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ABSTRACT

Technology is an ever increasing priority in education. Yet for the most part, only a minority of teachers have used technology as a supplement to the textbook. This study examines the differences between current and desired levels of knowledge that science teacher education faculty (n=305) have about learning to use computer technologies as instructional tools. The data indicates that only a small percentage of faculty have had any formal training in computer technology. In addition, data suggest that faculty have a desire to know more about computer technology; for instructional tasks, for specific computer applications, on the effects of computers on instruction associated with teaching science, and technology knowledge in general. (Contains 25 references and 10 tables.) (PR)

A Survey of Current Uses of Educational Technology in Science Teacher Education Programs

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Abstract

Technology is an ever increasing priority in education. Yet for the most part, a minority of teachers have used technology on the periphery as a supplement to the textbook (Bruder, 1993). Research would indicate that most pre-service teachers want to learn how to use technology effectively (Bruder, 1989; Scrogan, 1988). However, teachers teach as they have been taught and students have a tendency to identify with instructors they want to emulate. The case may be then, that the slow rate of integration of technology in elementary and secondary classrooms is linked to education majors' lack of opportunity to see effective applications of technology in their own university training programs (OTA, 1989).

The current study examines the differences between current and desired levels of knowledge that science teacher education faculty have about learning to use computer technologies as instructional tools. The data indicates that only a small percent of faculty have had any formal training in computer technology. In addition, data suggests that faculty have a desire to know more about computer knowledge; for instructional tasks, for specific computer applications, on the effects of computers on instruction, associated with teaching science, and general technology knowledge.

If faculty are to be effective roles models, they will have to demonstrate their commitment to meeting the technological needs of their students. Knowing faculty's current and desired levels of knowledge about using technology in classrooms, specifically computers, will aid in the development of learning experiences for science teacher education faculty.

INTRODUCTION

Technology, specifically computers, is an ever increasing priority in education. In science, technology is playing a more significant role on a daily basis. Yet, for the most part, a minority of teachers have used technology on the periphery as a supplement to the textbook (Bruder, 1993). Technology, especially computers, should play a more important role in advancing the substance and process of learners' acquisition of more sophisticated knowledge and skills. This should be of particular importance to science education (Aikenhead, 1992; De Vore, 1992).

As Aikenhead (1992) and De Vore (1992) point out, teachers will always be the key to achieving the goal of educating a citizenry that is literate in science and technology and is empowered to make informed decisions and take responsible actions. However, if science teachers are not prepared to integrate technology into their science classrooms that goal may not be realized. To a real degree, the development of skills, attitudes and knowledge that students attain in the course of their academic training is inherently influenced by first-hand opportunities afforded them by their teachers as well as second-hand information presented in textbooks. Thus, it is important that teacher educators, especially science educators, become increasingly effective in their use of instructional technologies in classrooms.

Importantly, the Office of Technology Assessment (OTA, 1989) highlights the fact that educational technologies used in classroom settings, such as computers, are not self-implementing. Conceptual knowledge and applied experience using technologies as instructional tools are critical to their effective application in solving real classroom problems. Despite years of rhetoric about the need to train teachers to use technologies in their classrooms and increased technology course requirements in teacher preparation programs, current statistics reveal that as many as two-thirds of graduating teachers have insufficient experiences to prepare them to effectively integrate computer-based technologies in their own classrooms (OTA, 1989). In addition, Bruder (1989) suggests that teachers are not adequately trained to teach or use technology in their classrooms and indicates that less than 15% of all teachers in the United States use computers in their teaching. Other statistics supports this notion by showing that students rarely use computers in school. An example is The Nation's Report Card (Educational Testing Service, 1988) which indicated that over one half of the 11th grade students never used a computer to write with, over three quarters never made graphs, and 80% have never made a data base. It appears, as Bosch (1993) suggests that, "teachers do not seem to be taking advantage of the computers potential." (p. 14) Most science teachers have ignored the message: use microcomputers in science teaching (Ellis and Kuerbis, 1993). Why?

In the past, non availability of technology was one of the most often sited reasons for teachers' inability to learn to use technologies (Barker, 1983). However, since many technologies have become affordable, easier to use, and qualitatively better over the past five years, it may be unrealistic to continue to blame the performance problems of graduating teachers on non availability of technology.

