

# ***Information Technology In Education: A Critical Study***

***Hemchandra Padalikar***

***&***

***Kirti Mahajan***

*Faculties*

*Bharati Vidyapeeth's IMED, Pune*

## **Abstract:**

The computer is the 'teaching-machine' corresponding to the fifth generation of education (i.e. e-Learning). Its essence is its universality, and its power to simulate. Because it can take on a thousand forms and can serve a thousand functions (through respective software), it can appeal to a thousand tastes. This enables the proliferation of digital technology in education environment due to the interests shown by the parents, students, governing authorities, and educators.

But there is mysticism involved about the practical applications of computers in education environment. Sometimes the tsunami of advancements in technology hijacks the issues corresponding to their implementation in education domain. Also the practical advantages of Information Technology in education get unnoticed in the midst of technological details.

This paper discusses the fifth generation of education characterized by the introduction of Information Technology in education process. It also discusses the factors responsible for the increasing adoption of e-Learning and provides advantages behind them in concrete terms.

## **Generations of education environments:**

The Indian culture has a rich educational tradition. The origin and growth of Indian Education System progressed through five generations [20] – namely;

- Pre-Vedic system of education: oral experience sharing (1500 BC – 1000 BC)
- Post-Vedic system of education: formal education system (Gurukul system) (1000 BC – 200 BC)
- Buddhist system of education: mass education through educational institutions (e.g. Takshashila, Nalanda ) (200 BC – 1000 AD)
- Islamic system of education: education proliferation through books (1000 AD – 1700 AD)
- British system of education: Western education system (1700 AD onwards)

While it is an important area for consideration, it will be seen that the western education system overlaps on traditional Indian education system. Also the western education system has global presence. Hence, this research is oriented towards western education environments.

The origin and growth of western education system has also progressed through five distinct generations [5]. Prior to writing, books and schools, learning was essentially experiential (the first generation of learning). The individual learned by doing. The cave paintings and hieroglyphics of the ancients were to instruct future

## Information Technology

generations about what had been learnt by their ancestors.

The formal education process was developed in the 5th century B.C. in Athens with the advent of the Socratic-method based on deduction. Until that time learning was very much a process of everyday experience. The idea of learning in an abstract setting (rather than experience) constitutes the first formal education process (the second generation of education) that eventually gave rise to today's educational system.

The learning process tilted even more towards formal education in the third generation, with the academies founded by Aristotle and Plato in 4th century B.C. These early academies for many years relied on the oral tradition of the teacher reciting from memory, while students memorized the recitation. Faculty and students then engaged in a dialogue to discover the truth. The origination of symbol systems eventually led to the formal writing of codified knowledge in documents known as books. The first books were extremely rare, and writers were severely criticized for introducing them into the education system. In this early period, books were the exclusive domain of faculty. Instead of reciting lectures from memory, faculty read to students from handcrafted manuscripts. For reasons of economics and ideology, students didn't have access to such books. This era formed the latter part of third generation.

The invention of the printing press erased the economic argument against students' having access to books. The wide availability of books eventually ushered in the fourth generation of learning, which has persisted until this time. The advent of the book and the printing press added a major level of productivity enhancement towards the proliferation of education.

The emergence of digital technology started the fifth generation. Its multidimensional approach is changing our traditional perceptions towards management of education environment, transfer of instructional resources and teaching-learning process itself.

### These five generations of education can be summarized as;

- **first generation:** experience sharing (through auditory, cave paintings, and hieroglyphics)
- **second generation:** formal education, 5th century B.C.
- **third generation:** formal institutions of higher education, 4th century B.C.
- **fourth generation:** printing press enabled students' access to the books, 15th century
- **fifth generation:** digital technology enhanced the educational environment, 20th century

Computers are used in education environment following different approaches; to manage education institutions, to provide virtual learning environments (VLE), and to provide instructional resources.

The first is the extension of the current procedures. It represents the same activities using a new tool (through adaptation of digital technology to suit present setup). The second and third approach introduces a catalyst in the form of a computer, in educational environment. It proposes the use of computers in teaching-learning process to assist teacher and learner. It is also proven that they together enhance the teaching-learning process.

### Fifth generation of education environment:

Fifth generation education environment is tightly bound to the advent of digital technology and its advancement throughout the 20th century into 21st century. Table 1 provides a brief trace-out of its origin and progress.

