Does Technology Influence Teaching Practices in the Classroom?

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INTRODUCTION

The world is experiencing an information explosion of unprecedented proportions. Not only is the volume of new information large, but it is also growing exponentially. Rapid changes in many fields are making basic knowledge and skills obsolete.

In the technological world of the 21st century, the meaning of the phrase "to know" means more than simply having information stored in one's memory; it means having access to information and knowing how to use it. The challenge for education is to design technologies for learning that draw both from knowledge about human cognition and from practical application of how technology can facilitate complex tasks in the workplace. "Like training wheels," computers enable learners to do more advanced activities, and engage in more advanced thinking and problem-solving than they could without such help (Pea, 1985).

In this rapidly transforming world, where employment requirements and fundamental literacy expectations are quickly changing, education must also change to meet these demands. The essence of education has been to transmit society's cultural heritage to successive generations and to foster competencies will permit children to successfully participate in a society. To that end, Information technology must become an integral part of the general education curriculum so students are prepared to meet future technology challenges.

Many teachers now have access to an unprecedented amount of instructional technology in their classrooms. However, there is little evidence showing that teachers integrate technology within the curriculum on a regular basis. Several factors influence districts' or schools' to focus on hardware rather than the more complex issue of implementation. One reason is a weak implementation and planning process that fails to meet the needs of all teachers and provides little if any time for staff development. Before teachers can successfully implement technology, they need a change in their pedagogy. Such change requires a paradigm shift from viewing their role as a giver of knowledge to a facilitator of knowledge (Dexter, Anderson, & Becker, 1999).

Researchers suggest the teacher has been the most important piece that makes learning occur (Soloway, 1996). Teachers have always been responsible for teaching content. With the expansion of Information Highways and technology teachers must also take on the added responsibilities of teaching students how to use the computer as a tool and creating innovative strategies to enhance computer literacy and computer based training in the curriculum. Lundeberg, Coballes-Vega, Standifor, Langer, and Dibble (1997) supported the constructivist learning theory when they found teachers were committed to "project-based learning in a technology-rich environment" (p.61). They believed students could use technology to build concepts from existing knowledge and to obtain information from a variety of sources. Bracey (1994) found that teachers who use technology view learning as an active process and knowledge as something students must construct rather than receive passively.

The confidence level toward technology increases as teachers receive formal training (Espinosa and Chen, 1996). Additional researchers (Anderson & Harris, 1997; Follansbee, Hughes, Pisha, & Stahl, 1997; MacArthur, Pilato, Kercher, Peterson, Malouf, & Jamison, 1995; Whelan, Frantz, Guerin, & Bienvenu, 1997) concluded that teachers required in-service training on specific technology applications to integrate computers into the curriculum in meaningful ways. Becker (1999) showed that formal staff training was a significant factor in increasing the use of computers by teachers. Also, he observed that the value of staff training increased when teachers met informally to discuss teaching practices and project ideas.

Griest (1996) stated, “Teachers must drive change” (p.33). But Kahn (1997) noted, “Teachers teach as they have been taught” (p.33). Change is a process that takes place over a span of years and for some, it may never happen. Administrators who facilitate change need to understand the importance of providing time and support through this change process. Clearly, defining both teacher and student expectations and effectively communicating them is critically important. Teachers can be successful, but they must take ownership of a new instructional strategy or technological application if change (Dexter, Anderson, & Becker, 1999).

Teachers’ instructional practices are influenced by numerous personal factors, including their personality and belief system. Belief system and values are a product of teachers’ own prior knowledge, development, and experience as an individual. The greatest influence of teacher style appears to be the organizational culture. In order for instructional technology to be successfully implemented, teacher beliefs and values need to be shaped. If this shift does not occur, the integration of instructional technology in education will not occur on a broad scale (Dexter, Anderson, & Becker, 1999).

Researchers have identified steps to follow in order to overcome the contextual barriers faced by teachers as they integrate technology. Dexter, Anderson, and Becker (1999) showed how powerfully contextual barriers influence instructional practices, teaching strategies, classroom management, technical expertise, curriculum directives, and organizational support for teachers. These researchers provided support for the teachers involved in the study which included staff development sessions, technical assistance, support for modifications of laboratory lessons to improve student learning, and problem-solving strategies to support integration. As a result, several state supported technology integration programs have followed their model to assist teachers in shifting their teaching practices to a cognitive learning process (Dexter, Anderson, & Becker, 1999).

