Attitudes to technology, perceived computer self-efficacy and computer anxiety as predictors of computer supported education

Vehbi Celik, Etem Yesilyurt*

Mevlana University, Educational Faculty, Department of Educational Sciences, Yeni Istanbul Street, 42003 Selcuklu/Konya, Turkey

ABSTRACT

There is a large body of research regarding computer supported education, perceptions of computer self-efficacy, computer anxiety and the technological attitudes of teachers and teacher candidates. However, no study has been conducted on the correlation between and effect of computer supported education, perceived computer self-efficacy, computer anxiety and attitude to technology and which additionally explains their relationship to each other. This research is conducted in order to test the effect levels among the latent variables of attitude to technology, perceived computer self-efficacy, computer anxiety and the attitude toward doing computer supported education and these latent variables' ratios to each other. For this, eight hypotheses were developed in light of theoretical information by reviewing the literature. This research is done by using Technology Attitude Scale, Perceived Computer Self-Efficacy Scale, Computer Anxiety Scale and The Attitude Scale toward Applying Computer Supported Education. The participant group of the research consists of 471 pre-service teachers. Exploratory factor analyses of scales were analyzed via SPSS 16.0 software. For the confirmatory factor analyses of scales and the structural equation modeling, AMOS 17.0 software was used. The most significant finding of this study is that attitude to technology, perceived computer self-efficacy and computer anxiety are important predictors of teacher candidates' attitude toward using computer supported education.

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1. Introduction

Technology holds an important place in human life in a large variety of contexts from science to education, agriculture to commerce, transportation to communication and facilitates life and continues to develop. Of course, this advancement which occurred in technology supported the development of the first computers and as a result, the computer has become an inseparable part of our daily and educational life. As a matter of fact, it has been observed that in recent years, the use of information and communication technologies has become widespread in elementary education (Davies, Szabo, & Montgomerie, 2002). This situation also entails integration of technology into teacher training programs. For teachers to be able to integrate technology in an effective way, training programs should be formed based on national standards (Marra, 2004). In this context, Oztok & Ozdener (2005) argue that it is necessary for “technology education” at every level from elementary to higher education to be re-organized in accordance with the requirements of the era and to appear more predominantly in training programs. This is because some studies conducted on technology (Sevindik, 2006; Yilmaz, 2005) propose that using technological equipment in education has a positive effect on the academic achievement and attitudes of students.

The computer, which ranks among the most important products of technology, is the main tool of computer-supported education. Therefore, perceived computer self-efficacy among teachers and students plays an important part in applying computer supported education and achieving its goal. Self-efficacy is the principal concept of social learning theory, and entails that one should aware of him/herself and the individual should act according to the situation by comparing the performance that he/she is required to display with his/her

* Corresponding author. Tel.: +90 3324444243/1211, +90 5065868229 (mobile); fax: +90 332241111.
E-mail addresses: etemyesilyurt@gmail.com, eyesilyurt@mevlana.edu.tr (E. Yesilyurt).
performance (Korkmaz, 2006). Perce computer self-efficacy, which affects individuals’ interests toward computers and their desire to use a computer, (Gurcan, 2005) also emphasizes that when facing difficulties in computer-related tasks, one should be determined to overcome these difficulties (Compeau & Higgins, 1995).

Another factor that is important in delivering computer supported education is computer anxiety. According to Spilberger (1972), anxiety is unpleasant, emotional and observable reactions such as sadness, perception and tension caused by stress-creating circumstances. In parallel to this definition, Maurer (1994) defines computer anxiety as “concern and fear experienced by an individual when he/she thinks that he/she is using computer technology or he/she is really using a computer”. Computer anxiety introduces itself as a part of general anxiety and mostly appears as a sense of hesitation toward computers (Elfitimova, 2008). In this regard, according to Ceyhan (2002), avoiding computers and areas where computers are present, preferring to use computers only briefly and taking excessive precautions while using them are present among behaviors seen in individuals who have computer anxiety.

