Computer Usage in Fourth and Fifth Grade Elementary Classrooms

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ABSTRACT

This study examined factors and perceptions that influenced the implementation of computer technology in fourth and fifth grade classrooms. Change theory provided a framework for examining the differences exhibited between teachers who were identified as high-end users, midlevel users, and low-end users of technology. Computer usage of 20 teachers was identified based on their responses to a questionnaire and interviews.

The low-end users’ pedagogical styles were reflective of teacher-centered instructional methodologies, while high-end and midlevel users’ pedagogical styles were student-centered. Pedagogical styles influenced the level of implementation in the classroom. Low-end users complained more about the working ability of the computers than other users. Since the computers were inoperable to them, there was no flexibility to locate other resources to promote computer technology implementation. Midlevel and high-end users also complained but found ways to use the technology either in other colleagues’ classrooms or in the media center. Midlevel and high-end users did not rely solely on the Internet but instead used different resources to increase student learning.

Teachers who utilized student-centered methods were more successful and flexible in implementing technology than those who used teacher-centered instruction.

The findings suggest that to increase the amount teachers use computer tools in their classrooms and improve how they are used; administrators should provide professional development opportunities to change instructors’ attitudes and beliefs about technology.
DEDICATION

This work is dedicated to my mother, Mabel Burks, my role model and my friend, who has encouraged me through prayer, perseverance, and persistence to continue my education until I accomplished all of my goals. I love you, mother.

To my daughter, Alyssa, who has made great sacrifices for this project to come to fruition, I hope you will embrace the same desire and aptitude as me to pursue all of your educational goals.

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CHAPTER 1
INTRODUCTION TO THE STUDY

Technology’s role in education and the current educational reform movement is a topic of discussion at national, state, and local levels. The National Commission on Excellence in Education instituted a reform initiative through the publication in 1983 of A Nation at Risk. The document called for reform in the educational system in order for the working class in the United States to meet the demands of a changing world. In 1994 the United States Congress enacted the Goals 2000 legislation, making the federal government a supportive partner in state and local systemic reform efforts. It called for coherent, high-quality educational opportunities for students, with the expectation that students would demonstrate competency in given situations.

Technology was important in these reform efforts. Goals 2000 required that technology plans be developed by individual states. In these plans, states were asked to describe how technology would be used to support systemic reform and to help students achieve high standards through the effective use of technology.

In 1996, then President Bill Clinton announced the Technology Literacy Challenge to emphasize the importance of technology to the vision of higher achievement set forth by Goals 2000. In the state of Georgia the legislature passed House Bill 1187, the A+ Education Reform Act in 2000 (Georgia Department of Education, 2000). Out of this act came two technology-related initiatives, which have profoundly impacted teachers and teacher preparation programs.
First, the *A+ Education Reform Act* mandates that renewable teaching certificates will not be granted unless the candidate demonstrated satisfactory proficiency on a test of oral and written communication skills, a test of computer skill competency, and an assessment to demonstrate satisfactory on-the-job performance appropriate to the applicant’s field of certification. Successful completion of the phase one InTech model training at a state educational technology training center or by a State Board of Education approved redelivery team is considered be acceptable for certificate renewal purposes.

Second, the *A+ Education Reform Act* “holds teacher preparation programs at universities and colleges accountable for their graduates’ technology competencies” (p. 68). Universities and colleges require students in such programs to be proficient in computer and other instructional technology applications and skills, including understanding desktop computers, their applications, integration with teaching and curriculum, and their use for individualized instructions and classroom management. There is a test to assess the proficiency of students enrolled in teacher preparation programs in computer and other instructional technology applications and skills.

Technology can be a catalyst for change, a change toward classrooms that cultivate meaningful learning environments for students. Although national and state agencies are promoting effective uses of technology, mandates such as those in the *A+ Education Reform Act* of 2000 do not guarantee appropriate and effective use of computers. Integrating computer technology into instruction is a difficult task for teachers, even if they have had training. It is important to observe and confer with
teachers who are successfully integrating computers into their classroom practices in order to identify and share the best practices of these technology integrators.

