Effects of an Educational Computing Course on Preservice and Inservice Teachers: A Discussion and Analysis of Attitudes and Use

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Abstract

This study examined the changes in preservice and inservice teachers' attitudes toward computers following their participation in an educational computing class, and it explored the factors that contributed to their computer use. The study used data from 114 preservice and inservice teachers (83 female, 31 male) who attended a university in southern California. Results of doubly multivariate repeated measures indicated that teachers' attitudes (anxiety, confidence, and liking) significantly improved after the computer literacy course. The follow-up study indicated that teachers' prior computer experience shaped their expectations of the course. Teachers reported that having a home computer, a professor's willingness to teach, and the current use of technology in the schools at which they work also influenced their attitudes toward and use of computers. (Keywords: attitudes toward computers, preservice and inservice teacher education, preservice technology training.)

Technology is defined as the process through which we attempt to expand human potential to improve and control our world (Seymour, 1993). Ever since the advent of technology into society and the workplace, educational institutions have struggled with the question of how to teach, given the variety of technologies that are available to enhance human potential and improve teaching. Similarly, teacher education programs have also struggled with the question of how to prepare prospective teachers for the next century. It is obvious that in the 21st century, almost all jobs will involve computers in some way. It is, therefore, crucial for teachers to have appropriate technology training during their preservice education, if they are to meet their students' needs for the next century.

A large body of literature supports the idea that the biggest obstacle to teachers using technology in their classrooms is the lack of adequate teacher training (Beaver, 1992; Brooks & Kopp, 1990; Ingram, 1992; Vagle & College, 1995; Yaghi, 1997; Yildirim & Kiraz, 1999). Perkins (1992), for example, pointed out that teachers are not being adequately prepared for the challenges of the next century: "students are learning and teachers are teaching in much the same way they did twenty or even fifty years ago. In the age of CDs and VCRs, communication satellites and laptop computers, education remains by and large a traditional craft" (p. 3). Moursund (1989) is even more expressive in his criticism: "our colleges of education are doing a miserable job of preparing teachers to deal with the Information Age" (p. 9).

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Perkins's (1992) and Moursund's (1989) standpoint in the issue of information technology and teacher education is one of the most detracting ones. However, there is a large body of literature that supports their point of view. In a report, the U. S. Congress Office of Technology Assessment (OTA) (1995) predicted that American schools have 5.8 million computers in use for instruction. However, the number of teachers who report little or no use of computers for instruction is still considerable. In the same report, OTA also demonstrates that teachers tend to use technology for instruction in traditional ways rather than as a tool to solve problems or improve students' critical thinking.

In most teacher education institutions, computer-specific courses are offered as an initial attempt to prepare a student teacher's future in computer technology. In fact, most states require preservice and inservice teachers to take a computer literacy course while fulfilling the requirements for a teaching credential. For example, Title 5 Regulation, in Section 44161.7 of the California Education Code (California State Legislature, 1997), requires teachers to take an educational computing course. These courses are usually designed to teach basic computer skills, introduce teachers to several common computer applications (e.g., word processing, spreadsheets, databases, telecommunications, and presentation programs), and teach how to integrate these applications into the classroom. These courses are intended to provide preservice and inservice teachers with hands-on experience so they can integrate computer technologies into their teaching.

Despite current attempts to prepare student teachers to use computer technology in the classroom, significant amounts of research indicate,"teachers are more hesitant and less likely to embrace computer technology than other professionals" (Paprzycki & Vidakovic, 1994, p. 74). According to Wetzel (1993), education majors who become teachers report that they hesitate to use technology and do not feel prepared to integrate technology into their instruction when they are employed in schools. This raises questions about the effectiveness of preservice teachers' technology training.

Though the literature states a variety of reasons for inadequate use of computers among educators, attitudes have been recognized as influential (Francis, 1994). Because of this belief, educational researchers have been very interested in teacher attitudes toward computers (Savenye, 1993). It is important to understand that negative attitudes toward computers influence the learning process. Simonson (1995) also emphasizes the importance of positive attitudes in the learning process. He claims that promoting positive attitudes will also promote achievement, liking, and learning.

