

Computer-based learning and web-based training: A review for higher education

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Introduction

The purpose of this paper is to discuss computer-based learning and web-based learning. Computers have been used in various areas of education since the 1950s (Saettler, 1990). A computer can store information, receive information, send information and manipulate information based on the user's commands. A computer can store information about students and curriculums, receive information from students, other teachers and/or administrators, send information to students, other teachers and administrators, exchange ideas among others, and manipulate information based on the need of educational situation from a teacher's perspective. If teachers can use it effectively, students should be able to use it effectively for their education. In this paper, I will examine computer-based learning and web-based training from higher education's perspectives.

Computer-based learning (CBL)

Brief history of computer-based learning

Although computers have been used in education since the 1950s, vigorous development occurred in the 1960s (Saettler, 1990). There were three major research and development projects in computer-assisted instruction (CAI) in the early period of its history.

Computers have become an important tool for people with disabilities. They use them not only for education but also for communication. A pioneer project for this field is called the PLATO (Programmed Logic for Automatic Teaching Operation) project. The PLATO project began in 1960 at the University of Illinois (Saettler, 1990). According to Hackbarth (1996), Donald Bitzer conceived the PLATO project at the University of Illinois in 1959. This project was "the tutorial and drill-and-practice models of CAI" (Saettler, 1990, p. 309). PLATO's principal emphasis was "to develop a comprehensive system of hardware and software" (Saettler, 1990, p. 309), and students with disabilities could respond to the computer by touching the plasma panel display, and had an access to thousands of hours of instructional material (Hackbarth, 1996).

Educational technology doesn't concern itself only with technological aspects. It deals with the combination and interrelationship of technology and learning. Saettler stated that "the Institute for Mathematical Studies in the Social Sciences at Stanford University, under the direction of Richard Atkinson and Patrick Suppes, developed some of the earlier applications of CAI at both the elementary school and university levels" (1990, p. 308). According to Hackbarth, "the project studied the learning process and used its findings to develop course ware" (1996, p. 191). This was a collaborative project with IBM (Saettler, 1990), and an action research project of the CAI.

Atkinson and Suppes, joined with Estes, established the Computer Curriculum Corporation (CCC)

in 1967 (Saettler, 1990), and developed "CAI drill-and-practice materials in mathematics, reading, and language arts" (Saettler, 1990, p. 308). According to Saettler, "CCC has continually improved and expanded the capability of its system" (1990, p. 308), and "they introduced a digital speech system that has been used to teach English as a second language to native speakers of Spanish, Japanese, and Chinese" (Saettler, 1990, p. 308). The project lasted over 20 years, influenced by the CAI in terms of the action research.

The cost effectiveness of educational delivery is also a concern of educational technology. The Time-Shared, Interactive, Computer-Controlled Information Television (TICCIT) project attempted "to demonstrate that CAI could provide effective instruction at lower cost than traditional instruction in community college" (Saettler, 1990, p. 309). "The TICCIT system was conceived by the Mitre Corporation in 1969" (Saettler, 1990, p. 309), and Mitre developed both hardware and software.

Compared to the first two projects, the "TICCIT placed great emphasis on learner control" (Saettler, 1990, p. 310), and "the student was presented with displays on a television screen to which he responded on a typical typewriter keyboard that was augmented by a series of learner-control keys" (Saettler, 1990, p. 310).

In the 1980s, the Apple II and Microsoft's DOS (Disk Operation System) were introduced, and personal computers became more user-friendly devices. More students and families purchased PCs, thus the developers of CAI simplified the delivery of its materials to suit home PCs. In 1995, Microsoft introduced MS Windows operating system. This operating system provide the graphical user interface (GUI), and users choose the commands just by moving the pointing arrow and clicking icons, little drawings, with a hand-held device which is called a mouse. The hand-held devices come in many shapes and sizes so that even individuals with disabilities can choose based on their needs. The delivery of CAI will change based on technological advancement.

The use of computer-based learning

According to Hackbarth (1996), "there are at least eight major categories of CBL: drill-and-practice, tutorial, problem solving, simulation, inquiry, electronic performance support system, testing, and programming" (p. 192). These eight categories indicate that teachers are able to choose appropriate computer based learning materials based on the educational goals or aims within a particular learning situation. In other words, if teachers choose inappropriate materials, it will not be an efficient learning experience for their students.

