow/listen to classes better which involve technology use.	• (Allison and Rehm, 2007)
21. I get more motivated in classes which involve technology use.	• Interviews Compositions

The formed item pool was presented to five field experts for their views for face and content validity. The scale items including five-point Likert-type rating were assigned scores ranging from 1 to 5 and responded as “I totally disagree”, “I disagree”, “I am neutral”, “I agree” and “I totally agree”. After finalizing the scale, analyses and applications regarding EFA and CFA were conducted.

Data Analysis

For the analysis of the research data, EFA was conducted, using the SPSS 18.0 program. The Lisrel 8.5 program was used for CFA. The assumptions of the EFA and CFA on missing data, outliers, normality, linearity and multicollinearity were first examined (Hutcheson and Sofroniou, 1999; Tabachnick and Fidell, 2007). After computing for the descriptive statistics, the validity-reliability studies for the TSTUC were conducted. For the validity analysis, the content validity, face validity and construct validity were examined. For the construct validity of the TSTUC, the results of the factor analysis, parallel analysis and the item analysis based on correlations were evaluated together. The method of Principal Components Analysis was used for factor analysis.

The appropriateness of the structure of the TSTUC obtained through EFA and other item analyses were confirmed using the CFA method. The indices of $\chi 2$ (Chi-Square Goodness of Fit), GFI (Goodness of Fit Index), AGFI (Adjusted Goodness of Fit Index), CFI (Comparative Fit Index), NFI (Normed Fit Index), NNFI (Not-Normed Fit Index), RMR (Root Mean Square Residuals), SRMR (Standardized Root Mean Square Residuals) and RMSEA (Root Mean Square Error of Approximation) helped in determining the appropriateness of the model. For the reliability analysis of the items obtained as a result of these analyses, the Cronbach's Alpha (α) value, which is also called the internal-consistency coefficient, was calculated.

FINDINGS

Data Screening and Examining the Assumptions

For EFA, regarding the data collected from 414 participants found in the sample, z-scores for the univariable outliers and Mahalanobis distances for the multivariate outliers were calculated (Huck, 2012; Kline, 2011). The z-scores are suggested to be in the range of ±3 (Hutcheson and Sofroniou, 1999; Kline, 2011). It was found out that the Z scores regarding the initial form of TSTUC ranged between +2,000 and -2,711. As the values of both Z points and Mahalanobis output for the remaining 414 students were in acceptable range, no other outliers were observed in the data set. As for CFA, the participants with missing data were not included in the data set, and the outliers in the data set of a total of 332 participants were determined. In this respect, three outliers (z=-4,030; z=-3,451 and z=-3,244) were excluded from the data set. As the values of the Mahalanobis output for the remaining 328 participants were in acceptable range, it was seen that there were no multivariate outliers in the data set. In addition, normality, linearity, multicollinearity and singularity, which are all assumptions of multivariate analyses, were examined (Hutcheson and Sofroniou, 1999; Kline, 2011; Tabachnick and Fidell, 2007). The values of skewness (-.368; ±1) and kurtosis (-.331; ±1) for EFA and those of skewness (-.415; ±1) and kurtosis (.088; ±1) for CFA were found to be in acceptable range. In addition, when the histogram, P-P and Q-Q graphics for EFA and the histogram, P-P and Q-Q graphics for CFA were examined, it was seen that the distributions were normal (Huck, 2012; Pallant, 2007; Kline, 2009).

Multivariate normality and linearity were examined with scatter plot matrix (Tabachnick and Fidell, 2007), and all the variables were observed to demonstrate an oval scatter in between. Finally, whether there were multicollinearity and singularity problems between the variables were examined. In this respect, the item-item correlations of the 21 items found in the item pool were examined, and the Pearson correlation coefficients of all the items were found to be lower than .90 (Field, 2009;

Kline, 2011; Tabachnick and Fidell, 2007). Also, in order to determine the multicollinearity problem, the tolerance and VIF values were examined. The tolerance values for the EFA participants were found to range between .273 and .575 and the VIF between 11,738 and 3,665; in addition, the tolerance values for the CFA participants ranged between .251 and .648 and the VIF values between 1,543 and 3,977. In this respect, it was seen that the tolerance value for each item was higher than .10, which is suggested in related literature, and that the VIF value was lower than 10, which is suggested in related literature (Kline, 2011). Based on these results, it was concluded that there was no multicollinearity or singularity problem for the EFA and CFA participants.