Differences are experienced in the definition of computer supported education, which computer anxiety and perceived computer self-efficacy affects directly or indirectly. According to Arslan (2006), computer supported education is defined as the utilization of computers as a supplementary tool for teachers to enrich and improve the quality of learning provided during educational activities. The definition stating that “Computer supported education is the transfer of instructional content or activities to students via computer”, which is made by Hannafin & Peck (1988) and among the most recognized definitions in this subject, is widely acknowledged in the literature.

Many studies have been conducted which explore the possibility that computer supported education increases the academic achievement of students (Cannalbur, 2008; Cavanaugh, 2001; Demirer, 2006; Drost, 2002; Duman, 2007; Egelioglu, 2008; Karakus, 2008; Shachar, 2002; Tankut, 2008; Wong, 2001; Zhou, Brouwer, Nocente, & Martin, 2005). However, in their study called “Can Computer Use Damage Scientific Achievement?”, Papanastasiou, Zemblyas, & Vrasidas (2003) investigated the correlation between computer and scientific achievement and they inferred that essentially, using or not using computers has no positive or negative effect on student achievement.

Regardless of the benefits of computer supported education, it is seen that computer supported education has not been promoted at a desired level in the education process (Hu, Clark, & Ma; 2003; Marcinkiewicz, 1993; Muir-Herzig, 2004). Among the reasons present for this situation are concerns that students’ interest will decrease toward lessons, classrooms being over-crowded and principals not allowing the use of computers (Yesilyurt, 2006). In addition, training given to teachers on how to use computers remains limited and they are not taught how to use computers in education (Cox, Preston, & Cox, 1999). Teachers have also reported not finding sufficient time to be able to use computers, taking into account the intensity of the curriculum, and have also reported not receiving adequate technical support (Waite, 2004). The aforementioned issues represent barriers to the development of computer supported education.

According to Becker (2001), factors such as technical knowledge and experience of the teacher, the number of computers in class, to what extent the teacher is interested in his/her own professional development and their educational philosophy determine whether computers will be used and how they will be used. Also, in the respective literature, attitudes are emphasized as being one of the most essential factors toward the raising of awareness among pre-service teachers (teacher candidates) regarding computer supported education so that they become successful in their duty (Shashani, 1993). Teachers and teacher candidates’ attitudes and self-efficacy perceptions concerning computer supported education is the primary factor to achieve success in computer supported education practice, which holds an important position in the educational system (Kutluca & Ekici, 2010).

Recognizing the effectiveness of computer supported education is possible when teachers having a positive attitude. The attitude that they have gained in the pre-service education process is of considerable importance. It has been detected in research that the most important determinant in teachers adopting computer supported education is the training that teachers have received related to computer technologies (Dupagne & Kendri, 1992; Torkzadeh, Pfughofet, & Hall, 1999).

There are many studies regarding computer supported education, perceptions of computer self-efficacy, computer anxiety and the technological attitudes of teachers and teacher candidates (Akloyunlu & Kurbangolu, 2003; Becker & Maunssayat, 2002; Erdemir, Bakirci, & Eyduran, 2009; Frantom, Green, & Hoffman, 2002; Jegede, 2007; Oakes & Martin, 2002; Orhan 2005; Schumacher & Morahan-Martin, 2001; Shapkaa & Ferrarib, 2003; Tanguma, Martin, & Crawford, 2002; Usta & Korkmaz 2010; Yanik, 2010). In general, these studies were conducted in order to put forward opinions of participants regarding computer supported education, perceived computer self-efficacy, computer anxiety and technology attitude. On the other hand, the performed studies have concentrated on only one of these themes. It is theoretically known that technology attitude, perceived computer self-efficacy and computer anxiety influence computer supported education. But, no research has been found, which confirms the statistical accuracy of this theoretical information. In this study, perceived computer self-efficacy, computer anxiety and technology attitude’s level of impact on computer supported education both separately and together, their explaining ratio and their statistical significance are dwelt upon. This situation also reveals this study’s biggest difference and originality from similar studies that have been both stated above and appear in the literature. On the other hand, no study has been conducted on the correlation between and effect of computer supported education, perceived computer self-efficacy, computer anxiety and attitude to technology and their ratio to each other. For this reason, it is important to detect which variables affect teacher candidates’ attitudes regarding computer supported education and to what extent changes in these attitudes are explained under which variables and it is also important to put forward a concrete model in this subject. Moreover, by beginning to use high-level analysis software (AMOS, Lisrel etc.) in the social sciences, the level of effect and explaining ratio of one or more independent variables on one or more dependent variables can be detected.