The slow rate of integration of technology in elementary and secondary classrooms may be instead linked to education majors' lack of opportunity to see effective applications of technology in their own university training programs (OTA, 1989). Provided with few good role models for learning to integrate technologies into their daily professional careers, large numbers of graduating pre-service teachers may continue to be unable to achieve this task when entering their own classrooms. This may be particularly true for computer-based technologies.

For science educators, computer -based technology is fast becoming an increasingly significant instructional tool in terms of its ability to provide access to information, simulate laboratory experiences and model outcomes while directly engaging learners in the process. Trowbridge and Bybee (1990) indicate that, "...computers promise to be one of the most effective learning devices in a long line of technological aids to education over the past decades." (p. 183) Of particular importance to science teachers are the ways that computers can assist their students in forming and testing hypotheses needed to explore the different ways science and technology can advance human welfare within limitations (Brusic, 1992). In our information rich society, computers and other technologies of instruction are essential for students to learn about making informed decisions. Increasingly, technological literacy is fast becoming a crucial factor in the equation for success in society. To be effective in helping students achieve such levels of understanding, teachers must be confident in their use of computers as instructional tools (Troutman, 1991). Students must recognize their teachers' confidence and general acceptance of technology in the learning process (Zammit, 1992).

As Brusic (1992) points out, by its nature, science and technology can arouse curiosity and interest. Unfortunately, many students fail to be interested in science and technology and as a result, will be ill prepared for their future roles as consumers, citizens, and workers in a technological society. It is apparent from Brusic's statements that students at every level are the beneficiaries of their teacher's demonstrated technological expertise and acceptance of technology. Thus, it is reasonable to expect that student teachers' performances may not change significantly until their teachers' performances change. How is this likely to occur?

According to Rogers (1969), the stage in the adoption of innovation, where additional information is sought, is the reinforcement stage. He states that although adoption rates may vary, the reinforcement stage of acceptance indicates a commitment to gaining additional knowledge and skills in the use of an innovation. In turn, commitment induces change in behavior (Mehloff & Sisler, 1987). Cocoran & Clark (1984) suggest that one indication of commitment is an investment of time and effort in work. Concurrently, one of the qualities that legitimatizes a professional's status is expertise (Mehloff & Sisler, 1989). Technological expertise is attained by commitment of time and effort in learning how to use technology. For teachers learning how to use computers and other technologies of instruction, a high commitment to gaining and extending technological expertise will be needed for them to be recognized and function as a professional in the future.

Research on teacher education training generally concludes that most pre-service teachers want to learn how to use technology effectively (Bruder, 1989; Scrogan, 1988). However, teachers teach as they have been taught and students have a tendency to identify with instructors they want to emulate. Further more, it is known that classroom teachers who have had isolated and insufficient exposure to effective training methods for integrating technology report that they foresee little or no change in their teaching practices or influence on their content areas as a result of technology. Thus, a role model's influence (i.e., the science methods instructor) can extend for many years. It is clear, if teacher educators don't use it (technology) in their teaching, their students, by default, lose an important area of instruction, that is, by example (Bruder, 1989). For science education, in particular, this is critical.

One must ask then: Are teacher education faculty using technology in their classrooms? How are they using it and when and why are they using it? Do many teacher education faculty fall prey to the presumption that anyone who can operate instructional technology can use it effectively to deliver instruction, or do they desire to learn more about integrating technology into their classrooms? Staggering quantities of resources are already being invested to find ways for promoting quality educational experiences in teacher education programs (OTA, 1989). These resources may be ill-spent unless higher education faculty make a concerted effort to provide pre-service teachers with models of effective instructional applications by integrating technologies of instruction in their training classrooms. To be effective role models, faculty will need to demonstrate their commitment to meeting the technological needs of their student teachers. In order to demonstrate their commitment, faculty may require additional training. Knowing faculty attitudes and their current and desired levels of knowledge about using technology in classrooms, specifically computers, would help trainers to develop useful workshops or other learning experiences for teacher education faculty.