This present investigation addressed the effectiveness of one state supported professional development program as it related to changing the pedagogy of teachers. *Integrate Technology* (InTech) was the primary means of delivering technology training to teachers in the state of Louisiana during the time of this study. The training was designed to introduce teachers to a variety of appropriate technologies and encourage constructivist pedagogy shifting practices from teacher-centered to student-centered learning. This study looked at the impact technology training had on teachers' shift to using constructivist learning theory in classroom practices.

Purpose of Study

The purpose of this study was to determine whether a state-supported staff development program influenced teachers to shift their teaching practices from teacher-centered to student-centered learning. Student-centered learning for the purpose of this study refers to hands-on activities, investigative activities, Web-based activities, cooperative learning groups, group projects, research projects, and the use of the Internet, word processing, World Wide Web, and presentation software.

The ultimate goal of this study was to provide information to the education community with justifiable data concerning the large amount of money spent on technology integration. Also, the data provided information to school administrators in regards to instructional practices with the use of technology integration. One can conclude from this information provided by this study the effectiveness of the state technology training that is provided to teachers.

Hypotheses

The study was guided by the following null hypotheses:

H1: There is no statistically significant difference between InTech and Non-InTech trained teachers with respect to student-centered learning, utilization of a variety of technology skills, teaching pedagogy, and attitudes toward technology use in the classroom.

H2: There is no statistically significant difference between InTech and Non-InTech trained teachers with the respect to student-centered learning.

H3: There is no statistically significant difference between InTech and Non-InTech trained teachers with the respect to utilization of a variety of technology skills.

H4: There is no statistically significant difference between InTech and Non-InTech trained teachers with the respect to teaching pedagogy.

H5: There is no statistically significant difference between InTech and Non-InTech trained teachers with the respect to their attitudes toward technology use in the classroom.

METHODOLOGY

This study gathered data to investigate if completion of InTech training influenced how effectively teachers integrated technology into the classroom. The two groups were analyzed for similarities and differences for use of student-centered learning, utilization of a variety of technology skills, teaching pedagogy, and attitudes toward technology use in the classroom. This chapter includes the following topics: participants, research design, instrumentation, data collection procedures, data analysis, and summary.

Participants

The general population of this study was public school elementary educators employed by a selected district in the state of Louisiana. The school system consisted of 51 schools with a total student population of 34,000. The school system was the largest employer in the parish, employing about 4,900. Of this number, approximately 2,930 were teachers. Half reportedly held a Master's degree or higher. The average years of experience for educators in the system were 15.25 years. This school district was selected because at the time of the study four schools within the district were 100% InTech trained. This is greater than any other parish in the state of Louisiana.

A stratified random sample of certified elementary (K-6) teachers employed by the selected school district was identified for this study. A total of 400 subjects (200 InTech and 200 Non-InTech trained teachers) were invited to complete the survey. The 400 subjects ware selected from a data base that maintains professional development records for all teachers within the parish that was under study. The researcher submitted a query for InTech and Non-InTech trained teachers. Then, the researcher used systematic techniques were every fourth name was selected from an alphabetized list. The school district was selected for convenience and accessibility reasons. Convenience sampling has been justified by Gall, Borg, and Gall (1996), as long as the researcher describes in detail the sample used and the reasons for selection.

Non-InTech trained elementary teachers (n=200) were all employees in the targeted school district who had not completed or attended the seven day InTech training provided by the Louisiana Regional Technology Center (LRTC). InTech trained elementary teachers (n=200) were employees of the chosen school district and had completed the seven day InTech training.

Research Design

This study utilized a Multivariate Analysis of Variance (MANOVA) to address the five research questions. If the multivariate test was statistically significant, univariate follow-up tests were conducted. The researcher determined the effects of the independent variables solely and jointly on the dependent variables (Gall, Borg, & Gall, 1996). The independent variables were classified as InTech or Non-InTech trained teachers. The dependent variables were the elements produced from learning technology integration skills. The elements included use of student-centered learning, utilization of a variety of technology skills, teaching pedagogy, and attitudes toward technology use in the classroom.

