

Results of Attitude toward Computer Use for Pre-service Teachers

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## **Abstract**

This study describes the results of the Attitudes Toward Computer Use Survey (ATCUS). Eight hundred and thirty pre-service teachers completed the Attitudes Toward Computer Use Survey (ATCUS) as part of the University of Northern Colorado's Preparing for Tomorrow's Teacher to Use Technology (PT3) grant. This study specifically focuses on the analyses and findings from the attitude, anxiety, and computer use data collected from the pre-service teachers who took the two technology classes in the Spring 2003, Fall 2003, and Spring 2004 semesters. Positive and negative reactions to computers, attitudes about computers and children, and general attitudes about everyday computer technologies were explored to identify relationships among anxiety and computer use. The result shows that there are significant differences in Computer Use, Anxiety, and Computers and Children/Education Factor between pre-test and post-test.

## **Introduction**

Although the number of computers in K-12 schools has increased dramatically over the past two decades, the actual integration of these computer-based technologies is not being efficiently and effectively utilized by the majority of teachers (Charsky et al., 2002; Ferguson-Pabst, 2003). Teachers reported that there is a low level of computer usage in their classrooms because of limited access to equipment (National Center for Educational Statistics, 2001), and they feel inadequately prepared to use it (AACTE, 1999; Schrum, 1999). Research suggests that the only way we can hope to see improvements in technology integration across the system is with reform of the teacher education programs (Moursund & Bielefeldt, 1999). Ely (as cited in Glazewski, Brush, Ku, & Igoe, 2001) indicated pre-service teacher education programs need to provide instruction in educational technology in order to better prepare prospective teachers. Not only does the need for technology integration surface in research, but it has been mandated through the National Council for Accreditation of Teacher Education (NCATE) and Colorado's Department of Education (CDE) content standards.

With the support of a three-year Preparing Tomorrow's Teachers to Use Technology (PT3) grant, University of Northern Colorado (UNC) began a research effort which is ultimately focused on the development of a technology infusion model for pre-service teacher education. One goal of the grant is to achieve graduates of the UNC teacher education programs who will effectively utilize technology for instruction in their classrooms when employed as full-time teachers. This goal is to be accomplished through development of two one-credit Educational Technology courses: Technology in Education (ET200) and Educational Technology Applications (ET300).

Pre-service teachers take the first course early in their program, usually during their sophomore year. This first course, Technology in Education (ET200), is an introduction to a variety of technologies which are typically used in K-12 classrooms and helpful for teaching preparation. This is a project driven course. Students have to finish the seven projects designed for the course. These seven projects are Scavenger Hunt (Searching on the web), Excel Spreadsheets (Microsoft Excel), Advanced Word Processing (Microsoft Word), Graphics Manipulation (PhotoShop), PowerPoint Presentation Design (Microsoft PowerPoint), Graphic Organizers (Inspiration), and Web Design (Macromedia DreamWeaver).

During the first semester of their senior year, just before student teaching, the pre-service teachers take the second course, Educational Technology Applications (ET300). This course concentrates on the application of the technologies learned in the ET200 course. The theory portion of the ET300 classes addresses four components that are critical to technology integration and the student's knowledge base: Software Evaluation, Rationale for Technology Integration, Technology and Teaching Strategies, and Room Design and Management. In addition, the topic of Colorado Students Assessment Project (CSAP) is also incorporated into the content of ET300 class. This course also utilizes case study practices and models ways in which problems related to technology integration can be solved. Both ET200 and ET300 classes are instructor-led and supplemented with extensive web-based materials. They are also required in the elementary, middle grade, and secondary teacher preparation programs.

Attitudinal data along with self-reports of anxiety were collected from each student who took ET200 and ET300 at the beginning and the end of the semesters to provide a baseline for these variables and to allow comparison analyses.

Specific questions addressed in this study included:

1. How did students' attitudes towards computer use change after taking the ET200 class?
2. Are there any differences in the attitudes toward computer use among the ET300 students before and after taking the classes?