In this direction, based on theory, hypotheses developed to test the effect of the variables of attitude to technology, perceived computer self-efficacy, computer anxiety and the attitude toward adopting computer supported education on each other and their relation to each other are presented below.

**H1.** The attitude of pre-service teachers (teacher candidates) to technology positively and significantly affects perception of computer self-efficacy.

**H2.** Teacher candidates’ attitude to technology significantly explains perception computer self-efficacy.
H3. The attitude of teacher candidates to technology positively and significantly affects the attitude toward applying computer supported education.
H4. Teacher candidates’ attitude to technology positively and significantly affects computer anxiety.
H5. Teacher candidates’ attitude to technology significantly explains computer anxiety.
H6. Attitude to technology and computer anxiety of teacher candidates together positively and significantly affects attitudes toward using computer supported education.
H7. Attitude to technology and perceived computer self-efficacy of teacher candidates together positively and significantly affect the attitude toward adopting computer supported education.
H8. Attitude to technology, perceived computer self-efficacy and computer anxiety of teacher candidates together significantly explain the attitude toward applying computer supported education.

2. Method

2.1. Research model

A relational survey model was utilized to conduct the research. A relational survey model is a research model that aims at determining the presence and extent of covariance among two or more variables. In this context, the effect of teacher candidates’ attitudes toward using computer supported education, attitudes to technology, perceived computer self-efficacy and computer anxiety on each other and their relation to each other are considered in this research.

2.2. Participants

The participant group of the research consists of 471 pre-service teachers who receive education at the first year level at the Faculty of Education at Mevlana University, Eregli Faculty of Education at Selcuk University and the Faculty of Education at Aksaray University in the spring semester of the 2010–2011 academic year. A participant group with substantial numbers (200 and above) is necessary for complex models in structural equation modeling. The \( p + 1 \) formula with \( p \) being the number of variables (items that are present in the scales) can be used to determine the number of participants (Bayram, 2010). In this regard, the “Computer Anxiety Scale”, which has the maximum number of items among the scales used as part of the research, was taken into account. The number of items in the scale is 28. Thus, the number of participants should be \( 28 + 1 \) or above in the scope of this research. Due to the fact that the research participant group consists of 471 people, this number is suitable for the research objective and statistical analysis. The demographic features of the participants are as follows: in terms of gender, 72.6% (72% – 342) of participants are women, 27.4% are men (72% – 129). 47.6% (72% – 224) of participants receive education at the Faculty of Education at Aksaray University, 41.2% (72% – 194) receive education at the Faculty of Education at Mevlana University and 11.3% (72% – 53) receive education at Eregli Faculty of Education at Selcuk University. In terms of the type of program studied, 25.1% (72% – 118) of participants study in the department of psychological counseling and guidance, 24.0% (72% – 113) study in the department of elementary education, 13.4% (72% – 63) study in the department of science and technology teaching, 12.7% (72% – 60) study in the department of Turkish teaching, 8.7% (72% – 41) study in the department of social studies teaching, 8.5% (72% – 40) study in the department of English teaching and 7.6% (72% – 36) study in the department of classroom teaching.

2.3. Data collection process

Permission was obtained from scale owners for using scales in line with the research objective and participants voluntarily attended the scale implementation process. The goal of the scales and the form of the implementation were explained to the participants. The implementation period of scales was applied between 02 and 12 May 2011 and lasted 20 min on average per person.

