A Catalyst for Change : Influencing Preservice Teacher Technology Proficiency

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Abstract

To prepare future teachers for today's technology driven society, Colleges of Education must produce technology proficient teachers, which involves a change in the attitude of educators, increased access to technology rich K-12 schools, and creating positive attitudes on the part of preservice teachers. The purpose of this study was to determine whether or not preservice teachers received the training and support that is needed to gain technology proficiency. The sample for this study consisted of preservice teachers that were in the Internship II stage of their education degree program and had completed a technology training program during the Spring Semester of 2003. A survey was administrated to determine the preservice teachers' self-efficacy with respect to their technology proficiency. Careful analyses of the data led researchers to conclude that preservice teachers were being exposed to a variety of technology tools and applications in their content courses and field experiences; however, many of the preservice teachers felt they needed more technology preparation to equip them with the skills they need to integrate technology into their future classroom.

Keywords : *Educational technology; Preservice teachers; Self-efficacy; Technology proficiency*

Introduction and Background

As our society has become highly technology oriented, its growth has been continuous and rapid. The way we do business, the way we communicate, and the way we live has become infused with technology. More and more businesses are demanding that potential workers be both educated and technology competent (McIsaac, 2001). Many see teachers as being the major catalyst for required change (Whetstone, 2001) but are teachers being properly prepared to equip students with the skills they are expected to have upon graduation?

According to the National Council for Accreditation of Teacher Education (NCATE), preservice teachers are not receiving the necessary technology preparation. In 1997, NCATE released a study entitled *Technology and the New Professional Teacher:Preparing for the 21st Century Classroom.* The report stated that many teacher preparation programs did not sufficiently prepare preservice teachers to integrate technology into future classrooms (National Council for Accreditation of Teacher Education, 1997).

Curriculum for preservice teachers should emphasize the exploration, integration, and evaluation of technology in core subjects (Smith, 2001), however, many teacher training programs do not currently provide the comprehensive instruction that preservice teachers need to become proficient at integrating technology (Gunter, 2001; Horung & Bronack, 2000). A comprehensive technology program allows preservice teachers to experience technology integration as both students and teachers (Vannatta & Beyerbach, 2000). Preservice teachers must come into contact with experiences that provide practical application of instructional technology if they are expected to learn innovative teaching strategies (Abdal-Haqq, 1995; Gunter, 2001; Smith, 2000; Horung & Bronack, 2000).

Teacher preparation programs typically require preservice teachers to take one course in instructional/educational technology that is designed to teach the skills and applications necessary to use technology (Smith, 2001; Vannatta & Beyerbach, 2000; Whetstone, 2001). In these self-contained technology courses, preservice teachers are usually introduced to the latest hardware and software through demonstration, but are seldom required to use these technologies to complete course work (National Council for Accreditation of Teacher Education, 1997). While researchers do not dispute that understanding the value of technology and developing appropriate skills are necessary and important aspects of preservice teacher preparation, they also agree that preservice teachers must learn to become effective integrators of technology (Bielefeldt, 2001; Krueger, Hansen, & Smaldino, 2000; National Council for Accreditation of Teacher Education, 1997; Niederhauser, 2001; Smith, 2001). In addition to a self-contained course, preservice teachers need the opportunity to extend their use of instructional technology into core courses and field experiences. The amount of success that preservice teachers will have integrating technology into their curriculum is not only dependent upon skill, but it is also dependent upon learning effective integration strategies and developing a positive attitude toward the use of technology (Whetstone & Carr-Chellman, 2001).

Changes in teacher education programs

Colleges of Education realize that teachers are the means by which technology is introduced into K-12 students' learning experiences (Krueger, Hansen & Smaldino, 2000) and many education programs are seeking ways to provide preservice teachers with the skills, knowledge and attitude necessary to integrate technology into their future classroom (Krueger, Hansen & Smaldino, 2000; Horung & Bronack, 2000; Queitzsch, 1997). However, developing technology proficient teachers is not a small task; the undertaking involves a change in the attitude of educators, increased access to technology rich K-12 schools, and positive attitudes on the part of preservice teachers (Hornung & Bronack, 2000; Whetstone & Carr-Chellman, 2001).

