A Review of Computer-based Technology Integration in Urban and High Poverty Schools

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Abstract

Despite the fact that current reforms in education have place significant emphases on the integration of computer-based technology in the curriculum and the use of it to improve teaching and learning, researchers reveal that effective technology pedagogy that assists to increase student achievement is not always used in urban and high poverty schools. (Archer, 1998; Williams, 1999; Daniel, 2003) If this is the case, those students that could use the most assistance to improve academically are not receiving the most effective method of instruction when technology is integrated in the curriculum. Researchers have also determined that it is necessary to provide on-going, site-based support and assistance in order for teachers to integrate effectively computer-based technology into the curriculum. Therefore, this paper will focus on the use of technology and technology pedagogy in urban schools, effective technology pedagogy, and suggest a model for professional development to integrate technology.

Introduction

In a quest to improve pre-service and in-service teachers' overall knowledge as to the use of effective pedagogy for the improvement of students' achievement, this paper will focus on the use of technology and technology-based pedagogy in urban schools. Despite the fact that current reforms in education place significant emphases on the integration of computer-based technology in the curriculum and the use of it to improve teaching and learning, researchers reveal that effective technology pedagogy is not always used in urban schools. (Archer, 1998; Williams, 1999; Daniel, 2003) If this is the case, those students that could use the most assistance to improve academically are not receiving the most effective form of instruction when technology is integrated in the curriculum.

The International Society for Technology in Education (ISTE) initiated the National Educational Technology Standards (NETS) Project (1998) that created Standards for Students that would produce students that are capable of using technology effectively to increase achievement. The following scenario was given as an example of the effective use of technology in an class:

> Lakeisha's eighth-grade class began a unit on rocks and minerals. They explored topics using CD-ROM encyclopedias, stored both the information they found, and results from their laboratory sessions, including a weeklong rock-simulation program, in their databases. When their studies were complete, Mrs. Perkins helped the students create HyperStudio presentations to share with the class. She also found an Internet site called "Ask a Geologist." Lakeisha and her classmates were then able to e-mail questions about rocks and minerals to the geologists who were sponsoring the site. Lakeisha and her friends were fascinated with the information they received on rocks and minerals in their native area. Lakeisha's science teacher organized a local geologic dig to help students begin their own rock and mineral collections. (p. 14)

In reading the above quote, one can clearly understand how the effective use of computer-based technology pedagogy can increase students' achievement. However, the scenario is quite different in most urban schools.

In the fall of 2002, I began my tenure at Dillard University as an assistant professor of middle level education. The first course I taught was a teaching methods course for mathematics and science. With the notion of the Internet being "an equalizer of knowledge" and effective computer-base technology increases student achievement, I was determined that my students would become masters at using technology effectively to maximize student achievement. I began this process by creating partnerships with the area middle schools. The majority of middle schools near the university had received a low rating because of several reasons, but the main reason for the low ratings was low performance on standardized tests. All but three of the middle schools in the parish are in corrective action.

In spite of this fact, I was informed by the distinguish educator (a professor from a nearby university placed at the school sight to assist with professional development of the teachers) at one of the schools that this allowed the schools with a low rating to get additional help that might not have been available before the rating system was in place. In addition, the schools received limitless amounts of new technology to integrate into the curricula and all of the eight grade teachers received a laptop computer for each student to use with Internet connection and access to Compass Learning Software (which is content-oriented computer-assisted instruction).

Although, the schools had received a large quantity of new technology, through interviews and observations I only witness the teachers using the laptop computers with the computer-assisted instruction software. I also observed the mathematics teacher using calculators. When one of the mathematics was asked if he planned to integrate computer-based activities in addition to the calculators, the teacher responded by saying, "I can barely get them to use the calculators. I am not familiar with using computers." He further commented about the twelve new computers in his class and stated that he was not familiar with integrating the use of them into the curriculum and that he was afraid that the students would destroy them. Therefore, he had not use them for instruction.

The Impact of Computers on Education

Computer use has dramatically improved teaching methods and instructional effectiveness, according to Roblyer (1989). Roblyer studied the effectiveness of computer use in the educational system on student achievement, attitudes, dropout rate and learning time. At the time of Roblyer's study, computers had been used in education for nearly 25 years and the impact of this technology on student achievement, attitudes, dropout and learning time were largely unknown.