According to the OTA (1995), more than 1,300 institutions of higher education now prepare future teachers in the United States; within the next decade, schools will need to hire nearly two million teachers. Teachers teach as they have been taught, and it is unlikely that computer skills will be transferred to students and encouraged by teachers unless the teachers have positive attitudes toward computer use. Hence, critical issues for the fields of teacher education and technology include an understanding of how preservice and inservice teachers

are trained and prepared for new technologies, the factors related to their attitudes, and how their attitudes and computer use are affected and improved through computer courses.

PURPOSE OF THE STUDY

The dramatic developments in computer technology during the past three decades have influenced expectations from educational institutions. Now, educational institutions are expected to prepare the next generation of citizens for the technologically oriented global world. Teacher education institutions are also being asked to prepare teachers for the technology-enriched classrooms of the 21st century. For example, President Clinton challenged the United States to bring the power of the Information Age to students by connecting each classroom and library to the Internet before the 21st century (Clinton, 1997). However, Internet connections are useless unless teachers are adequately prepared and continuously supported in integrating computer technology into the classroom.

California requires preservice and inservice teachers to take a computer course for educators to enhance their experience with computers. Based on the assumption that participating in a computer literacy course helps develop positive attitudes toward computers and increases computer use in the classroom, this study examines the effects of a computer literacy course on preservice and inservice teachers' attitudes and use. The purpose of this study was to examine the changes in attitudes of preservice and inservice teachers stemming from participation in an educational computing class and to explore the factors that contributed to the teachers' use of computers.

METHOD

Subjects

This study examined preservice and inservice teachers working on their professional teaching credential. This study focused on students enrolled in the State of California's mandated educational computing course. The study used data from 114 students (83 female, 31 male) attending California State University in Los Angeles. Of the participants, 32% were between the ages of 20–25, 38% were aged between 26–30, 21% were between the ages of 31–40, and 9% were 41 or older. Thirty-nine percent reported having taken no previous computer course, while the same percentage of the participants reported having taken at least one previous computer course. Finally, 22% reported having two or more previous courses. In this sample of 114 teachers, 60% reported owning a home computer.

Description of the Course

This study examined the effectiveness of the educational computing course offered for preservice and inservice teachers working on their professional teaching credential. This course was designed for those with no prior experience with computers. As outlined in the course syllabus, student goals were to

- identify issues involved in the access to, use, and control of computer-based technologies;
- demonstrate knowledge of basic operations, terminology, and capabilities of computer-based technologies;
- demonstrate use of computer hardware, software, and system components;
- demonstrate a basic understanding of and ability to use representative software programs; and
- demonstrate the application and use of computer technologies within appropriate subject areas and grade levels.

Instruments

The study was conducted using a computer competency survey I developed to assess students' competency on computer skills outlined in the course syllabus (see Appendix, p. 495). The computer competency survey assessed were: (1) word processing, (2) database management, (3) spreadsheet use, (4) presentation software use, (5) Web browsing, (6) telecommunications use, (7) educational software use, and (8) desktop publishing. The scale rated eight items on a 4-point Likert-type scale, with 1 equaling *not familiar*, and 4 equaling *proficient*. The reliability for the computer competency survey was high ($\alpha = 0.88$).

This study used three subscales—computer anxiety, confidence, and liking—from the computer attitude scale developed by Loyd and Gressard (1984). Each subscale rated 10 items on a 4-point Likert-type scale, with 1 equaling *strongly disagree* and 4 equaling *strongly agree*. The total instrument range was 30 to 120; each subscale had a range from 10 to 40. Woodrow (1991) found these subscales and overall reliability ($\alpha = 0.94$) coefficients high, indicating that the total score gave a reliable measure of attitudes toward computers.

Finally, a follow-up questionnaire and semistructured interviews were prepared and distributed to those who volunteered to participate. Twenty students (14 females, 6 males) agreed to participate in the follow-up survey and interviews, focusing on the following areas:

1. Expectations—Students' expectations from the course and effectiveness of the course in terms of satisfying their expectations.
2. Attitudes and Computer Use—Effectiveness of the course in terms of helping students develop positive attitudes toward computers.
3. Other Factors—Other factors that students believed contributed to the changes in their attitudes toward computers and increased their computer use.
4. Professional Development—Effectiveness of the course in terms of students' professional development.