Technology proficient educators are essential to developing technology proficient preservice teachers (Queitzsch, 1997). The faculty in Colleges of Education are typically the basis from which preservice teachers determine how they will teach. Teacher educators must be willing to increase the amount of technology that they integrate into their instruction (Gunter & Sivo, 2003) so that preservice teachers can fully understand the influence that technology has on education.

The more technology experiences that preservice teachers are provided with during teacher preparation, the less anxiety that they will face during inservice experiences (Whetstone & Carr-Chellman, 2001). Colleges of Education need to seek means of providing preservice teachers with continuous exposure to the use of technology as they observe and work in the field (Queitzsch, 1997; Snider, 2003). Exposure to technology rich classrooms allows preservice teachers to observe educational technology in action and to practice teaching with technology (Mathematica Policy Research, Inc, 2001).

Preparing tomorrow's teachers at the University of Central Florida

According to Dr. Tom Carroll, the director of Preparing Tomorrow's Teachers to Use Technology (PT3), the purpose of the PT3 grant program was to increase the number of teachers that are proficient in the use and application of technology (Preparing Tomorrow's Teachers: An Interview with Tom Carroll, 1999). The University of Central Florida received a Capacity Building grant during the 1999-2000 project period. A consortium was formed to reorganize the teaching and learning process in the teacher preparation program. The reorganized program would infuse technology throughout the teaching and learning experience of all College of Education faculty, preservice teachers during internship, and classroom teachers.

During the 2000-2003 project period, the University of Central Florida received an Implementation grant from PT3 to engage their entire faculty in technology reform and actively partner with K-12 schools. The University

of Central Florida formed a consortium that consisted of Seminole, Orange, and Osceola County Public Schools, Intel-Teach to the Future, Inspiration Software, The Learning Company, Tom Snyder Productions, Apple Computer, WMFE Channel 24, Friends of the Wekiva, Alpha-Smart, Sunlink, Instructional Technology Resource Center, and Area Center for Educational Enhancement. The project entitled Tech IMPACT, set forth to reach the goals of the PT3 grant program. Tech IMPACT is based on the competencies that technology proficient teachers should possess according to NCATE and International Society for Technology in Education (ISTE) standards. Technology proficient teachers should be able to **I**mplement, **M**odel, **P**lan, **A**pply, **C**ontinually use, and **T**each with technology (Mitchell, 2002).

According to Dr. Debby Mitchell, the Program Coordinator, Tech IMPACT was designed to be a technology rich program that fostered development through research, content, and practical hands-on experiences. The Tech IMPACT program was adapted from Georgia InTECH, Louisiana INTECH, and Miami Museum Start. The University of Central Florida partnered with its consortium members, which in part included three local school districts and Intel-Teach to the Future, to use resources to meet the following objectives:

1. Develop Learning Communities and provide systematic training and support for preservice teachers to integrate technology into their curriculum.
2. Develop Learning Communities and provide specific technology integration training and support for faculty connecting the College of Education and the College of Arts & Sciences.
3. Develop Learning Communities to provide internships in technology rich schools in diverse settings.
4. Develop Learning Communities and facilitate change providing a structure to transform education that will sustain technology integration including methods to evaluate, share internally, and disseminate information nationally (Mitchell, 2002, 1).

The Tech IMPACT program is presented as the **T**ech **I**MPACT **M**odel and **E**xperience (TIME) or T.I.M.E. Model. The T.I.M.E. Model is a twelve-step approach to technology integration. T.I.M.E is designed to help preservice teachers infuse technology into their daily classroom curriculum. The twelve steps include: developing a vision, incentives, personalization, awareness, learning communities, action plans, research, module development, skills, implementation, evidence of change, and evaluation/reflection (University of Central Florida, n.d.).

Preservice teachers in the Internship II phase of their degree program

receive the Tech IMPACT training using the Florida Black Bear curriculum as a model for technology integration. Students have the opportunity to see technology, experience technology, and create theme-based projects that are integrated throughout with technology. Upon the completion of Tech IMPACT training, preservice teachers leave with unit plans and products for their future classrooms. Preservice teachers also develop the knowledge of how to integrate technology in a way that enhances their students' learning (University of Central Florida, n.d.).