Roblyer reported in 1989 that computer applications seemed to have slightly greater effects with mathematics than with reading and language skills, although this difference was not significant. The effect of computers used to teach cognitive skills (problem solving and critical thinking) was about equal to mathematics and reading/language. Using computers to teach science had the highest effect and tutorials used in reading had a positive effect. As Roblyer concluded in 1989, insufficient data exist to indicate that computer-based instructions have any impact on dropout rates. (Roblyer, 1989)

Contrary to Roblyer's findings, Liu, Macmillian and Timmons (1998) "found that there was no significant effect of computer integration on achievement. Although positive attitudes toward computers were high both before and after the computer integration." (p. 189). Liu, et al. (1998) reported that "students perceived using computers as having a positive effect on their learning." (p. 189) In the Liu, et al. study students perceived the impact of computers on achievement quite differently. One student claimed: "Yeah, I'd say that [made me a better

biology student];" "Another student stated that teachers might have given better marks to his assignments because they were typed with a word processor" (p. 197) and a student with dyslexia who had trouble reading and writing, found that typing projects on the computer and using the spell check helped to improve grades.

However, Liu, et al (1998) reported other students were not quite so sure computer integration aided in improving their grades. "One student, when asked if computers had increased his grades, said, 'I don't know. I've always used . . . Like, I've always been a computer person, so . . . ' It appears that not all students felt that computers helped improve their grades. Most . . . agreed that computers had a great potential to help them in their subjects." (p. 198).

Liu, et al (1998), National School Boards Foundation (2001) and Roblyer (1989) discovered that students' attitudes were the most significant variable studied. Attitudes toward school, subject matter, self-image and self-esteem were improved.

> Not only is the Internet influencing how students are learning, it also is influencing attitudes about learning–in a positive way. Forty-three percent of nine- to 17-year-olds with access to the Internet in their schools says the Internet has improved their attitudes toward school, including 17 percent who say it has improved their attitudes a lot. Almost all of the other 57 percent say the Internet has not changed their attitudes about school at all. The Internet has had a strong positive effect on school attitudes among a broad range of children, including low-income 9- to 17-year-olds (59 percent of school Internet users in this group cite a positive effect); children in large families (63 percent cite a positive effect); children in single-parent households (54 percent cite a positive effect); and African-American children (35 percent say the Internet has had a very positive effect). (National School Boards Foundation, 2001 p. 2)

Positive Findings on Computer-based Instruction

In a report on the "Impact of Education Technology on Student Achievement" Schacter (1999) reported the following positive findings:

- On average, students who used computer-based instruction scored at the 64th percentile on tests of achievement compared to students in the control conditions without computers who scored at the 50th percentile.
- Students learn more in less time when they receive computer-based instruction.
- Students like their classes more and develop attitudes that are more positive when their classes include computer-based instruction. (p. 4)
- Students in technology rich environments experienced positive effects on achievement in all major subject areas.
- Students in technology rich environments showed increased achievement in preschool through higher education for both regular and special needs children.
- Students' attitudes toward learning and their own self-concept improved consistently when computers were used for instruction.
- The Apple Classrooms of Tomorrow (ACOT) experience appeared to result in new learning experiences requiring higher-level reasoning and problem solving, although the authors claim this finding was not conclusive.

- ACOT did have a positive impact on student attitudes and did have an impact on changing teacher-teaching practices toward more cooperative group work and less teacher stand-up lecturing. (p. 5)

Technology use in Urban Schools

From the listed positive finding on computer-based instruction, it is imperative for teachers to use technology in methods that are most effective for improving the achievement level of all students, especially those in urban schools. Since a larger number of students in urban schools scores lower on standardized tests than students in other school environments, teachers in urban schools should be competent in effective technological pedagogy.