## **Method**

### *Subjects*

The participants for this study were 830 pre-service teachers at UNC, who completed Technology in Education course (ET200: N =461) and Educational Technology Applications course (ET300: N = 369) in the Spring 2003, Fall 2003, and Spring 2004 semesters (see Table 1). The majority of the participants were in the sophomore to senior years and over 90 percent were between the age of 18 and 25. Over 85 percent of subjects were female.

Table 1

### *Group Characteristics*

Courses	n	Age		Sex	
		M	SD	Female	Male
ET200	461	21.41	4.11	377 (81.8 %)	84 (18.2 %)
ET300	369	22.36	3.70	314 (85.1 %)	55 (14.9 %)
Total	830	21.83	3.95	691 (83.3 %)	139 (16.7 %)

### *Materials*

The instrument used to collect the attitudinal data is the Attitudes Toward Computer Use Survey (ATCUS) (Popovich, Hyde, Zakrajsek, & Blumer, 1987). This instrument (see Appendix A) was designed to "...assess how people react to using computers and computer-related mechanisms" (Popovich et al., 1987, p.262). The ATCUS is a 20-item Likert-scale questionnaire ranked on a seven-point scale from "Strongly Agree" to "Strongly Disagree" (from 1 to 7). The ATCUS survey covers the following four factors: negative reactions to computers, positive

reactions to computers, computers and children or education, and reactions to familiar computer-related mechanisms. Reverse coding was used to run and analyze the data. Therefore, higher scores on Factor 1 (negative reactions to computers) indicate more negative reactions to computers. The descriptions of the other three factors suggest the respondent's degree of positive reaction toward computers. That is, higher scores on Factor 2, Factor 3, and Factor 4 indicated more positive attitudes.

Factor 1, negative reactions to computers, contained seven questions such as "I know that I will not understand how to use computers" and "Whenever I use something that is computerized, I am afraid I will break it". Factor 2, positive reactions to computers, included five items such as "I would like to own, or I do own a computer" and "I feel that having a computer at work would help me with my job". The third factor, computers and children or education, contained five items asking subjects such as "I feel that the use of computers in schools will help children to learn mathematics" and "If I had had a child, I would buy them computerized toys". The last factor, reactions to familiar computer-related mechanisms, contained three items such as "I prefer to use an automatic teller for most of my banking". The Cronbach Alpha reliability for the ATCUS was .84.

Additionally, two self-report items were added to the survey instrument that asked students to estimate the average hours of computer use per week and to rate their anxiety level. The scale for the anxiety self-rating is 1 (high) to 5 (low). General information (i.e., gender, age, and the class section number) was also collected on the questionnaires.

### *Procedure*

The ATCUS data was collected from the Spring 2003 to Spring 2004 semesters. The survey was completed in the first week of each semester, and it was completed again in the last

week of the semester. Students were given approximately 20 minutes to complete the on-line survey from the class websites in the computer lab. The response rate of the surveys was over 90%. The results of the pre-test and post-test were used to find out if there is any change in students' attitudes toward computer use before and after taking the ET200 and ET300 classes. Factor analyses were conducted with the data to determine if pre-service teachers' scores on any of these four factors have a statistically significant relationship with either their self-anxiety rating or their average hours of computer use per week.

### *Data Analysis*

Reverse coding was used to run and analyze the data except Computer Use. A paired Samples T Test and Pearson Correlation Coefficients were used to analyze the ATCUS data collected in the Spring 2003, Fall 2003, and Spring 2004 semesters.

### **Results**

After comparing ET200 pretest and posttest mean scores of each of the four Factors, Computer Use, and Anxiety, the result (see Table 2 & 3) shows that the mean score of Factor 1 (Negative reactions to computers) increased from 2.56 to 2.64, the mean score of Factor 2 (Positive reactions to computers) increased from 5.09 to 5.11, the mean score of Factor 3 (Computers and children /education) increased from 4.39 to 4.49, the mean score of Factor 4 (Reactions to computer-related mechanism) increased from 4.43 to 4.49, the mean hours of using computers increased from 12.12 to 14.87, and the mean score of Anxiety decreased from 2.32 to 2.13. The standard deviation of Computer Use is high because of the wide range of students' time spent on computers per week. Among all of them, the mean scores of Factor 3, Computer Use, and Anxiety are significantly different from pretest and posttest.