Methodology

Purpose of the study and description of the sample

The purpose of this study was to determine whether or not preservice teachers at the University of Central Florida received the training and support needed to gain technology proficiency. The study specifically focused on the following questions:

1. Are preservice teachers introduced to the skills and applications that are necessary to use technology? Does the teacher education program at the University of Central Florida foster positive attitudes about integrating technology into preservice teachers' future classroom?
2. Does the teacher education program the University of Central Florida equip preservice teachers with the skills necessary to implement, model, plan, and apply technology integration strategies into their future classroom?
3. Can preservice teachers at the University of Central Florida produce lessons and products that are indicative of technology proficiency after completing their teacher preparation program?

The participants for this study were 40 preservice teachers of diverse ethnicities in their senior year in the College of Educational at the University of Central Florida. They had completed the Tech IMPACT program and were enrolled in their Internship II stage of the degree program during the Spring Semester of 2003. A consent form was given to all subjects and participation was voluntary. The respondents consisted of 37 females, two males, and one who did not report gender. Two of the participants reported that they used a computer once a month or less and 38 reported that they used a computer once a week or more.

Instrumentation

A technology attitude survey was designed to gather data regarding the influence of technology preparation and knowledge on the proficiency of preservice teachers. All subjects were given a 42-item survey. The survey included a demographic section and three subcategories: Computer Tools and Applications, Perceptions of Technology, and Barriers to Technology

Usage. The Computer Tools and Applications sections consisted of 15 questions with response choices of: "I have used this for personal reasons." "I have used this to complete assignments in content courses." "I have used this in field experiences." "I have seen this modeled in courses but have not used this, and I have not used this." Participants were permitted to mark more than one of the response choices, if appropriate. The Perceptions of Technology section, which consisted of 13 statements, and the Barriers to Technology Usage section, which consisted of 10 statements, used a Likert scales rating ranging from strongly agree to strongly disagree. Thirteen out of 13 statements in the Perceptions of Technology section were positively stated. Nine out of 10 statements in the Barriers to Technology Usage section were positively stated; one statement was negatively stated.

Findings

Quantitative analysis was used to determine the influence and effectiveness of the preparation of preservice teachers' technology proficiency. Frequencies and percentages were used to quantify responses. First, the demographics, such as gender, age, academic year, and frequency of computer use, were analyzed.

Descriptive statistics were then preformed on the responses to selected questions from each group. A five point Likert scale was used. Each response was assigned a value; strongly agree-5, agree-4, neutral-3, disagree-2, and strongly disagree-1 for statements that were stated positively. A value of strongly argee-1, agree-2, neutral-3, disagree-4, and strongly disagree-5 was assigned to statements that were positively stated. Again, frequencies and percentages were calculated, compiled, and presented in tables, charts, or graphs where appropriate and an accompanying narrative was included to further explain the data.

The data in Figure 1 shows that the majority of the surveyed preservice teachers used a computer everyday (52.5%). A total of 42.54% of the students used a computer several times a week and 5% of the subjects reported using a computer once a month.

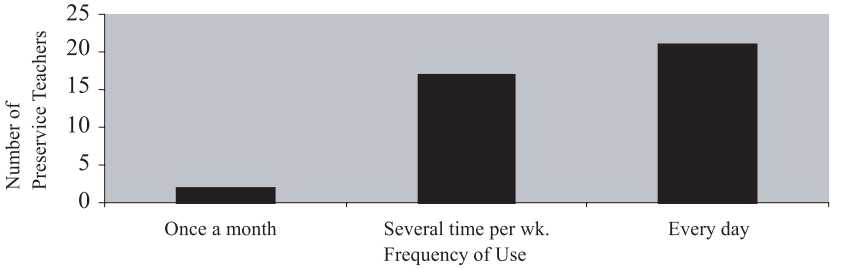

Figure 1 Reported Frequency of Computer Use

Technology tools and applications

Table 1 shows the percentage of preservice teachers that used specified computer tools and applications. The collected data indicates that a high percentage of preservice teachers used the Internet (97.5%), word processing (95%), e-mail (95%), graphical applications/organizers (69.2%), and digital cameras/scanners (65%) for personal use. The data also indicates that preservice teachers reported being exposed to the use of word processing (93.75%), Internet (87.5%), graphical applications/organizers (78.8), e-mail (78.8%), and multimedia presentation packages (73.8%) in their teacher preparation program during content courses and or field experiences. See Table 1.