PURPOSE

A primary purpose of this study was to identify significant differences between current and desired levels of knowledge that science teacher education faculty had about learning to use computer technologies as instructional tools. In essence, the difference between their current and desired levels of knowledge could be realistically interpreted as their expressed commitment to learning about using computers as instructional tools. An equally important focus of the study was to determine current uses of a variety of technology in teacher-education programs. To achieve this assessment, data were compiled from a national sample of science teacher education faculty. The national data were analyzed for differences in current and desired levels of knowledge about computers and other technologies using paired t-tests. Demographic data were reported using percentages as a way to provide a descriptive interpretation of the data. Demographic data included measures from items related to gender, years and grade levels of teaching experience, required academic computer experience, computer ownership, access and levels of computer usage for various general instructional uses and science classroom uses, and levels of uses of other technologies in classrooms.

METHOD

Population and Sample

The population consisted of science education faculty with responsibility for preparing K-12 science teachers at institutions offering a four- or fifth-year degree program in teaching. Sample selection consisted of two steps. First, the Association for the Education of Teachers in Science (AETS) were contacted to solicit a mailing list of all current members of the association. This association was selected as the primary source because it represented the most complete list of science teacher educators available to the researchers. Of course the limitation of using such a sample is that not all science teacher educators belong to the association. It was the judgement of the researchers however, that the list represented a diverse population including all regions of the United States, some international educators, public and private institutions, as well as adjunct teacher educators. The second step was to identify a random sample of 400 individuals from the AETS mailing list. A cover letter, the survey and a self-addressed stamped envelop was included in the mailout to the 400 science teacher educators.

Instrument

The instrument used for the study was a two-section questionnaire. Section one consisted of 20 items developed to identify demographic information about respondents. Measures included respondents' (1) Primary Teaching Assignment, (2) Years taught (K-12 and University) (3) Grade levels taught in K-12 schools, (4) Faculty rank, (5) Gender, (6) Race, (7) Required computer classes in secondary school, (8) Required computer courses for highest degree, (9) Belief in required computer courses for their degree, (10) Computer workshops/courses taken, (11) Computer ownership, (12) Enrollment in an instructional technology course (i.e., a course that teaches the use of technology in the teaching-learning process), (13) Ability to operate a computer, (14) Frequency of general computer use (daily, weekly, monthly), (15) Access to office computer, (16) Access to classroom computers, (17) Access to computers in building lab, (18) Use of different technologies in class, (19) Type of instructional technology used in classroom teaching, and (20) Use of media center to produce classroom materials.

Section two consisted of 40 items developed to measure respondents' current and desired levels of knowledge about using technology. Items were grouped by subheadings to help subjects respond to the items easier. Items 1-8 were associated with knowing ways that computers can be used to help teachers accomplish specific instructional tasks. Items 9-15 were related to knowledge about how to use specific computer applications. Items 16-20 measured respondents' knowledge about the effects of computer use on different areas of teaching. Items 21- 31 were related to knowledge about how to use a computer in science, while items 32-40 measured respondents' current and desired knowledge about how to use other types of technology in the classroom. A five-response Likert-type scale was used with "0" indicating a Very Low level of knowledge, "1" indicating a Low level, "2" a Moderate level, "3" a High level and "4" a Very High level of knowledge. Reliability using coefficient alpha was .95 for current knowledge and .93 for desired knowledge.

PROCEDURE

Pilot Study

Prior to mailing the questionnaire for the national study, a pilot was completed to identify any problems with the questionnaire. The sample used for the pilot was a group of science teacher education faculty from the University of Arkansas, Fayetteville, AR. These faculty were not part of the national study sample. After review of the pilot study results, vertical spacing of items in section two was completed to make the items and Likert-type scale easier to read and score. The instrument was reviewed again by the same group of science educators to make certain the changes to the page layout of the items had been effective.

National Study

After completion of the pilot study, the 400 subjects were sent the survey. After six weeks a systematic sample of 10 of the 150 nonrespondents were called to make sure there were no differences between the characteristics of the nonrespondents and the respondents. A second mailing was completed to all remaining 150 nonrespondents as some of the subjects who were called had reported misplacing their original copy of the survey. Of the 400 surveys mailed, 305 were returned, for a response rate of 76 percent.

