IOSR Journal of Humanities and Social Science (IOSR-JHSS)
Volume 2, Issue 4 (Sep.- Oct., 2012) 50-53
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Computer Applications in Education: Evolution, Uses and Challenges

Palwinder Kaur
Department of Computer Science, Public College Samana

Abstract
Computers have transformed modern education by improving access to information, facilitating interactive learning, and enhancing communication between teachers and students. Since the introduction of personal computers in educational institutions, computer-assisted learning has become an integral part of teaching methodologies. This article discusses the historical development of computers in education, their applications, advantages, challenges, and future prospects as understood up to 2010. The article also highlights the role of computers in distance education, e-learning, research, administration, and skill development.
Keywords: *Computer, Education, E-learning, Computer-Assisted Instruction, Information Technology, Distance Learning.*

I. Introduction

Introduction

The computer is widely regarded as one of the most significant inventions of the twentieth century. Since its development, it has transformed nearly every aspect of human life, including science, business, communication, healthcare, industry, and education. The remarkable ability of computers to process large amounts of information quickly and accurately has made them indispensable tools in modern society. In the field of education, computers have brought revolutionary changes in teaching methodologies, learning environments, educational administration, and research activities. Their integration into educational systems has enhanced access to information, improved instructional effectiveness, and created new opportunities for learners and educators alike.

The use of computers in education began gradually during the latter half of the twentieth century. Initially, computers were large, expensive machines available only in research institutions and universities. However, the development of personal computers during the 1970s and 1980s made computer technology more accessible to schools, colleges, and individual learners. Educational institutions increasingly adopted computer-based technologies to support classroom instruction, administrative tasks, and academic research. During the 1980s and 1990s, computer literacy became an important educational objective, and many schools introduced computer education as a separate subject within their curricula.

One of the major contributions of computers to education has been the enhancement of teaching and learning processes. Traditional classroom instruction often relies heavily on textbooks, lectures, and written assignments. Computers introduced new possibilities for interactive and student-centered learning. Through educational software, simulations, tutorials, and multimedia presentations, students could engage with learning materials in more dynamic and meaningful ways. Computer-assisted instruction enabled learners to progress at their own pace while receiving immediate feedback on their performance. Such individualized learning experiences helped address differences in learning abilities and styles among students.

Before the widespread availability of the internet, computers were primarily used for word processing, data storage, educational software applications, and scientific calculations. Teachers used computers to prepare lesson plans, examination papers, and educational materials. Students employed computers for completing assignments, conducting basic research, and developing technical skills. Educational software programs covering subjects such as mathematics, science, languages, and social studies became increasingly popular and contributed significantly to classroom learning.

The emergence of multimedia technology during the 1990s further expanded the educational potential of computers. Multimedia systems combined text, graphics, images, sound, animation, and video into a single learning environment. This integration enhanced students' understanding of complex concepts and increased motivation and engagement in the learning process. Multimedia learning was particularly beneficial in subjects requiring visualization, such as science, engineering, medicine, and geography.

The rapid growth of internet technologies during the late 1990s and early 2000s marked a new era in educational computing. The integration of computers with internet-based resources transformed the way

knowledge was accessed, shared, and delivered. Students gained access to online libraries, academic databases, educational websites, and digital learning resources from around the world. Teachers could communicate with students through email, discussion forums, and online learning platforms. Consequently, the concept of e-learning emerged as an important educational innovation.

The development of virtual classrooms and distance learning systems further demonstrated the transformative role of computers in education. Through these technologies, learners could participate in educational programs regardless of geographical location. Educational institutions began offering online courses and degree programs, making higher education more accessible to diverse populations. Computers also facilitated collaborative learning by enabling communication and knowledge sharing among students and educators across different regions and countries.

In addition to teaching and learning, computers have become essential tools for educational administration and research. They are widely used for student record management, examination processing, library automation, financial administration, and institutional planning. Researchers utilize computers for data collection, statistical analysis, literature reviews, and scientific communication. These applications have significantly improved the efficiency and effectiveness of educational institutions.

In conclusion, computers have fundamentally transformed education by improving access to knowledge, enhancing teaching and learning processes, and supporting educational administration and research. Their continued development and integration into educational systems have created new opportunities for innovation and lifelong learning. As technology continues to evolve, computers will remain central to the advancement of education and the development of knowledge-based societies.

Historical Development of Computers in Education

The historical development of computers in education represents one of the most significant transformations in modern teaching and learning. Over the past several decades, computer technology has evolved from a specialized scientific tool to an essential component of educational systems worldwide. The integration of computers into education has fundamentally changed the ways in which knowledge is delivered, accessed, managed, and shared. Understanding this historical progression provides valuable insights into the role of technology in shaping contemporary educational practices.