Procedure

The data from the subjects were collected in the following manner. At the first class meeting, the instructor gave a brief overview of the class and than introduced me to the students. They were asked to participate in the study and were given time to complete the pretest. Each participant in the study also received and signed a consent letter indicating that he or she understood the main

goal and the methodology of the research and that he or she agreed to participate to the study voluntarily. Posttests were given at the last class meeting, and students were asked to participate in a follow-up study. The students were also informed that all responses would be kept completely confidential.

FINDINGS

Summary of Observed Variables

Means and standard deviations of the observed variables for the sample are presented in Table 1. The pretest mean score for computer confidence was highest among all three subscales of the computer attitude scale. On the other hand, the mean score for computer liking was the lowest. Compared to pretest scores, the posttest mean scores of all three subscales (anxiety, confidence, and liking) and overall attitude score were higher.

Table 1. Summary Statistics of Observed Variables: Mean Scores of Computer Attitude Scale and Computer Competency Scale

		Pretest		Posttest	
	Variable	*M*	*SD*	*M*	*SD*
Computer Attitude Scale	Total	3.05	.52	3.37	.44
	Anxiety*	3.11	.64	3.46	.54
	Confidence	3.14	.56	3.46	.47
	Liking	2.90	.64	3.20	.55
Computer Competency Scale	Total	1.86	.60		

** A high score represents a low level of anxiety.*

One-Way MANOVA—Pretest

Means and standard deviations of pretest attitudes toward computers measured at different levels of competency (1 = novice, 2 = intermediate, 3= competent) are presented in Table 2. Members of group 3, the competent computer group, had more positive attitudes, more confidence, less anxiety, and liked computers more than members of groups 1 and 2.

Pretest attitudes toward computers (anxiety, confidence, and liking) measured at different levels of competency were analyzed using one-way multivariate analysis of variance (MANOVA) to examine if mean differences were significant. The results showed that the competency main effect was significant, $F(6, 220) = 5.023$, $p = .000$, indicating there were differences among the levels of competency (novice, intermediate, competent) on pretest attitudes toward computers (anxiety, confidence, and liking). Subsequent to the MANOVA, the Tukey's HSD method was used to make comparisons between group means for competency. The results (presented in Table 3) showed that members of group 3, the highly competent computer group, had significantly more positive attitudes, more confidence, and less anxiety than members of groups 1 and 2. There were no significant differences between groups 1 and 2. There were no significant differences among all three groups in regard to liking.

Table 2. Descriptive Statistics: Pretest Mean Scale Scores of Groups

Dependent Variable	Competency Level	*M*	*SD*	*N*
Attitude	1	2.84	0.56	36
	2	2.96	0.45	39
	3	3.33*	0.43	39
	Total	3.05	0.52	114
Anxiety **	1	2.79	0.67	36
	2	3.03	0.58	39
	3	3.48*	0.49	39
	Total	3.11	0.67	114
Confidence	1	2.91	0.60	36
	2	3.02	0.47	39
	3	3.47*	0.46	39
	Total	3.14	0.56	114
Liking	1	2.81	0.68	36
	2	2.82	0.61	39
	3	3.06	0.61	39
	Total	2.90	0.64	114

** Significant at the .05 level. ** A high score represents a low level of anxiety.*

Table 3. Mean Differences of Levels of Competency on Pretest Attitudes

	Competency Level (I)	Competency Level (J)	Mean Difference (I–J)	*p*
Attitude	3	1	14.92*	.000
		2	11.35*	.000
	1	2	–3.57	.546
Anxiety	3	1	6.87*	.000
		2	4.53*	.002
	1	2	–2.33	.198
Confidence	3	1	5.57*	.000
		2	4.43*	.001
	1	2	–1.14	.604
Liking	3	1	2.47	.217
		2	2.38	.228
	1	2	–0.01	.998

** Significant at the .05 level.*

One-Way MANOVA—Posttest

Means and standard deviations of posttest attitudes toward computers measured at different levels of competency (1 = novice, 2 = intermediate, 3= competent) are presented in Table 4. Unlike the pretest attitude scores, members of