2.4. Data analysis

The data obtained were first entered in the SPSS 16.0 software package and the demographic characteristics of the participants and exploratory factor analyses of scales were analyzed via this software. For the confirmatory factor analyses of scales and the model, AMOS 17.0 programs were used. Confirmatory factor analysis is a method that is mostly applied after exploratory factor analysis studies. At the same time, this analysis takes into account contributions to the model and “modification indices” of all correlations, which do not exist in researcher’s mind but are possible considering the data set in question (Simsek, 2007). Confirmatory factor analysis puts forward more real statistical outcomes (Kline, 2005). Besides, a structural equation model was generated in line with the research hypotheses. Structural equation model have been used since the end of 1980s in social sciences. Structural equation models are widely employed in scientific studies due to the fact that they consider measurement errors regarding observed variables and direct and indirect impacts of variables in the model and enable researchers to develop, predict and test multiple-variable complex models (Bayram, 2010). The abovementioned properties also put forward the reasons for using confirmatory factor analysis and structural equation model in this study. The maximum likelihood estimation method was used to estimate model parameters in confirmatory factor analysis. The Root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the goodness of fit index (GFI), the comparative fit index (CFI), the adjusted goodness of fit index (AGFI), the normed fit index (NFI) and the chi-square/degrees of freedom (\( \chi^2/\text{df} = \text{CMIN}/\text{DF} \)) and the level of significance (p) fit indexes were taken into account in
the evaluation of the model goodness of fit. With RMSEA value being between 0 and 0.08; SRMR value being between 0 and .10; GFI value between .90 and 1.00; CFI value between .90 and 1.00; AGFI value between .85 and 1.00; NFI value between .90 and 1.00; $\chi^2$/sd (CMIN/DF) value between 0–3 and $p$ value being between .01 and .05 show good fit indexes (Bayram, 2010; Byrne, 2001; Joreskog & Sorbom, 1993; Kline, 2005; Reisinger & Mavondo, 2006; Schermelleh-Engel & Moosbrugger, 2003; Simsek, 2007). The lower boundary of factor loads in exploratory and confirmatory factor analysis was accepted as .30. If there is a limited number of items in a scale prepared in the field of social sciences, boundary value can be reduced to .30 for factor load. Moreover, if an item whose factor load is below .30 considerably affects the content validity of the scale; in this case analyses can be conducted without omitting the respective item from the scale (Buyukozturk, 2007). In addition, the critical ratio was based on being below 10 in normality testing for confirmatory factor analysis and structural equation modeling. According to Kline (2005), the critical ratio is somehow a normalized estimation of multivariate kurtosis, to wit $z$ value. A critical ratio being absolutely higher than 10 suggests that there is a problem in kurtosis value of distribution.

2.5. Data collection instruments and confirmatory factor analyses

2.5.1. Technology attitude scale

The “Technology Attitude Scale”, which consists of 5 factors and 19 items developed by Yavuz (2005) was used to measure the teacher candidates’ attitudes to technology attitudes. Factors that are present in the scale are sorted as not using technological tools in education, using technological tools in education, the effects of technology in educational life, teaching how to use technological tools and evaluating technological tools. The following two items were provided as an example to items situated in this scale. Fundamental lessons about computer literacy should be provided to students (T9). Computer supported instruction should be frequently included during the course (T15). The reliability coefficient for the instrument of measurement was calculated with the method of Cronbach’s Alpha and the reliability coefficient of the test was found to be .866. Factor loads of items in the scale are between .744 and .412. 5-point Likert-type questions appeared in the technology attitude scale and every item was assessed with a 5-point rating expressed as “Strongly Agree” (5), “Agree” (4), “Undecided” (3), “Disagree” (2) and “Strongly Disagree” (1).

The reliability for the measurement instrument on the data obtained from this study was calculated with Cronbach’s Alpha and the reliability coefficient of reliability of the test was found to be .848. Furthermore, as a result of exploratory factor analysis, factor loads of items situated in the scale were detected to be between .712 and .553. Besides, the diagram for confirmatory factor analysis of the scale is shown in Fig. 1.

As a result of confirmatory factor analysis and taking normality testing, into consideration, critical ratio (c.r.) turned out to be 57.771 in terms of multivariate (Mardia) values. For this reason, first of all, items with a critical ratio bigger than 10 were not analyzed in the next step. In this case, considering confirmatory factor analysis results of the “technology attitude scale” which consists of 16 items, fit index occurred as RMSEA = .056, SRMR = .0602; CMIN/DF ($\chi^2$/sd) = 2.498; GFI = .962; CFI = .957; AGFI = .917 and NFI = .912. This result demonstrates that the model fit index is at an acceptable and desired level.
2.5.2. Perceived computer self-efficacy scale