Support for technology education continues to be a priority for the government. In October 2000, then President Clinton signed The Hi-TECH Act of 2000 into law (Holt, 2001). This law provides funds for competitive grants in science, math, and technology education. President George W. Bush’s education plan emphasizes flexible funding for teacher professional development and increased funding to schools for technology (Holt, 2001). The availability of computer technology in public schools continues to increase.

Problem Statement
Integration of computer technology use in public school institutions has become the focus of attention especially with regard to its significance as an instructional tool and has become a top priority for both educators and policy makers. The emphasis on the integration of computer technology as a part of the curriculum has proceeded unabated without equal consideration for its viability (Bond-Upson & Latham, 2000). Implementation of computer technology into the classroom curriculum is essential for students of the 21st century. Therefore, it is important to understand the differences in praxis with respect to computer technology among those elementary teachers who have been identified as high-end users, midlevel users, or those identified as low-end users of technology in the classroom for classroom instruction.

Purpose of the Study
Computers in the workplace are typically used as resources to answer questions, solve problems, or share information. Teacher implementation of computers in the
classroom, however, continues to provide drill and practice for remediation of basic skills or to reward students who finish class assignments early (Barab, Hay, & Duffy, 1998; Lowther & Morrison, 1998). To become a viable part of instruction, the use of computers must be redesigned (Tapscott, 1998; Wright & Foster, 1999). Educators are facing the age of technology and they need to prepare students to use the technology (Bond-Upson & Latham, 2000). Motivating students to learn, to enjoy learning, and to want to learn more has assumed greater importance in recent years as strong correlations between dropping out of school and undesirable outcomes such as criminal activity have been recognized (Robyler & Edwards, 2000).

To make learning more important to students, teachers often try to engage them in creating their own technology-based products. This strategy has been used effectively with word processing (Franklin, 1991; Tibbs, 1989), hypermedia (Volker, 1992), computer-generated art (Buchholz, 1998), and telecommunications (Marcus, 1995; Taylor, 1989). Students seem to like the activities because they promote creativity, self-expression, and feelings of self-efficacy and result in professional looking products they can view with pride.

The purpose of this study was to (a) examine how teachers implement computer technology into their instructional praxis and at what level, (b) discuss teacher’s perceptions of the benefits and disadvantage of computer technology, and (c) determine the factors that influence their implementation of computer technology in the classroom. The activities and instructional practices of fourth and fifth grade teachers in an urban
school district who have been characterized as high-end, midlevel, or low-end users of computer technology were studied.

Significance of the Study

The instructional design or instructional systems movement took shape in the 1960s and 1970s, adding another dimension to the media-and-communications view of technology in education. Systems approaches to solving educational problems originated in military and industrial training but later emerged in university research and development projects. K-12 school practices began to reflect systems approaches when university personnel began advocating them in their work with schools (Robyler & Edwards, 2000). These approaches were based on the belief that both human and nonhuman resources (teachers and media) could be parts of a system for addressing an instructional need. From this viewpoint, educational technology was seen not just as a medium for communicating instructional information, but as a systematic approach to designing, developing, and delivering instruction matched to carefully identified needs (Heinich, Molenda, Russell, & Smaldino, 1997). Resources for delivering instruction were identified only after detailed analysis of learning tasks and objectives and the kinds of instructional strategies required to teach them.

From the 1960s through the 1980s, applications of systems approaches to instruction were influenced and shaped by learning theories from educational psychology. Behaviorist theories held sway initially and cognitive theories gained influence later. Views of instructional systems in the 1990s also were influenced by popular learning theories; however, these theories criticized systems approaches as too
rigid to foster some kinds of learning, particularly higher-order ones (Robyler & Edwards, 2000).