Item Analysis

Regarding the item analyses, Table 3 and Table 4 present not only the scale-total statistics but also the descriptive statistics for each item. After the total-scale scores and the item statistics were examined, the EFA calculations were done. The Cronbach Alpha (α) internal consistency reliability coefficient of the initial scale was found to be .94. If the internal consistency reliability coefficient is higher than .90, then the value is considered to be highly reliable (DeVellis, 2003).

Table 3. Descriptive Statistics Regarding the TSTUC Total Scores

	N	$\overline{X}$	Var.	sd	Min.	Max.	Skewness	Kurtosis
Statistic	414	74,703	214,510	14,646	35	104	-.368	-.331
Std. error							.120	.239

Table 4. Descriptive Statistics Regarding the Items

Item	N	$\overline{X}$	sd	Skewness	Kurtosis	Item-total scale cor.
I1	414	3,965	.940	-1,072	1,119	.670*
I2	414	3,845	.946	-.755	.286	.669*
I3	414	3,102	1,085	.043	-.714	.587*
I4	414	3,925	.895	-.813	.388	.716*
I5	414	3,874	.963	-.822	.273	.671*
I6	414	3,247	1,135	-.228	-.853	.665*
I7	414	3,062	1,080	.013	-.769	.622*
I8	414	3,003	1,089	-.093	-.796	.590*
I9	414	3,121	1,157	-.121	-.920	.538*
I10	414	3,453	1,158	-.420	-.681	.556*
I11	414	3,328	1,063	-.242	-.637	.690*
I12	414	3,287	1,110	-.346	-.628	.722*
I13	414	3,647	1,072	-.696	-.104	.540*
I14	414	3,724	1,043	-.760	.031	.769*

I15	414	3,746	.985	-.750	.056	.748*
I16	414	3,847	1,000	-.902	.416	.447*
I17	414	4,078	.914	-1,059	1,008	.662*
I18	414	3,877	1,055	-.978	.418	.490*
I19	414	4,107	.901	-1,378	1,397	.544*
I20	414	3,539	1,022	-.512	-.313	.735*
I21	414	3,517	1,016	-.473	-.274	.783*

*p<.001

As shown in Table 4, the skewness and kurtosis values regarding the normal distribution of each item were in acceptable range. In addition, it was seen that the item-total scale correlation coefficients demonstrating the correlation of each item with the scale were significant for all the items.

Exploratory Factor Analysis (EFA)

In order to determine the factor structure of the initial scale applied to 414 students, EFA was conducted. In literature, it is reported that at least 300 individuals are necessary for EFA (Field, 2009; Tabachnick and Fidell, 2007). Prior to EFA, for the purpose of testing whether the sample size was convenient (enough) to conduct EFA, the value of Kaiser-Meyer-Olkin (KMO) was examined. A KMO value higher than .50 means that factor analysis can be continued (Kaiser, 1974). As shown in Table 5, the KMO value was calculated as .937 in the present study.

Table 5. KMO and Bartlett's Test

KMO		.937
Bartlett's Test of Sphericity	Approx. Chi-Square	4964,612
	df	210
	p	.000

In order to determine the factor structure of the scale, Principal Component Analysis was used as the extraction method, and Varimax, one of orthogonal rotation methods, was applied as the rotation method. In EFA, besides eigenvalues and rotation methods among various ways of deciding on the number of factors, such analytical techniques as parallel analysis, scree plot and contributions to variance are used as well (Brown, 2006; DeVellis, 2003; Field, 2009; Pallant, 2007). The values obtained as a result of parallel analysis conducted can be seen in Table 6.

Table 6. Comparison of EFA and Parallel Analysis Eigenvalues

Component	EFA (PCA) eigenvalue findings	Parallel analysis eigenvalue findings	Decision
1	9,852	1,522	Accept
2	2,185	1,421	Accept
3	1,181	1,352	Reject
4	.818	1,299	Reject
5	.771	1,249	Reject
.	.	.	.
.	.	.	.