"Perceived Computer Self-Efficacy Scale", which consists of single factor and 18 items developed by Askar & Umay (2001), was employed to measure computer self-efficacy of the teacher candidates. The following two items were provided as an example to items situated in this scale. I think that I am able to effectively use computer (P3). I believe that I have a special gift toward using computer (P10). The reliability coefficient for the instrument of measurement was calculated via the Cronbach's Alpha and was found to be .91. 5-point Likert-type questions appeared in the perceived computer self-efficacy scale and items were assessed with a 5-point rating expressed as “always” (5), “usually” (4), “occasionally” (3), “rarely” (2) and “never” (1). In this study, it appeared that Cronbach's Alpha reliability coefficient of the scale was .85 and factor loads of items were between .730 and .541. Besides, the diagram for confirmatory factor analysis of the scale is displayed in Fig. 2.

As a result of confirmatory factor analysis and taking normality testing into consideration, critical ratio (c.r.) appeared to be 33.453 in terms of multivariate (Mardia) values. Therefore, items with a critical ratio bigger than 10 were not analyzed in the next step. In this case, RMSEA = .059, SRMR = .039; CMIN/DF (χ²/sd) = 2.635; GFI = .954; CFI = .951; AGFI = .932 and NFI = .923. This result demonstrates that the model fit index is at an acceptable and desired level.

2.5.3. Computer anxiety scale

The “Computer Anxiety Scale”, which was developed by Ceyhan & Namlu (2000), whose reliability and validity was re-ensured by Jangulova (2010) in three languages as Russian, Kazakh and Turkish, was used to measure computer anxiety levels of the teacher candidates. The computer anxiety scale consists of 28 items and 4 factors as affective anxiety toward computers, fear of damaging computers, fear of learning to use computers and sense of confidence toward computers. The following two items were provided as an example to items situated in this scale. Computer makes me so tense to the extent that I become unable to do the things that I will do (AN7). I trust myself on the subject that I can easily learn computer skills (AN21). The reliability coefficient of the instrument of measurement was calculated via Cronbach's Alpha and was found to be .928. 4-point Likert-type questions appeared in the computer anxiety scale and items were assessed with a 4-point rating expressed as “always” (4), “usually” (3), “occasionally” (2), and “never” (1). As a result of analysis conducted on the data obtained from this study, the following result emerged that Cronbach's Alpha value of the scale was .858 and factor loads of items in the scale were between .730 and .541. Besides, the diagram for confirmatory factor analysis of the scale is displayed in Fig. 3.

As a result of confirmatory factor analysis and taking normality testing into consideration, critical ratio (c.r.) appeared to be 53.657 in terms of multivariate (Mardia) values. Therefore, items with a critical ratio bigger than 10 were not analyzed in the next step. In this case, RMSEA = .059, SRMR = .039; CMIN/DF (χ²/sd) = 2.635; GFI = .954; CFI = .951; AGFI = .932 and NFI = .923. This result demonstrates that the model fit index is at an acceptable and desired level.

2.5.4. The attitude scale toward applying computer supported education

"The Attitude Scale toward Applying Computer Supported Education", which consists of single factor and 20 items developed by Arslan (2006) was used to measure the teacher candidates' attitudes toward applying computer supported education. The following three items were provided as an example to items situated in this scale. I willingly and lovingly use computer in lesson (AT1). Computer supported education is a crucial subject for me (AT4). I think that computer is an effective instructional instrument (AT18). The reliability coefficient of the instrument of measurement was calculated using Cronbach's Alpha and was found to be .93. 5-point Likert-type questions appeared in the perceived computer self-efficacy scale.
questions appeared in the Attitude Scale toward Making Computer Supported Education and items were assessed with 5-point rating expressed as “Strongly Agree” (5), “Agree” (4), “Undecided” (3), “Disagree” (2) and “Strongly Disagree” (1). As a result of analysis conducted on the data obtained from this study, the Cronbach’s Alpha value of the scale was detected to be .881 and factor loads of items in the scale were detected to be between .680 and .509. Besides, the diagram for confirmatory factor analysis of the scale is displayed in Fig. 4.

