Effective uses of technology in the classroom

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Abstract
Research Questions: How is technology being effectively used in the elementary, middle, and high schools both by the teachers and the students? What are some effective pieces of software students are utilizing in their learning? What is the best way to integrate technology into the curriculum?

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Effective Uses of Technology in the Classroom

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Division of Educational Technology
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Titled: *Effective Uses of Technology in the Classroom*,
has been approved as meeting the research requirement for
the Degree of Master of Arts.

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CHAPTER ONE

Introduction

Technology refers to all of the ways people use their inventions and discoveries to satisfy their needs and desires and to make work easier. Technology is concerned with making things happen. The expansion of technology in education has educators and non-educators concerned with the effectiveness of its use. The message, "the success of our nation will depend on our students' ability to acquire the skills and knowledge necessary for high-tech work" is a thought repeated as each new technological advance has come down the pipeline (Riley, Kunin, Smith, and Roberts, 1996). Acquiring skills through various technology products has been an ongoing concern for educators as they equip students to live in the information age.

Technology is being promoted in many facets of the educational field. Students are becoming more and more knowledgeable in the area of technology. They are inquisitive about computers, their functions, and the tools that go with them. Technology in education increases the relevancy of content to the children, provides for enthusiasm in learning, and exhibits an improvement in test scores. Using technology in the classroom helps to build confidence in their ability to learn. Children receiving information both orally and visually are more likely to
retain what is being taught, thus increasing their test scores (Milone, 1998). A concern among many adults (teachers, parents, community members) is the age at which technology is being introduced to children, the extent to which the children must acquire skills at various grade levels, the effectiveness of the technology within the curriculum, and the proficiency of the skills being retained.

Research questions

How is technology being effectively used in the elementary, middle, and high schools both by the teachers and the students? What are some effective pieces of software students are utilizing in their learning? What is the best way to integrate technology into the curriculum?

Terms

Effective use: A desired outcome.

Integration: To join with something else, unite.
(The American Heritage Dictionary, p.436)

Multimedia: Combination of text, sound, and video used to present information in ways that bring pages of information or ideas to life.
(Mandell and Mandell, 1996, 238)

Software: Programs used by the computer.
(Mandell and Mandell, 1996, p. 239)

Technology: Application of skillful methods and materials.
(The American Heritage Dictionary, p.830)
CHAPTER TWO

Literature Review

To succeed in the society of the twenty-first century, today’s students must graduate with more than the memorized knowledge of the past. They must be able to synthesize and analyze information. Today’s students must learn to think for themselves and be able to adapt to a world in which the only constant is rapid change (Bracey, 1996). Effective use of technology by both educators and students will allow for people to think for themselves, synthesize and analyze information, and become problem solvers. When the basic possibilities of how computers can be used in the classroom are understood, parents and educators can better analyze their use in the schools.

Computers may enhance specific content areas of the curriculum, such as reading/language arts, math, science, social studies, and English as a Second Language. Several ways computers can be used in the schools are for demonstrations, classroom work by students, as tool laboratories, networked instruction, integrated learning systems, writing laboratories, distance learning, and telecommunications (Smith, 1995).

There are many software programs that can help children learn skills, these are usually drill and practice programs that help children refine their existing skills. It is here
that the software, not the computer, is doing the teaching. Another application takes advantage of the computer's ability to simplify tasks. People who use word processing programs understand what this means almost immediately, for no longer must they retype entire pages to accommodate for editing changes (Welton, 1998).

A California school district tells how they use computers in their classrooms to embellish learning:

The classroom computers are used primarily to reinforce writing skills. Having a small classroom computer lab enables students to do authentic writing, writing that will be read by someone else on a daily basis. Some of these activities include: journal writing, finishing an already started paragraph, preparing a monthly newsletter for parents, producing book summaries and book advertisements, and finally developing multimedia presentations. (Axelson, 1996, p.26)

It is the goal of this California school district to acquire enough compact keyboards so that every two children will have access to one. "After all, accessibility is, and will continue to be, the key to computer use" (Axelson, 1996, p.26). Students in the elementary grades participate in projects with the enhancement of computers.