The U.S. Department of Education (1996) described computers as “the new basic” of American education, and the Internet as “the blackboard of the future” (p. 3). Over the past 20 years educational technology has been a major focus of reform and policy at the federal level, as well as at state and local levels. Such initiatives have been guided by the goals of increasing the availability of computers in classrooms and schools, assisting schools with Internet access, and providing resources and guidance for teacher training and the integration of technology in the curriculum. The availability of computers and the Internet has increased significantly in the nation’s schools and classrooms (Williams, 2000). This increase has been coupled with initiatives aimed toward understanding how best to use computer technology to improve teaching and learning and to train educators to use technology effectively.

The information gained through this study should prove helpful to school administrators, teachers, and the public in uncovering factors that appear to enhance effective instruction using computer-based activities. Student learning should be at the epicenter of all instruction, and this study could provide a starting point for determining exactly how teachers are using computer tools in their classrooms to increase student learning.

Background

Educational change requires more than strategies. It also requires ways to anticipate and overcome obstacles to sustain change over time (Stoll & Fink, 1996). The
move away from the traditional classroom is influenced by a number of recent developments outside the call for education reform. New developments in telecommunications, increased use of the Internet, proliferation of affordable hardware and software, and growing acknowledgement among policy makers that proper use of computer technology has the potential to improve teaching and learning (Charp, 1999).

While computers and the Internet have transformed how business and research are conducted in the United States, most public school teachers do not yet feel prepared to use these technologies. In 1999, only 10% of public school teachers reported feeling very well prepared and an additional 23% reported feeling well prepared to use computers or the Internet for instruction. The National Center for Education Statistics (NCES) repeated this study in 2002 and found the majority (53%) reported feeling somewhat prepared and 13% reported feeling not at all prepared (NCES, 2002a). Although this trend is encouraging there still remain a significant number of teachers uncomfortable with integrating computers in the classroom.

Differences in teachers’ readiness to use computers and the Internet translated into large differences in how often teachers used these technologies. Teachers who reported feeling well or very well prepared were more likely than teachers who reported feeling not at all prepared to use them to create instructional materials, gather information for planning lessons, access research and best practices for teaching, and create multimedia presentations for their classes. They were also more likely than teachers who reported feeling not at all prepared to assign students schoolwork requiring the use of a computer or the Internet (NCES, 2002b).
Changing pedagogical methodology in order to implement technology into the curriculum will be difficult; educational reform has been a struggle for the last 3 decades. Earlier reform movements operated on the assumption that the educational system was working well for some students and focused on providing opportunities for those excluded groups that were identified (Shields, 1994). The reform movement of the 1990s called for restructuring of education. Many initiatives such as outcome-based education, whole language instruction, charter and theme schools, school choice, and school-based reform have emerged.

Many of these initiatives have made little or no impact due largely to the nature of the reforms (McAdams, 1997). They were largely narrow in focus, fragmented, disconnected, project-oriented, and often underfunded (Fullan, 1996; Hertert, 1996; Knapp, 1997; McAdams, 1997). Dissatisfaction with these reform initiatives led to a movement toward the current comprehensive and systemic reform (Knapp, 1997).

Systemic reform is the current focus of the educational community. Standards are a product of the systemic reform movement (Cohen, 1995). The goal of systemic reform is to recreate the educational system to one in which all students can reach much more challenging expectations and performance standards (Floden, Goertz, & O’Day, 1995). According to Anson (1994), the current initiative also addresses the concern of making education more effective now and in the future. This effort is fundamentally different from previous reform initiatives because it calls for national and state policy makers and education and business leaders to work collaboratively to restructure the educational system to qualitatively increase the performance of all students (David, 1994).
Substantive reform in a complex social system such as a school district requires a level of intellectual sophistication and unity of purpose that is seldom attainable under the prevailing model of school governance (McAdams, 1997). Change requires a belief that the proposed change is necessary, beneficial, and possible. Beliefs and practices change gradually. Changing teachers’ practices involves experiences over time that challenge old beliefs and convince teachers to adopt new ones. Incorporating such changes requires that teachers believe the changes will be beneficial to them as well as the students.