RESULTS AND DISCUSSION

Analysis

The initial focus of the data analysis was to identify the extent to which science teacher education faculty use various types of technology and media in their everyday teaching. A second focus of equal importance was to compare faculty's current and desired levels of knowledge about using computer and instructional technology to achieve instructional tasks associated with their daily professional responsibilities as teacher educators. The first task is clearly descriptive, and was accomplished by comparing percentages. The second task involved running a paired t-test between the current and desired levels of computer and technology knowledge for each item. The alpha level of $p < .05$ was established.

Characteristics of Respondents

Surveys were mailed to 400 randomly selected science educators from the AETS mailing list from around the world. The respondents to the survey were 260 teacher education faculty currently teaching in colleges of education plus 45 retired faculty, classroom teachers or others who were not involved in the teaching of pre-service science teachers. The 45 retired faculty, classroom teachers and others respondents were not used in the analysis of the data.

Demographic information for the respondents showed that the subjects represented the teaching areas of science methods (78%), science content (9%), and general methods (13%). All respondents taught in a curriculum and instruction department. Most respondents held the rank of full professor (39%), followed by assistant professor (26%), associate professor (22%), and instructor (13%). When asked how many years teaching experience they had in public or private K-12 schools, and in higher education, respondents reported a vast diversity of experience ranging from no experience to 35 years for K-12 and from 1 to 27 for higher education. The most frequently reported period for K-12 teaching experience was 5 years or less (43%) followed by 5 to 10 years (30%), 10 to 15 years (13%) for K-12 Table 1. As shown in Table 2, the most frequently reported period for higher education experience was 5 to 10 years (38%) followed closely by 1 to 5 years (35%), 10 to 15 years (20%), and more than 15 years (7%).

Insert Table 1
About Here

Additionally, when asked to identify which grade levels they had taught in public school, respondents reported having taught in several grades in elementary, middle and secondary levels. As shown in Table 3, 23% had taught at an elementary (K-12) level, 72% at the middle school (grades 7-9) level, 71% at the 10th grade level, 67% at the eleventh grade level, and 66% at the twelfth grade level.

Insert Table 2
About Here

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The respondents were primarily Caucasian (87%) with Hispanic (5%), African American (4%) and Asian (2%) faculty represented in the sampling. There were more than twice as many male respondents as female which yielded a distribution comprised of 72% males and 28% females.

Computer and Technology Use.

A very small percentage (2%) of respondents had required computer training in high school. Only 12% of the group indicated that computer classes were required for their doctoral program, but, 79% believed that at least one computer course should be required for their degree. Twenty-seven percent of the group had taken a course in using computers to teach. Similarly, 27% had taken a computer workshop or course within the past 5 years. A majority of respondents (96%) reported knowing how to operate a computer with 88% using one daily, 9% weekly and 2% monthly in their work. Most respondents (88%) reported owning a computer and a similar percentage (88%) had a computer in their office. When asked if they had access to computers for use in their classrooms, 59% said they did. A greater percentage (91%) reported that they had access to computers located in labs within their building. Table 4 presents this information.

Insert Table 4
About Here

The subjects were asked to indicate whether or not they use various types of technology in their teaching. Table 5 shows the results of subjects' responses. The results show the most widely used types of technology are overhead transparencies (91%), video tapes (87%), and computers (73%). Respectively, slides (64%) were used fairly often, followed by films (47%), Television (34%), Interactive Video (30%), Hypermedia (19%), Concrete Manipulatives (13%), and Two-way radio (3%).

Insert Table 5

About Here

Current and Desired Levels of Technology Use Knowledge

Respondents were asked to indicate their current level of knowledge on 40 items by rating each item on a Likert scale from 0 to 4, where "0" indicated a Very Low level of knowledge, "1" indicated a Low level, "2" a Moderate level, "3" a High level and "4" a Very High level of knowledge. Respondents were then asked to rate the items a second time according to their desired level of knowledge using the same 5-point scale. Statistical analysis using paired t-tests were used to determine significant differences between mean scores for respondents' current and desired levels of knowledge on the 40 items.

Table 6 shows the results for items 1-8 that correspond to respondents' current and desired knowledge about ways that computers can be used to help teachers accomplish specific instructional tasks.

