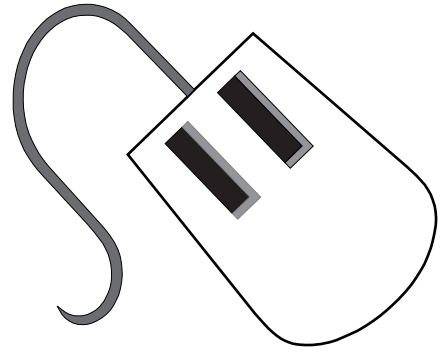


CHAPTER 1

Integrating Computers: How Do Computers Help Educators?



Mrs. Miven, a fourth grade teacher, considers herself lucky to have a laptop for herself and two older desktop computers in her classroom. She uses her computer to do attendance, word processing and e-mail, but little else. Her desktops, when they are working, are used as rewards for students to utilize when they have completed their work. Many days they are not turned on. If they have a problem, it can take up to two weeks to get help from the technology specialists. The “extra” computers are considered non-essential. She says that she would like to do more toward integrating them into her curriculum, but she has little time to work on it. The kids wish they had better computers with “cooler” games.

Mr. Smitter, an 8th grade Social Studies teacher, can't imagine teaching without computers and Internet access. Students can see information on his computer with the aid of a data projector. He is also lucky to have wireless Internet access. Most of his classes begin with a PowerPoint presentation introducing the daily topics. Most of these presentations have links to live web pages with more information or current data. His students frequently utilize a mobile wireless lab with laptops to research projects in groups, and many times they produce and edit documentaries for their presentations.

COMPUTERS IN THE CLASSROOM

“At the 1984 introduction of Apple’s Macintosh computer, Steve Jobs of Apple Computer predicted that the personal computer would become a common household appliance, much like a toaster or a television set. Job’s remark was laughed at by a large portion of the computer industry, particularly by people who worked for companies that made large, expensive mainframe computer systems.” (1995, Freed, ix) When Steve Jobs made these prophetic statements, Apple had already developed a large installed base of personal computers in the educational community, but the concept of a digital appliance was still science fiction.

Early computer use in education was plagued by slow machines with black and white (monochromatic) monitors that ran drill and practice software. In the higher grades some students were allowed to use these wonderful machines to create new programs that could do amazing things like average 12 numbers, or repeat a saying like “Go fighting Quakers” infinitely, at incredibly high speeds. Needless to say, the promise of computers was far from realized.

Now, almost 30 years after the arrival of the Apple IIe, technology and conditions for using technology effectively are improving and continuously evolving.

What Is Educational Technology?

It has been said that technology is anything that was invented after you were born, does this mean educational technology is educating with things that were invented after you were born?

Searching the Internet for the phrase “educational technology” yields over 8,000,000 hits but most websites fail to define the term. The website of the San Diego State University Department of Educational Technology (http://edweb.sdsu.edu/EDTEC/EDTEC_Home.html) explains, “How one really answers the question, ‘What is Educational Technology?’ depends on who’s asking the question.”

Some people think of educational technology as the study of technology. This is a very useful educational area that entails the study of how technology is developed and utilized in order to enhance human abilities, but it is just one curricular area.

Educational Technology is better defined as “Using technologies as a tool to enhance the teaching and learning process” (<http://www.emsc.nysed.gov/technology/nclb/definition.htm>). The focus here is not on the technology as in Technology Education, but on the enhancement of the learning experience for all of those involved. The technology is only a tool used toward the goal of learning. This book will focus on the use of many technological tools to enhance learning.

A Short History of Computers in Education

Educational institutions, especially Universities have been instrumental in the development of the computer and its peripheral technologies. Professors such as Dr. John von Neumann and Dr. Grace Hopper developed concepts that lead to programming and reusable software. Many of the early programming languages such as COBOL were also developed by professors and graduate students. Despite this strong tie to education, the computer’s early educational impact was basically limited to administrative tasks and research (1999, Shelly).

1960 saw the establishment of one of the first successful Computer Aided Instruction programs (PLATO) at the University of Illinois at Urbana-Champaign. In 1966 the Educational Resources Information Center (ERIC) is developed to compile and disseminate research on education. LOGO, a programming language that allows students to move a “turtle” around the screen, developing programs that draw shapes, was developed. LOGO is still in use today, under the watchful eye of Seymour Papert (2001, Bruce).