As for the result of Pearson Correlation Coefficient, Anxiety and Factor 1 are moderately correlated in pretest ( $r=.51$ ) and posttest ( $r=.52$ ) while the others are low correlated.

Table 2

*ET200 ATCUS Mean, SD & Paired Samples T Test Outcome*

		Factor 1	Factor 2	Factor 3	Factor 4	Computer Use	Anxiety
Pretest	M	2.56	5.09	4.39	4.43	12.12	2.32
	SD	1.03	.52	.59	1.15	9.07	1.03
Posttest	M	2.64	5.11	4.49	4.49	14.87	2.13
	SD	1.08	.60	.65	1.16	12.00	1.00
p		.07	.59	.01*	.34	.00*	.00*
t		1.82	.55	2.66	.96	-5.82	-4.18

*Note:* Factor1: Negative reactions to computers; Factor2: Positive reactions to computers; Factor3: Computers and children/education; Factor4: Reactions to computer-related mechanisms; \* $p<.05$

Table 3

*ET200 ATCUS Pearson Correlation Coefficients Outcome*

		Factor 1	Factor 2	Factor3	Factor 4	Computer Use	Anxiety
Pretest							
Factor 1	r	1	-.15	-.05	-.20	-.25	.51
	p		.00*	.27	.00*	.00*	.00*
Factor 2	r	-.15	1	.06	.18	-.08	-.09
	p	.00*		.18	.00*	.10	.06
Factor 3	r	-.05	.06	1	.16	-.10	-.15
	p	.27	.18		.00*	.03*	.01*
Factor 4	r	-.20	.18	.16	1	-.19	-.19
	p	.00*	.00*	.00*		.00*	.00
Computer Use	r	-.25	-.08	-.10	-.19	1	.20
	p	.00*	.10	.03*	.00*		.00
Anxiety	r	.51	-.09	-.15	-.19	.20	1
	p	.00*	.06	.01*	.00	.00	
Posttest							
Factor 1	r	1	-.09	.06	.04	.20	.52
	p		.06	.20	.40	.00*	.00*
Factor 2	r	-.09	1	.22	.21	-.06	-.09
	p	.06		.00*	.00*	.24	.06
Factor 3	r	.06	.22	1	.28	-.06	-.06
	p	.20	.00*		.00*	.18	.22
Factor 4	r	.04	.21	.28	1	-.11	-.04
	p	.40	.00*	.00*		.02*	.43
Computer Use	r	.20	-.06	-.06	-.11	1	.19
	p	.00*	.24	.18	.02*		.00*
Anxiety	r	.52	-.09	-.06	-.04	.19	1
	p	.00*	.06	.22	.43	.00*	

*Note:* Factor1: Negative reactions to computers; Factor2: Positive reactions to computers; Factor3: Computers and children/education; Factor4: Reactions to computer-related mechanisms; \*p<.05

After comparing ET300 pretest and posttest mean scores of each of the four Factors, Computer Use, and Anxiety, the result (see Table 4 & 5) shows that the mean score of Factor 1 (Negative reactions to computers) increased from 2.42 to 2.54, the mean score of Factor 2 (Positive reactions to computers) increased from 5.10 to 5.13, the mean score of Factor 3 (Computers and children /education) increased from 4.41 to 4.55, the mean score of Factor 4 (Reactions to computer-related mechanism) increased from 4.59 to 4.63, the mean hours of using

computers increased from 12.96 to 16.23, and the mean score of Anxiety decreased from 2.02 to 1.87. The standard deviation of Computer Use is high because of the wide range of students' time spent on computers per week. Among all of them, the mean scores of Factor 3, Computer Use, and Anxiety are also significantly different from pretest and posttest.

As for the result of Pearson Correlation Coefficient, Anxiety and Factor 1 are moderately correlated in pretest ( $r=.64$ ) and posttest ( $r=.51$ ) while the others are low correlated.