Fig. 3. Confirmatory factor analysis diagram of the computer anxiety scale.

Fig. 4. Confirmatory factor analysis diagram of the attitude scale toward applying computer supported education.
As a result of confirmatory factor analysis and taking normality testing into consideration, the critical ratio (c.r.) appeared to be 79.657 in terms of multivariate (Mardia) values. Therefore, items with a critical ratio bigger than 10 were not analyzed in the next step. In this case, considering confirmatory factor analysis results of “the Attitude Scale toward Making Computer Supported Education”, which consists of 15 items, fit index occurred as RMSEA = .073; SRMR = .058; CMIN/DF (X^2/sd) = 2.963; GFI = .965; CFI = .957; AGFI = .913 and NFI = .906. This result demonstrates that model fit index is at an acceptable and desired level.

3. Results

As a result of research, a model was put forward which shows the effect level of the latent variables of attitudes to technology, computer anxiety, perceived computer self-efficacy and the attitude toward computer supported education on each other and their ratios to each other. While forming this model, testing the study hypotheses was taken into consideration. Structural equation modeling built for this purpose is present in Fig. 5.

The fit index of the model built was obtained as follows: RMSEA = .051; SRMR = .076; CMIN/DF = 2234; GFI = .965; CFI = .957; AGFI = .898; NFI = .913; Chi squared = 3,938,069; df = 1763 and p = .000. This result illustrates that the model fit index is at an acceptable and desired level.

Attitude to technology has five latent variables and 16 observed variables. Teaching how to use technological tools and not using technological tools in education are the most crucial latent variables under attitude to technology. The effect coefficients of the latent variables that are present in this scale range between .85 and .14.

Computer anxiety has four latent variables and 18 observed variables. Variables of affective anxiety toward computers and anxiety about learning to use computers have the highest effect coefficient within the latent variables that appear under computer anxiety. The effect coefficients of the latent variables that are present in this scale range between 1.01 and .59. This area is also the area where the latent variables have the highest coefficient.

Perceived computer self-efficacy has 12 observed variables. While P9 and P4 have the highest effect coefficient hierarchically among the observed variables, P15 and P14 have the lowest effect coefficient. The effect coefficients of the observed variables that are present in this scale range between .83 and .24.

The attitude scale toward applying computer supported education has 15 observed variables. While AT18, AT2, AT12 and AT14 have the highest effect coefficient among the observed variables, AT9 and AT19 have the lowest effect coefficient. The effect coefficients of the observed variables range between .71 and .17.

Taking the research hypotheses into consideration, the following results were attained.

Fig. 5. Structural equation modeling and analysis results of hypothesis.
As can also be seen in the model which was obtained as a result of research and is present in Fig. 5, it was detected that attitude to technology significantly and positively affects perceived computer self-efficacy at a level of .64. This result shows the accuracy of the hypothesis that appears in H1 that “Teacher candidates’ attitude to technology positively and significantly affects perceived computer self-efficacy”. Moreover, attitude to technology explains perceived computer self-efficacy at a ratio of 41%. In other words, the change taking place in perceived computer self-efficacy can be said to depend on attitude to technology at a ratio of 41%. This result confirms the hypothesis in H2 that “Teacher candidates’ attitude to technology significantly explains perceived computer self-efficacy”.

With regard to the third research hypothesis, it appeared that attitude to technology positively and significantly affects the attitude toward applying computer supported education at a level of .22. This result attained indicates the accuracy of the hypothesis stated in H3 that “Teacher candidates’ attitude to technology positively and significantly affects the attitude toward applying computer supported education”. However, as is also seen in the model which is situated in Fig. 5, it was detected that technology to technology affects perceived computer self-efficacy at the highest level and the attitude toward enacting computer supported education at the lowest level.

The research results also indicate that attitude to technology affects computer anxiety positively and significantly at a level of .59. This result displays the accuracy of the hypothesis stated in H4 that “Teacher candidates’ attitude to technology positively and significantly affects computer anxiety”. Furthermore, the following result emerged that attitude to technology explains computer anxiety at a ratio of 35%. In other words, the change taking place in computer anxiety stems from attitude to technology at a ratio of 35%. This result which emerged verifies the hypothesis in H5 that “Teacher candidates’ attitude to technology significantly explains computer anxiety”.