Students as young as first grade at Cuba Elementary School in New Mexico were involved in creating electronic
books through the use of Microsoft PowerPoint (Holzberg, 1997). Although many children at this age may not be fluent readers and writers they accommodate themselves well by using icons. For example, when voting on their favorite version of the book, *The Mitten*, students transferred the class results to a simple spreadsheet and clicked on the chart icon to experiment with bar graphs and pie charts styles for presenting the data.

Another elementary school, this one in Tennessee, uses the Multimedia Workshop to teach students to put their stories online (Holzberg, 1997). Students hand write their stories, then after editing, type their stories onto the computer. They scan a picture and use a microphone to read aloud and record what they have written.

One more project uses HyperStudio, a multimedia authoring tool where second graders compare their community to others around the world. Students learned about geography as they received responses via e-mail from various countries and states. They then compiled all of the information into stacks on the HyperStudio software and created one large presentation of different communities:

Technology offers plenty of reinforcement. If kids have collected and charted data, experimented with bar charts, pie charts, and pictograms to determine which representation best suits their information, they have
a deeper understanding and are more likely to remember what they have learned (Holzberg, 1997, p. 44).

Another form of technology to enhance language arts is through the use of CD-ROM and laserdiscs. Teachers use these technologies to teach students about the basics of sentence structure and punctuation, as well as more complex tasks like writing paragraphs or full essays (Noden, 1997).

CD ROM databases are one of the most interesting educational tools available. They have the ability to store a huge amount of information on one compact disc. Children enjoy interactive stories available on CD ROM. Other subjects that can benefit from this technology aside from language arts are science and social studies. Kids can click on animations, sound, talking storybook characters, music, and more. CD ROM draws kids closer to the text and language of a story (Lance, 1996).

Math skills are also enhanced greatly by the use of technology. Judith Seidel (1998) from Brearley School in New York states that the fifth graders there use the Geometer’s Sketchpad as they learn about reflections, rotations, symmetry, and angles. Second graders at this school also learn about symmetry only they use a Super Paint program. Second graders have a set of mathematical understandings and computer skills that are different from that of a young middle school student. The symmetry
activity designed from the Super Paint program builds on a familiar use of the computer for freehand illustrations. In contrast, the Sketchpad exposes the fifth grade students to a more specialized vocabulary and a step by step approach to creating transformations. "Technology can foster environments in which students' growing curiosity can lead to rich mathematical inventions. The control of exploring mathematical ideas is turned over to the students" (Seidel, 1998, p. 81). According to Manoucherhri, Enderson, and Pugnucco (1998), the Geometer's Sketchpad is one piece of software that allows implementation for many of the NCTM's recommendations in the classroom. Technology enables teachers to create an exciting and productive learning atmosphere in which the focus of geometry is not on memorizing definitions and formulas but on investigating and using geometric concepts and relationships (Manoucherhri, Enderson, and Pugnucco 1998). Geometer's Sketchpad is a piece of software most suitable for middle school and high school, but could be adapted to upper elementary if structured well. In Plainfield, IL, Patty Ptoocki's math class of middle school students develop charts and graphs from spreadsheets they create in their production lab (Deninger, 1997).

