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Procedia Social and Behavioral Sciences 1 (2009) 676–680

Procedia Social and Behavioral Sciences

World Conference on Educational Sciences 2009

# The investigation of the views of student mathematics teachers towards computer-assisted mathematics instruction

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Received October 17, 2008; revised December 14, 2008; accepted January 03, 2009

**Abstract**

The aim of this study is to investigate the views of student mathematics teachers towards Computer-Assisted Mathematics Instruction (CAMI). This study was conducted using survey method. The sample consisted of total 180 student mathematics teachers. "CAMI Questionnaire" developed by Yenilmez and Sarıer (2007) consisting of thirty 5-point Likert-type items was used as an instrument. The data were analyzed by using the SPSS 13.0 statistics program. This study showed that the views of student mathematics teachers towards CAMI are positive. The views of student teachers towards CAMI showed no significant difference in terms of gender and computer ownership, whereas it posed a significant difference in terms of the frequency of computer usage, year of study, having an experience of CAI and computer competency.


*Keywords*: Computer-assisted instruction; mathematics teaching; student mathematics teacher.

## 1. Introduction

Today, several reasons such as large number of students, increase in the amount and complexity of knowledge and insufficiency in the number of teachers force the use of computers in the education process (Alkan, 1995). With the use of computers in the learning and teaching processes the term "Computer Assisted Instruction (CAI)" was coined. NCTM's Principles and Standards for School Mathematics (2000) states that "computers are essential tools for teaching, learning and doing mathematics. They furnish visual images of mathematical ideas, they facilitate organizing and analyzing data, and they compute efficiently and accurately" (NCTM, 2000, p. 24). Furthermore, the computers make learning easier by conveying the abstract concepts to screen and reifying them, allow students to progress at their own pace and work individually, activate students and let the students take control of their learning by getting feedbacks (Baki, 2002). Also, researches at all levels of education show that CAI is superior to traditional instruction in terms of its effects on mathematics learning (Birgin, Kutluca, & Gürbüz, 2008; Gürbüz, 2007; Isıksal & Aşkar, 2005; Liao, 2007; Tjaden & Martin, 1995; Tutak & Birgin, 2008), learning rate (Kulic, 1985), and attitudes towards mathematics (Senteni, 2004). For this reason, the effective integration of computers into mathematics education is very important. On the other hand, learning to teach mathematics with technology is best learned when technology infused into the teacher education curriculum (Baki, 2000).

1877-0428 
doi:10.1016/j.sbspro.2009.01.118

Based on social cognitive theory, a person's belief in performing a behavior or a task can lead to the successful completion of the task (Bandura, 1986). Therefore, an important aspect in successfully implementing CAI in education is user acceptance, which is greatly influenced by users' attitudes towards computers. Teachers and students teachers' attitudes and experiences play an important role in using computers in teaching and learning mathematics. Researchers have examined computer attitudes to understand how attitudes towards computers play a critical role in enhancing the acceptance of computers as well as understanding current and future user behavior, such as computer usage (Birgin, Kutluca, & Çatlıoğlu, 2008; Huang & Liaw, 2005; Mcalister, Dunn, & Quinn, 2005; Teo, 2008).

A number of studies in Turkey (Altun, Yiğit, & Alev, 2007; Baki, Kose, & Karakuş, 2008; Çobanoğlu, 2007; Kaya, 2006; Pamuk, 2007; Tuncer & Tuncer, 2007; Yılmaz & Sarıer, 2007) investigated the views and attitudes of student teachers towards CAI. Yet, the studies in Turkey on the attitudes of student mathematics teachers towards CAI are limited. For this reason, it is important identifying the factors that affect the views of student mathematics teachers towards CAI as a means for effective development of teacher training curriculum that will prepare teachers to face the challenges in the information age.

The aim of this study is to investigate the views of student mathematics teachers towards Computer-Assisted Mathematics Instruction (CAMI). Specifically, the following questions will be examined: What is the overall profile of student mathematics teachers' views towards CAMI? Do CAMI views differ by gender, year of study, computer ownership, having an experience of CAI, frequency of computer usage and perceived computer competency?

## 1. Methods

### *1.1. Participants*

The sample consisted of total 180 student mathematics teachers randomly selected from Fatih Faculty of Education, Karadeniz Technical University in Turkey. Participants are consisted of 45 student teachers from each class. Of all participants, 88 (48.9 %) were female and 92 (51.1%) were male.