Table 4. Descriptive Statistics: Posttest Mean Scale Scores of Groups

Dependent Variable	Competency Level	*M*	*SD*	*N*
Attitude	1	3.29	0.47	36
	2	3.34	0.38	39
	3	3.48	0.46	39
	Total	3.37	0.44	114
Anxiety	1	3.39	0.55	36
	2	3.42	0.55	39
	3	3.56	0.54	39
	Total	3.46	0.54	114
Confidence	1	3.32	0.53	36
	2	3.43	0.40	39
	3	3.60	0.41	39
	Total	3.45	0.46	114
Liking	1	3.17	0.56	36
	2	3.15	0.49	39
	3	3.27	0.59	39
	Total	3.20	0.55	114

group 3 had slightly higher mean scores than groups 1 and 2 on the overall attitudes scale and on the anxiety and confidence subscales. All three groups scored higher on the posttest than on the pretest.

Posttest attitudes toward computers (anxiety, confidence, and liking) measured at different levels of competency (1 = novice, 2 = intermediate, 3= competent) were analyzed using a one-way MANOVA. The results showed that the competency main effect was not significant, $F(6, 220) = 1.3$, $p = .226$, indicating there were no differences among the levels of competency (novice, intermediate, and competent) on posttest attitudes toward computers (anxiety, confidence, and liking). Subsequent to the MANOVA, the Tukey's HSD method was used to make comparisons between group means for competency. As presented in Table 5, group differences detected on pretest attitudes measured at different level of competency disappeared after completing the educational computing course.

Doubly Multivariate Repeated-Measures MANOVA

The doubly multivariate repeated-measures MANOVA is considered to be one of the more sophisticated within-subject analyses. When using typical repeated-measures MANOVA, one dependent measure is measured multiple times. With the doubly multivariate repeated-measures MANOVA, two or more dependent variables can be measured at two or more points in time. In this study, three dependent variables—the subscales of computer attitudes—are measured two times—pretest and posttest.

The doubly multivariate repeated-measures MANOVA was performed to examine the multivariate main effect for both level of competency and pre- and postcourse measures for attitude toward computers. As presented in Table 6, the

Table 5. Mean Differences of Levels of Competency on Posttest Attitudes

	Competency Level (I)	Competency Level (J)	Mean Difference (I–J)	*p*
Attitude	3	1	5.46	.178
		2	4.17	.346
	1	2	−1.28	.907
Anxiety	3	1	1.75	.355
		2	1.38	.507
	1	2	−0.57	.955
Confidence	3	1	2.74	.206
		2	1.66	.239
	1	2	−1.08	.557
Liking	3	1	0.96	.728
		2	1.12	.640
	1	2	0.16	.991

Table 6. Doubly Multivariate Repeated-Measures MANOVA

Multivariate Effect		Value	*F*	*df*	Error *df*	*p*
Between Subjects	Competency Level	.189*	3.84	6.00	220	.001
Within Subjects	Attitude	.356*	20.1	3.00	109	.000
	Interaction	.120*	2.35	6.00	220	.032

* *Significant at the .05 level.*

doubly multivariate repeated-measures MANOVA revealed a significant multivariate main effect for both level of competency, Pillai's = .189, $F(6, 220) = 3.84$, $p = .001$, and pre- and postcourse measures for attitude towards computers, Pillai's = .356, $F(3, 109) = 20.1$, $p = .000$. There was also a significant interaction, Pillai's = .120, $F(6, 220) = 2.35$, $p = .032$, indicating that the teachers in group 1 with limited or no computer knowledge and experience had as much of a positive attitude, less anxiety, and more confidence on the postcourse attitudes measure as the teachers in groups 2 and 3, who already had some computer experience and competency. In other words, the teachers in group 1 gained most from the course in regard to increasing confidence, reducing anxiety, and improving positive attitudes toward computers.

Follow-up Study

Throughout this section, illustrative student quotes from written questionnaires and follow-up semistructured interviews highlight the results.

Theme 1—Expectations

The first theme focused on students' expectations of the course and the effectiveness of the course in satisfying them.

Participants' responses clearly indicated that their expectations varied, even though all expected to learn more about computers in education. For example,

most of the students indicated the main reason for taking the class was to learn how to use the computer and software for teaching students in the classroom.