Besides reading, writing, and math, computers and other technology are useful in the content area of social studies.
Students from Timber Ridge Middle School use the Internet to research chosen countries they are studying (Deninger, 1997). Laserdiscs are another form of technology used by teachers. This form of technology allows the teacher to show an indepth presentation about a topic or short excerpts when specific topics are discussed. Jackie King from St. John’s Episcopal School in Austin, Texas had her students develop a multimedia presentation on the Civil War using laserdiscs (Boehm, 1996). "Laserdiscs offer a new dimension in learning and understanding history," (Boehm, 1996, p. 36). The barcode readers used with the laserdisc allow teachers and students to instantly display relevant clips from the laserdisc without taking time to fast forward or rewind and guess. Kathy Modlin, a fifth grade social studies and geography teacher in Virginia, incorporated the use of a videodisc and computer presentation software, Media Text by Sunburst, as a technology extension to her "Regions of the United States Unit" (Etchison, 1995). Students used the videodisc to obtain pictures and descriptions of various climate regarding their assigned region. Once students gathered information their next job was to design a multimedia presentation using the Media Text software incorporating at least five facts and links for the videodisc, animation, and audio. These students were not familiar with these programs prior to working on this unit,
but did receive help from the technology resource teacher (Etchison, 1995).

Janet Coburn (1997) tells about educators from different areas of the United States and how they have effectively used technology with their students. George Cassutto teaches ninth grade in Maryland. His students surf the Internet to conduct social studies research and then incorporate that onto a web site. "Our web site is a repository of knowledge, a useful oasis on the Internet so that anyone and everyone can participate with us," says Cassutto (cited in Coburn, 1997, p. 36). Marianne Teague, a middle school educator in Maryland, planned a unit on urban planning that uses the SimCity Classic software (Coburn, 1997). Students worked in small groups. Teague facilitated the learning by using the evaluation reports that the software provide to engage the students in some critical thinking and problem solving. Teague notes that with computers and related equipment, students get to have unique educational experiences. "The technology helped make students more aware of what's out there, without it they would have been limited to reading out of a textbook," stated Teague (cited in Coburn, 1997, p. 37). Paul Zangrillit, a high school social studies educator feels that, "one of the most powerful uses of computers is to help students organize their learning, present their thoughts,
and teach one another” (cited in Coburn, 1997, p. 37). The school just five years ago only had the software called The Oregon Trail, now houses an extensive floppy, CD-ROM, and videodisc collection. They also have productivity tools such as PageMaker, Photoshop, and Cricket Graph as well as social studies resources, Vital Links, Atlas of the U.S. Presidents, Where in the U.S. is Carmen Sandiego, and the Video Encyclopedia of the 20th Century. Zangrilli states, “With these tools, students learn how to learn and teach” (cited in Coburn, 1997, p. 37).

Don Groff of Woodbine Elementary School organized a computer club made up of fifth and sixth graders (Coburn, 1997). They utilized the software, HyperStudio and the Internet to create a historical collection of data on the 99 counties in Iowa. Pupils gathered information on the soil types in Iowa by faxing officials in the 99 counties asking for data on soil types, they used Internet and e-mail to search for magazines that might be interested in their work, and they used wordprocessing and e-mail to communicate with various people in the state. Groff exclaims, “This has been a great experience” (cited in Coburn, 1997, p. 39). Loisann Huntely, a fifth grade teacher in Connecticut uses technology to facilitate instruction within the curriculum (Coburn, 1997). “Computers are used in every single phase of the project,” Huntley notes (cited in Coburn, 1997, p. 39).
A unit where her students study people, events, and geography begins with the children creating a timeline of their own lives. It then moves to researching the background of a relative where the students use online atlases to trace where the family came from. They also use the Internet to locate a folk tale from their country or origin and incorporate family interviews, coat of arms, and more. Once the students gain the experience of researching their families using technology, they are ready for other topics in history. Huntley states, "Technology will change the face of teaching forever" (cited in Coburn, 1997. P. 42).

Todd Novakofski's middle school students explore immigration through a variety of methods, including simulation (Coburn, 1997). Students may use genealogy software to trace their families back to their countries. Novakofski uses a version of Harvard E.T.C.'s Irish Immigrant Adventure hooked up with Clarisworks to provide source materials such as ship manifest, want ads, and cost-of-living figures from the 1800s. Students take the role of a family member and try to survive. They keep a journal for their family and in the end create a real life simulation of Ellis Island with costumed students role-playing their parts. "They're fascinated with what they're learning as
they're playing the game," Novakofski says (cited in Coburn, 1997, p. 43).

