

2000

## Technology in education : is it working?

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### Recommended Citation

Hartwig, Daryl, "Technology in education : is it working?" (2000). *Graduate Research Papers*. 806.  
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## Technology in education : is it working?

### **Abstract**

Presents an overview of determining if implementation of technology into classrooms of schools is a significant factor in the increase in student learning. Results in technology assessments as well as the comparing and contrasting of traditional learning versus constructivist learning by ways of technology are closely examined. Successful guidelines for the implementation of technology into classrooms are also discussed in showing their important relationship in the enhancement of student learning. The end results are that there is much evidence which proves that the integration of technology into the classroom of schools is advantageous and therefore draws upon the conclusion that technology does improve student learning.

TECHNOLOGY IN EDUCATION: IS IT WORKING?

A Graduate Research Paper

Submitted to the

Division of Educational Technology

Department of Curriculum and Instruction

in Partial Fulfillment

of the Requirements for the Degree

Master of Arts

UNIVERSITY OF NORTHERN IOWA

by

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August, 2000

This Research Paper by: Daryl Hartwig

Title: Technology In Education: Is It Working?

has been approved as meeting the research requirement for the Degree of Masters in Arts Education.

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## Table of Contents

Chapter	Page
I. Introduction.....	1
Research Question.....	2
Terms.....	2
II. Review of the Literature.....	3
III. Conclusion.....	12
IV. References .....	15

## Introduction

Viadero (1997) states that during the past ten years, many changes have taken place in public schools. The latest change has been that of implementation of technology into the classrooms. Although school rooms really have always had types of technology - chalkboards, overheads, televisions and vcrs, and even the simple pencil - the most recent technological advances are the ones that are creating most of the debate in school systems today. These latest advances range from the basic computers, web pages, CD-ROMs, to new ways of presenting material, such as Powerpoint presentations. Truly, a new wave of education has emerged in our present day schools. Mostly, just within the past five years (p. 12). Why so much talk and even debate about this new technology? The main reason for the implementation of the most recent technology is that students in these classrooms are thought to be learning as well and even better than in more traditional classrooms in earlier years. But, is this the case? Schacter (1999) explains that legislators, governors and other policymakers each year make difficult choices among a variety of educational improvement plan options. Whether to invest in class size reduction, teacher training, textbooks, or modern technology are some of the decisions they must face. The need to report and investigate the state of technology in the schools is more important than ever. Billions of dollars are being spent each year in an effort to provide schools the resources and equipment to allow teachers and students to be part of the information age - to be better learners (p. 3).

### **Research Question**

Is technology in education enhancing student learning in today's school systems?

### **Terms**

**Educational Technology:** A tool; a means to an end with endless specific implementation possibilities (Glennan and Melmed, 1996).

**Traditional Learning:** Closely allied with the basic organizational basics of school - books, lecturing, testing, one teacher (Sandholtz, Ringstaff, and Dwyer, 1997).

**Instructional Technology:** The theory and practice of design, development, utilization, management and evaluation of processes and resources for learning (Seels and Richey, 1994).

**Constructivist Learning:** Learning is not only a matter of transferring ideas from one who is knowledgeable to one who is not. Instead, learning is perceived as a personal, reflective, and transformative process where ideas, experiences, and points of view are integrated and something new is created - a view where teacher work is construed as facilitating individuals' abilities to construct knowledge (Collins, 1991).



### Literature Review

Jobs (cited in Winans, 1996) stated that “What’s wrong with education cannot be fixed with technology. Lincoln did not have a Web site at the log cabin where his parents schooled him”(p. 1). Are comments like this accurate or do schools need the latest technology to help students achieve more in their education? At Maxwell Middle School in Tucson, Arizona, one will find many people quite eager to answer this question. Maxwell is said to be one of few schools in America where “classroom” and “technology” now go together almost as seamlessly as blackboard and chalk (Winans, 1996, p. 3).