Also present among the results reached is that attitude to technology and computer anxiety together affect the attitude toward instituting computer supported education positively and significantly at a level of .38. This result proves the accuracy of the hypothesis that appears in H6 that “Attitude to technology and computer anxiety of teacher candidates together positively and significantly affect the attitude toward applying computer supported education”. As a result of the research it was detected that attitude to technology and perceived computer self-efficacy together positively and significantly affect the attitude toward applying computer supported education at a level of .34. This result asserts the accuracy of the hypothesis stated in H7 that “Attitude to technology and perceived computer self-efficacy of teacher candidates together positively and significantly affect the attitude toward applying computer supported education”.

With regard to the last research hypothesis, it was detected that attitude to technology, perceived computer self-efficacy and computer anxiety together significantly explain the attitude toward making computer supported education at a ratio of 60%. This result verifies the hypothesis that is present in H8 that “Attitude to technology, perceived computer self-efficacy and computer anxiety of teacher candidates together significantly explain the attitude toward enacting computer supported education”.

4. Discussion

As part of this research, the effect levels among the latent variables of attitude to technology, perceived computer self-efficacy, computer anxiety and the attitude toward doing computer supported education and these latent variables’ ratios between each other were tested. For this, eight hypotheses were developed in light of theoretical information by reviewing the literature first. In this section of the research, the results obtained by taking the order of hypotheses into account are discussed and compared with other research results attained regarding the subject.

With regard to the first research hypothesis, it appeared that teacher candidates’ attitudes to technology positively and significantly affects perceived computer self-efficacy. On the other hand, regarding the second research hypothesis, it was detected that teacher candidates’ attitude to technology significantly explains perceived computer self-efficacy. These results that emerged overlap with other research results related to the subject. As a result of research conducted by Gunter, Gunter, & Wiens (1998), it was seen that the correlation between attitudes of pre-service teachers toward working and learning with computers and toward technology is positive. In another study, Usta & Korkmaz (2010) determined that perception of teacher candidates toward using technology in education is positive and this positive perception level positively affects the attitude toward the teaching profession; as teacher candidates’ technology literacy levels increase, this positive attitude toward using technology also increases. In addition, research performed on teacher candidates and lecturers (Kisa and Kaya, 2006; McCoy, Heafner, Burdick, & Nagle, 2001; Yavuz & Coskun, 2008) indicate that these people have a positive attitude toward technology.

Regarding the third research hypothesis, it appeared that teacher candidates’ attitude to technology positively and significantly affects the attitude toward doing computer supported education. Research putting forward the idea that attitudes of teachers toward technology and using technology in education are positive and that there is a positive correlation between a positive attitude toward technology and the frequency of use of technology (Cagiltay, Cakiroglu, Cagiltay, & Cakiroglu, 2001; Celik & Bindak, 2005; Cure & Ozdener, 2008; Goktas, Yildirim, & Yildirim, 2008; Seferoglu, Akbıyık, & Bulut, 2008) have the characteristic of supporting the result obtained regarding the third hypothesis.

With regard to the fourth research hypothesis, the result was detected that teacher candidates’ attitude to technology positively and significantly affects computer anxiety. On the other hand, regarding the fifth research hypothesis, it was inferred that the attitude of teacher candidates to significantly explains computer anxiety. These results acquired from research show parallelism with the results of other research carried out. It appeared among the results of many studies carried out regarding the subject that there is a direct correlation between computer anxiety and computer use (Chua, Chen, & Wong, 1999; Howard & Mendelow, 1991; Rosen & Weil, 1995; Scott & Rockwell, 1997; Todman & Monaghan, 1994; Torkzadeh & Angula, 1992). On the other hand, the following is present among the results of a research conducted by Basarmak (2008) that teacher candidates have low-level anxiety toward computers and that their anxiety levels differ according to where they live, the type of high school from which they graduated, the monthly income levels of their families, whether they had taken a computer course before, their length of computer use and whether there is a computer where they live. The result that age, gender and experience affect the use of technology in class appeared among the results of research conducted by Jennings, Holcomb, Lima, and Brown (2005) which put forward a similar outcome.