Drill-and-practice means, "the teacher introduces new concepts and skills in which it gives practice" (Hackbarth, 1996, p. 192). To learn a foreign language, students will memorize vocabulary. Repeated use of words reinforces the accumulation of vocabulary. A computer "submits questions and appropriate answers quickly and tirelessly, while allowing students to pace themselves" (Hackbarth, 1996, p. 192).

After installing new software into personal computers, the software sometimes asks if the user wants to follow self-learning pages to use the software efficiently. This process is tutorial, and "the computer introduces and explains concepts and skills in which it gives practice" (Hackbarth, 1996, p. 192). Not only acquiring new concepts and skills, tutorials help to confirm users knowledge about similar concepts and skills. The problem of tutorials is that many tutorial programs are based

on the programmer's assumptions. "Good (human) tutors present subjects in personally chosen detail, give examples from their own lives, and ask challenging questions" (Hackbarth, 1996, p. 193). However, the tutorial's menu is limited as is programmed.

Hackbarth (1996) stated, "once students have achieved a basic grasp of subject matter, whether by conventional teaching or CBL, they are ready to tackle problems posed by the computers" (p. 194). He also stated, "problem solving CBL currently is used not only in basic school subjects but also in professional studies of teaching, counseling, medicine, and engineering" (p. 194). In social work education, computers are now used to keep client records in a data base program such as Access or File Maker, and it is effective to use it for assessment training. Role playing computer games are popular among different generations. Some of them are violent and not recommended for educational use. However, some role-playing games are also effective for acquiring problem-solving skills. Players can change behaviors based on the role experience.

Role playing computer games also provide good simulation. "Students confront an environment that operates under a set of rules. Their role is to act within this environment and then observe results" (Hackbarth, 1996, p. 194). Hackbarth (1996) also stated, "other simulations permit laboratory-style dissection and experimentation" (p. 194). Computer simulation creates virtual realities because the computer graphics become very realistic. Flight simulator and driving simulator software are used for flight and driving schools.

Computers can store enormous amounts of information. Not only for storing information, it is also a fast way to find particular information from storage. Inquiry is another use of CBL (Hackbarth, 1996). Students can inquire information not only from the computer but also outside of the school systems via Internet or World Wide Web (WWW).

The important function of an electronic performance support system "is to make information available as it is needed to solve immediate problems" (Hackbarth, 1996, p. 194). Electronic performance support system software is made as a tool kit, and users can use the kit for planning projects, writing proposals, and/or budgeting.

Testing is also an ideal use of computers. Preparing tests in many forms and scoring them are time consuming for teachers, and testing requires accuracies in scoring. Computers can score enormous amounts of tests quickly and accurately. It also calculates the individual's points, and statistically presents the result of tests. However, the advantages are limited to scoring simple answers, such as true or false, multiple choice, or simple words responses. It is difficult for computers to score poems, compositions and/or composed music.

Finally, computer programming might be extremely difficult to learn without computers for students' use, and it might be also difficult to teach without computers for teachers' use. Several programming languages have been developed, such as Logo, BASIC, CBL, and HTML. To learn these programming languages, it makes more sense to use them in one's own computer.

Introduction to Web-based training

Inquiry was one of the categories in computer based learning as introduced at the previous section. Students can inquire information from a desktop computer or a database away from where he or she is at via Internet or World Wide Web. Horton (2000) defined web-based training as "any purposeful, considered application of Web technologies to the task of educating a fellow human

being” (p. 2). Web-based training is a combination of distance learning, computer based learning, and Internet. Computer based learning was discussed in the previous section, thus distance learning and Internet will be discussed briefly as an introduction to web-based training.

Distance learning

Distance learning has over 100 years of history. Horton (2000) stated, “by 1840, Sir Isaac Pitman was teaching his shorthand system by mail” (p. 3). In higher education, Horton also stated, “Scottish educator James Stewart of Cambridge University began offering off-campus lectures” (p. 3) at about the same time. Britain’s largest university, Open University, was established in 1969 (The Open University, n.d.). Horton stated, “in the US, Illinois Wesleyan University began a home-study program in the 1870s, and a ‘Correspondence University’ was founded in Ithaca, New York, in 1883” (2000, p. 3).