As shown in Table 6, the EFA eigenvalues for the 1st and 2nd factors were higher than the parallel analysis eigenvalues. For this reason, these factors were accepted. Figure 1 presents the scree plot regarding this comparison.

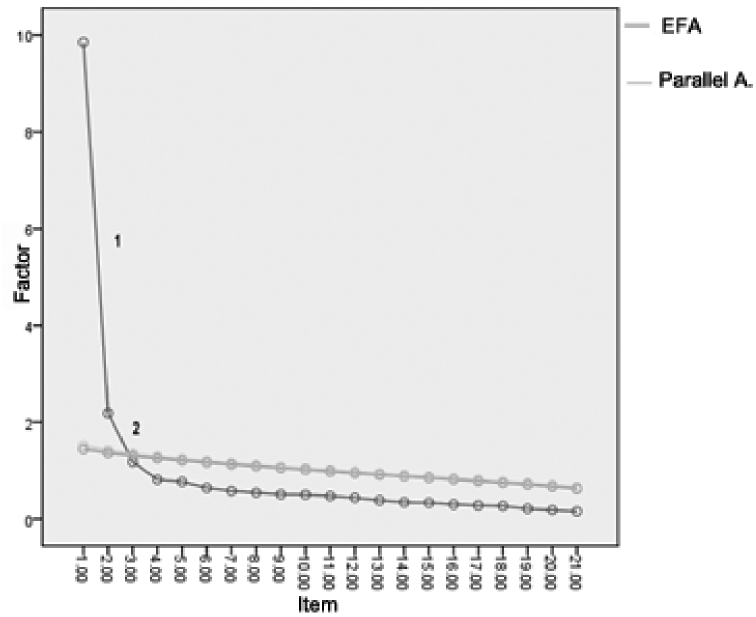

Figure 1. Scree plot regarding EFA and parallel analysis TSTUC

As shown in Figure 1, the six-factor structure occurred at the intersection point where the line of parallel analysis (or mean) eigenvalues cut the line of EFA eigenvalues. In addition, the contributions to variance and eigenvalues in EFA output were examined. The criterion for examining the eigenvalues was to consider the factors with an eigenvalue over 1. However, it is not right to decide on the number of factors only by examining the eigenvalues. Table 7 presents the eigenvalues regarding the factors obtained with the initial EFA and variance rates explained.

Table 7. Extraction and Rotation Eigenvalues Regarding EFA

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Comp.	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9,852	46,916	46,916	9,852	46,916	46,916	5,158	24,560	24,560
2	2,185	10,404	57,320	2,185	10,404	57,320	5,150	24,524	49,083
3	1,181	5,622	62,942	1,181	5,622	62,942	2,910	13,859	62,942
4	.818	3,895	66,837						
5	.771	3,672	70,509						

As shown in Table 7, there were 3 factors with an eigenvalue higher than 1. However, especially in rotated eigenvalues, an important decrease or difference was observed after the second factor. Taking all these results, particularly the parallel analysis results, and the theoretical structure into consideration, the initial TSTUC was determined to have a two-factor structure. After EFA was determined as a two-factor structure, the analysis was repeated (Table 8).

Table 8. Extraction and Rotation Eigenvalues Regarding EFA with the Factor Number Determined

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Com.	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9,852	46,916	46,916	9,852	46,916	46,916	6,236	29,696	29,696
2	2,185	10,404	57,320	2,185	10,404	57,320	5,801	27,625	57,320
3	1,181	5,622	62,942						
4	.818	3,895	66,837						
5	.771	3,672	70,509						

As shown in Table 8, the results of EFA revealed that the total variance explained by the two-factor structure was 57,320%. Table 9 demonstrates the two-factor structure and the related factor loadings.