Having access to the Internet does not assure the user that the information available will be used to construct meaningful learning (Sunal, 1998). The Internet provides a way for communication with others and for research that embellishes teachers' efforts to help students form new knowledge and reconstruct existing ideas. Sunal states that there are five levels for using the Internet in the classroom. Level one involves finding information for personal use, level 2 involves sharing Internet material with students as resources for information, level 3 involves information directly incorporated into a unit, level 4 involves teacher as a facilitator in a student-directed project, and finally level 5 involves students involved in projects they have directly planned and implemented. "It is the exploration, reflection, and building of expertise that make the use of the Internet a valuable part of the instructional program," stated Sunal (1998, p. 16).

A group of Florida teachers developed a multimedia social science curriculum for grades K-8 which integrated interactive software, videodisc imagery, trade books, maps and audio tapes (Keller and Gentry, 1996). Students are actively involved as they move from station to station, completing different aspects of each lesson. Much of the
elementary lessons with Internet are structured by the teacher before students actually have their hands on the computer. For example, a Kindergarten unit on comparing costumes from different countries entails the teacher reviewing and selecting footage depicting environments and clothing worn in the United States, Japan, Nigeria, and Australia. Ms. Gumms, the teacher, then types a short lesson plan that includes links to the selected images and stores them in an on-line notebook (Keller and Gentry, 1996). This way students will simply click on the saved links and make their comparisons.

A fifth grade classroom works to research what it would be like to be a 19th century worker on the transcontinental railroad. A videodisc is used to help research groups find case studies and illustrations of a typical day at work during this time. Gerri Bradley's 8th grade class is studying how the wetlands development affects Florida's complex ecosystem (Keller and Gentry, 1996). This class of students uses atlases, laserdiscs, videos, computers, magazines, CD-ROMs, and software, as well as textbooks. Bradley states, "We are constructing new knowledge about the world around us from past experiences and present investigations. We talk. We listen. We share. We are creating a community" (Keller and Gentry, 1996, p. 12). In St. Louis, Mo., high school students use multimedia atlas
programs to look at the earth as an environmental concept, a political object, and a physical place (Pride, 1997). The CD-ROM atlases allow students to view costumes and symbols of ethnic heritage, listen to spoken languages and examine physical and political components, and electronically place points on a map. For students corresponding with students from other countries on the Internet, an atlas can teach them more about that country. "Students view the world in different ways when they can interact with the features of today's atlas programs" (Pride, 1997, p. 8).

In addition to using technology within a specific unit of study in the classroom, distance learning is another way technology is being used to present information to students. Foreign languages can be taught through a fiber-optic network system where remote site classrooms are set up in different areas of the state. Maryland high school students experienced distance learning when a Chinese Language class was offered to three remote sites in the Baltimore area. Students were able to see the other sites on 27" monitor screens. Microphones were located at each student workspace for verbal communication between the instructor and the students at the other sites (Itzel, 1996).

A high school in Massachusetts created an Internet-based course at the pre-college level to serve 43 high schools in 13 states (Mather, 1998). As of August 1997,
there were 500 eleventh and twelfth graders registered. The video high school (VHS) courses are created with Lotus Notes software, housed within *Lotus Notes’ LearningSpace* educational environment, and delivered to students over the web. Teachers moderate student discussions and deliver reading, lectures, assignments, and assessments, while students work on and submit personal or collaborative documents, keep journals, use Internet resources, and participate in discussions with their peers. Throughout the entire virtual high school, students meet and make friends with people in parts of the world they may never visit. Virtual Schooling takes place in Massachusetts, Utah, Oregon, and Colorado for students who seek learning through a different means other than traditional schooling:

We see a huge population of students who are not being served by traditional schools. Home-schoolers, expelled students, emancipated students, single parents, and others who are dissatisfied and looking for nontraditional solutions. We expect to see successful alternative programs become even more significant. And we’re pleased to be there to participate in this growth and expansion. (Mather, 1998. p. 41).