Overall, the respondents' current level of knowledge are in the moderate range and their desired level of knowledge are in the high range. Respondents would like to have more knowledge about all computer areas listed, especially about using computers to design instructional materials. They least desired to learn more about writing computer programs. In this area, respondents reported that their moderate level of knowledge is sufficient.

Insert Table 6

About Here

Table 7 shows results for items 9-15 that are related to respondents' current and desired knowledge to learn how to use specific computer applications. The respondents' current level of knowledge are in the moderate range and their desired level of knowledge are in the high range. Respondents would like to have more knowledge about all of the specific computer areas listed, with word processing (3.74), spreadsheet (3.62) and database applications being the top areas of interest. A high current (3.30) and desired (3.74) mean for word processing indicates that subjects value this application and would like to increase their knowledge of its use.

Insert Table 7
About Here

Table 8 shows results for items 16-20 that measured respondents' current and desired knowledge about the effects of computer use on different areas of teaching. Overall, the respondents' current level of knowledge are in the moderate range and their desired level of knowledge are in the high range. Respondents would like to have more knowledge about the effect computers on all areas of teaching listed. Interestingly, respondents knew the least about ways that computers could influence time management (2.14) followed closely by what they knew about computers and making classroom presentations (2.33). Areas that respondents most wanted to know more about were class management (3.23), class preparation (3.30) and class presentations (3.12).

Insert Table 8
About Here

Table 9 shows results for items 21- 31 which measured respondents' current and desired knowledge about how to use computers in science. Respondents' current level of knowledge varied from low to moderate on all of the items listed. Conversely, their desired levels are nearly all in the high range. The areas that respondents knew the least about were Science/Technology/Society (1.81) and Telecommunications (1.84). Of those two areas, respondents desired to know more about ways that computers can be used for telecommunications than for STS. Areas of highest desirability were collecting data (3.33), followed by database storage of lab data (3.22) and graphing (3.34).

Insert Table 9
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Table 10 shows results for items 32-40 that measured respondents' current and desired knowledge about how to use other technology in the classroom. Respondents' current level of knowledge varied from low to high on the items listed. Their desired levels are all in the high range. The areas that respondents knew the least about were Hypermedia (1.41) and interactive video (2.05). Respondents desired to know a great deal more about both technologies with their interest in interactive video (3.42) being just slightly higher than hypermedia (3.23). Their knowledge was already high for overhead transparencies (3.46), film (3.11) and slides (3.26) and although not significantly, so was their desired levels of knowledge. A high score on both current and desired levels of knowledge on these technologies indicated that while they valued these technologies, they thought their current knowledge was sufficient.

Insert Table 9
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CONCLUSION

Respondents in this study represented the areas of science methods, science content, and general methods. All respondents were employed within a curriculum and instruction department and were primarily white (87%), with a greater distribution of males (72%) than females (28%). Most taught science methods courses (78%) with only a few teaching science content courses (9%) or and general methods (13%) courses. In addition, the respondents reported a vast diversity of K-12 classroom experience that ranged from no experience to 35 years. The most frequently reported period was 5 years or less (43%) followed by 5 to 10 years (30%), 10 to 15 years (13%).

Only a very small percentage (2%) of respondents indicated that they had computer training in high school. As respondents sought more education, however, they also engaged in more computer technology training. At the doctoral level only (12%) of the respondents had taken a required computer course.. While their computer training had been minimal, 78% of the group indicated that computer classes should be required for their degree program. Interestingly, while few respondents had been required to take a computer course to earn their highest degree, 96% reported knowing how to use a computer and 88% used it daily in their work. Obviously the group as a whole had taken it upon themselves to learn how to use a computer on their own.

These findings suggest that the respondents in this study are highly committed to the use of computer technologies both at home and in their office. They also believe that emerging professionals in their field should share a similar commitment to computer technology. While these results provide information about the respondents' current availability of computer technology and the level of their commitment to the use of technology, it does not help to explain why the respondents are committed to computer technology, specific examples of how they use the technology themselves, or how they envision professionals in their field using technology in the future. Future research that would be useful would include questions to address these issues.