Table 9. Rotated Component Matrix

Item	Dimension	1	2
I8	Emotional	.823	
I17	Emotional	.769	
I14	Emotional	.756	
I19	Emotional	.750	

I1	Emotional	.709	
I5	Emotional	.666	
I16	Emotional	.660	
I15	Emotional	.649	
I4	Emotional	.627	
I2	Behavioral	*.623**	*.593**
I10	Emotional	.617	
I18	Emotional	.605	
I13	Behavioral	*.571**	*.511**
I6	Behavioral		.769
I12	Behavioral		.749
I7	Behavioral		.743
I3	Emotional	*.655**	*.730**
I9	Emotional	*.636**	*.724**
I21	Emotional	*.584**	*.677**
I11	Behavioral		.645
I20	Behavioral		.633

* Cross-loading item

The interview and the composition data were evaluated, and it was found out that the students' tendencies towards technology were perceived within the scope of the faculty member's technology use in class, students' sharing with their peers and faculty members via the Internet and students' use of technology while fulfilling their course-related responsibilities/assignments. In other words, the students' technology-related tendencies could be said to occur within the scope of the faculty member's technology use and students' in-class and out-of-class use of technology. However, the items and the factor structure obtained as a result of EFA were evaluated by two experts, and the students' tendencies towards technology were named as the dimensions of emotional tendency and behavioral tendency.

The cut-off point for the factor loadings of the items was taken as .40 (Stevens, 2002). As shown in Table 9, the cross-loading problem with I2, I3, I9, I13 and I21 was found. These five items received values over the cut-off point of .40 factor loading for both factors, and a difference lower than .10 was found between these values (I2: .623-.593=.030; I13: .571-.511=.060; I3: .730-.655=.075; I9: .724-.636=.088; I21: .677-.584=.093; <.10). Thus, the items were excluded from the scale one-by-one starting from the most cross-loading one. In other words, these items were deleted from the scale because the cross-loading problem with the remaining items continued. These items were excluded one by one from the scale. In the process of all these analyses, considering the theoretical framework and item-item and item-total scale correlations, a total of 5 items were deleted from the scale. After EFA was completed, it was seen that the variance explained by the remaining 16 two-factor items was 59,540%.

Reliability Analysis Findings as a Result of EFA

As a result of EFA, a total of two factors, which were Emotional Tendency and Behavioral Tendency were obtained, and the total variance explained was calculated as 60%. The Cronbach Alpha (α) internal consistency reliability coefficient for the total-scale was calculated as α=.930, while it was α=.894 for the factor of Emotional Tendency and α=.869 for the factor of Behavioral Tendency.

Confirmatory Factor Analysis (CFA)

The SES structure made up of 16 two-factor items obtained via EFA was confirmed with CFA. As the data set demonstrated a normal distribution, the *Maximum Likelihood Method* as the parameter estimation method and *Covariance Matix* as the data matrix were used in CFA. As shown in Table 10, as a result of CFA conducted, the outputs were examined, and primarily the *t* values, factor loadings and error variances were evaluated.

Table 10. Item Statistics Regarding the CFA Findings

Item	*t*	Factor loading	Error variance	Item-Total Scale cor. (r)	Item-Factor cor. (r)	$\overline{X}$	sd
Emotional Tendency α= .928							
I give more importance to classes which involve technology use.	16,56	.78	.40	.712*	.753*	3,967	.968
I want new/different technologies to be used in classes.	18,84	.84	.29	.791*	.826*	3,884	1,025
I want technology to be used more in classes.	13,82	.68	.54	.609*	.688*	4,131	.887
Using technology makes it easier to do my course-related responsibilities/assignments.	15,15	.73	.47	.737*	.692*	3,433	1,104
I learn better in classes which involve technology use.	6,36	.35	.88	.418*	.412*	3,613	1,025
Classes involving technology use are more entertaining.	19,27	.86	.27	.838*	.824*	3,610	.996
I like communicating with faculty members via the Internet.	17,55	.81	.35	.749*	.780*	4,012	.902
Technology use in classes increases my interest.	7,98	.43	.82	.410*	.427*	3,845	.930
I enjoy learning with technology.	20,61	.89	.20	.851*	.843*	3,762	.951
I would like technology to be used in all classes.	19,76	.87	.24	.818*	.795*	3,701	1,027