Changing teachers’ beliefs and practice in a way that will help them incorporate technological innovations must be considered in light of the barriers that they encounter. Much research has been done and there is an overwhelming consensus on the barriers to technology integration. Those factors include lack of training, lack of access to technology, lack of time to practice, lack of support while learning, lack of resources, lack of administrative and technical support, and the lack of leadership (Diaz, 1999; Hancock, 1993; Ross & Bailey, 1994).

It is reasonable to assume that elements within the change process affect efforts to persuade teachers to integrate computer tools into their current teaching. For example, Mecklenburger (1998) suggested that even if every school had at least one computer, teachers would continue to ignore the computers until they became more comfortable with the innovation. It is important, therefore, to delineate processes that support and encourage teachers to incorporate computer tools into their teaching and learning.

Technology innovations in the classroom have placed further demands on teachers and school systems to keep abreast of the trends and current developments.
Fullan (2001) stressed the importance of teachers having the opportunity to incorporate the usage of technology (i.e., computer tools) into their existing teaching practices. Wedman and Diggs (1999) identified five phases of teacher understanding about technology innovations that they called the Technology Learning Cycle (TLC). The TLC is based on the premise that teachers are constantly learning how to apply new innovations to meet educational needs. With each new innovation, teachers progress through five stages: (a) awareness, (b) exploration and filtering, (c) application, (d) integration, and (e) reflection.

At the first stage the teacher becomes aware of the technology and how it might be used in the curriculum. Moving on to the second stage of exploration and filtering, the teacher begins to integrate the new technology into his or her curriculum, and filters the new technology through lenses of past experiences and beliefs. Next the teacher moves to the third stage of application, where the new technology is used in a variety of ways to plan and deliver instruction. During this stage, the teacher begins to use more advanced features of the new technology, moving them toward the fourth stage, integration. During the integration stage, teachers are at a high performance level with the new technology. They begin to use the new technology to enhance and support learning throughout their curriculum. Finally, in the fifth stage of reflection and evaluation, educators think about how effective their use of the new technology is throughout the teaching and learning process. Teachers grow professionally and adopt the new technology to support teaching and learning.
Robyler and Edwards (2000) suggested that teachers must determine specific contributions that computer tools can make in their classroom over other teaching/learning materials to justify not only the expense, but also the time involved in learning how to use computer tools. Technology is not static, so the need for training is unending and time consuming. Even with continuing training, learning to use technology is a difficult process. Both change and the acceptance of an innovation take time (Kalmbacher & Maxson, 2000).

Teachers’ beliefs and concepts about technology have an impact on the amount of technology implemented in their classrooms. A perennial difficulty for many teachers is finding the time and resources to implement educational technology in the classrooms (Iding, Crosby, & Speitel, 2002). This difficulty may be a conviction that the incorporation of instructional technology may involve more effort than it is worth, therefore developing a low-end technology user. Other variables may inhibit effective computer technology integration in the classroom as well. Teacher planning time may be limited and does not allow for the teacher to have the opportunity to research lessons that could be feasibly implemented into the content. Budgetary constraints, inoperable hardware, and limited access are inhibitors as well.

The reality is that given the pace of new developments in technology, many teachers and administrators look like the proverbial deer in the headlights when it comes to technological advancements (Nelson, 2000). Teachers are the principal dispensers of instructional technology in the classroom. Ultimately, the effective use of technology
depends on the knowledge and skills of the classroom teacher, without question the
person with the greatest impact on the learning environment (Tomei, 2002).

Definition of Terms

The following terms will be used in this study. These definitions are provided to
aid in providing an understanding of the terms utilized in the body of the text.

*High-end user technology integrator.* A teacher who (a) describes himself or
herself as being very experienced or an expert in computer usage, and (b) rates computer
usage in the classroom as very important.