Current researchers are using the National Educational Technology Standards (NETS) for Teachers and Students (1999) as a guide to determine the effectiveness of computer-based instruction; this researcher will present an overview of the use of technology in urban schools revealed by current literature. In which, these finding reveal that technology is more likely to be used ***ineffectively*** in urban school setting that have 50 percent or more of its students receiving free and reduced lunch (Daniel, 2003; Lanahan, 2002; and Marshall, 2001).

The United States Department of Education (2000) conducted a study on "the use of technology as a catalyst for change in ways that better support the acquisition of higher-order skills by all students." (United States Department of Education, 2000 p. 4) This research project revealed that:

> Technology can have a particularly significant impact on the schooling of economically disadvantaged students, whose educational experiences frequently have stressed repetitious rote drill on lower-order skills, with relatively little attention to the areas of comprehension, problem solving, composition, and mathematical reasoning that will support both higher education and effective functioning in the real world. (p. 4)

Computers have become a necessary part of our society. Almost every business or company depends on computers to help them function efficiently. It is important that students are exposed to effective technology pedagogy and develop the ability to use computers effectively at an early age. Early exposure can help students gain the computer literacy that will be critical for future success in the workplace. "Access to computers allows students to retrieve information, manipulate data, and produce results efficiently and in innovative ways. Examining the extent to which students have access to computers at home and at school may be an indicator of how well prepared students will be to enter an increasingly technological workplace." (National Center for Educational Statistics, 1999, p. 1).

In 1999, Williams using data from the US Department of Education reported that 95 percent of all public schools had Internet access. Despite this fact, only 47 percent of the teachers in schools reporting 50 percent to 70 percent free and reduced lunch use computers or the Internet for instruction during class time. While 63 percent of the teachers with less than 11 percent free and reduced lunch reported using computers and the Internet for instruction during class time, teachers in schools that reported less than 6 percent minorities used computers and the Internet for instruction during class time. Teachers with more students on free and reduced lunch reported having less access to the Internet and less technology integrated into the curriculum.

Furthermore, a report from the National Center for Education Statistics (1999) revealed that teachers with a large number of students receiving free and reduced lunch (50% or more) reported receiving less support, training, and assistance than teachers in schools with 11 to 30 percent (see table below). Moreover, when a support system was in place, the percentage of

computer use increased, as well as teachers using computers for long-terms. This applied to all types of schools.

Consequently, when long-term effective technology pedagogy is used, researchers have revealed that student achievement level increase in all school types. As a result, long-term use is only shown for those teachers receiving on-going, site-based support and assistance (Lanahan, 2002; and Marshall, 2001).

For that reason, this project sought to train in-service teachers and pre-service teachers to work collaboratively to use technology effectively in instruction. Thereby, giving them the on-site support and assistance necessary to implement the technology and to monitor students' achievement to determine whether or not effective technology pedagogy has a positive effect on student achievement and to determine whether these conditions will increase teachers' long-term use of computers for instruction.

Percent of public school teachers reporting the availability of various Internet-related resources, by selected school characteristics: 1999

School characteristics	Teachers reporting the availability of resources: Classroom-level access to the Internet	Training in use of the Internet	Assistance in use of the Internet	Training and assistance in use of the Internet, and classroom-level access to the Internet
All public schools	**53**	**80**	**75**	**43**
Percent of students eligible for free or reduced-price school lunch				
Less than 11 percent	57	90	82	48
11-30 percent	60	85	79	49
31-49 percent	56	86	79	44
50-70 percent	44	72	72	33
71 percent or more	44	67	62	36
Percent minority enrollment				
Less than 6 percent	58	82	76	46
6-20 percent	61	87	79	50
21-49 percent	55	83	81	44
50 percent or more	40	70	65	31

NOTE: Teachers who reported that the Internet was not available to them anywhere in the school were excluded from the analyses presented in this table.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System, "Public School Teachers Use of Computer and the Internet," FRSS 70, 1999.

Educational Importance of the Computer-based Instruction

It is important to train in-service teachers with effective technology pedagogy, but pairing pre-service teachers with in-service teachers to mentor and assist train pre-service teacher candidates in effective technology pedagogy is a necessity. The most efficient method is when an in-service teacher collaborates together to develop a technology rich curriculum with a pre-service teacher candidate. (American Association of Colleges for Teacher Education, 1998) Through the mentoring process, in-service teachers will benefit from assisting pre-service

teachers to implement their technology projects in the field. This component is especially important in pre-service teacher candidates' education because both parties work together to develop and understand the importance of the use to technology in urban schools and the effectiveness of technology in these educational settings.