Item	t	Factor loading	Error variance	Item-Total Scale cor. (r)	Item-Factor cor. (r)	$\overline{X}$	sd
I like sharing with my classmates via the Internet.	20,14	.88	.23	.839*	.807*	3,765	1,033
Behavioral Tendency α= .945							
I attend classes more which involve technology use.	19,25	.86	.27	.761*	.838*	3,390	1,098
I am more willing to attend classes which involve technology use.	21,83	.92	.15	.838*	.877*	3,467	1,037
I am better prepared for classes which involve technology use.	22,52	.94	.12	.841*	.884*	3,460	1,077
I am more active in classes which involve technology use.	21,39	.91	.17	.828*	.877*	3,564	1,033
I follow/listen to classes better which involve technology use.	16,69	.78	.39	.690*	.770*	3,262	1,100
Scale-Total Reliability	α= .953						

*p<.001; α= Cronbach's Alpha

As shown in Table 10, the *t* value for each item was higher than ±1.96, and the error variance was lower than .90. The *t* value for each indicator in the scale is suggested to be out of the range of ±1.96 (p<.05) (Kline, 2011; Raykov and Marcoulides, 2006; Tabachnick and Fidell, 2007). Accordingly, it was seen that the items had a high level of *t* value and that the error variance was not much high. The path diagram regarding the model can be seen in Figure 2.

