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The Adaptation of the Scale of Attitude Towards Computer Into Turkish for Middle and Secondary School Students

Ömer Demir [1], Halil Yurdugül [2]

Abstract

This study aimed to develop a Turkish scale, which is reliable, valid and meets the current requirements for assessing the attitudes of students towards computers. That is why, the scale of students' attitude towards computers (SATC), which originally belongs to Teo (2008), was adapted into Turkish. When it comes to methodology part of the study, the scale was administered to a total of 1678 students enrolled in primary or secondary school located in Ankara. After Confirmatory Factor Analysis (CFA) was performed, it was ascertained that the scale consisted of 20 items and 3 factors (computer enjoyment, computer importance and computer anxiety). The Cronbach Alpha and Omega values of the scale were found out to be 0.83 and 0.95 respectively. The findings and implications based on these findings were discussed in a more detailed way in the full paper.

Keywords

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Scale Adaptation
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Introduction

Electronic learning (e-learning) is one of the most popular learning methods. Therefore, the usage of Information and Communication Technologies (ICT) as a learning or/and teaching tool has rapidly becoming more and more prevalent in all the levels of education. Students' use of computers bear great importance in relation to the integration of technology into learning since information and communication tools plays a crucial role in both accessing the learning environment and establishing interactions there, and participating in the learning activities. Along with the more common usage of computers' as learning and teaching tools, students' attitudes towards them have gained significance, too. Students' attitudes towards the use of computers constitute the key concept of theories such as Theory of Reasoned Action (Fishbein and Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1991), Technology Acceptance Model (TAM) (Davis, 1989), Diffusion of Innovation (Rogers, 2003). In these theories, the importance of attitudes behind the overt behaviors of individuals is discussed. Students' stance towards adopting the use of computers, in addition to their current and future computer usage, were investigated in various studies (Davies and Brember, 2001; Huang and Liaw, 2005; Teo, 2006; Teo, 2008). In these studies, the finding that attitudes towards computer (ATC) have an influence on students' adaptation to computers was revealed. Attitudes towards computers reflect tendencies towards computer usage and learning with computers and they are the predictors of attitudes toward adopting new technologies like computers (Myers and Halpin, 2002). Besides, attitude towards computers shows positive correlation with effective use of technology in a learning process (Yıldırım,

[1] Hacettepe University, Faculty of Education, Department of Computer Education and Instructional Technologies, Turkey, omerdemir@hacettepe.edu.tr
[2] Hacettepe University, Faculty of Education, Department of Computer Education and Instructional Technologies, Turkey, yurdugul@hacettepe.edu.tr

2000). It was stated in different studies that students' negative or positive attitudes towards computers serve as a significant agent in achieving pre-determined learning goals (Meelissen and Drent, 2008; Teo, 2006; Teo, 2008; Willis, 1995). Moreover, in some other studies about attitudes towards computers, the relationships between the attitudes and other variables related to attitude were also examined. Experience in computer usage presents a positive correlation with attitudes towards computer usage (Kumar and Kumar, 2003; Potosky and Bobko, 1998; Seyal, Rahim and Rahman, 2000). Instruction in computer usage decreases anxiety about computers whereas it increases enjoyment resulted from computer usage and self-confidence in using it (Chau, 2001; Rovai and Childress, 2002; Tsitouridou and Vryzas, 2003).

Students' Attitude towards Computer and Scales of Attitude:

Students' behaviors exhibited in learning environments might be expressed in two categories. These are typical behaviors that are reflections of psychological constructs (affective properties) such as students' attitude, motivation, and personality; and maximal competency behaviors, which are reflections of cognitive constructs (Cronbach, 1984; Tekin, 1991). These two constructs have a strong impact on each other. Attitude, one of the affective properties, is quite an outstanding variable in educational studies due to the fact that attitude reflects the state of having a negative or positive stance with respect to a person, place, subject, an event, or object (Ajzen, 2005; Köklü, 1995; Tavşancıl, 2010).

Attitudes, consisting of cognitive, affective, and behavioral components, are a kind of evaluation in relation to an "object" which may be expressed with a positive or negative judgment. While cognitive component of attitude is described as beliefs and information about the object, affective component is described as negative or positive emotional reactions towards the object. Lastly, behavioral component determines how the individual will act towards the object (Ajzen, 2005; Tavşancıl, 2010).