In the present study, respondents were also asked to indicate whether or not they use other types of technology in their teaching. Results showed the most widely used types of technology by the respondents are overhead transparencies (91%) followed closely by video tapes (87%), and computers (73%). Only a minuscule of the respondents reported using two-way radio (3%) in their teaching. Surprisingly, only a very few (34%) reported using television even though many local and national cable television companies have made significant commitments to providing a variety of educational resources free of charge or at a greatly reduced cost.

Useful research would extend the findings of this study by investigating <u>why</u> respondents lack commitment to various types of technologies. Results from this line of research could be used to develop training to provide faculty with knowledge needed to take advantage of recent advances in inexpensive technologies of instruction like television.

Additional survey items were used to identify respondents' current and desired levels of knowledge about specific applications of technology. Respondents' reported wanting more knowledge about ways to use computer technology applications. Areas of highest interest were word processing, spreadsheets, databases and desktop publishing applications. Next, they wanted more information about how to use computers to design instructional materials, aid them in statistical analysis, and record-keeping. Overall, the area of least interest was knowing more about how to use computers to write computer programs. Respondents rated their current and desired knowledge of using computers to write papers and do word processing as high, indicating that these are skills the respondents value.

It is interesting to note respondents' high level of desire to know more about using computers as teacher productivity tools and their lack of interest in knowing more about how to write programs. Future research that would be useful would identify whether or not similar commitments exists for authoring packages or programs such as Hypercard. Since these types of applications are relatively simple to learn to use, science educators might benefit greatly from being able to write their own software to teach specific skills and knowledge not available in commercial products.

Additional areas of interest would include identifying faculty commitment to use technology to teach specific types of skills within in a variety of other content areas, or in a specific content areas. Along those lines, questions that would be useful to ask would be those that helped to identify the specific types of computer applications faculty would select to use and the reason for their selection.

Respondents indicated they want significantly more knowledge about using computers in science. They reported having the greatest desire to how to use computers to collect data, graph, model, analyze data, and problem solve. Their current knowledge in each of these areas was moderate. Considering that much of science is conducted and learned through laboratory experience, and that teachers often have difficulty managing laboratory experiences (Goldin & Ellis, 1984), the areas the respondents identified as most desirable to learn about seem pedagogically relevant and useful. Respondents had the least desire to learn more about using computers to making science class materials or work with STS issues.

Respondents indicated they want significantly more knowledge about using hypermedia and interactive video. They reported having less desire to learn more about using video, concrete manipulatives or calculators. When asked about their desire to learn more about using transparencies, films, and slides, respondents reported that they were satisfied with their current level of knowledge in those areas. Overhead projection, film, and slides, however, was high on both current and desired levels of knowledge which suggests that respondents value the use of these technologies in their teaching practices.

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TABLE 1

SCIENCE EDUCATORS' YEARS OF K-12 TEACHING EXPERIENCE

YEARS	Percentage Response
0-5	43
5-10	30
10-15	13
15-20	10
20-25	2
> 25	2

n=260

TABLE 2

SCIENCE. EDUCATORS' YEARS OF HIGHER EDUCATION TEACHING EXPERIENCE

YEARS	Percentage Response
0-5	35
5-10	38
10-15	20
< 15	7

n=260

TABLE 3

SCIENCE EDUCATORS' K-12 GRADE LEVEL TEACHING EXPERIENCE

ITEMS	Percentage Response	
LEVEL EXPERIENCE	Yes	No
K-6 GRADE	23	77
7-9 GRADE	72	28
10TH GRADE	71	29
11TH GRADE	67	33
12TH GRADE	66	34

n=260

TABLE 4

PERCENTAGES OF SCIENCE TEACHERS' COMPUTER EXPERIENCE

ITEMS	Percentage Response	
COMPUTER EXPERIENCE	Yes	No
1. Were computer courses required for your highest degree?	12	88
2. Should a computer course be required for your highest degree?	79	21
3. Have you ever had a course that teaches the use of computers in the teaching-learning process?	27	73
4. Have you taken computer courses or workshops in the past 5 years?	27	72
5. Do you know how to operate a computer?	96	4
6. Do you own a computer?	88	12
7. Do you have a computer in your office?	89	11
8. Do you have access to a computer to use in your classrooms?	59	41
9. Do you have access computers in a lab in your building?	91	9
10. Do you use a computer daily?	89	11
11. Do you use a computer weekly?	9	91
12. Do you use a computer monthly?	2	98