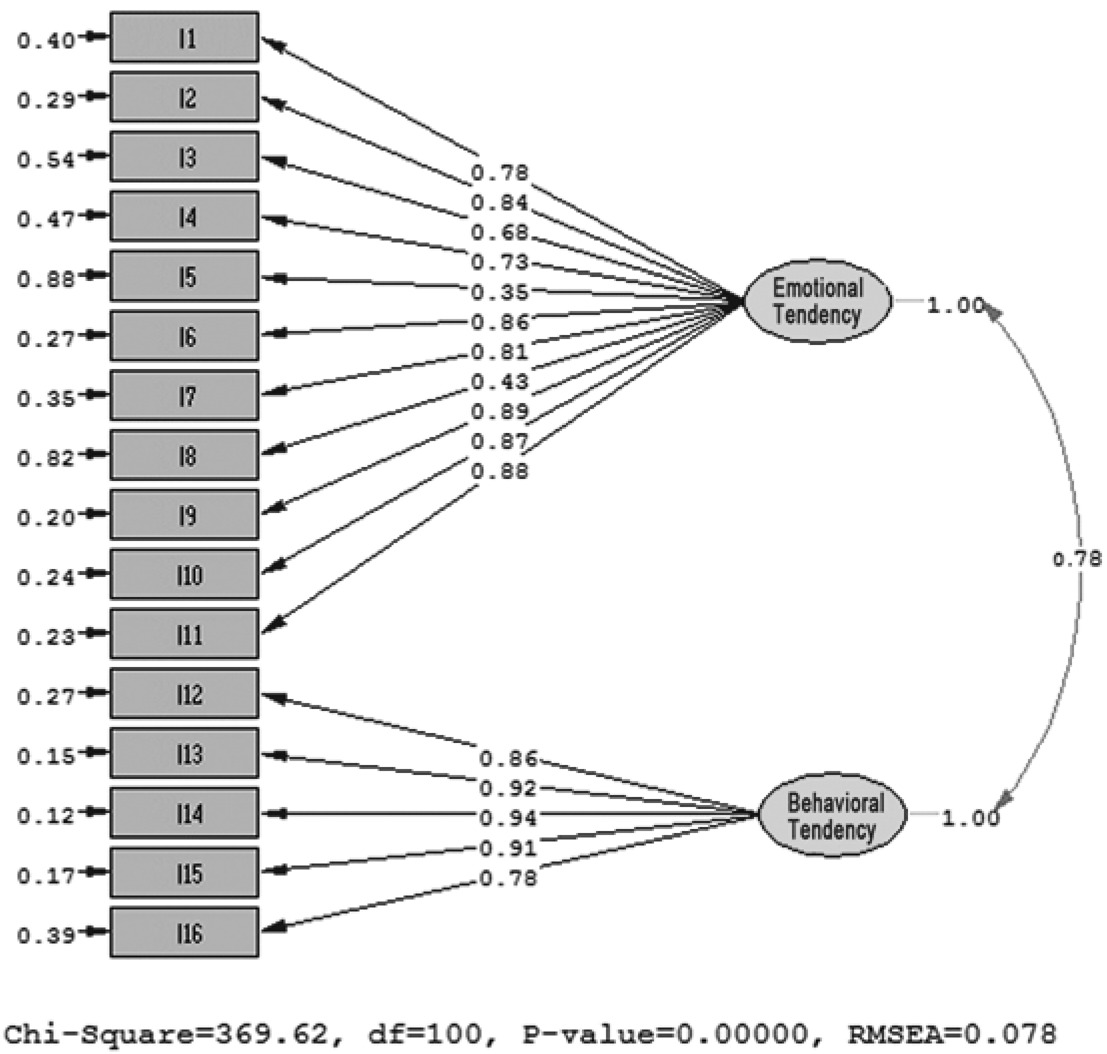

Figure 2. Standardized path diagram

When the fit indices of the model were taken into consideration, the *p* level for the $\chi 2$ value was examined. If this value is p>.05, then it shows good fit. However, as this value is likely to be significant (p< .05) for large sizes of samples, it is suggested that the ratio of $\chi 2$/df and other fit indices should be evaluated (Tabachnick and Fidell, 2007). The Chi-square value was calculated as $\chi 2$ = 369,62 and degree of freedom as df= 100. If this value is lower than 3, then it shows good fit (Tabachnick and Fidell, 2007). In this respect, the ratio of $\chi 2$/df (1632,57/762) was calculated as 3,69 (acceptable or poor fit). In addition, the other fit indices are presented in Table 11 and evaluated in line with related literature.

Table 11. Evaluation of Fit Indices Regarding CFA

Index	Sample statistic	Perfect fit	Good fit	Decision	Rationale
χ^2 /df	3,69	χ^2 /df ≤ 2	χ^2 /df ≤ 3	Acceptable fit	(Kline, 2011)
RMSEA	.078	RMSEA ≤ .05	RMSEA ≤ .08	Good fit	Hooper ve arkadaşları (2008)
RMR	.055	RMR ≤ .05	RMR ≤ .08	Good fit	Brown (2006) Hu ve Bentler (1999)
SRMR	.055	RMR ≤ .05	RMR ≤ .08	Good fit	Brown (2006) Hu ve Bentler (1999)
NFI	.97	NFI ≥ .95	NFI ≥ .90	Perfect fit	Tabachnick ve Fidell (2007) Thompson (2008)
NNFI	.98	NNFI ≥ .95	NNFI ≥ .90	Perfect fit	Tabachnick ve Fidell (2007) Thompson (2008)
CFI	.98	CFI ≥ .95	CFI ≥ .90	Perfect fit	Hu ve Bentler (1999) Tabachnick ve Fidell (2007)
GFI	.87	GFI ≥ .95	GFI ≥ .90	Acceptable (poor) fit	Hooper ve arkadaşları (2008) Hu ve Bentler (1999)

$\chi 2$= 369,62; df=100

As shown in Table 11, it was found out that except for the GFI indice and χ^2/sd ratio, all the other fit indices had perfect or good fit values. Thus, it could be stated that the model determined to have two factors was confirmed. Table 12 demonstrates the correlations between each factor in the scale and the total-scale and those between the factors themselves.

Table 12. Pearson Correlation Coefficients between TSTUC and the Sub-Factors

Dimension	Emotional Tendency	Behavioral Tendency	Total-Scale
Emotional Tendency	1		
Behavioral Tendency	.775*	1	
Total-Scale	.869*	.787*	1

**p*<.001

As shown in Table 12, significant correlations were found between each factor and the scale (p<.05). In addition, significant correlations were also found between the sub-factors. The fact that there were correlations between the sub-factors proved that separate measurements could be conducted for each factor and that a single measurement could be done using the total scores regarding the total-scale.

Reliability Analysis Findings As a Result of CFA

As a result of CFA, the Cronbach Alpha (α) internal consistency coefficient for the total-scale made up of two factors was calculated as α=.953, while it was α=.928

for the factor of Emotional Tendency and α=.945 for the factor of Behavioral Tendency.