Five participants specifically outlined their expectations of the course. It was evident from their responses that they already had some previous computer experience. One of these students wrote that he had enrolled in every computer science class since 1991. Because of their previous exposure to computers, they were able to articulate their expectations. For instance, one of those students said,

> I was expecting to learn how to make the most effective and efficient use of the available instructional technology in order to enhance the teacher–learner interaction. I also expected to learn new classroom applications of computers like WWW and Java language, so as to maintain my knowledge and skills up to date, given the fact that instructional technology is a rapidly changing field. Finally as an educator, I would like to learn how to improve students' computer literacy in order for them to meet the demands of society and of the job market, which always requires a higher computer literacy level.

When asked to evaluate the effectiveness of the course in terms of meeting his expectations, this student said, "This course did not satisfy my needs and expectations as much as I had hoped." He believed that he already had basic computer skills, and he wanted to enhance his skills by learning new advanced applications:

> This course did refresh my memory about certain software that I had previously been exposed to and this was fine. But, I was expecting to explore new applications and programming like Java and HTML and how to develop learning materials by using these programs. I guess this course was a great opportunity for those who had no prior knowledge of computers.

On the other side of the spectrum, the remaining students did not elaborate on their expectations; they basically indicated that they expected to learn how to use computers in the classroom. Fulfilling the requirements for the teaching credential was also a concern of one of the students. Unlike experienced students, one student stated, "I expected to develop increased confidence and enthusiasm about the computer. I thought this course was to teach us programming. I am happy that it was not." The following statement from one student best represents how these students described their expectations of the course.

> When I enrolled in the course, I was expecting to be introduced to basic computer skills and software that I could use for myself and for the classroom. I also expected to learn more computer terminology so I may understand items using computer terms.

When the same students were asked to evaluate the effectiveness of the course in relation to meeting their needs, they all stated that the course was satisfactory and was of high value to them. They thought the course was useful to them not

only as educators but also as students. For example, they learned how to access online sources for their class assignments. The following statement summarizes these students' perceptions of the effectiveness of the course in meeting their needs and expectations:

> The course was helpful because it introduced materials that I did not know before. The most useful parts were the spreadsheets and database because those were the two applications I felt most reluctant about using. The course has really supplied me with very valuable information. WWW search for lesson plans is one that I know I can use.

Students' responses to the first question clearly indicate that schools of education are faced with students whose computer backgrounds vary considerably. Because many high school students now have at least minimal experience with computers, the student population of education schools is often more computer literate than faculty of education schools assume. Therefore, students with previous experience enroll in computer literacy courses expecting to enhance their current skills and explore advanced applications and programming languages. On the other hand, students with little or no prior computer knowledge expect computer literacy courses to introduce them to basic computer skills and applications. They also believe that such courses should help them gain confidence using computers.

Theme 2—Attitudes and Computer Use

The question for the second theme was used for two reasons: (1) to ask students whether the course itself contributed to changes in their attitudes toward computers and (2) to determine how the course contributed to changes in teachers' attitudes. This ensured the validity of statistical analysis and illustrated the significant differences between teachers' pre- and posttest scores on the computer attitude scale.

Not surprisingly, all of the respondents reported that the course had positive effects on their attitudes even though some students reported much greater gains than others. Three students said they had always had positive attitudes toward computers. Therefore, they believed that the information they learned from the course was supplemental. One of these students commented,

> Since I already had positive views about computers in education, this course merely supported those views. It did clarify some issues I did not understand. This course also opened up my eyes, a bit more, about the power of computers in education. Its effect on my attitudes towards computers has been positive because it has shown me how easier things can be using a computer.

On the other hand, the remaining students wrote that the course helped them feel more positive and confident with computers. One student commented,

> This course made me realize how important it is for the teachers to take a course like this and be exposed to computers because it plays a critical role in education today and/or the future. I have also learned not only it is essential to understand the basics of computers, but it's also helpful in the classroom.

Another student reported that she was not comfortable with some of the new programs, but this course helped her build confidence using them. Similarly, one student further elaborated on the reasons that he thought the course changed his attitude toward computers.