There should to be a focused on recent research finding that reveals when technology is integrated effectively the level of student achievement increases. In most urban schools, technology is used ineffectively and student achievement is not affected by the integration of technology. Student achievement for students in urban, high poverty schools does not improve at the level of suburban schools with low poverty levels (Daniel, 2003; Lanahan, 2002; and Marshall, 2001). Mainly, this is in part to the pedagogical methods used with technology; particularly, teachers in urban schools where teachers are not trained effectively to use technology.

A Milken Foundation report by John Schacter (1999) revealed that the impact of technology is positive on student achievement when teachers are properly trained to integrate technology into the curriculum. These increases was due to the "new learning experiences requiring higher level reasoning and problem solving" of students in classes that had teachers who had completed training to change there teaching practices when using and integrating technology into the curriculum. The results of this study will confirm that with adequate training teachers in urban, high poverty schools can effectively use technology to improve students' achievement levels. Although all of the parts to the equation must be in place, these are: effective professional development; on going, on-site support; time to plan, research, develop and organize lessons and activities; and assistance with implementation of curriculum.

It would be a tragedy if technology reform in urban schools became a mirror image of the "pedagogy of poverty" that is used most often in urban schools. (Haberman, 2004) This theory suggests that instruction in urban schools do not incorporate methods that encourage high-order thinking skills that are needed in later life for higher education and the workplace. Presently, researchers are discovering similar findings about the integration of technology in urban schools; it does little to promote higher-order thinking skills in students. Researchers have revealed that effective technology use is more likely to be implemented long-term when the teacher is supplied with on-site technology assistance and support. Daniel (2003) suggests that urban schools have taken on a "technological pedagogy of poverty" in its use to computer-based instruction and use of technology. (Daniel, 2003; Lanahan, 2002; and Marshall, 2001; Williams, 2000)

Suggested Professional Development Model

In order to prepare teachers in urban schools to integrate technology effectively in the curriculum on long-term bases, a series of workshops on effective technology integration was developed to train teachers how to plan, organize and implement the use of computers and technology successfully. During the summer of 2003, a pilot workshop was conducted to test the model of professional development. For this pilot workshop, university faculty volunteered to participate. They used their syllabi, textbooks and course outcomes to integrate technology in courses. The participants were able to update their syllabi and assist in the study by giving valuable feedback on the structure of the workshop and suggestions for improvement. The model developed to facilitate the workshop consists four simple phases with two sessions (morning and afternoon) that span a period of four days, allowing one day for completing each phase (see chart):

Phases	Technology Workshop Activities
Phase One **Introduction to Technology Pedagogy And Connecting Goals and Objectives**	**Session One** • Introduction to the difference between effective and ineffective technology pedagogy • Introduction to performance-based goals and objectives • Develop collaborative teams by content areas
	Session Two • Participants worked collaboratively in teams to create performance-based technology connected goals and objectives – based on course outlines, curriculums, textbooks and student outcomes
Phase Two **Research, Plan, and Integrate Technology**	**Session One** • Participants are introduced to online resources for creating performance-based activities
	Session Two • Participants work collaboratively to brainstorm, plan and integrate electronic resources into student assignments and activities
Phase Three **Develop Performance-based Assessment**	**Session One** • Participants are introduced to performance-based assessment, creating assessment rubrics and online resources for developing activities and rubrics
	Session Two • Participants work collaboratively to research and develop assessment rubrics for student assignments and activities
Phase Four **Sharing Lessons, Assignments, Activities and Ideas of Implementation**	**Session One** • Participants work individually and collaboratively to complete assignments and activities.
	Session Two • Participants spend the afternoon sharing lessons, assignments, and activities developed for students. • Participants share ideas of implementing plans to integrate electronic lessons, assignments, and activities developed for students. (mini-presentations and discussion)