**Table 1: A brief chronology of digital technology in education**

1927	The first 'teaching-machine' was introduced by S. L. Pressey [13].
1940's	Introduction of first operational computers; MARK 1 (1944), Harvard (1946), and ENIAC (1946); initiated the early use of computers in education. It was primarily in mathematics, science, and engineering as a mathematical problem-solving tool [15].

1959	The first formal project for the use of computers in education, PLATO, was introduced by Donald Bitier [10].
1963	Time-sharing system and easy-to-use computer language, BASIC, was introduced by John Kemeny and Thomas Kurtz [18]. This system spread rapidly and was used for the creation of text oriented computer-based instructional materials by the teachers themselves.
1963	Patric Suppes and Richard Atkinson introduced the concept of Computer-Assisted-Instruction (CAI) [22], to free the students from group-paced instruction and to develop individualized instructional strategies. Here the computer-based instruction approach was teacher-centric.
1971	The learner-centric paradigm shift in learning environments resulted in the introduction of Computer-Assisted-Learning (CAL) [23]. Seymour Papert introduced LOGO language following the philosophy that; ‘ One should not teach mathematics, but should teach children to be mathematicians’ [26].
1973	Growing interest in Artificial Intelligence (AI) domain introduced procedural knowledge based approach resulting in Intelligent-CAI (ICAI) systems. SOPHIE, GUIDON and GEORGE were the examples of this approach [21].
1975	First micro-computer systems were introduced, enabling a shift in computer-based learning from mainframe and mini-computer centric domain to microcomputer centric domain. Contributing to the expanding microcomputer base, computer-based learning software became a software category in itself starting mass production of educational packages. This resulted in economically feasible computer based learning approach [6].
1990’s	Introduction and proliferation of the Internet introduced distributed model which gave rise to virtual learning environments [4].
Current status	Internet based distributed model is redefining education environment through e-Learning paradigm [17].

**Digital technology in education environment:**

The computer is the ‘teaching-machine’ of fifth generation [5]. Its essence is its universality, and its power to simulate. Because it can take on a thousand forms and can serve a thousand functions (through respective software), it can appeal to a thousand tastes [11]. This enables the proliferation of digital technology in education environment due to the interests shown by the parents, students, governing authorities, and educators.

The parents themselves are demanding computers in educational institutions. Middle class parents in particular seem to feel that their children are receiving an inferior education unless computers are available. This reflects the fact that society sees computers as magical devices, ones people hope will solve the major social problems. Parents also see computer skills as valuable for future jobs [2].

Information and communication technologies (ICTs)—which include radio and television, as well as newer digital technologies such as computers and the Internet—have been touted as potentially powerful enabling tools for educational change and reform.

The Students show high enthusiasm about working with computers which improves their academic motivation [24] [9] [14]. Also, students project feelings, intentions, and psychology onto the computer which supplements this [3].

E-learning encompasses learning at all levels, both formal and non-formal, that uses an information network—the Internet, an intranet (LAN) or extranet (WAN)—whether wholly or in part, for course delivery, interaction and/ or facilitation. Others prefer the term online learning. Web-based learning is a subset of E-learning and refers to learning using an Internet browser (such as Netscape or Internet Explorer).

The governing authorities are supporting and sometimes sponsoring the use of digital technology in education

## Information Technology

at multiple levels. In India, 'country classroom' project initiated by University Grants Commission (UGC), the Satellite Instructional Television Experiment (SITE), government's initiative to interlink all technical education institutes with the Anna University of Technology in Chennai, UGC's INFLIBNET which was setup to connect university libraries throughout India, UGC's proposal to link 5000 colleges in the country through an information network system to ensure uniformity in access to teaching material, Indian Space Research Organization's (ISRO) EDUSAT satellite to take the teaching expertise of expert educators to remote areas and Computer Literacy at Secondary School (CLASS) project are instances of such trend [20].

India's 10th Five Year Plan (2002-07) states, '8.52: During the Tenth Plan it is proposed to provide computer connectivity to 140 government senior secondary schools through Vidya Vahini Programme and upgrade the IT infrastructure at Delhi University through Gyan Vahini Programme. Later, efforts would be made to replicate these programmes in other schools and colleges by involving private sector' [28]. This underlines the positive approach of governing authorities towards this paradigm.