> This course changed my attitude toward educational uses of computers by teaching me how computers can make instruction more meaningful for K–12 students and how they can bring students to make connections across content areas. For instance, a hypermedia environment on a real life problem, such as building a bridge near the school, can bring pieces of the real world into the classroom and bring them under students' control. The course also changed my attitude toward computers by broadening my background on the possibilities they offer, and on the content available through software and the Internet.

When asked to describe the effects of the course on their attitudes, the student tended to express them in general terms. However, nearly all of them mentioned the following topics. They believed the course helped them develop positive attitudes by

- making them more at ease using applications,
- helping them gain more confidence,
- increasing their awareness of computers and their applications, and
- demonstrating how computers can be integrated into the curriculum.

Responses to the second question revealed that all students believed the course contributed to the changes in their attitudes toward computers, even though a few students stated that this contribution was supplemental because they had always held positive views of computers in education. It was very important to students that the course helped them gain more confidence and demonstrated how computers could be integrated into classroom learning.

Theme 3—Other Factors

The question for the third theme was asked to determine whether any other factors contributed to the changes in student attitudes and computer use. Responses to this question varied considerably. For example, one student reported that having a home computer influenced her attitude, because she wanted to learn how to use it. She stated that she wanted to get the most out of the class for what she paid. Another student believed the professor's willingness to use computers in education motivated her to learn more about computers.

Analysis of responses indicated that most respondents believed the demand they are facing from the schools at which they work increased their willingness to learn about computers. For example, one student commented,

> Because I am a teacher, it is almost essential for me to be somewhat computer literate. The children in my class go to the computer lab often and so I have to be able to help them. This has made me want to learn more about using computers.

She further stated:

> The most important factor that has helped me feel comfortable with computers, however, is that I own one. The computer has proved to be extremely helpful for me when I am doing my schoolwork, my personal business and my work activities.

Likewise, one student teacher stated that seeing students in his classroom use the computer and learning from them made him want to learn about computers. He wrote, "because they [students] are interested in the computers, they are willing to learn. Every classroom goes to one of our two computer labs to strengthen and acquire new and previous acquired knowledge and skills. I really feel they [computers] are beneficial." Another student said, "I see that computers can aid the students, especially tutorials, and they can enhance the curriculum."

On the other hand, one student stated that it was not computer use that encouraged her to learn about computers; rather, it was the lack of computer use she had witnessed in the school at which she works. In addition, she commented, "I believe every child should be able to use them [computers] and it is our [teachers'] responsibility to teach them about computers."

Three students related their willingness to learn more about computers for more personal reasons. For example, one said, "I have two elementary-school-age nephews, and I want them to learn computers to be successful in education as well as professionally." She further stated that her concern also extends to the students she is teaching. Another student found computers to be beneficial for her own education, a feeling that led to her positive feelings about computers. She wrote, "The fact that computers have been an invaluable asset to me in my own education has greatly affected my attitude towards computers." Finally, the third student wrote, "I use a computer at work everyday, and it helps me handle my job more efficiently. I also extended my computer skills to communicate with my professors and coworkers, and I love playing with the Internet."

It is obvious from these responses that the most important factor for teachers who believed their attitudes toward computers were affected by factors other than the course was seeing their students already using computers in their class. They felt that they needed to be computer literate to help their students with their endeavors. Analysis of the responses to the third subquestion also indicated that possession of a home computer for teachers provides more access to computers and increases their willingness to learn about them. Finally, given that preservice teachers are also students working on their teaching credentials,

they felt that computers helped with their own education; thus, this requirement helped them develop positive attitudes toward computers.

Theme 4—Professional Development

The last theme sought to discover whether preservice and inservice teachers believed the course contributed to their professional development. Numerous research sources suggest that students value a course more if they believe the course contributes to their professional development (Evans & Nation, 1997; Oberman, 1995; Velayo & McKeachie, 1994). Research also indicates that when students value the course they are more likely to have positive attitudes toward it (Kellenberger, 1996). The question for the last theme was asked to find out if participants valued the computer literacy course in regard to their professional development.

The responses to this question indicated that students valued the course according to their previous computer experience. Those who had prior computer experience reported that the course did not contribute a great deal to their professional development, while inexperienced students thought that the course contributed significantly to their professional development.