Instrumentation

The InTech Summative Evaluation (see Appendix A) used in this study was designed specifically to assess InTech training in West Georgia. It was validated and developed by Jeanne Dugas and Polly Adams in the spring of 2001 to study the impact of InTech training upon university faculty and inservice elementary teachers during the period of January 2001 to June 2001. Permission was obtained from the developers (See Appendix B) to use the instrument for this study. This evaluation was included in the Federal Department of Education Grant, "Preparing Tomorrow's Teachers to Use Technology: Co-Reform in West Georgia" funded in August 1999 (Dugas & Adams, 2001).

Reliability

Reliability analyses were documented in a previous study conducted on each scale to determine how well they performed as measurement instruments to determine the impact of InTech training upon university faculty and inservice elementary teachers (Dugas & Adams, 2001). The results of these analyses are summarized in Table 1. Scale reliabilities, measured by Cronbach's Alpha, indicated that the internal consistency of each scale was extremely high. Reliability coefficients provide an index of the proportion of response variability that has been produced by systematic factors.

Table 1

Reliability Analysis for InTech Summative Evaluation Subscales

Scale	#Items	Pretest	Posttest
Proficiency	13	0.94	0.93
Likely-To-Do	22	0.95	0.93
Classroom Technology Attitude	29	0.93	0.93

Note. From *Summative Evaluation Report for Preparing Tomorrow's Teachers to Use Technology: Co-Reform in West Georgia* (p.13), by Jeanne Dugas and Polly Adams, 2001, Columbus, GA: Columbus State University.

Table 2 summarizes additional information about the Classroom Technology Attitude Scale, breaking it down into its four subscales: Technology Confidence/Anxiety, Technology Usefulness, Technology Liking and Internet Technology. Reliabilities on these subscales ranged from .75 to .88, which was within acceptable limits.

Table 2

Reliability Analyses for CTAS and Subscales and Total Scale

Subscale	#Items	Pretest	Posttest
Confidence/Anxiety	9	0.88	0.84
Usefulness	7	0.78	0.81
Liking	5	0.85	0.84
Internet	8	0.8	0.75
Total Scale	29	0.93	0.93

Note. From *Summative Evaluation Report for Preparing Tomorrow's Teachers to Use Technology: Co-Reform in West Georgia* (p.13), by Jeanne Dugas and Polly Adams, 2001, Columbus, GA: Columbus State University.

Data Collection Procedures

The participants for this study consisted of the elementary grade teachers (K-6) in the target district. They were informed of the survey by an e-mail and postal mail that had been approved by the superintendent notifying them that they have been selected to participate in a technology survey that was sent out October 2003. Any teacher did not desire to participate in the survey could reply to the researcher and request his or her name be removed from the list. The researcher contacted non-participants with a letter requesting that they complete the survey (see Appendix E). An additional sixteen

Non-InTech trained teachers and twenty-two InTech trained teachers completed the survey after receiving a second request.

This study was conducted using online data collection Perseus Survey Solutions for the Web (Persueus Development Corporation, 1998). Subjects were also given the option to complete a paper and pencil survey (see Appendix D). The online and paper survey administration of the survey each took approximately 30 minutes. Data was solicited from 400 certified elementary education teachers in the fall 2003.

Both InTech trained and Non-InTech trained teachers completed surveys either by Internet or paper-based administration after permission was granted by the assistant superintendent of curriculum and instruction in the selected district. The 400 subjects were selected from a data base that maintains professional development records for all teachers within the parish under study. The researcher submitted a query for InTech and Non-InTech trained teachers and selected the first 200 subjects from each list. Teachers who were selected for the study were informed they would receive a survey by school mail. Participants' e-mail addresses were obtained through the global e-mail address book provided by the parish Information Technology Department.

The incoming data was monitored by the researcher and each survey received a number. Each online result was printed and also received a number. As surveys were submitted, the researcher entered and stored the data in Microsoft Excel. A reminder or thank you note (see Appendix E) was sent out by mail and e-mail to all respondents as a reminder if they had not completed the survey, or if they had completed the survey, the researcher expressed thanks to the participant for completing the survey.