Table 1 Percentage of Preservice Teachers Using Specified Computer Tools and Applications

	Used Personally	Used in Teacher Preparation	Not Used
Word processing	95.0	93.75	2.5
Multimedia presentation packages	52.5	73.8	2.5
Graphical applications/ organizers	69.2	78.8	2.6
Desktop publishing	41.0	53.8	12.8
Database	34.3	27.1	24.3
Programming/ Authoring tools	19.4	13.9	34.7
Digital camera/ Scanner	65.0	42.5	11.3
Library Online Information retrieval	51.3	48.7	7.7
Internet	97.5	87.5	1.3
Content specific software	28.2	48.7	14.1
Web page development	20.0	30.0	28.8
E-mail	95.0	78.8	3.8
Spreadsheets	42.5	50.0	12.5
Electronic Gradebook software	17.5	31.3	27.5

The data in Table 1 shows that a low percentage of preservice teachers that were exposed to programming/authoring tools (13.9%), databases (27.1%), Web page development (30%), and electronic gradebook programs (31.3%) during teacher preparation. Of the preservice teachers, 34.7% had never used programming/authoring tools and 28.8% of them had never done any Web page development. Another 27.5% of preservice teachers reported that they had never used an electronic gradebook and 24.3% reported that they had never used a database. (See Table 2.) The teacher preparation program did provide increased exposure to electronic gradebook software, spreadsheets, Web page development, content specific software, desktop publishing, graphical applications/organizers, and multimedia presentations.

Perceptions of technology

Seven out of the eight statements selected from the Perceptions of Technology section of the survey had a mean score greater than three, which suggests that a positive attitude existed. One statement, "I am familiar with the ISTE and NCATE technology standards," received a mean score of 2.575. Only 30% of the subjects marked that they strongly agree or agree with that statement, 60% of the preservice teachers marked disagree or strongly disagree, and 10% were neutral.

Approximately 97.5% of the preservice teachers felt that it was important to integrate technology into the curriculum; however, only 70% of the preservice teachers felt that they had sufficient training on how to integrate technology into K-12 curriculum and 55% reported that the courses that they took during their teacher preparation program were sufficient to teach the needed technology skills. Furthermore, 72.5% of the preservice teachers reported that the technology that was used in their content courses enhanced their learning.

Of the surveyed preservice teachers, 72.5% felt that they had access to the technology that they need during their field experiences. However, only 65% of the subjects reported that they opportunity to integrate technology into lessons that they created during field experiences, Results are in Table 2.

Table 2 Measures of Central Tendency and Percentage for Preservice Teachers' Perceptions of Technology

	Mode	Mean	Median	%
It is important to integrate technology into K-12 curriculum.	5	4.6	5	97.5
I have had sufficient training on how to integrate technology into K-12 curriculum.	4	3.975	4	70.0
I have had the opportunity to integrate technology into lessons that I created during field experiences.	5	3.821	4	65.0
I will infuse technology into my future classes' curriculum.	5	4.525	5	95.0
The courses I took during my teacher preparation program were sufficient to teach me the technology skills that I need.	4	3.6	4	55.0
I am familiar with the ISTE and NCATE technology standards.	2	2.575	2	30.0
The technology that I used in my content courses enhanced my learning.	4	4.05	4	72.5
I had access to technology that I needed during my field experience.	4	4	4	72.5

Percent indicates the percentage of Preservice teachers that reported strongly agree or agree.

Barriers to technology usage

The results indicate that the majority of the subjects were neutral to whether or not there was time available for them to learn to use technology

in the classroom. See results in Table 3. Forty percent of the subjects agreed or strongly agreed that there is time to learn to use technology in the classroom and 50% of the preservice teachers reported that technology did not have to be easy to learn in order for them to use the technology.