### *1.2. Data collection*

This study was conducted using survey method. CAMI Questionnaire developed by Yenilmez and Sarıer (2007) and the "Computer Usage Information Form" were used as data collection tools. The questionnaire consists of 30, 5-point Likert-type items. There were questions about student teachers such as gender, class level, computer ownership, having an experience of CAI, frequency of computer usage and perceived computer competency. Participants responded to the questionnaire using a five-point scale. Cronbach alpha coefficient for CAMI questionnaire was calculated as 0.86. This coefficient is regarded as acceptable according to Büyüköztürk (2002).

### *1.3. Data analysis*

Positive items in the CAMI survey were assigned with numerical values ranging from 1 = "Strongly disagree", to 5 = "Strongly agree". For the negative items the scoring were reversed. The 30-item scores can be collectively summed to represent an individual's overall views towards CAMI ranging from 30 to 150. For different variables, frequencies, percentages, the means and standard deviations were calculated. The data were analyzed by independent samples *t*-test and analysis of variance (ANOVA) statistical techniques using the SPSS 13.0 statistics program. We also examined the eta squared ($\eta 2$) values to determine the effect size of independent variables. To interpret the eta squared values the guidelines (0.01=small effect, 0.06=moderate effect, 0.14=large effect) proposed by Cohen (1988) were used.

## Findings

### *1.4. What are the views of student mathematics teachers towards CAMI?*

The mean score for student mathematics teachers' views about CAMI was found as 107.92, standard deviation as 14.14, the maximum score as 144 and the minimum score as 80. The lowest and highest attained score were 80 and 144, respectively. Therefore, the student mathematics teachers' views about CAMI were regarded as positive.

### *1.5. Do the views about CAMI differ in terms of gender, computer ownership and having an experience of CAI?*

Independent *t-test* was implemented for the gender, computer ownership and having an experience of CAI variables regarding the views of student teachers about CAMI. Results of *t*-test were presented in Table 1.

Table 1: Independent *t*-test analysis for CAMI perception by gender, computer ownership, and having an experience of CAI

| *Variable* | | *n* | *Mean* | *SD* | *df* | *t* | *p* | *Eta squared (η2)* |
|---|---|---|---|---|---|---|---|---|
| Gender | Male | 92 | 109.53 | 13.83 | 178 | 1.56 | .119 | 0.013 |
| | Female | 88 | 106.24 | 14.33 | | | | |
| Computer Ownership | Yes | 78 | 108.58 | 14.46 | 178 | .543 | .538 | 0.001 |
| | No | 102 | 107.42 | 13.79 | | | | |
| Having an Experience of CAI | Yes | 90 | 115.89 | 11.28 | 178 | 9.13 | .000 | 0.31 |
| | No | 90 | 99.96 | 12.10 | | | | |

As shown in Table 1, no significant difference according to gender [$t_{(178)}$=1.56, $p$>.05] and computer ownership [$t_{(178)}$=.543, $p$>.05] was found. However, a significant difference according to having an experience of CAI was found [$t_{(178)}$ =9.13, $p$<.01]. Eta squared (η2) values in Table 1 indicated that gender (eta squared=.013) and computer ownership (eta squared=.001) have a small effect size, and that having an experience of CAI (eta squared=.31) have a very large effect size for the CAMI perceptions of student mathematics teachers.

### *1.6. Do views about CAMI differ according to frequency of computer usage, computer competency and year of study?*

A one-way ANOVA was performed for the perception scores of student mathematics teachers towards CAMI for the frequency of computer usage, year of study and computer competency variables. Post-hoc analyses were conducted by Tukey's HSD test. Results of ANOVA are presented in Table 2.

Table 2: ANOVA results according to the frequency of computer usage, year of study and computer competence

| *Variable* | | *n* | *Mean* | *SD* | *df* | *F* | *p* | *Eta squared (η2)* | *Difference* |
|---|---|---|---|---|---|---|---|---|---|
| Frequency of Computer Usage | (A) Seldom | 36 | 91.02 | 9.25 | 2-179 | 94.66 | .000 | 0.51 | A-C |
| | (B) Moderate | 93 | 107.51 | 10.74 | | | | | A-B |
| | (C) Frequent | 51 | 120.60 | 8.57 | | | | | B-C |
| Year of Study | (1) 1st year | 45 | 97.75 | 11.85 | 3-179 | 26.13 | .000 | 0.30 | 1-2 |
| | (2) 2nd year | 45 | 104.41 | 12.43 | | | | | 1-3 |
| | (3) 3rd year | 45 | 110.55 | 10.71 | | | | | 1-4 |
| | (4) 4th year | 45 | 118.98 | 12.36 | | | | | 2-4 |
| Computer Competency | (D) Little | 40 | 90.76 | 9.11 | 2-179 | 169.52 | .000 | 0.65 | D-F |
| | (E) Moderate | 99 | 107.85 | 7.90 | | | | | D-E |