In 1976 Steve Wozniac and Steve Jobs changed the climate of computing by offering the Apple II. It was a wonder of power to size ratio, and it came with a built in keyboard and a monitor. This is where the educational technology movement really took off. Inexpensive computers along with Minnesota Educational Computing Consortium

The Evolution of the Computer

- 1943 Colossus, a computer the size of a room is built to break German codes.
- 1945 Dr. John von Neumann publishes a paper describing how computer memory could store both programming and data
- 1951 UNIVAC I the first commercially available computer. It will later correctly predict the outcome of a presidential race.
- 1952 Dr. Grace Hopper publishes a paper on the concept of reusable software.
- 1964 Douglas Engelbart develops a prototype mouse. It was named for the tail that came out of the end.
- 1968 IBM demonstrates use of the first floppy disk. It is 8 inches in diameter.
- 1969 ARPANET is developed. This will later become the Internet.
- 1971 Dr. Ted Hoff of Intel Corporation develops the first microprocessor.
Robert Metcalf of Xerox PARC develops Ethernet, allowing for networking.
- 1975 Altair by MITS, Inc. is the first microcomputer. It has no keyboard, monitor, or memory.
- 1976 The Apple I is created by Steve Wozniak and Steve Jobs. It leads to the very successful Apple II.
- 1980 Microsoft Develops MS-DOS.
Alan Shugart develops the Winchester hard drive.
- 1982 Hayes introduces the modem. It runs at speeds of 300 bits per second.
- 1984 Apple introduces the Macintosh. This is the first widely accepted use of a Graphical User Interface (GUI).
Hewlett-Packard introduces the first laser printer for use with personal computers.
- 1986 IBM the PC Convertible. Weighing in at 12 pounds, it was the first true laptop computer.
- 1989 Tim Berners-Lee develops the World Wide Web portion of the Internet.
- 1992 Microsoft releases Windows 3.1.
- 1993 Marc Andreessen develops a graphical web browser called Mosaic. This later leads to Netscape.
- 1996 US Robotics introduces the Palm Pilot.
- 1999 Apple adds built in wireless cards and antennas for all of their computers. Apple also releases the Airport base station to allow home and small business users to access networks wirelessly.
- 2000 Napster, a music swapping software, brings peer-to-peer networking to the masses.
- 2001 Apple releases Mac OS X. The first major release UNIX based Operating System.
- 2002 Handspring offers the first all in one handheld. It incorporates a cell phone, web browsing and e-mail into a palm held organizer.

(MECC) software allowed students who needed more practice to use drill and practice software, or to utilize educational games. More software such as the multimedia development tool Hyperstudio (1978) and the word processor Wordstar (1979) soon followed.

1984 saw the launch of the Macintosh 128, which was the first commercially successful use of the Graphical User Interface (GUI), mouse, and networking. This machine was quickly adopted in the educational arena because of its ease of use.

This year also saw the release of the CD-ROM with its, at the time, seemingly unlimited storage capacity. This technology allowed the development of the digital encyclopedia and other digital reference sources, including multimedia sources.

Tim Berners-Lee in 1989 invented the World Wide Web, or more correctly the Hypertext Markup Language (HTML) that drives web pages. Although the Internet had found its origin in 1969 with the advent of the Arpanet, its use had been limited mostly to e-mail and scholarly communications. The advent of the World Wide Web was the catalyst that would eventually push the Internet into the classroom. (1999, Shelly)

1989 also spawned the International Society for Technology in Education (ISTE). This organization was developed to help K–12 teachers and administrators share best practices in technology integration.

PowerPoint, the most popular presentation software was released by Microsoft in 1990. This software tool allows teachers and administrators to create slide shows to go along with their lectures and presentations. Students can also use this to augment class projects.

1991 saw the introduction of the Macintosh Powerbook; this is the first introduction of a laptop computer that had enough features in a portable machine that could be described as a portable desktop alternative. This has led to portable labs and wireless connectivity.

Microsoft released Windows 3.1 in 1992. Although other versions of Windows had been released, this was the first version to be widely accepted. With the release of Windows, Microsoft guaranteed that the foreseeable future of computing would include the GUI. Computers became easier to use and more schools brought them into the classroom.

In 1993 Marc Andreessen created the first successful web browser called MOSAIC. With this success he starts Netscape Communications Corporation. The addition of the web browser to the World Wide Web allows for easier information searches. In education the WWW becomes a leading source of information.