Until today, only a few scales of attitude towards computers have been developed. Among them, Loyd and Gressard (1984) defined attitude towards computer in three dimensions and developed a 40-item scale to measure those dimensions. Adaptation of this scale into Turkish was carried out by Berberoğlu and Çalıkoğlu (1991); however, it was found out to be measuring a single-dimension construct within the sociocultural structure of Turkey. Nickell and Pinto (1986) added a fourth dimension, namely computer usefulness, to this scale and treated the attitude towards computers as a four-dimensional construct. Nonetheless, the reliability and validity of the scale was subject to degradation in the course of time because of continuously advancing technology and changing culture (LaLomia and Sidowski, 1990; Rainer and Miller, 1996). Selwyn (1997) developed another scale for students aged between 16 and 19, and named the sub-dimensions of the scale as follows: affective attitude, computer usefulness, computer control, and behavioral attitude towards computer. Finally, Aşkar and Orçan (1987) developed "The Scale of Attitudes towards Computers" in Turkish. This is a one-dimensional scale comprising of twenty four items, fourteen of which are positive, while the rest of which is reversed. Participants can get at least 24 points and at most 120 points from the scale, and higher points indicate higher positive attitudes towards computer.

Knezek, Christensen and Miyashita (1998) prepared "Computer Attitude Questionnaire" (CAQ). This questionnaire was comprised of 8 sub-dimensions and 65 items. Teo (2008) made use of this questionnaire by adapting it into Singapore culture; however, he used only three sub-dimensions in the scale related to attitude rather than all sub-dimensions of the original questionnaire. In this study, adapting the short form of it, used by Teo (2008), into Turkish and examining the psychometric properties of Turkish form of it were aimed.

Method

In this study, quantitative research paradigm was utilized and steps of scale adaptation recommended by Hambleton and Patsula (1999) and Deniz (2007) were followed.

Population and Sampling:

Students enrolled in middle, and secondary schools in Ankara constituted the population of this study, and convenient sampling method was employed. 1678 students enrolled in middle and secondary schools located in Ankara constituted the sample. These students were sampled from twenty two different schools. In order to increase the external validity of this study, sampling was expanded as much as possible. Larger sample increases analytical power of the model being tested, as well (McCallum vd, 1996; Weston ve Gore, 2006). Another reason for using a larger sample is the fact that the investigation techniques used in this study, which are Factor Analysis and Structural Equation Modeling, requires large sampling (Comrey and Lee, 1992; MacCallum, Widaman, Zang and Hong, 1999). Some demographic information about the participants is presented in Table 1.

Table 1. Demographic Findings Regarding Students' Gender and Level of Education

Variable	Sub-variable	Frequency (N)	Percentage (%)
Gender	Female	831	49.52
	Male	847	50.48
Level of education	Middle school	830	49.46
	Secondary school	848	50.54

As it is presented in Table 1, the students participated in the study have approximately the same characteristics in terms of gender and level of education.

Original Measurement Tool:

The original form of the scale of students' attitudes towards computers (SATC) adapted into Turkish within the scope of this study consists of twenty items and factors. These three factors are computer enjoyment, computer importance and computer anxiety. A point to note is that factors of computer anxiety and computer enjoyment of the scale of SATC correspond to affective domain of attitude whereas factor of computer importance of it corresponds to cognitive domain of attitude. In this scale, behavioral domain of attitude was disregarded. The factors computer enjoyment and computer importance consisted of six items per each whereas computer anxiety consisted of eight items. The negatively-worded items in the scale are as follows: item number 2, 6, 14, 15, 16, 17, 18, and 19. When the Cronbach Alpha reliability coefficients of original scale concerning factors and overall were computed, they varied between 0.79 and 0.86. Items were presented on a 5-point likert scale (ranging from "Absolutely Agree (5)" to "Absolutely Disagree (1)"). One can get a maximum score of 100 and a minimum score of 20 based on his/her markings in the scale. Higher score gotten from the scale signifies higher positive attitudes towards computers.