n=260

TABLE 5

PERCENTAGES OF FACULTY USING TECHNOLOGY IN TEACHING

Technology	Percentages	
Type	YES	NO
Overhead Transparencies	91	9
Videotapes	87	13
Computers	73	27
Slides	64	36
Films	47	53
Television	34	66
Interactive Video	30	70
Hypermedia	19	81
Other (manipulatives)	13	87
Two-Way Radio	3	97

n=260

TABLE 6

PAIRED T-TEST RESULTS FOR CURRENT AND DESIRED LEVELS OF COMPUTER KNOWLEDGE FOR SPECIFIC INSTRUCTIONAL TASKS

Paired T-test Results	Raw Score Means			
ITEM	Current	Desired	N	Sig
Design Instructional Materials	2.30	3.37	255	* *
Aid in Statistical Analysis	2.57	3.34	258	* *
Personal Record-keeping	2.70	3.30	256	* *
Delivery Individual Instruction	2.42	3.25	257	* *
Classroom Management	2.83	3.23	257	* *

* * p<.01

TABLE 7

PAIRED T-TEST RESULTS FOR CURRENT AND DESIRED LEVELS OF KNOWLEDGE FOR SPECIFIC COMPUTER APPLICATIONS

Paired T-test Results	Raw Score Means			
ITEM	Current	Desired	N	Sig
Word Processing	3.30	3.74	257	* *
Spreadsheet Applications	2.43	3.62	257	* *
Database Applications	2.39	3.40	257	* *
Desktop Publishing	2.05	3.28	258	* *
Making Presentations	2.33	3.12	247	* *
Time Management	2.14	3.10	94	* *
Disk operating Systems	2.20	2.99	258	* *
Telecommunications	1.54	2.57	255	* *
Computer Programming	1.59	1.98	248	* *

** $p<.01$

TABLE 8

PAIRED T-TEST RESULTS FOR CURRENT AND DESIRED LEVELS OF KNOWLEDGE ABOUT THE EFFECTS OF COMPUTERS ON INSTRUCTION

Paired T-test Results	Raw Score Means			
ITEM	Current	Desired	N	Sig
Classroom Management	2.83	3.23	257	* *
Class Preparation	2.70	3.30	256	* *
Making Class Presentations	2.33	3.12	247	* *
Professional Presentations	2.92	3.54	101	* *
Time management	2.14	3.10	94	* *

* * $p<.01$

TABLE 9

PAIRED T-TEST RESULTS FOR CURRENT AND DESIRED LEVELS OF COMPUTER KNOWLEDGE ASSOCIATED WITH TEACHING SCIENCE

Paired T-test Results	Raw Score Means			
ITEM	Current	Desired	N	Sig
Data Collection Using Peripherals	2.07	3.33	254	* *
Database Storage of Lab Data	2.19	3.22	254	* *
Graphing	2.25	3.34	255	* *
Demonstrations of Modeling	2.10	3.30	254	* *
Delivery Science Instruction (CAI)	2.27	3.09	255	* *
Problem Solving	2.07	3.23	252	* *
Making Science Class materials	2.10	2.99	245	* *
Individualizing Instruction	2.17	3.04	255	* *
Science/Technology/Society	1.81	2.89	254	* *
Telecommunications/Interfacing	1.84	3.13	253	* *
Spreadsheet Analysis of Lab Data	2.07	3.22	254	* *

* * p<.01

TABLE 10

RESULTS FOR PAIRED T-TESTS FOR CURRENT AND DESIRED LEVELS OF TECHNOLOGY KNOWLEDGE

Paired T-test Results	Raw Score Means			
ITEM	Current	Desired	N	Sig
Hypermedia	1.41	3.23	247	* *
Interactive Video	2.05	3.42	252	* *
Video	3.14	3.41	256	* *
Concrete Manipulative (Models)	3.22	3.47	256	* *
Calculators	3.07	3.13	255	* *
Overhead Transparencies	3.46	3.48	255	
Film	3.11	3.11	256	
Slides	3.26	3.26	255	

* * $p<.01$