On one side of the spectrum, experienced students indicated that the course could have contributed to their professional development if the content was determined according to their needs. For example, one student commented,

> I would recommend this course to those who are not at all familiar with computers. However, for experienced users, I didn't find it challenging enough. It was a lot of busy work as far as the homework was concerned. This course did add computer terminology that I was not very familiar with, but most items were not new to me. Also, I did obtain a few practical ideas about using computers in the classroom, but again, I would have wanted more.

Another experienced student agreed. He further suggested,

> I would rate the course above average because I felt it took a bit long on the basics like the hardware and monitor. A more effective way would be to divide the class into those with no experience, those with some, and experts. Once we got into working on different programs this course did help my professional development.

One student underlined the importance of a follow-up course for teachers' professional development. She wrote that, "It needs to be more in depth. This course breezed over a lot of information because of the time frame, but for our professional development, a follow-up course is needed so teachers are more competent with computers."

On the other side of the spectrum, students with no or little prior experience with computers indicated that the course was a great contribution to their professional development. One of these students wrote:

> This course has been one of the most valuable classes I have taken. It has opened many new avenues for me to explore. Now that I have gained

> a better understanding of the programs available to me, I can better teach my students and prepare them for the 21st century. Each child must become computer literate in order to succeed in our highly competitive world. As their teacher, I am responsible for their success.

Another student also thought the course contributed to her professional development. Similar to experienced students, she further indicated that she was in favor of having more computer courses. She commented that, "I did value this course and wished there were more courses just like it or similar offered because I would surely enroll and enjoy them very much. This course helped me to feel more advanced/educated in my field." Another student gave a concrete example to describe the effects of the course on her professional development while she believed that the course was only a beginning for her. She wrote:

> I am satisfied this course has contributed much to my professional development. Surely, I still need to learn much more knowledge and skills to consider myself truly computer literate. yet this course has sent me on the road toward becoming computer literate. I am definitely a lot better than when I first began.

It was obvious from these responses that the more new skills students gained from the class, the more they valued the class and the more it contributed to their professional development. Interestingly, regardless of previous experience with computers, students believed that a follow-up computer course would significantly contribute to their professional development. Finally, all respondents agreed that the course was very useful to those who had no prior experience.

RECOMMENDATIONS

Based on my findings, I offer the following recommendations to practitioners and teacher education institutions:

1. Previous computer experience contributes to preservice and inservice teachers' competency and has an effect on their attitudes. Therefore, teachers' computer competency should be assessed before they enroll in a computer competency course.
2. One way to encourage teachers to use computers in the classroom is to increase their level of competency. This can be achieved by providing several computer literacy courses tailored to specific levels of confidence, anxiety, and competency.
3. If more advanced computer courses are not available for those who are highly competent users, those individuals could be given more challenging assignments based on their competency levels and expectations. On the other hand, teachers with little or no prior experience should be provided with more personal attention to explore the basics of computers.

4. Faculty of teacher education programs should demonstrate their competency and willingness to use technology in teaching. They should be role models for prospective teachers in integrating technology into classroom teaching.
5. Teacher education programs should provide technology training for prospective teachers that can satisfy their specific needs in the schools at which they work. Therefore, teacher education institutions and schools districts should cooperate in designing technology-training curricula to meet teachers' specific technology needs. ■

Contributor

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Appendix

Computer Competency Survey

Rate your competency level in using the following categories of software applications.

1 = Not familiar
2 = Familiar but not competent
3 = Competent
4 = Proficient

1.	Word processing (e.g., Word)	1	2	3	4
2.	Database management (e.g., Access, FileMaker Pro)	1	2	3	4
3.	Spreadsheet (e.g., Excel)	1	2	3	4
4.	Presentation software (e.g., PowerPoint)	1	2	3	4
5.	Telecommunications (e.g., e-mail)	1	2	3	4
6.	Web browsing (e.g., Netscape Navigator, Internet Explorer)	1	2	3	4
7.	Educational software (e.g., drill, simulation)	1	2	3	4
8.	Desktop publishing (e.g., PageMaker)	1	2	3	4