Students who are at-risk due to low-income, behavior problems, attention deficit disorders, truancy problems, and
other problems that might interfere with their learning are being challenged in education through the use of technology (Milone, 1998). In Anderson, Indiana a project called, Anderson Community Technology Now! is being implemented for students who are underchallenged in school. Terri Austin, a facilitator, tells about using technology in nontraditional ways. She believes that technology is a learning tool that will help their students do better in school and prepare them for productive careers. Online tutoring, a summer technology leadership camp, and a loaner program that puts a computer in the home of low-income families are offered to students (Milone, 1998). Pupils in Fairfax, Virginia who have difficulty with behavior and other problems that interfere with their learning may apply for admission to The Enterprise School. This school focuses on a business model where students are expected to behave as if they were employed. Michele Surwit, founder of the school states, “Because technology is so important in the business world, our students receive a high dose of technology training, including a loaner program so students and their parents can have a computer at home” (Milone, 1998, p.47).

Teachers also use technology to help deliver instruction to their students. Richard Adams (1995), a science and social studies teacher in Oregon discusses his success with HyperCard, a presentation software. Adams
created a HyperCard stack on weather and geography. "The stack can be used as a lecture display tool or in a computer lab where students can explore and draw their own conclusions," states Adams (1995, p. 33).

The most highly used technologies by teachers were found to be microcomputers, overhead projectors, videocassette recorders, software teaching aids, and movie/slide projection systems. Emerging technologies include multimedia computer projection systems, computer networks, videodiscs, telecommunications, and software to aid problem solving. Current technologies considered promising for continued usage are microcomputers, video recorders, and overhead projectors, including computer-driven projectors. Respondents stated that their greatest need was funding, followed by training and support for educational technology products. Teachers also responded that more time is required for planning, implementing, training, and studying technology (Janowiak, 1990).

In Louisiana 131 educators revealed a significant discrepancy between educators' familiarity with technology and media, and the accessibility of such technology (Baldwin and Sinclair, 1994). Respondents reported that their level of technology knowledge exceeded the availability of the technology. Educators reported that the most serious obstacle to technology usage was the lack of hardware
followed by lack of training and lack of software (Baldwin and Sinclair, 1994). The US Department of Education is interested in the role computer technology plays in education and has provided block grants via the Educational consolidation and Improvement Act (ECIA) which have been used to purchase books and computer equipment. Teacher computer literacy is one area that needs further development (Senese, 1983a). Acting within current programs, the US Department of Education will be awarding $1.6 million to schools using technology to advance learning in teaching the sciences, reading, and writing. Extra funds for current "Lighthouse" schools serving as models for other school systems in using technology has hosted a conference focusing on research in technology (Senese, 1983b).

One hundred twenty-two elementary school teachers responded to a questionnaire, information was collected on the following topics; 1) availability of computers 2) level and types of computer uses 3) beliefs about computer use; and 4) current conditions and conditions needed or desired for using computing. Fifty-one percent of the elementary teachers agreed that computers would improve science instruction (McGinnis, 1991).
CHAPTER THREE

Conclusion

The area of education today has a wide variety of "tools" that can be used to enhance the learning process. Educators dream of making instruction both productive and enriching. The dream persists into the 1990s with the promoters urging each student to have his or her own computer. As to the future of technology in schools, educators need to be knowledgeable about the uses of these "tools" for teaching as well as for the learning of their students. Educators are in the number one business of instructing students. Technology, computers, and the add-ons that complement them are the tools with which will be able to extend the minds of the students. Computers and technology can be used in a variety of ways; as demonstration tools, as classroom-based labs, as tool laboratories (spreadsheet, database, graphics, etc.), multimedia computers, integrated learning systems, school wide networks, writing laboratories, distance learning, and telecommunications. Computers and advanced technology are effective tools for teacher use as well as for the enhancement and learning of students.
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