The Maxwell system of combining the regular classroom with technology is basically set up this way. This school hosts 600 students--and 423 computers. Each seventh and eighth grade classroom contains about 20 PCs, networked and a full range of workplace and educational software. All of this software is integrated into Maxwell’s staff-driven curriculum which includes reading, writing, thematic instruction, and cooperative learning. The results are impressive. Winans (1996) stated the following:

In the 1995-1996 school year, Maxwell seventh graders--of all abilities--registered an impressive four-year boost in their Iowa Test scores, averaging 8 percent gains in English, 10 percent in reading, and 12 percent in math. Learning was made relevant to the kids. With many things going on in the kids lives, the school needed to show them what skills they needed to keep on moving to be life-long learners. What made the difference? The technology. (p. 2)

Maxwell Middle School is a prime example of where technology certainly enhanced student learning. Another example is the research created by the Milken Exchange on Educational Technology. Schacter (1999) described what was called the "Sivin-Kachala's Review of the Research":

Jay Sivin-Kachala reviewed 219 research studies from 1990 to 1997 to assess the effect of technology on learning and achievement across all learning domains and all ages of learners. From his analysis of these individual studies he reported the following consistent patterns. First, students in technology-rich environments experienced positive effects on achievement in all major subject areas. Second, students in technology-rich environments showed increased achievement in preschool through higher education for both regular and special needs children. Lastly, students' attitudes toward learning and their own self-concept improved consistently when computers were used for instruction. (p. 4)

A "technology-rich" environment is the key to what Schacter described in his article about Sivin. So, if this is a key in technology efficiently increasing student achievement, what is considered to be a "technology-rich" environment?

In the book titled "Fostering The Use Of Educational Technology: Elements of a National Strategy," the authors Glennan and Melmed (1996) discussed what they believe were qualities that are shared by technology-rich schools:

1. Each of the schools is "learner-centered," placing emphasis on the individual treatment of students according to their needs and capabilities.

2. Each of the schools seemed to utilize and emphasize curriculum frameworks to ensure that the goals for student outcomes were clearly understood.
3. Each of the schools had a density of computers that far exceeds that which is common in schools today.
4. All the schools had restructured programs substantially.
5. Each of the school programs appeared to be the product of a fairly concentrated development effort.
6. Each school's development was pushed forward by an initial increment of external funding.
7. Relations among adults in the schools appeared changed. (p. 32-34)

A prime example of a school system that clearly integrated these seven qualities of Glennan and Melmed was described by Schacter (1999). He referred to a study done by Dale Mann (1999) of West Virginia's Basic Skills/Computer Education (BS/CE) program. This program analyzed a sample of 950 fifth-grade students' achievement from 18 elementary schools across the state of West Virginia. Since 1991-1992, these fifth-grade students had been participating in the West Virginia BS/CE program. Data was also collected from 290 teachers to show what influence that West Virginia's Integrated Learning System technology had on students and their achievement in school. The Integrated Learning System technology focused its teaching on spelling, vocabulary, reading and mathematics.

Schacter explained that several variables were collected and analyzed i.e. significance of Basic Skill/Computer Education (BS/CE), student prior achievement and sociodemography, teacher training, teacher and student attitudes towards BS/CE. The following are the findings in the program. First, the more students that participated in BS/CE, the more the students' test scores rose on the Stanford 9. Second, the greatest achievement gains were brought about by consistent student access to the technology, positive attitudes towards the technology (by both teachers and students), and teacher training in the technology. With BS/CE, all students' test scores rose on the Stanford 9 with lower-achieving student scores rising the most. Lastly, although the relative disadvantage of girls is a regularity of the technology literature, girls and boys did not differ in achievement, access, or use of computers in the West Virginia study.

Effective technology integration can make a difference in student learning in significant ways. Rein (1997) explained that the Apple Classrooms of Tomorrow (ACOT) research project, conducted from 1985 to 1995, looked at the impact of technology on teaching and learning, and found that effective technology integration facilitated student improvement in a variety of skill identified as essential to prepare today's students for tomorrow's world. Rein (1997) stated that The SCANS Report, published in 1991 by the U.S. Department of Labor, identified, in addition to traditional basic skills, the following vital skills for tomorrow's workforce: Personal Qualities - individual responsibility, self-esteem and self-management, sociability, and integrity; Thinking Skills - the ability to learn, reason, think creatively, make decisions, and solve problems.

The ACOT studies concluded that technology, when used appropriately, can help facilitate an increase in collaboration, problem solving and experimentation, social awareness and independence, and positive orientation toward the future.