Formation and Administration of Turkish Form of the Scale:

Turkish draft form of the scale was created by the researchers after obtaining necessary permission for scale's adaptation into Turkish. Afterwards, two commissions comprising of field and language specialists were set up with the aim of evaluating this draft form. This Turkish draft form was forwarded to field specialists after necessary corrections were done by the members of language commission. Further corrections were done based on the feedback given by field specialists. In addition, both groups of specialists were kindly asked to take the age of target group into consideration in terms of the comprehensibility of the scale.

Commission of field specialists consisted of four members. Two of them are faculty member at the department of Computer Education and Instructional Technologies (CEIT) and other two members of the field commission are PhD students at the same department. Commission of language specialists is comprised of three members. One of them is faculty member at the English translation department, and second one is PhD student at the same department. When it comes to last one, she is a faculty member at the department of CEIT and completed her PhD in USA.

After above process, scaling options to draft scale items and demographic data and instructions to scale were added. After putting the draft scale into its final form, it was administered to students in paper and pencil form. After that, data were digitalized and negatively-worded items were reversed.

Data Analysis Method:

Psychometric properties of the scale were tested through particularly construct validity and reliability. Parameters and measurement models used in this testing procedure were analyzed through the method of Confirmatory Factor Analysis (CFA). As it is known, measurement model is defined as correlation between the construct to be measured and observed points (measurements). For the analysis of measurement model, methods such as classical testing theory (Novick, 1966) and item response theory (Lord and Novick, 1968) are employed. Especially in the approach based on classical testing theory, factor analysis has been widely run from the times of Spearman (1904) to today (Bartholomew, 1995). However, factor analysis is preferred for the estimation of measurement model and factorial validity. It is also used for determining the construct validity; yet using it alone for construct validity is not a sufficient method. Cronbach and Meehl (1955) gave correlations between constructs prominence rather than item-construct correlations (measurement model) for construct validity. Byrne (1994) pointed out that although first-order factor analysis contains findings regarding factorial validity, higher level analyses are needed for construct validity. In line with Cronbach and Meehl's (1955) recommendations, by reasons of calculation hardships in unearthing patterns amongst constructs Campbell and Fiske (1959) developed the matrix of multi trait-multi method, the calculation of which is relatively easier and through which convergent and discriminant validities can be tested for construct validity. Thanks to the models developed by Jöreskog (1971) to define the congeneric measurements and analyze covariance matrix, and Fornell and Larcker (1981) developed a method to test construct validity, which can be analyzed easier for convergent and discriminant validities. In this study, the values of Average Variance Extracted (AVE) and shared variance for construct validity were obtained through CFA.

Findings

In this part, the results of the study are presented. Findings regarding the items in the Turkish form of the scale were presented in Table 2.

Table 2. Findings regarding the Items in the Scale

Item	Mean	SD	Skewness	Kurtosis
1	3.91	1.07	-0.80	0,00
2	3.88	1.02	-0.63	-0.28
3	3.15	1.14	-0.05	-0.76
4	3.71	1.13	-0.51	-0.59
5	3.51	1.15	-0.37	-0.65
6	3.01	1.14	-0.02	-0.68
7	3.72	1.13	-0.56	-0.50
8	2.84	1.24	0.13	-0.91
9	3.78	1.10	-0.65	-0.37
10	3.87	1.02	-0.68	-0.11
11	3.05	1.25	0.00	-0.96
12	3.68	1.15	-0.53	-0.61
13	3.84	1.03	-0.91	0.71
14	3.82	0.93	-0.50	-0.06
15	3.68	1.03	-0.70	0.26
16	3.88	0.95	-0.64	0.09
17	3.96	0.99	-0.89	0.61
18	3.68	0.99	-0.56	-0.02
19	3.93	1.01	-0.93	0.68
20	3.84	1.03	-0.78	0.29

After Table 2 was studied, the mean, standard deviation, skewness and kurtosis of scale items were ascertained to vary between 2.84 and 3.96, .93 and 1.25, -.93 and .13, -.96 and .71 respectively. Item points showed normal distribution since especially the skewness and kurtosis coefficients' range between -1.0 and 1.0 (Kline, 2011:63; Muthén and Kaplan, 1985).