DISCUSSION and CONCLUSIONS

Depending on such a need in related literature, in the present study, a scale was developed to measure the students' tendencies towards technology in class. As there is limited research in literature, the item pool was developed mostly based on the data collected via the interviews and the written compositions. Regarding TSTUC, EFA and CFA were conducted with different samples, and a five-point Likert-type scale made up of 16 items and two factors was developed. As a result of EFA, the factor structures regarding the scale were confirmed with CFA. The results of the factor analysis conducted revealed that the factors obtained were related to the dimensions of emotional tendency and behavioral tendency. The total explained variance for the two factors of TSTUC was calculated as around 60%. The Cronbach Alpha (α) internal consistency reliability coefficient of the total scale was calculated as .93 as a result of EFA and .953 as a result of CFA.

TSTUC was a scale which was related to emotional and behavioral responses and which aimed at measuring the tendencies towards technology use in class. When the 16 items obtained as a result of the validity and reliability analyses of the scale were examined, it was seen that the students' tendencies occurred within the scope of the faculty member's use of technology in class, the students' sharing with their peers and faculty members via the Internet and the students' use of technology while fulfilling their course-related responsibilities/assignments. While the items were formed within this scope, it was seen as a result of the examination of the factor structure that the items belonged to the emotional and behavioral dimensions and that the factors were named as emotional tendency and behavioral tendency. Depending on these dimensions, it could be stated that the students developed two types of tendency towards technology. Using the causal research method, future studies could investigate whether emotional tendency triggers behavioral tendency or whether emotional tendency occurs as a result of behavioral tendency. However, it could be stated that before the development of students' behavioral tendency, the emotional tendency should occur as a prerequisite condition, and the causal or path design can be formed and tested in this way. When the scale items within the scope of the emotional and behavioral dimensions were examined, it was seen that some of the items especially within the scope of emotional tendency also included the cognitive process. However, due to the fact that the cognitive dimension did not occur as a factor and that it is difficult to define the factor of cognitive tendency and to determine its scope, the cognitive process was found under the emotional dimension.

The analysis of the interview and composition data helped determine the participants' preferences and perceptions regarding technology use in instructional activities. Accordingly, it was seen that what the participants perceived regarding the concept of "technology use" was "the faculty member's use of technology in class". Therefore, while generating the item pool, especially the students' perceptions and the meanings they thought the concepts conveyed were taken into consideration. In addition, although the statements in the scale were related to technology use, the comparative structures (-er, more) included in the statements allowed the students to respond to the scale by making comparisons between the classes which involved technology use and those which did not. Higher scores to be produced by TSTUC refer to the fact that there is a higher tendency towards technology use in classes or that technology use is favored more by students in classes; and lower scores refer to the fact that there is a lower level of tendency towards technology use in classes or that students do not prefer (or give much importance to) technology use in classes at all. According to the results, as each factor correlated significantly with each other as well as with the total scale, measurements can be done by using the total scores related to each factor or by using the total scores regarding the total scale. Consequently, a scale with a good level of validity-reliability was obtained.

Certain issues regarding the structure of the measurement tool developed in the study should be taken into consideration. In this respect, one important point to be considered is the fact that TSTUC does not have any measurement purpose for effective technology integration. In other words, while effective technology integration may increase students' tendency towards technology use, the faculty member's incompetency in technology integration is likely to change students' perceptions. In this case, TSTUC aims at measuring students' tendency that occurs as a result of their perceptions. Lower scores to be received from TSTUC could not only indicate that students have negative attitudes towards technology use in class or that they do not give importance to technology use in class but also demonstrate that the technology currently in use has not been effectively integrated. Therefore, in cases of low tendency scores, it is also necessary to examine the causes of these low scores. However, for individual reasons or without considering the technology integration factor, this scale focuses on whether, in both cases, students have tendency towards the use of technology in class or not. On the other hand, effective integration of technology into education could contribute to students' tendencies towards technology use.

Another point regarding the limitations of TSTUC was the fact that the technologies used in class were examined in general. Thus, it could be stated that students may give more positive responses to the use of technologies or environments they like while they may fail to give detailed response to technology use in general. For instance, not all students may have a positive tendency towards the use of Twitter technology in class. Therefore, only the students who like using Twitter or those who have experience in Twitter are likely to have increased tendencies (Welch and Bonnan-

White, 2012). However, in this study, no discrimination was made between the technologies liked or those disliked, and individual differences were thus ignored. For this reason, future studies could focus on students' tendencies towards the technologies they like as well as on the role and influence of effective technology integration on technology use in class.

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