| | | | | |
|---|---|---|---|---|
| (F) Much | 41 | 124.84 | 8.52 | E-F |

As shown in Table 2, a significant difference was found in terms of the frequency of computer usage [$F$(2-179)=94.66, η2=0.51, $p$<.001]. Using the Tukey's HSD test, it was found that significant differences in terms of frequency of computer usage were between groups A–B, A–C and B–C.

A significant difference was also found in terms of year of study [$F$(3-179)=26.13, η2=0.30, $p$<.001]. The Tukey's HSD test revealed that the significant differences in terms of year of study were between groups 1-2, 1-3, 1-4, 2-4.

A significant difference was found in terms of computer competency [$F$(2-179)=169.52, η2=0.65, $p$<.001]. The Tukey's HSD test revealed that the significant differences in terms of computer competency were between groups E-D, F-D and F-E.

Eta squared (η2) values in Table 2 indicated that the frequency of computer usage (eta squared=.51), computer competency (eta squared=.65) and year of study (eta squared=.30) variables have large effect size for the views of student mathematics teachers about CAMI.

## 2. Conclusion

This study suggests that the views of student mathematics teachers about CAMI are positive, and that computer ownership and gender do not pose a significant difference to the views of student mathematics teachers about CAMI. These results also align with a number of studies reporting that gender (Baki *et al*, 2008; Çobanoğlu, 2007; Kaya, 2006; Özgen, Obay, & Bindak, 2008; Pamuk, 2007) and computer ownership (Altun *et al*., 2007; Çobanoğlu, 2007; Özgen *et al*, 2008; Yılmaz & Sarıer, 2007) do not pose a significant difference to the views of student teachers about CAI and attitudes towards computers usage (Birgin, Kutluca & Çatlıoğlu, 2008; Teo, 2008). Indeed, North and Noyes (2002) state that increased use of computers for teaching and learning in schools has worked against the development of gender differences. Though, this result contradicts with the results of several studies reporting that gender (Alev *et al*, 2007; Fisher & Margolis, 2002; Tuncer & Tuncer, 2007) and computer ownership (Baki *et al*, 2008) variables pose significant differences to the attitudes of student mathematics teachers towards CAI. The findings of this study that the views of student mathematics teachers about CAI are positive and do not differ according to gender and computer ownership may be attributed to the availability of and accessibility to computers given to the student teachers at various stages of their education.

In this study, it was found that having an experience of CAI, year of study, computer competency and the frequency of computer usage variables pose significant differences to the views of student mathematics teachers about CAMI. This may be explained with the fact that the attitudes and views of individuals are shaped with the complete and true past experiences as stated by Bandura (1986). As a matter of fact, the participants have taken the "Computer-Based Mathematics Education" and "Special Teaching Methods I-II" courses in the 4th year, the "Instructional Technologies and Material Development" course in the 3rd year and they prepared CAI activities and gained experiences. All these experiences affect the frequency of computer usage, computer competency and views about CAMI of the student teachers positively. Similarly, several studies suggested that CAI experience (Davies & Brember, 2001; Huang & Liaw, 2005; Khine, 2001; Lin, 2008; Tuncer & Tuncer, 2007; Savenye, 1993; Yılmaz & Sarıer, 2007), year of study (Altun *et al*, 2007; Mcalister *et al*, 2005; Pamuk, 2007; Tuncer & Tuncer, 2007; Yılmaz & Sarıer, 2007), computer competency (Kaya, 2006; Lin, 2008) and the frequency of computer usage (Özgen *et al*, 2008; Pamuk, 2007) variables affect the attitudes towards CAI in a positive manner.

Student teachers are key drivers who play crucial roles in technology integration in the schools (Baki, 2000; Teo, 2008). The results of this research indicate that having a CAI experience and computer competency foster positive attitudes toward CAI among students mathematics teachers. Therefore, this study suggests a need for teacher educators to provide a conducive and non-threatening environment for student teachers to experience success in using the computers. It is also suggested that mathematics teacher education programs should preview and take students' needs into account and thus, prepare students teachers to teach tomorrow's students by using computers in the mathematics classroom effectively.

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