When President Bill Clinton signed the Telecommunications Act of 1996 he set up the Universal Service Fund (USF). Through this fund, schools receive discounts, based on the level of poverty in their district, for Internet and phone services. This fund also allowed discounts on infrastructure improvements needed to get the Internet in the hands of students. The FCC approved the e-Rate program, as the USF came to be known, in 1997. This program has been very successful, and is responsible for much of the growth in Internet access in schools.

In 1998 the International Society for Technology in Education (ISTE) developed a set of technology standards for teachers. These are later adopted by the National Council for Accreditation of Teacher Education (NCATE). With this educational technology takes an important role in the preparation of pre-service teachers.

Technology in educational environments has progressed rapidly in the recent past. All of the data tracking that has been demanded by the State and Federal Governments would be economically devastating if it was not for the use of computers and data warehousing. Tracking of student attendance patterns, or achievement gap analysis all depends on the cheap abundance of computing power.

How Should We Use These Machines in Education?



To best understand how to use computers in education, this chapter examines three fundamental questions.

1. What is the purpose of education?
2. What do computers do well?
3. What do people do well?

While each question could fill a book by itself, the overviews in this chapter will help to provide a vision for how technology can best fit into education.

What Do Computers Do Well?

Computers do many things well and the function of a computer is dependent upon the software being used and the person controlling the machine at any given time. This is true in educational settings as well. Basically, it is most important to decide on a purpose here, are schools here to create an “educated electorate”, good workers, or lifelong learners. It is probably best to say yes to all of these and move on.

In their 2002 study *The Learning Return on Our Educational Technology Investment*, Ringstaff and Kelley describe two different types of educational computer use, that of learning from computers and learning with computers. They explain that computers can become tutors helping students to learn. This is best seen in the use of drill and practice software, along with Computer Aided Instruction (CAI) and Integrated Learning System (ILS) systems.

“In learning ‘with,’ by contrast students use technology as a tool that can be applied to a variety of goals in the learning process.” This is a higher-level use of the computer, and requires a greater level of curriculum integration.

Saloman talks about using computers as “intellectual partners that share the cognitive burden of carrying out tasks” (1993, as cited by Jonassen) so that “When learners use computers as partners, they off-load some unproductive memorizing tasks to the computer, allowing learners to think more productively.” (1996, Jonassen, 15)

Jonassen talks about a sharing of work load where each of the partners works to their strengths. “Learners should be responsible for recognizing and judging patterns of information and then organizing it, while computer systems should perform calculations and store and retrieve information” (1996, 15).

Computers as Tools for Teachers

As a professional tool, computers have drastically changed the way the daily grind of teaching is handled. These tasks break easily into the three areas of Record Keeping, Communication, and Instructional Delivery.

Computers have become indispensable in the field of record keeping. Using a computer for keeping track of grades and computing grades is worth the price of the computer to many teachers. As teachers enter assignment grades into the computer, updated grades are immediately displayed, and at report card time, all information can be uploaded at the push of a button, which can save considerable time for teachers. These programs have made it much easier to report to students and parents about academic progress, and missing work, while allowing teachers the ability to check grade distributions on specific assignment, assessing student mastery and the possible need to revisit certain subjects.

Communication has greatly increased due to the use of the Internet. Through e-mail and web pages teachers can more conveniently communicate to parent and student groups. Within many districts, the number of basic, housekeeping meetings have been reduced through the effective utilization of in-building and in-district e-mail. These new communication technologies (e.g., listservs and educational chat areas) have helped teachers feel less isolated. Professional contacts can more easily be continued through the use of e-mail.

Instructional delivery has some obvious changes when technology is factored in, like the use of PowerPoint, and the availability of information through the Internet. Along with these comes the ability for teachers to organize and retrieve resources electronically, the ability to track student achievement much more specifically, and the ease of locating extension activities for students that need them.

Technology can also be a hindrance to productivity. Once a secretary spent two hours trying to find a way to keep an extraneous line from printing on a page. When the technology director finally came to help, he suggested white out.

Computers as Tools for Students

Students are beginning to take the availability of computing power in the schools for granted. There is an expectation that computers will be there to use when they are needed. With this ubiquitous computing comes the desire to control and access more of their educational experience. Student management systems allow students to track their attendance, grade, and missing work. Information is available for them through the use of the Internet. They are no longer limited to the resources housed inside the walls of the school building. Boolean searching allows for much more powerful information searching, and productivity software helps with creating professional looking products. Servers allow for easier document storage, and a back up if a teacher loses an assignment, and e-mail allows them to collaborate with students throughout the world. Technology is causing big changes in schools and future developments are sure to continue this trend.