An example stated by Potosky (1997) explained an example of student self-esteem:

A middle school teacher, Dwayne Hughes, sees his student's self-esteem rising as they progress through his technology lab at Stevens Middle School, an urban school near Seattle, Washington. He recalls parents who asked whether he thought their son, who had completed the computer assembly module, could be trusted to upgrade their computer's memory. Hughes advised them to let their son take the case off the computer and demonstrate his knowledge. "The next day, that student's chest was puffed up several sizes with pride," he reports (p. 4).

Along with these factors being directly related to increasing student learning, another factor that also goes hand in hand with increase of student learning is that of "constructivist" learning. During the last ten years, an emergence from "traditional" classroom settings to more "active" or "constructivist" classroom settings has come about. Constructivist learning, technology, and student learning in the classrooms seem to come upon the schools hand in hand and side by side (Viadero, 1997, p. 3).

Going back to Potosky (1997) who describes the same teacher, Dwayne Hughes, in explaining and advising other teachers contemplating the move to technology is to reinvent their role and become facilitators and coaches rather than holders of all the knowledge. In other words, to use a more “hands-on” and “active” approach for student learning rather than the traditional teaching methods.

Winans(1996) described a teacher making use of the “constructivist” learning style:

Some of the kids I taught last year wouldn't make it in a traditional pen-and-pencil school setting. Now, they can go to the bounds of their imagination and have pride in a finished product. Students become more independent learners with resources like the spell checker at their fingertips. The students do not need the teachers as much. Through use of a more “hands-on approach to learning, the classroom computers foster teamwork, build self-confidence, and prepare students for the workplace.(p. 3)

If technology is to be effective in raising student learning, another factor is essential. Many educators claim that “how” the technology is used is very important. Viadero (1997) explained that the key point is simply this - it depends on how the technology is used in the classrooms. Many experts, after being asked if technology can improve schooling, have responded immediately with, “It depends.”

“It's kind of like asking, ‘Are pencils effective?’ It depends on what you're doing with them,” stated Ted Hasselbring, co-director of Vanderbilt University for Learning and Technology (cited in Viadero, 1997, p. 13). The underlying point is that a teacher could use technology in a very effective way, a very poor way, or simply not use technology at all in his or her classroom.

O'Riordan (1999) explained the following to confirm effective use of technology in increasing student learning. According to O'Riordan (1999), the way computers are used have a lot more to do with their impact rather than whether they are used in schools or not used in schools. A point of emphasis is that schools should not be trying to figure out ways to use computers. Instead, schools should be planning strategies for raising achievement levels for all students and using technology as a tool in the process. Many of the studies O'Riordan (1999) selected for review were large in scope, and applicable to local, state and national audiences.

"We analyzed the five largest scale studies of education technology to date," says John Schacter, Ph.D, of the Milken Family Foundation and author of the briefing, "and also two smaller studies that point to the promises newer technologies afford. Although the studies that are mentioned positively demonstrate the impact of technology on student achievement, they do not address an issue critical to the success of technology: evaluating a school or district's current performance in an academic area, selecting standards, and then choosing an appropriate technology or technologies to meet those standard. The briefing offers cautious optimism to educators and policymakers considering investments in education technology. It suggests that there are ideal classroom environments in which technology can be helpful and lead to improved test scores. "The goal of education technology should not be to throw a bunch of computers into classrooms. We want to see effective uses of these tools. More extensive analyses will be needed as we get closer to that goal, but the reports we have selected here provide a very good starting point," stated Cheryl Lemke (cited in O'Riordan, 1999, p. 1), who is executive director of The Exchange.

Schacter (1999) reviewed “Kulik’s Meta-Analysis Study”, which is based upon computer-based instruction and had these positive conclusions in favor of technology enhancing student learning. First, on the average, students who used computer-based instruction scored at the 64th percentile on tests of achievement. This was compared to students who were in control conditions without computers who only scored in the 50th percentile. Second, students learned in less time when they received computer-based instruction. Lastly, students were found to like their classes more and develop more positive attitudes when their classes actually included computer-based instruction.

Not only did this indicate that student learning was increased by technology, but there was the emphasis on other areas that helped bring about the increased student learning such as the positive outlooks upon computer-based instruction.