Table 3 Measures of Central Tendency and Percentage for Preservice Teachers' Barriers to Technology Usage

	Mode	Mean	Median	%
There is time available for me to learn to use technology in the classroom.	3	3.175	3	40.0
I am comfortable using technology.	4	3.9	4	75.0
I have personal interest in using technology.	4	4.05	4	72.5
Using technology will increase my students' learning.	4	4.256	4	84.6
I will only use new technology if it is easy to learn.	4	3.256	4	23.1
Using technology will increase my students' motivation.	4	3.974	4	71.8

Percent indicates the percentage of Preservice teachers that reported strongly agree or agree.

Of the surveyed preservice teachers, 84.6% reported that using technology would increase student learning and 71.8% of the preservice teachers reported that using technology would increase student motivation. Approximately 73% of the preservice teachers had a personal interest in using technology.

Conclusions and Discussion

Research has shown that effective technology programs offer preservice teachers the opportunity to experience technology incorporated within their curriculum (Guha, 2001) and the chance to observe and collaborate with infield educators that use technology (Vannatta & Beyerbach, 2000). Preservice teachers at the University of Central Florida are being exposed to a variety of technology tools and applications in their content courses and field experiences. The main sources of technology integration in content courses are word processing, multimedia presentation, the Internet, and the World Wide Web. A large number of content classes also integrate the use of graphical applications/organizers and e-mail communication. There was limited exposure to databases, programming/authoring tools, and electronic gradebook software. The primary focus of technology integration in field experiences was word processing, Internet, and e-mail communication.

This study targeted preservice teachers' self-efficacy with respect to technology integration. Although most of the preservice teachers considered technology to be an important aspect the K-12 curriculum, many of them did not feel or were uncertain as to whether or not their technology preparation

was sufficient to equip them with the skills they need to integrate technology into their future classroom. The majority of the preservice teachers were not familiar with International Society for Technology in Education (ISTE) and the National Council for Accreditation of Teacher Education (NCATE) standards for technology integration.

All of the surveyed preservice teachers at the University of Central have had some experience with technology integration in their content courses and during field experience. They have seen technology integration modeled and have been required to use technology to complete assignments. The majority of the preservice teachers have positive attitudes about integrating technology into their future classroom. Seventy percent of them have had the opportunity to create lessons that were integrated with technology during field experiences and 97.5% of the surveyed preservice teachers felt that it is important to integrate technology into K-12 curriculum. All had been exposed to the Tech IMPACT technology training and been provided with additional instructional preparation and excellent resources. The data indicated that preservice teachers perceive technology integration as a means to increase academic achievement and motivation. Furthermore, the preservice teachers felt in order to be secure in technology integration techniques they needed more training on all levels.

Researcher Recomendations

It is evident that preservice teachers at the University of Central Florida are being exposed to technology integrated into instruction; however, the types of technology that they are being exposed to are limited. Preservice teachers frequently reported using word processing, multimedia presentation packages, the Internet, and e-mail in their teacher preparation. Preservice teachers need to see a greater variety of technology integration modeled throughout their content courses.

The amount of success that preservice teachers will have integrating technology into their curriculum is not only dependent upon skill, but it is also dependent upon learning effective integration strategies. Seeing technology modeled in content courses is not sufficient if preservice teachers are not required to use the technology. Teacher educators need to require students to integrate technology into the assignments that they complete and the lesson plans that they write if they are expected to become proficient integrators of technology.

Finally, a greater number of preservice teachers need to be placed with supervising teachers that are technology proficient. Exposure to technology

rich classrooms allows preservice teachers to observe educational technology in action and to practice teaching with technology. The more opportunities and exposed that preservice teachers have to integrate technology during classroom and field experiences, the less anxiety they will have when the time comes for them to integrate technology integration into their own classrooms.

Recommendations for Future Research

Future studies on the technology proficiency of preservice teachers should seek to determine what barriers prevent preservice teachers from feeling equipped to integrate technology into future classrooms. Studies should also focus on determining what can be done to expose preservice teachers to a larger variety of technology applications and technology rich internship experiences. Furthermore, researchers would benefit from investigating ways to increase the number of faculty members that integrate technology into preservice teachers' content courses.