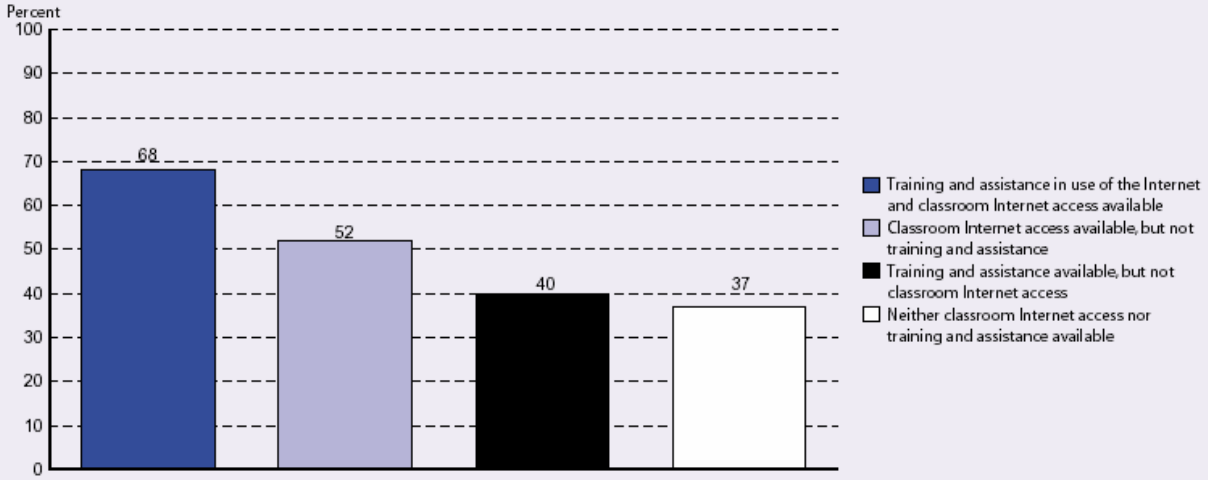
Outcomes of Workshop

Upon completion of the workshop, participants completed the following activities:

1. Developed a collaborative team, for support, with colleagues in the same content area.
2. Revised goals and objectives of their courses to include performance-based technology activities.
3. Created technology-based assignments and activities for students.
4. Created performance-based assessment and rubrics.
5. Participants are presenting revised syllabi to colleagues in a series and support roundtables and follow-up sessions.
6. The final stage was to provide participants with on-going, site-based support and assistance to implement the lessons (Lanahan, 2002; and Marshall, 2001). A technology committee was developed continuing support and assistance.

Just as illustrated in Figure 1 below, when teachers are given the proper training, assistance and support technology can be effectively integrated into the curriculum.

Figure 1.—Percentage of teachers reporting use of computers or the Internet for instruction during class time, by availability of resources: 1999



NOTE: For this figure, the training and assistance variables were combined into one dichotomous variable that indicated whether or not both training and assistance were available. Teachers who reported that the Internet was not available to them anywhere in the school were excluded from the analyses presented in this figure.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System, "Public School Teachers Use of Computers and the Internet," FRSS 70, 1999.

Conclusion

In order for teachers to integrate technology effectively into the curriculum, effective professional development must take place. Teachers need to understand clearly the significance of technology integration and its effect on students' achievement. A simple and effective model for training, providing on-going support and assistant is essential to teachers implementing effective technology pedagogy. Just as important, teachers should be allowed time to develop lessons that promote higher-order thinking skills is paramount in the success of technology reform. Developing new lessons, assignments and activities is very time consuming. One needs large blocks of time to plan, research and implement a new teaching strategy. The professional development model developed for this research is designed to allow teachers planning and implementation time. Teachers immediately apply the knowledge and skills acquired in the

workshop by developing lessons, activities and assignment during the workshop. Participants are not given days of information with no time for reflection and discussion. Teachers are taught a method or technique and are given time to reflect, discuss research, plan and implement the new teaching methods and techniques. (Monke, 1999)

Workshop evaluations from the participants express gratitude for having time during the workshop to plan, research, develop and discuss implementation. In addition, participants said they had a better understanding of the importance integrating performance-based technology activities and assignments into the curriculum.

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