Data Analysis Procedures

The statistical procedure of Multivariate Analysis of Variance (MANOVA) was used to test the hypotheses of the study. A .05 alpha level was used in all tests of the hypotheses. If the multivariate test was statistically significant, univariate follow-up tests were conducted. If the univariate follow-up tests were statically significant, the group with the higher mean was specified. Data for this study was compiled using the Statistical Package for Social Sciences (SPSS) software program, Version 10.

Summary of Findings

This study attempted to determine whether a state-supported staff development program influenced teachers to influence their views about their teaching practices from teacher-centered to student-centered learning. The following null hypotheses were analyzed:

1. There is no statistically significant difference between InTech and Non-InTech trained teachers with respect to student-centered learning, utilization of a variety of technology skills, teaching pedagogy, and attitudes toward technology use in the classroom.
2. There is no statistically significant difference between InTech and Non-InTech trained teachers with the respect to student-centered learning.
3. There is no statistically significant difference between InTech and Non-InTech trained teachers with the respect to utilization of a variety of technology skills.
4. There is no statistically significant difference between InTech and Non-InTech trained teachers with the respect to teaching pedagogy.
5. There is no statistically significant difference between InTech and Non-InTech

trained teachers with the respect to their attitudes toward technology use in the classroom.

A Multivariate Analysis of Variance (MANOVA) was performed to answer research questions using alpha .05 as the criterion for rejection of the null hypotheses. Research Question 1 examined whether there was a statistically significant differences between InTech and Non-InTech trained teachers with respect to student-centered learning, utilization of a variety of technology skills, teaching pedagogy, and attitudes toward technology use in the classroom. Univariate follow-up tests revealed statistically significant differences in the areas of teaching pedagogy and attitudes toward technology use in the classroom. There was no statistically significant difference in student-centered learning and utilization of a variety of technology skills.

Limitations

The results o this study was limited by several factors. First, there was an unequal sample size from each group. Attempts were made by the researcher to increase the sample size. Second, there was not opportunity to collect longitudinal data to support the findings. Third, this study was limited by the variables on the instrument to measure student-centered learning approach.

Implications

The study did not report a change toward student-centered learning. As supported by Gilbert (2000), faculty members were comfortable with use of e-mail and the Internet, but were not prepared to incorporate the use of student-centered learning into the classroom. McKenzie called this the “Software Trap” where teachers receive training in basic use of the computer but without a focus on student achievement. The current study provided that InTech trained teachers were more comfortable with the use of the Internet by completing 109 online surveys versus three paper surveys. In this study, student-centered learning was found to be not statistically significant F (4, 163) = 1.70, p = .20, η^2 =.01. Therefore, InTech trained teachers and Non InTech trained teachers find the uses of student-centered learning activities with their students equally important statistically. Technology training programs may need to shift their focus away from quantity of teacher interactions with technology to a quality of teacher interaction with technology. Often training programs only provided basics and unless the teacher knows how to modify those basics to make them relevant and meaningful, they will not be used (McKenzie, 1999).

The study did not report a statistically significant difference between the training groups with respect to utilization of a variety of technology skills. Previous studies reported a statistically significant change for use of technology skills. Persky (1990) performed 23 case studies and revealed a statistically significant change in teachers' use of technology in the classroom after three years of training. A 10-year study on technology integration, the ACOT project, showed a significant change toward a technology integrated classroom after four years of initial and follow-up training (Dwyer, 1994).

The current study showed the experience level between the InTech trained and Non InTech trained to be statically equal. However, the current study differed from previous studies in that the technology training program only consisted of 56 hours of training. Also, follow-up training was not provided to participants. The results of this research support the need for increased hours of training in technology integration and on-going follow-up of technology use in classroom. State Departments of Education should consider these findings when designing time lines for grants that are funded through the federal No Child Left Behind Act. Teachers' training hours need to be increased otherwise millions of dollars spent on limited technology training will continue to fail to produce statistically significant difference with respect to utilization of a variety of technology skills.