Radio and television have been used widely as educational tools since the 1920s and the 1950s, respectively.

There are three general approaches to the use of radio and TV broadcasting in education:[30]

- **direct class teaching**, where broadcast programming substitutes for teachers on a temporary basis;
- **school broadcasting**, where broadcast programming provides complementary teaching and learning resources not otherwise available; and
- **General educational programming** over community, national and international stations which provide general and informal educational opportunities.

Educators are encouraging the use of computers in education following their proven advantages in education setup. Teachers are not only interested in use of computers in education but they also have positive feelings toward them [12].

It is proven that use of computers as teaching-machine is at least as effective as traditional instruction and may actually lead to significant improvements in some subject areas. It is found that when computers are used the students learn instructional materials at a faster rate – in some cases up to 40 percent faster [14][1][27][8]. In particular, when used to present certain kinds of material graphically rather than textually, the computer can help a majority of learners comprehend some aspects of that material faster and more accurately [16]. Thus computer-based instruction results in significant reductions of instructional time.

One hour per day with a computer can theoretically provide a student with more interaction than he or she would receive in a day in a regular classroom [25] [14] [9]. It also produces favorable attitudes towards computers by students [7].

It is also discussed that to cope up with the accelerating change computer is necessary in education system. Thus making it the fourth aspect of education (along with reading, writing, and arithmetic) [19].

Researchers have conducted a number of meta-analyses (analyses of the previous research studies) to determine the impact of digital technology on student achievement (Table 2) [29]. These meta-analyses were conducted independently by different researchers, focused on the different uses of computers and multimedia technologies with different populations, and differed in terms of the methodology used to identify studies and analyze results. Nevertheless each meta-analysis concluded that instructional programs that included technology show a positive impact on student achievement.

**Table 2: Meta-analyses involving technology and achievement**

Meta-analysis	Grade level	Type of technology	Number of studies involved in the meta-analysis
Bangert-Downs, Kulik, & Kulik (1985)	Secondary	CBI, CMI, CEI	51

Burns & Bozeman (1981)	Elementary & secondary	Drill, tutorial	44
Hartley (1978)	Elementary & secondary math	Drill, tutorial	33
Kulik & Kulik (1986)	College	CBI, CMI, CEI	119
Kulik & Kulik (1991)	Kindergarten to higher education	CBI, CMI, CEI	254
Kulik, Kulik & Bangert-Downs (1985)	Elementary	CBI, CMI, CEI	44
Niemiec & Walberg (1985)	Elementary	Drill, tutorial, CMI, problem solving	48
Roblyer (1986)	Elementary to higher education	CAI, CMI, CEI	82
Ryan (1991)	Elementary to higher education	CAI, CMI, CEI	40
Sivin-Kachela & Bialo (1996)	Preschool through higher education	CAI, CMI, CEI	176
<b>Note: CAI = computer-assisted instruction, CBI = computer-based instruction, CEI = computer-enriched instruction, CMI = computer-managed instruction</b>			

### Advantages of Information Technology in Education:

Following this discussion, the discussed advantages of computers in education can be summarized as [2];

#### Learners enjoy using computers:

The computer has very high motivational value. People of all ages hear about computers constantly through news-papers, television, and films. Although the computer is not always pictured favorably, for most learners, particularly most young ones, it is presented as an exciting new device. So students are prepared for computers, even eager to have contact with them.

#### Individualization:

Most learning-theorists agree with comment that learning is a very individualized process. Students have quite different backgrounds and abilities, and they probably differ, from the standpoint of learning, in many ways unknown at present. The time required for learning may also differ from student to student. A central problem in any educational system is how to reach the individual student effectively. This problem is seldom addressed adequately in current educational systems. With good material available, computers can allow individualization responsive to student needs.

#### Faster learning:

Results suggest that curriculum based on computer-based learning can cut 30 percent from the time students need to learn something. The major advantage comes from individualization. That is, students do not have to spend much time on a subject they know when using good computer-based learning modules.

### Visualization:

Graphics are very extremely important in the learning process, as suggested by the brain research and by common educational practices. Hence the fact that computers today can provide a remarkable range of pictorial capabilities is important for learning.

### Interaction:

Most learning psychologists would agree upon another factor with respect to learning: Active learning works better than passive learning. One of the computer's main advantages in education is its capability to provide an interactive learning experience.