In terms of examples of raised student learning in low-income Hispanic students, there is the Tornillo Elementary School case study. Stevens (1999) explained the situation and conclusion at this school. Stevens explained that Tornillo is a public school located near El Paso, Texas and consists of over 98% of students who are Hispanic and more than 96% who are economically disadvantaged. Two reading software packages were introduced to Tornillo. The basic premise of the software was to foster improvements in basic reading abilities such as visual coordination, visual memory, and concentration. Stevens stated the following conclusions after one year on this program:



Several of the teachers I spoke with reported that they believed the reading software to be effective in improving the students' reading ability. One teacher commented that since the English language has certain sound structures that do not exist in Spanish, it is particularly difficult for the children to develop proficiency with the language. One of the reasons that it works is that it does so much repetition. It never gets tired like a teacher might. Let's say a student can't hear the 'e' and 'I' sounds. By about the third time they have gone over it in class the teacher is about to quit. But the computer just keeps saying good job, try again, and in a voice that doesn't get rattled. (p.1)

As mentioned earlier, technology has had very positive effects on student learning. Furthermore, independent researchers have found that students in the ACOT classrooms not only performed well on standardized tests but were also developing a variety of competencies not usually measured. ACOT students were found to explore and represent information dynamically and in many forms, become socially aware and more confident, used technology routinely and appropriately, became independent learners and self-starters, worked well collaboratively, and developed a positive orientation to the future (Glennan, Melmed, 1996).

Glennan and Melmed (1996), went on to explain that at the program, project, and classroom level, there is solid evidence that instructional activities making intensive use of technology can lead to definite improvements in student learning. As is the case with any educational program, the success of technology-based applications depends upon the quality of the implementation.

## Conclusion

In conclusion, it is clear that technology implemented effectively into school systems can indeed increase student learning. The key word here is “effectively.” As we have seen from examples from school districts around the nation, when technology is introduced to classrooms in an organized and efficient manner, where clear objectives are presented, technology is definitely effective.

As presented, there are some critical factors which influence very strongly an organized and efficient manner of introducing technology into classrooms. One of these was Glennan and Melmed’s (1996) Seven Characteristics of “Technology-Rich” schools. Points of emphasis to remember here were that classrooms need to be “student-centered” or “learner-centered” in order for technology to be effective. Traditional learning compared to constructivist learning is a key item in this characteristic. Consistently throughout our explorations of classrooms around the the nation, it appeared that students were taking a very active role in their own learning. It is obvious that in order for students to be life-long learners, be active in their own roles in their future occupations, and for technology to take an active part in their increased search for knowledge, the constructivist approach is elemental.

Another factor that was discussed in technology’s part in improvement of student learning was that the increasing of student self-esteem and his or her own positive outlook on technology.

A student who is able to achieve success in a particular area of technology can raise his/her self-confidence dramatically, as was discussed by Potosky (1997) and by the middle school teacher, Dwayne Hughes. In this particular circumstance, the student was able to master the skill of upgrading computer memory. Not only did this skill improve his self-esteem, but he was able to acquire a skill that his parents did not have. In this case, the student's parents did not have the knowledge or experience to upgrade the computer's memory which led to the student being able to do the job. Technology can be a very positive motivator for students. Does technology increase student learning? Any factor that provides people with a positive outlook on something, will in most cases go hand in hand with improvement.

A factor that may summarize all of the indicated results which have been discussed, is that of technology being a tool in schools' quests for improved student learning. Sometimes we look upon the area of technology as being the magical solution for problems schools are faced with.

Individuals feel that just the mere act of adding technology to a curriculum and classroom with in itself solve the problems that a school may be facing and increase student achievement. This is not the case. Technology can raise student learning. But, it must be used correctly as emphasized in Glennan and Melmed's (1996) Seven Characteristics. As with any tool, it can be used in a good way and it can be used in a bad way.

Just as with the chalk board and overheads that most classrooms have. These can be used to definitely help student learning. But they can also be used in ways that may not enhance student learning. Calculators in the classrooms are another example. Calculators have been around for some time. Do they help student learning in math? Again, it depends. Are they being used in a way that aids learning and can enhance as, for example, use of graphing calculators to show various relationships between linear equations? Or are they being used in classrooms or being allowed to be used in a way that is not going to help student learning. For example, are students being allowed to use calculators for basic math facts, where in the end calculators would even be a major negative instead of positive for student learning.

Technology can increase student learning. However, as with anything, it depends on how it is used. There is one aspect for certain. If technology is used appropriately, results show that it is one of the most powerful tools in the classroom that we have to prepare students for their future.

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