The earliest applications of computers in education emerged during the 1950s and 1960s when large mainframe computers were primarily used in universities and research institutions. During this period, educators and researchers began exploring the potential of computers as instructional tools. One of the earliest educational approaches was programmed instruction, which was based on behavioral learning theories developed by psychologists such as B. F. Skinner. Programmed instruction involved presenting information in small sequential steps, allowing learners to receive immediate feedback on their responses. Computers were viewed as ideal machines for implementing this approach because they could provide individualized instruction and automatically evaluate student performance.

During the 1960s, the concept of Computer-Assisted Instruction (CAI) gained prominence. Several pioneering projects demonstrated the educational potential of computers. Notable among these was the PLATO (Programmed Logic for Automatic Teaching Operations) system developed at the University of Illinois. PLATO was one of the first computer-based educational systems to provide interactive learning experiences, online discussions, and computer-managed instruction. These early developments laid the foundation for future educational technologies.

The 1970s witnessed significant advancements in computer technology and educational applications. As computer hardware became more affordable and accessible, educational institutions began expanding their use of computers. During this decade, computer-assisted learning programs were developed for subjects such as mathematics, science, and language instruction. Researchers increasingly recognized that computers could be used not only for drill-and-practice exercises but also for problem-solving, simulations, and critical thinking activities. Educational theorists such as Seymour Papert promoted the use of computers as tools for learning and creativity rather than merely devices for delivering instruction.

A major turning point occurred during the 1980s with the introduction of personal computers (PCs). The availability of affordable personal computers such as the IBM PC and Apple Macintosh enabled schools and universities to establish computer laboratories and integrate computer education into their curricula. During this period, computer literacy became an important educational objective, and students were encouraged to develop basic computing skills. Educational software applications gained widespread popularity, including tutorials, educational games, simulations, and drill-and-practice programs. Computers were increasingly used for word processing, data management, and classroom instruction.

The 1990s marked the emergence of multimedia technologies, which significantly enhanced educational experiences. Multimedia systems integrated text, graphics, images, animations, audio, and video into interactive learning environments. These innovations enabled educators to present information in more engaging and effective ways. Multimedia learning became particularly valuable in subjects requiring

visualization and practical demonstrations. Educational CD-ROMs, interactive encyclopedias, and multimedia tutorials became common resources in schools and higher education institutions.

Another transformative development during the 1990s was the rapid expansion of the Internet. The internet revolutionized educational communication and information access by connecting learners and educators across the globe. Students gained access to online libraries, academic databases, digital repositories, and educational websites. Teachers could share learning materials electronically and communicate with students through email and online forums. The internet also facilitated collaborative learning by enabling interaction among students from different geographical locations.

By the early 2000s, educational institutions increasingly adopted e-learning technologies and Learning Management Systems (LMS). Virtual classrooms, online courses, and web-based instructional platforms became important components of education. Distance education programs expanded rapidly, allowing students to pursue academic qualifications regardless of location. Computers became indispensable tools for teaching, learning, research, administration, and academic communication.

Thus, the historical development of computers in education reflects a continuous process of technological innovation and educational transformation. From programmed instruction in the 1960s to multimedia learning and internet-based education in the early twenty-first century, computers have played a crucial role in enhancing educational quality, accessibility, and effectiveness. Their evolution has laid the foundation for the digital learning environments that characterize modern education today.

Applications of Computers in Education

1. Computer-Assisted Instruction (CAI)

Computer-assisted instruction allows students to learn through interactive educational software. CAI provides immediate feedback, individualized instruction, and self-paced learning.

2. E-Learning

E-learning refers to education delivered through electronic technologies. It enables learners to access educational content anytime and anywhere. Universities increasingly adopted learning management systems to support online education.

3. Distance Education

Computers and internet technologies facilitate distance education by connecting students and instructors across geographical boundaries. Virtual classrooms and online discussion forums enhance learner engagement.

4. Educational Research

Researchers use computers for statistical analysis, data management, literature searches, and scientific communication. Software packages such as SPSS and Microsoft Excel became essential tools for academic research.

5. Administrative Applications

Educational institutions use computers for student record management, examination processing, payroll administration, and library management systems.

6. Multimedia Learning

Multimedia applications improve understanding by combining text, images, animations, audio, and video. Such tools support visual and auditory learning styles.