Table 4

*ET300 ATCUS Mean, SD & Paired Samples T Test Outcome*

		Factor 1	Factor 2	Factor 3	Factor 4	Computer Use	Anxiety
Pretest	M	2.42	5.10	4.41	4.59	12.96	2.02
	SD	.10	.52	.55	1.20	11.70	.97
Posttest	M	2.54	5.13	4.55	4.63	16.23	1.87
	SD	1.07	.57	.56	1.21	12.20	.92
p		.01	.34	.00*	.27	.00*	.00*
t		2.47	.92	4.04	-1.11	6.09	3.46

*Note:* Factor1: Negative reactions to computers; Factor2: Positive reactions to computers; Factor3: Computers and children/education; Factor4: Reactions to computer-related mechanisms; \* $p<.05$

Table 5

*ET300 ATCUS Pearson Correlation Coefficients Outcome*

		Factor 1	Factor 2	Factor3	Factor 4	Computer Use	Anxiety
Pretest							
Factor 1	r	1	-.12	-.08	-.22	-.20	.64
	p		.02*	.13	.00*	.00*	.00*
Factor 2	r	-.12	1	.11	.18	-.03	-.17
	p	.02*		.34	.00*	.55	.00*
Factor 3	r	-.08	.11	1	.09	-.07	-.13
	p	.13	.34		.08	.16	.01*
Factor 4	r	-.22	.18	.09	1	-.13	-.24
	p	.00*	.00*	.08		.01*	.00*
Computer Use	r	-.20	-.03	-.07	-.13	1	-.17
	p	.00*	.55	.16	.01*		.00*
Anxiety	r	.64	-.17	-.13	-.24	-.17	1
	p	.00*	.00*	.01*	.00*	.00*	
Posttest							
Factor 1	r	1	-.06	.15	-.04	.17	.51
	p		.30	.00*	.50	.00*	.00*
Factor 2	r	-.06	1	.11	.17	-.10	-.12
	p	.30		.04*	.00*	.06	.02
Factor 3	r	.15	.11	1	.19	.01	-.08
	p	.00*	.04*		.00*	.92	.15
Factor 4	r	-.04	.17	.19	1	-.01	-.11
	p	.50	.00*	.00*		.88	.04*
Computer Use	r	.17	-.10	.01	-.01	1	.19
	p	.00*	.06	.92	.88		.00*
Anxiety	r	.51	-.12	-.08	-.11	.19	1
	p	.00*	.02	.15	.04*	.00*	

*Note:* Factor1: Negative reactions to computers; Factor2: Positive reactions to computers; Factor3: Computers and children/education; Factor4: Reactions to computer-related mechanisms; \*p<.05

### Discussion

From the result of the pretest and posttest data, the questions addressed in this study are answered. There are some changes of students' attitudes towards computer usage before and after taking the ET200 class and ET300 class.

The mean scores of Factor 3 in both subject groups (ET200 and ET300) increased. This indicated that after taking these classes, students' attitudes towards the facilitation of computers in children/education increased. That is, they have more positive belief that computers can contribute to children's learning, education, and human life. The subjects were pre-service teachers who will be teaching young children a great deal upon their graduation from their collegiate teaching program. When they took the computer classes, they could see the great convenience and facilitation that computers brought to learning, and this strengthened their belief that computers could contribute to the children's learning.

During the time when the subjects took ET200 and ET300 classes, they had to use computers to do their projects. Moreover, they also understood the great convenience and facilitation that computers provide, so that they would make good use of computers to do their work in their daily life. Due to these possible explanations, the mean hours of Computer Use in both subject groups increased. This indicated that students spent more time using computers than before taking these classes. Computer technology has become an integral part of human life. Therefore, spending more time on computers should be helpful to students in order to become accustomed to this brave new world.

After taking the two classes, the mean scores of Anxiety in both subject groups decreased. This indicated that students' anxiety with using computers decreased after taking these classes. That is, these classes helped students know what computers were, and how they could facilitate and improve educational practices. They understood that computers were not so complicated and difficult, and they could use computers to finish tasks. Therefore, they did not have as much anxiety as before.