In this current study, InTech trained teachers reported a significant difference from Non-InTech trained teacher in regards to teaching pedagogy. The traditional focus of professional development in technology has focused on instructing teachers to operate equipment rather than how to integrate the technologies into instruction (McCannon & Crews, 2000). Educators need to learn how to use technology in context, matching the needs and abilities of learners to the curriculum goals (Kent & NcNergney, 1999). Kent & McNergney (1999) reported on the use of technology in K-12 education and described technology as supporting a pedagogical shift in education toward the constructivist paradigm. This move away from traditional methods of instruction was based on the premise that it is learning with, not from or about, technology that makes computer-based technologies important tools in a constructivist learning environment (Boethel & Dimock, 1999). Educational technologies offer powerful ways of engaging in authentic forms of learning. With a clear focus on program goals and the provision of extensive professional development opportunities, training must provide real-world experiences for teachers and administrators who have direct impact on the instruction of students (Adams & Burns, 1999; McKenzie, 1999).

InTech trained teachers reported that their schools shifted their teaching pedagogy to more of a student-center learning environment where technology use is modeled in a positive manner within the curriculum. InTech teachers found incorporating the use of technology integration into the classroom as a barrier to improve. Ezarik (2001) suggested several barriers to student-centered learning within classrooms. Time was noted as the main barrier. Planning time, classroom management using the computer, and time restrictions because of scheduling conflicts were the most frequently mentioned problems. This agrees with the findings from the National Center for Education statistics that, next to a lack of computers, lack of release time for teachers to learn technologies and lack of class time for students to use computers are barriers to teacher's use (Ezarik, 2001).

In the present study, the more positive reported attitudes of InTech trained teachers toward technology use in the classroom was supported by other research conducted into the correlation of positive attitudes towards technology and the amount of technology training. Loyd and Gressard (1986) showed that positive attitudes toward computers were positively correlated with teachers' extent of experience with computer technology. With familiarity, anxieties and fears tended to decrease and confidence increased. The amount of confidence teachers possessed in using computers and related information technologies greatly influenced their effective implementation of technology methods in the classroom. Positive teacher attitudes toward computers have been widely recognized as a necessary condition for effective use of information technology in the classroom (Woodrow, 1992).

Recommendations for Practice

The most critical issue is to provide activities that improve student achievement. Based on findings of this study, several recommendations are offered for educational administrators involved with decision making about training educators to use technology.

1. A needs assessment should be conducted to determine preferred training methods. Offer a variety of trainings that encourage teachers to integrate technology into the classroom.
2. Technology facilitators should be provided for educators as a means of support at the school level by demonstrating student-centered learning. Also, the technology facilitator could serve as a mentor to assist teachers with planning of student-centered lessons because teachers reported in this study that they were not practicing methods that they believed were student-centered learning.
3. Training hours since previous studies reported a statistically significant increase in technology integration when training spanned a three to four year time frame and included follow-up training.
4. Evaluative feedback should be sought on every training session to continue to improve the training.
5. Develop a new instrument to better determine the use of student-centered learning.

Recommendations for Further Research

Based on the process and results of this study, several recommendations are offered for future studies involving technology integration training.

1. Replicate the study using a larger population of InTech trained and Non-InTech trained teachers extending beyond the district that was used in the current study.
2. Replicate the study using more than one state and compare the results.
3. Provide a follow-up study that utilizes a pre-post design. This study should investigate training provided to educators based on a needs assessment. Participants' levels of technology integration should be assessed before and after training to measure impact. After the training, the survey would be given again to determine if the training methods were still rated as the first time.
4. Replicate the study with more equal sample size for each group.

Conclusion

The integration of technology into the K-12 curriculum is necessity to provide a rich environment for the continued success of students. In order to achieve this goal, educators need adequate training with follow-up and continuous support. A needs assessment could provide a blueprint for the training methods that educators' desire and also provide the best means for effective transfer to the classroom. This supports the belief in continuous follow-up training. In addition, implementing a follow-up program would foster collaboration and support, and ultimately the use of technology in the classroom. A large amount of money has been spent on training which has suggested changing the way teachers think. But, funds have not assisted in the application of student-centered learning. A reallocation in the funds that support follow-up training with additional on the job training could encourage the use of technology in the curriculum. According to this study, educators believed that student- centered learning was the most appropriate method to integrate technology. Thus, technology training should be revamped to include the methods that the educators themselves have affirmed as effective for learning technology integration skills. This will assure an integrated curriculum that prepares students for a technological society.

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