Guidelines for Computer Usage in Education

In the last 20 years many different models of educational technology use have been experimented with. Many have been abandoned as failures, others probably should be, but educational technology is clearly a field that is still in its childhood and looking for an identity.

When deciding to utilize technology as a teacher following a few simple guidelines is important. First of all, the technology use must fit the curriculum. Too often teachers try to make the curricula fit a piece of software they like. The curriculum should drive the technology use and not visa versa. Secondly, as an educator, focusing on the instructional outcomes of a unit or lesson, not the technology, is of the utmost importance. Instructors must, above all else, help students learn, and you do this by focusing on the objectives, not the tools you use to get there. Finally, teachers must focus on the collaboration of students with computers toward the students learning. Obviously, **LEARNING IS ALWAYS THE FOCUS**. Pretty products may be nice, and busy work may sometimes be necessary, but we educators must never allow these to become the priority.



SUMMARY

Educational technology, the use of technology with the purpose of making teaching and student learning more efficient, has become an important part of the educational landscape. Early computer use, although plagued with slow, monochromatic machines, showed much promise. As things have progressed, many of these promises have been fulfilled but the field is still evolving.

Throughout the history of computer technology the hardware has consistently become more powerful, smaller, and less expensive. These factors have led to more pervasive computer usage, and pushed for more user autonomy.

Professional Educators are finding that computers can increase their efficiency in the areas of grading. Teacher communication with colleagues and parents has become much more frequent with the use of e-mail, and the use of presentation tools, and the World Wide Web has changed instructional delivery practices.

Students, in many ways, have been much more willing to embrace the potential of the computer in education. They have expectations of technology and information availability that far surpasses that of many educators. With this comes the expectation of more personal control over their education. Use of student management software allows for

easier access to grades and teacher records, and the use of servers and networks eases the task of document management.

As a teacher using educational technology focusing on the curriculum more than the tool is a key. Bringing the focus back to the instructional outcomes and objectives should always be a goal of educational technology. Always remember to treat learning as collaboration between student, teacher, and now the computer.



DISCUSSION QUESTIONS

1. What is the purpose of education?
2. How can teachers use computers to streamline their work? To help with teaching?
3. How can students utilize computers to help with their own learning process?



KEY TERMS

Boolean: A term dealing with set theory in mathematics. In searching Databases and the Internet it is used to describe a search utilizing Boolean operators such as “and” or “not” in order to broaden or limit the returned results.

Computer Aided Instruction (CAI): This is the use of computers to aid in learning. In many cases it refers to a set of software that tests student’s abilities and then creates a set of lessons, usually drill and practice, that help to fill the gaps in ability.

Educational Technology: Broadly refers to any technology that is used in the process of education. Recently it has come to mean computers in education and the study of the best ways to utilize these tools.

File servers: A computer that is connected to a network that runs specialized software that allows users of machines connected to the network to save files on the server and retrieve them from any other computer connected to the server. A file server is a very useful item in schools where teachers and students may need to access their documents from many different machines throughout the building.

Graphical User Interface (GUI): This is the interface most people use when they interact with the computer. It is a group of icons representing files, folders and applications. By opening windows and pulling down menus a user can do their work without having to add lines of code, as was the norm before the advent of the GUI.

PowerPoint: A program, developed and sold by Microsoft, which allows users to create and show presentations.

Productivity software: Software such as Publisher, Excel, Word or Works. This software allows the user to develop a product. It has no teaching or training component to it.

Searching: In this case this is the term used for trying to find pertinent information from databases and the Internet. This is usually accomplished through some sort of Search Engine, and often involves Boolean operators.



EXTENSION ACTIVITIES

1. Reflect upon your experiences with technology. Would you be comfortable using technology in an educational setting? Why or why not?
2. What do you believe will be the most important technology tool you will use in teaching? What do you believe will be the most important technology tool your students will use? Why?
3. What do you think are the greatest reasons for using technology in the educational settings? What do you think are the best arguments against using technology in an educational setting?
4. Should students be able to use calculators when doing mathematics? Why or why not?



RELATED WEBSITES

US Department of Education: Office of Educational Technology

<http://www.ed.gov/about/offices/list/oe/technology/index.html>

International Society for Technology in Education

<http://www.iste.org/>

International Journal of Educational Technology

<http://www.ao.uiuc.edu/ijet/>

A Brief History of Computers

<http://www.ox.compsoc.net/~swhite/history/>

The Computer History Museum

<http://www.computerhistory.org/>



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