### Communications:

Interaction with other students – peer interaction – is very valuable in the learning process; computers can serve well in encouraging peer learning in a variety of ways.

### Conclusion:

Thus it is clear that the fifth generation of education is here to stay. It provides concrete reasons for its adoption and proliferation. The involved entities, i.e. teachers, students, management, and parents, are counting on the phenomenon of e-Learning with expectations. The research conducted in this domain also supports them. The benefits of e-Learning can be realized through more entertaining form of education, individual attention towards the students, self-paced learning, decreased complexity through improved visualization aids, active involvement of the students in the learning process, and improved interaction among the peers.

### References:

1. 'India's Five Year Plans: Complete Documents', Academic Foundation, 2003
2. 'Informational Technology and It's Impact on American Education', Office of Technology Assessment, U. S. Congress, 1982, p 128-133
3. Atieh, S., 'How to Get A College Degree Via The Internet', Magna Books, 2004
4. Bork., A., 'Personal Computers for Education', Harper and Row Publishers, 1985
5. Brown, J. S., 'Uses of Artificial Intelligence and Advanced Computer Technology in Education', Academic Press Inc., 1977
6. Fischer, G., 'Where CAI Is Effective: A Survey of The Research', Electronic Learning, November-December 1983
7. Gleason, G. T., 'Microcomputers in Education: The State of The Art', Educational Technology, March 1981
8. Hofmeister, A. M., 'Microcomputers in Perspective', Exceptional Children, October 1983
9. Homes, G., 'Computer-Assisted Instruction: A Discussion of Some of The Issues for would-be Implementers', Education Technology, September 1982
10. Ingersoll, G. M., Smith, C. B., and Elliot, P., 'Microcomputers in American Public Schools: A National Survey', Educational Computer, October 1983
11. Kemeny, J. C., and Kurtz, T., 'Dartmouth Time Sharing', Science, October 1968
12. Levien, R. E., 'The Emerging Technology: Instructional Uses of The Computer in Higher Education', McGraw-Hill, 1972
13. Merton, A., 'Computers in The Classroom', Technology in The Classroom, September 1983
14. Molnar, A. R., 'Viable Goals for New Educational Technology Efforts: Science Education and The New Technological Revolution', Educational Technology, September 1975
15. Oliver, R. W., 'e-Learning: Fifth Generation Learning and It's Impact on Management Education', as in 'E-Service: New Directions in Theory and Practice', Roland, R., and Kannan, P. K. (eds.), Sharpe, 2002
16. Orlansky, J., 'Effectiveness of CAI: A Different Finding', Electronics Learning, September 1983
17. Papert, S., 'Mindstorms: Children, Computers and Powerful Ideas', Basic Books, 1980
18. Papert, S., 'The Children's Machine: Rethinking School in The Age of The Computer', Basic Books, 1993
19. Pressey, S. L., 'A Simple Apparatus Which Gives Tests and Scores – and Teaches', School and Society, May 1927
20. Raghavan, S. S., 'Microcomputers in School Education', Prentice-Hall of India, 1990 p 4
21. Ramaiah, Y. R. 'Distance Education and Open Learning', Mittal Publications, 2001, p 153-187
22. Ramchandran, P., and Ramkumar, V., 'Education in India', National Book Trust, 2005, p 1-104
23. Roblyer, J. D., 'Measuring The Impact of Computers in Instruction: A Non-Technical Review of Research for Educators', AEDS, 1985
24. Smith, P. R., 'CAL-85: A Symposium in Advances in Computer Assisted Learning', Pergamon Press, 1986
25. Spencer, M., and Baskin, L., 'Computers in The Classroom', Childhood Education, March-April 1983
26. Taylor, R. P., and Cunniff, N., 'Moving Computing and Education Beyond Rhetoric', College Record, 1988
27. Taylor, R. T., 'The Computer in The School: Tutor, Tool, Tutee', Teachers College Press, 1980, p 213-260
28. Turkle, S., 'The Second Self: Computers and The Human Spirit', Simon and Schuster, 1984
29. Valdez, G., 'Computer-based Technology and Learning: Evolving Uses and Expectations', North Central Regional Educational Lab, 2000
30. Perraton, H. and C. Creed, 'Applying New Technologies and Cost-Effective Delivery Systems in Basic Education