Factorial and Construct Validity:

In this study, first, factorial validity of the SATC scale was tested through Confirmatory Factor Analysis (CFA). What is more, so as to support construct validity of the SATC scale, convergent and discriminant validity methods were employed and AVE values were calculated.

Confirmatory Factor Analysis:

Noar (2003) pointed out that different models are to be calculated by virtue of being able to compare different conceptualizations of constructs of the SATC scale in CFA; therefore, one-factor, correlated and uncorrelated 3-factor models were hypothesized and GFIs obtained as a result of analysis were investigated. Correlated 3-factor model was preferred since it yielded the best GFIs.

Table 3. GFI Values of Different Models

Model	χ^2/df	RMSEA	NFI	NNFI	CFI
One-factor model	50.74	0.172	0.77	0.75	0.78
Uncorrelated 3-factor model	14.05	0.088	0.89	0.89	0.90
Correlated 3-factor model	9.45	0.071	0.93	0.93	0.94

In accordance with Schermelleh-Engel and Moosbrugger (2003) findings, GFI values presented in Table 3 were seen to be sufficient. Hence, similar construct patterns were also attained in Turkey as they were obtained in original scale. According to results obtained, SATC can be revealed by these three

factors. Item-construct parameters of the scale obtained from correlated 3-factor model are given in Figure 1.

As it is seen in Figure 1, standardized factor loads between the items in the original scale and the constructs that items inclined to measure were found to be statistically significant according to t test results and all factor loads were obtained larger than 0.30 (Büyüköztürk, 2004). That is why, it may be said that scores of twenty items in the scale measure the sub-constructs comprising the overall construct of SATC as it was hypothesized, to put it another way, factorial validity of the scale was ensured.

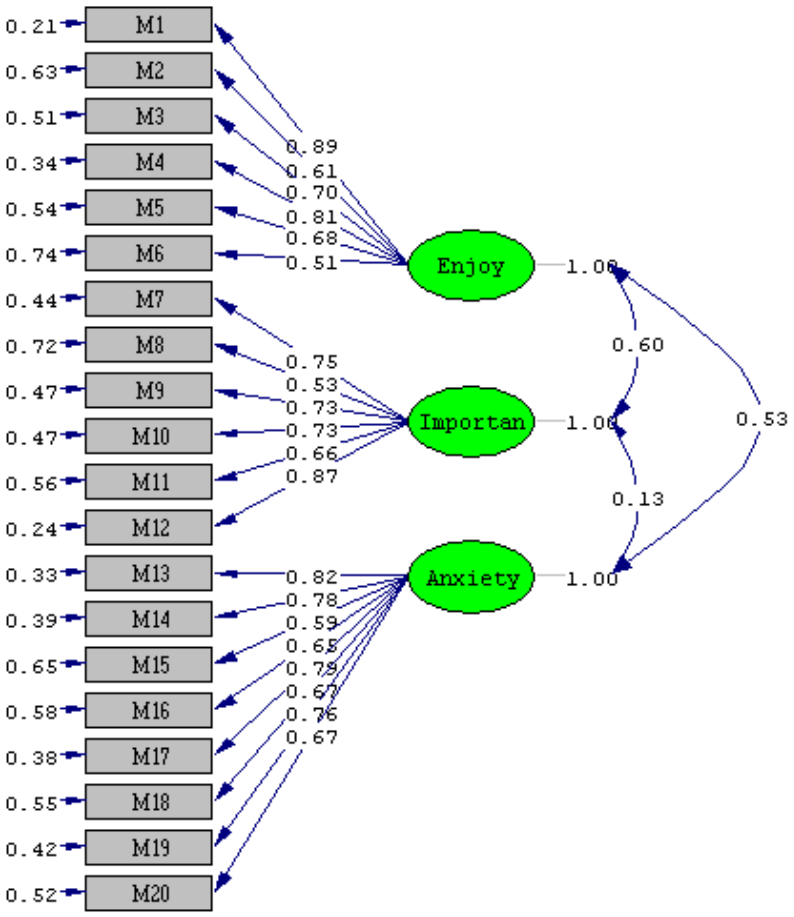

Figure 1. Standardized CFA Solutions regarding Item-Construct Correlations of the Scale of SATC.