As for the correlation of Factor 1 (Negative reactions to computers) and Anxiety, it is moderately correlated ( $r=.51$  &  $r=.52$ ) in ET200 group and also moderately correlated ( $r=.64$  &  $r=.51$ ) in ET300 group. That is, there is a positive correlation between students' anxiety on using computer and negative reactions to computers.

In addition to the discussion above on the data, which showed significance, there was an interesting phenomenon that caught the attention of the researchers. According to the data result of both ET200 and ET300, the Factor 1 (Negative reactions to computers) mean score of pretest increased in the posttest, which indicated that students had more negative reactions to computers after taking these classes. Although there is no significance on these two mean scores, this result might reveal another factor that might affect students' reactions to computers after taking the classes. The tedious and tough projects in these classes might cause students' negative reactions to computers. This could be discussed in a further study.

There were some limitations of this study. The ATCUS (see Appendix A) survey appears dated. Some questions like "I would prefer to go to a store that uses computerized price scanners rather than go where the clerks enter each price into the each register" could not adequately reflect people's attitudes toward computer use today because that technology has been widely implemented in today's supermarkets and people are used to that. Furthermore, students' impatience in filling out the survey might lead to the inaccuracy of the result.

### **Conclusion**

Many students are afraid of using technology because they have never used it, and maybe do not want to try at all. Their negative attitudes toward computer use might result in their isolation from the modern world. For those who are going to teach the next generation, it is more important to enrich themselves with computer skills, and to conquer the fear and anxiety of using

computers, so that they could help their students prepare to use technology. The computer classes designed for pre-service teachers (ET200 & ET300) contributed to positive changes in students' attitudes towards computer even though the heavy work load in these classes caused some complaints and negative reactions. Most importantly, these two classes helped reduce students' anxiety about using computers.

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## Appendix A

### The Attitudes Toward Computer Use Survey

	Strongly Agree			Strongly Disagree			
	1	2	3	4	5	6	7
1. I would prefer to type a paper on a word processor rather than on a typewriter	1	2	3	4	5	6	7
2. Whenever I use something that is computerized, I am afraid I will break it.	1	2	3	4	5	6	7
3. I like to keep up with technological advances.	1	2	3	4	5	6	7
4. I know that I will not understand how to use computers.	1	2	3	4	5	6	7
5. Using a computer is too time consuming.	1	2	3	4	5	6	7
6. I feel that having a computer at work would help me with my job.	1	2	3	4	5	6	7
7. I prefer not to learn how to use a computer.	1	2	3	4	5	6	7
8. I would like to own, or I do own a computer.	1	2	3	4	5	6	7
9. I like to play video games.	1	2	3	4	5	6	7
10. I feel that the use of computers in schools will help children to learn mathematics.	1	2	3	4	5	6	7
11. I prefer to use an automatic teller for most of my banking.	1	2	3	4	5	6	7
12. If I had children, I would not buy them computerized toys.	1	2	3	4	5	6	7
13. I have had bad experiences with computers.	1	2	3	4	5	6	7
14. I would prefer to order items in a store through a computer rather than wait for a store clerk.	1	2	3	4	5	6	7
15. I feel that the use of computers in schools will negative affect children's reading and writing abilities.	1	2	3	4	5	6	7
16. I do not like using computers because I can not see how the work is being done.	1	2	3	4	5	6	7
17. I would prefer to go to a store that uses computerized price scanners rather than go where the clerks enter each price into the each register.	1	2	3	4	5	6	7
18. I do not feel that I have control over what I do when I use a computer.	1	2	3	4	5	6	7
19. I think that computers and other technological advances have helped to improve our lives.	1	2	3	4	5	6	7
20. I do not like to program computerized items such as VCRs and microwaves.	1	2	3	4	5	6	7
21. Please make this last scale by circling a number between 1 (Very Anxious) and 5 (Not Anxious At All) that estimates how anxious computers and computerized machine make you feel.	1	2	3	4	5		
22. Average number of hours per week that your use a computer for <i>any</i> purpose: _____ hours							