References

Abdal-Haqq, I. (1995, November). Infusing technology into preservice teacher education. *ERIC Digests.* Retrieved January 16, 2003 from http://www.ed.gov/database/ERIC_Digests/eded389699. html.

Bielefeldt, T. "Technology in teacher education a closer look," *Journal of Computing in Teacher Education,* 17 : 4 (2001) : 4-15.

College of Education University of Central Florida. (2003). Tech impact preparing tomorrow's teachers to use technology. [Brochure]. Mitchell, D : Author.

Gunter, G.A. "Making a difference: Using emerging technologies and teaching strategies to restructure an undergraduate technology course for preservice teachers," *Educational Media International,* 38 : 1 (2001, March) : 13-20.

Gunter, G.A. & Sivo, S.A. "Effective online training: The Georgia GET FIT initiative," *Technology and Teacher Education Annual,* 2003, Paper published in the proceeding of the fourteenth international conference of the society of information technology and teacher education. Association for the Advance of Computing Education : Charlottesville, VA, 2003.

Hornung, C.S. & Bronack, S. "Preparing technology-based teachers professional lessons from a k-12/ university collaborative," *TechTrends,* 44 : 4 (2000, May) : 17-20.

Intel Teach to the Future. (2003). Retrieved March 3, 2003 from http://www97.intel.com/education/teach/index.htm.

Krueger, K., Hansen, L., & Smaldino, S. "Preservice teacher technology competencies a model for preparing teachers of tomorrow to use technology," *TechTrends,* 44 : 3 (2000, April) : 47-50.

Matematica Policy Research, Inc. (2001). Analysis of the 1999-2000 annual performance reports for preparing tomorrow's teachers to use technology final report. Retrieved October 15, 2002, from www.ed.gov/offices/OUS/PES/higher.html#pt3.

McIsaac, M. "Integrating technology in teaching and teacher education: Implications for policy and curriculum reform," *Education Media International,* (2001) : 127-132.

Mitchell, D. (2002, July 26). Tech impact. Retrieved October 23, 2002, from http://pt3.org/servlet/ ProjectDescription?grantee_id=347.

National Council for Accreditation of Teacher Education. (1997). Technology and the new professional teacher: Preparing for the 21st century classroom. Retrieved October 15, 2002, from

http://www. ncate.org.accred/projects/tech/tech-21.htm.

Niederhauser, D.S. "Technology and teacher education: Beyond preparing preservice teachers," *Journal of Computing in Teacher Education,* (2001, Winter) : 3.

Queitzsch, M. (1997, January). "The northwest regional profile: Integration of technology in preservice teacher education programs," *Northwest Educational Technology Consortium.* Retrieved January 16, 2003 from http://www.netc.org/preservice/challenge.html.

Preparing Tomorrow's Teachers to Use Technology. (2002) Retrieved March 3, 2003 from http://www.pt3.org/.

Smith, S. B. "Technology 101: Integration beyond a technology foundations course," *Journal of Special Education Technology*, 16:1 (2001, Winter) : 43-45.

Smithey, M.W., & Hough, B.W. Creating technology advocates: connecting preservice teachers with technology," *T.H.E. Journal,* 26 :8 (March 1999) : 78-79.

Snider, S. "Exploring technology integration in a field-based teacher education program: Implementation efforts and findings," *Journal of Research on Technology in Education,* 34:3 (2003, Spring) : 230-247.

University of Central Florida (n.d.). Tech impact info. Retrieved October 23, 2002 from http://reach.ucf.edu/~impact/techinfo.htm.

Vannatta, R. A., & Beyerbach, B. "Facilitating a constructivist vision of technology integration among education faculty and preservice teachers," *Journal of Research on Computing in Education,* 33:2, (Winter 2000) : 132-148.

Whetstone, L. & Carr-Chellman, A. A. "Preparing preservice teachers to use technology : Survey results," *TechTrends,* 45 : 4 (July/August 2001) : 11-17.