With regard to the sixth research hypothesis, it was detected that teacher candidates’ attitude to technology and computer anxiety together positively and significantly affect the attitude toward adopting computer supported education. On the other hand, concerning the seventh research hypothesis, it was inferred that teacher candidates’ attitude to technology and perceived computer self-efficacy together positively and significantly affect the attitude toward adopting computer supported education. The results of research characteristically
support the accuracy of these hypotheses. As a matter of fact, in research carried out by Busch (1995), a medium-level correlation was observed between university students’ perceived computer self-efficacies and attitudes toward computers. Arslan (2008), who attained a similar result, put forward the idea that teacher candidates’ perceived computer self-efficacies and attitudes toward doing computer supported education are high, but there is a medium-level and positive correlation between attitude and perceived self-efficacy. It was determined in other research conducted that individuals with high perceived computer self-efficacy are more successful at using computers, trust themselves more, are eager to take on more responsibility and are more successful at fulfilling responsibilities (Burkhardt & Brass, 1990; Langford & Reeves, 1998). In addition, determining that as the level of education increases, the negative correlation between computer anxiety and self-efficacy, and that between computer anxiety and experience along with the positive correlation between self-efficacy and experience increase (Doyle, Stamouli, & Huggard, 2005). Moreover, the existence of a positive and significant correlation between teachers’ computer self-efficacy and the frequency of computer use, and positive attitudes toward computers (Celik & Bindak, 2005) have the characteristic of verifying the outcomes obtained from this research.

With regard to the eighth research hypothesis, the following result emerged that attitude to technology, perceived computer self-efficacy and computer anxiety of teacher candidates together serve to explain the attitude toward applying computer supported education. Common results of research conducted regarding the subject (Akcay, Aydogdu, Yildirim, & Sensoy, 2005; Atam, 2006; Aykanat, Dogru, & Kalender, 2005; Morgil & Evrim, 2006) emphasize that computer supported education has a positive effect on increasing the success of students, students’ attitudes toward computers, the permanency of learning and the development of skills such as conducting research and teamwork, establishing communication, written and oral communication, problem solving and personal development. While this situation also puts forwards the positive aspects of computer supported education, the results of some research performed have the characteristic of supporting results obtained from the eighth hypothesis. It appears from the research conducted by Kutluca & Ekici (2010) that teacher candidates’ attitudes toward computer supported education are positive and their perceived self-efficacy is at a good level and that, in addition, the level of correlation between their perceived of self-efficacy and attitudes toward computer supported education was detected as .67. A similar result was obtained from the research performed by Busch (1995) and Celik and Bindak (2005). It was observed from the respective research that there is a positive and medium-level correlation between the attitudes toward adopting computer supported education and self-efficacy.

It was concluded that technology attitude positively and significantly affects perceived computer self-efficacy, computer anxiety and computer supported education. Besides, it was detected that technology attitude and computer anxiety, and technology attitude and perceived computer self-efficacy together significantly affect the attitude toward making computer supported education. On the other hand, it appeared that perceived computer self-efficacy, computer anxiety and technology attitude are important predictors and latent variables of computer supported education, which is among the most important outcomes of this research and also confirms H8. This outcome was verified both theoretically and statistically, also was concretized by structural equation model. On the one hand, this situation put forward the originality of this research, and its differentiation from similar researches on the other.

In conclusion, it appeared that attitude to technology, perceived computer self-efficacy and computer anxiety together significantly affect and serve to explain the status of computer supported education. In other words, it was detected that attitude to technology, perceived computer self-efficacy and computer anxiety are important predictors of teacher candidates’ attitude toward using computer supported education. In this respect, teacher candidates’ completion of pre-service (undergraduate) education in such a way that they have a positive attitude to technology, have no computer anxiety and heighten their perceived computer self-efficacy will be a crucial gain for them in terms of acquiring a positive attitude toward the application of computer supported education. On the other hand, it bears great importance for technology attitudes of both teachers and students to be positive, that they have overcome computer anxiety and their perceived computer self-efficacy is high-level to perform computer supported education, which is an indispensable element of the present education world, in a way that suits its purpose.

References