Definitions of distance learning have changed. Roblyer and Edward (2000) pointed out key components of the past definition of distance learning. According to Roblyer and Edward, the key components were “instructor and learner separated by time and/or geographic distance, and electronic, print resources, voice communications, and combinations of them are used to bridge the gap” (2000, p. 192). United States Distance Learning Association (USDLA) defined distance learning as “the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance” (USDLA, n.d.). Distance learning refers to the role as a learner, and distance education refers to the role as teacher (Roblyer & Edward, 2000), but Roblyer and Edward (2000) stated, “now, they typically are used interchangeably” (p. 192).

Housou Daigaku (The University of the Air) was established in 1983 in Japan, and the school started to offer graduate level education in 2001 (Housou Daigaku, n.d.). Currently distance learning is widely used in Japan not only in higher education but also in preschool children’s English programs to life long learning programs.

Internet or World Wide Web (WWW)

The United States Department of Defense Advanced Research Project Agency (DARPA, formerly ARPA) started to make computer networks more credible (Hackbarth, 1996). DARPA linked with university labs and government agencies to exchange information, but “military agencies split from ARPAnet in 1983 to form MiLnet” (Hackbarth, 1996, p. 241). Interconnection between two networks remained, and “known as ‘DARPA Internet’, soon abbreviated to the ‘Internet’” (Hackbarth, 1996, p. 241).

When working with others or using two or more computers, connecting computers makes exchanging or sharing information easy. It can be done using coaxial cables, and the newly created system of computers is called local area networks (LAN). It is common for schools or companies to create LAN, and according to Roblyer and Edward (2000), “the Internet has been called the ultimate network or ‘the mother of all networks’ because it is a network of networks” (p. 208). Internet became a main communication tool and not only an exchange or sharing of information.

Many people misunderstand that the World Wide Web (WWW) is the synonymous of the Internet.

Roblyer and Edward (2000) pointed out that WWW “is a subset of the Internet system. The WWW is an Internet service that links sites around the world through hypertext documents” (2000, p. 208). The computers of LAN have to use the common text to be interconnected for users, and hypertext document is used for this purpose. To be used in education, hypertext was shown in web pages, thus web-based education was spun.

Web-based training and e-learning

Just by browsing web pages, people can obtain information. However, the difference between web browsing and web-based training is “purposeful, considered” (Horton, 2000, p. 2) or not. To develop a web-based training site, the educator should consider the students and its needs and the purpose of the education.

Rosenberg stated, “web-based training...are simply more up-to-date descriptions of CBT, and are also too limiting as a description of e-learning” (2001, p. 29). According to Rosenberg, “e-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance” (2001, p. 28). Then, he established three criteria.

First, “e-learning is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of instruction or information” (2001, p. 28). Next, “it is delivered to the end-user via computer using standard Internet technology” (2001, p. 28), and finally, “it focuses on the broadest view of learning-learning solutions that go beyond the traditional paradigms of training” (2001, p. 29). Thus, e-learning covers CBT, WBT and distance learning with the updated technologies, and is considered the core category of all related areas that were discussed in the above sections.

The ultimate goal of educational technology is to increase the effectiveness of teaching. The first criteria of e-learning suggested that it is not difficult to update, storage and/or share the information. The second criteria suggested that the student use Internet for learning, thus it can be done from many different places. Therefore, e-learning is useful for teaching as well as learning.

Several issues emerged. Internet is widely used; however, there are some people who don't have access to the Internet. This digital divide creates inequality in educational opportunities. Next, Internet security is still under development, thus someone can modify or even delete educational materials. Palloff and Pratt (2001) stated issues for both faculty and administrators as follows:

As development and acceptance of online distance learning continue to grow, new critical concerns for both faculty and administrators have begun to emerge, including such things as planning for a solid technological infrastructure, intellectual property rights, review and development of agreements with faculty that reflect good understanding of work for hire and copyright, and choice of software with which to conduct online courses (p. 10).

Because the e-learning is still new and developing, these concerns would emerge. By developing practical rules and ethical guidelines at each educational agency and professional organization, these problems will be solved.

Conclusion

As discussed above, the use of computers is for almost ultimate purposes. Although it seems as a computer can teach anything anywhere, it should not be forgotten that computers need to

be programmed according to the educational purpose. It is the educators' responsibility to select and prepare the contents for learners.

For higher educational institutions, taking advantages of the state of arts educational technology are critical for many reasons; such as effectiveness on its education, its administration, and even on its marketing. Because 18-year-old population is decreasing, colleges and universities reach out their future students not only high schools, but also overseas and non-traditional students. Computers in this area of education will be the key tool for learning and communications. Exercising this type of education will bring the new era or stages of education in general.

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