*Midlevel user technology integrator.* A teacher who (a) describes himself or
herself as having a little or moderate amount of experience with computer usage, and (b)
rates computer usage in the classroom as moderately important.

*Low-end user technology integrator.* A teacher who rates computer usage in the
classroom as of minor importance or reports no use of computers.

*Computer-based technology.* In relation to this study, computer technology is
defined as the hardware and software used to produce, store, retrieve, and distribute
analogical or digital representations of information that are designed to target specific
learning objectives. It is not the design process in creating educational materials. This
definition is exclusive to computers only.

*Computer tools.* Computer tools refer to computer applications that are used in
classrooms to facilitate teaching and learning (Jonassen, 2000).
Curriculum integration of technology (infusion). The use of technology that involves the implementation of technology as a tool to enhance learning in a content area or multidisciplinary setting (ISTE, 2000a).

Technology. In this study the term technology refers to computer-based technology as defined above.

Technology integration. Technology integration is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information, and presents it professionally (ISTE, 2000a).

When one speaks of technology integration in the curriculum, it is typically considered learning about technology. That is students learn about the technological world that was created by inventors, engineers and other innovators. When technology is integrated into the classroom one generally speaks of learning to do technology. This concept goes hand-in-glove with integration into the curriculum, but can stand independently, also. When students learn to do technology, they are taught practical problem solving skills and are asked to practice those skills using the appropriate technological tools (International Society for Technology in Education, 2000a).

Theoretical Framework

The theoretical basis for this study will be grounded in change theory. What causes people to be resistant to change? Why are some people able to adopt new innovations while others are not? This process can be explained through theoretical frameworks. Two frameworks will be explored in order to describe phases or stages that individuals pass through during the change process. The social interaction model explains
change or the adoption of new ideas within any organization, while Fullan’s (2001) change theory described change within the school setting. These two frameworks are important for gaining an understanding for computer technology reform and implementation within educational organizations.

The social interaction model explained how the individual adopter moves through a series of decision phases referred to as the innovation adoption process (Havelock & Zlotolow, 1995). It further explained how the innovation is diffused throughout a social system and how this relates to the adopter. During the first phase, an individual develops an awareness of the innovation. This phase is followed by increased interest in the innovation with the individual seeking out more information about the new idea. The third phase is evaluation, during which time a decision is made whether to adopt or reject the innovation. The fourth phase is trial, followed by the final phase, adoption. Anytime during the phases, the decision to reject the innovation can be made.

Fullan’s (2001) change theory pertains to the individual and to the organization (e.g., school system). The change process consists of three phases: initiation, implementation, and continuation. Lasting change is achieved only if the third phase (continuation) is reached (Fullan, 2001). During each of these three phases, Fullan suggested that four issues must be considered within the organizational framework (i.e., school system) where the change is taking place: active initiation and participation, pressure and support, changes in behavior and beliefs, and the overriding problem of ownership or autonomy.
The change process is complex and difficult. It is not easy for a teacher to implement new innovations if the implementation of the innovation is not supported within the context of the work environment. Fullan (2001) pointed out that “change is a highly personal experience, [sic] each and every one of the teachers who will be affected by change must have the opportunity to work through this experience in a way in which the rewards at least equal the cost” (p. 127).

Assumptions/Limitations

It is assumed that the goals of the teachers in this study include their desire to be quality teachers and that goal may or may not dictate that they are exemplary technology users. A limitation to the study is the lack of an initial reliability analysis on the researcher-developed questionnaire. Although a pilot study was conducted, too little data were collected to provide a reliability analysis to guide the development of the instrument.

An additional limitation to the study is that no generalization to a larger population can be made due to the qualitative nature of the study. The original data collection plan provided for multiple data collection in order to provide triangulation while analyzing the results. Plans for videotapes, interviews, and questionnaires were made to accomplish this goal. However, the school district withdrew permission to videotape after the study was in progress, thereby compromising the triangulation plan.

Research Questions

The research questions and the accompanying hypotheses for the first two questions follow.