Construct Validity:

Fornell and Larcker (1981) suggested techniques based upon AVE values obtained from each factor as a method of examining construct validity for both discriminant validity and convergent one. Fornell and Larcker (1981) further expressed in a more detailed way that every single AVE value not be larger than internal consistency coefficient (Composite reliability) whereas for convergent validity it should be larger than 0.5. AVE and composite reliability values obtained in solution performed with data obtained from the administration of the scale of SATC were presented in Table 4.

Table 4. AVE and Reliability Coefficient Values regarding the Constructs of the Scale of SATC

Dimension	AVE	Composite Reliability (ω)	Cronbach Alpha (α)
Computer Enjoyment	0.51	0.86	0.75
Computer Importance	0.52	0.86	0.80
Computer Anxiety	0.52	0.90	0.81

Nunnally and Bernstein (1994) indicated that reliability coefficient of a scale be larger than 0.7 to be accepted as reliable. When the Table 4 is studied, it can be seen that this condition is met.

Table 5. AVE and Correlation Coefficient Values between Factors

Dimension	Computer Enjoyment	Computer Importance	Computer Anxiety
Computer Enjoyment	**0.71***		
Computer Importance	0.60	**0.72***	
Computer Anxiety	0.53	0.13	**0.72***

Diagonal elements of the matrix are square roots of AVE values.

Fornell and Larcker (1981) stated that larger AVE values than shared variance estimation (square of the correlation between constructs) support discriminant validity. That is to say, having larger square roots of AVE values than correlation coefficients between latent variables is the proof of discriminant validity. As it can be seen it Table 5, diagonal elements, square roots of the AVE values, of the matrix are larger than non-diagonal elements of it.

Discussion

Within the context of this study, the scale of SATC developed by Teo (2008) was adapted into Turkish. Linguistic equivalence and content validity of the scale were supported with the help of language and field specialists. For the factorial validity, CFA was performed. After CFA, the scale was found out to comprise of three factors and twenty items. There are six items in both computer enjoyment and importance factors, whereas there are eight items in computer anxiety factor. Besides, GFI values were ascertained to be sufficient. In order to prove the reliability of the scale, composite reliability and Cronbach Alpha internal consistency coefficient were employed. Cronbach Alpha values of the overall scale and computer enjoyment, computer importance, and computer anxiety factors were computed to be 0.83, 0.75, 0.80, and 0.81 respectively. Composite reliability coefficients of these factors were computed as 0.95, 0.86, 0.86, and 0.90 again respectively. In the light of these findings, it was proved that the scale of SATC is a reliable and valid measurement tool. Among the factors in the scale, computer enjoyment measures to what extent the students feel happy while using computers in addition to using computers as a learning tool. Computer importance factor measures the benefits and indispensability of computer. In a way, it looks like Davis's (1989) perceived usefulness dimension. Finally, computer anxiety factor measures the anxiety felt by the students while using computer and their skills to use it. In conclusion, the scale of SATC might be utilized with the purpose of determining students', who are aged between 12 and 18 and therefore can be named as child, attitudes towards computers. With such an evidence in hand, the study provides the authorities with the issues, which requires them to take precautions in relation to the elimination of the obstacles in the integration of technology in teaching and learning environments.

Conclusion

When the psychometric properties of the scale of SATC are investigated, twenty items in the original scale were found to measure the dimensions of the attitude, which are computer enjoyment, computer importance and computer anxiety. At this point, there is a need to indicate something concerning computer anxiety factor in order to hinder some possible misunderstandings before they occur. The fact is that getting a high score in computer anxiety factor does not mean to have a higher computer anxiety level, on the contrary, it signifies just the opposite; in other words, it refers to low level of anxiety in relation to computer usage. In addition to this, reliability coefficients concerning results of measurement were proved to be at the satisfactory level. Thus, it can be concluded that items in the scale measure the construct aimed to be measured free of error. On the other hand, when it comes to the construct validity, the items in the scale were found to be predicting the construct intended to be measured.

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