Advantages of Computer Use in Education

1. Enhanced access to information.
2. Improved learning efficiency.
3. Individualized instruction.
4. Interactive learning environment.
5. Improved communication.
6. Better data management.
7. Increased learner motivation.
8. Support for lifelong learning.

Challenges and Limitations

Despite numerous benefits, computer-based education faces several challenges:

1. High implementation costs.
2. Lack of infrastructure.
3. Digital divide among students.
4. Limited computer literacy among teachers.
5. Dependence on technology.
6. Maintenance and technical support requirements.

7. Potential distractions associated with internet use.

Impact on Teaching and Learning

Computers have shifted educational approaches from teacher-centered instruction to learner-centered learning. Students actively participate in knowledge construction rather than passively receiving information. Teachers increasingly function as facilitators and guides rather than sole providers of information.

Future Prospects (Perspective up to 2010)

By 2010, experts anticipated increased use of online learning environments, mobile technologies, digital libraries, and virtual learning communities. The continued integration of computers into education was expected to enhance educational quality and accessibility worldwide.

II. Conclusion

Computers have become indispensable tools in education. They support teaching, learning, research, and administration while expanding access to educational opportunities. Although challenges remain, the benefits of computer applications in education outweigh the limitations. Continued investment in technological infrastructure and digital literacy is essential for maximizing the educational potential of computers.

References

[1]. Alessi SM, Trollip SR. Computer-Based Instruction: Methods and Development. 3rd ed. Boston, Massachusetts: Allyn & Bacon; 2001. p. 1–560.
[2]. Bates AW. Technology, E-Learning and Distance Education. 2nd ed. London, United Kingdom: Routledge; 2005. p. 1–256.
[3]. Becker HJ. Internet Use by Teachers: Conditions of Professional Use and Teacher-Directed Student Use. Teaching, Learning, and Computing Survey. Irvine, California: Center for Research on Information Technology and Organizations, University of California; 2000. p. 1–48.
[4]. Bork A. Personal Computers for Education. New York, NY: Harper & Row Publishers; 1985. p. 1–352.
[5]. Cuban L. Oversold and Underused: Computers in the Classroom. Cambridge, Massachusetts: Harvard University Press; 2001. p. 1–256.
[6]. Driscoll MP. Psychology of Learning for Instruction. 3rd ed. Boston, Massachusetts: Pearson Education; 2005. p. 1–592.
[7]. Garrison DR, Anderson T. E-Learning in the 21st Century: A Framework for Research and Practice. London, United Kingdom: RoutledgeFalmer; 2003. p. 1–168.
[8]. Jonassen DH. Computers as Mindtools for Schools: Engaging Critical Thinking. 2nd ed. Upper Saddle River, New Jersey: Prentice Hall; 2000. p. 1–320.
[9]. Kozma RB. Technology and Classroom Practices: An International Study. Journal of Research on Technology in Education. 2003;35(3):295–308.
[10]. Laurillard D. Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies. 2nd ed. London, United Kingdom: RoutledgeFalmer; 2002. p. 1–288.
[11]. Levy Y. Assessing the Value of E-Learning Systems. Proceedings of the Academy of Human Resource Development Annual Conference. 2003. p. 678–685.
[12]. Moore MG, Kearsley G. Distance Education: A Systems View. 2nd ed. Belmont, California: Wadsworth Publishing; 2005. p. 1–368.
[13]. Norton P, Wiburg KM. Teaching with Technology: Designing Opportunities for Learning. 3rd ed. Belmont, California: Thomson Learning; 2003. p. 1–432.
[14]. Oppenheimer T. The Flickering Mind: Saving Education from the False Promise of Technology. New York, NY: Random House; 2003. p. 1–528.
[15]. Papert S. Mindstorms: Children, Computers, and Powerful Ideas. New York, NY: Basic Books; 1980. p. 1–252.
[16]. Roblyer MD. Integrating Educational Technology into Teaching. 4th ed. Boston, Massachusetts: Pearson Education; 2006. p. 1–432.
[17]. Schrum L, Levin BB. Leading 21st Century Schools: Harnessing Technology for Engagement and Achievement. Thousand Oaks, California: Corwin Press; 2009. p. 1–208.
[18]. Siemens G. Knowing Knowledge. Vancouver, British Columbia: Lulu Press; 2006. p. 1–176.
[19]. Taylor RP. The Computer in the School: Tutor, Tool, Tutee. New York, NY: Teachers College Press; 1980. p. 1–128.
[20]. Warschauer M. Technology and Social Inclusion: Rethinking the Digital Divide. Cambridge, Massachusetts: MIT Press; 2003. p. 1–288.