What does educational technology mean in the promotion of student achievement: a literature review

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Abstract
Research indicates that educational technology has a valued status, especially in the promotion of student learning. The theory behind the study of educational technology includes the four paradigms defined by Saettler (1990): the media view, the communications and systems view, the behavioral sciences view, and the cognitive science concept. This theory serves as the basis for the implementation of educational technology by the teachers.

Implementing educational technology, in special education and regular education (k-12), has indicated positive influences on student achievement. Greater student achievement would translate to better worker-citizens for the United States, thereby allowing the country to be competitive in the political and economic spheres of the world. Educational technology when applied correctly has demonstrated that student achievement did markedly improve. The method of teaching has changed from a didactic mode to that of a constructivist mode with the support of educational technology. A motivated learner is a lifelong learner, and by using technology in the classroom students can be motivated.
What does Educational Technology mean in the Promotion of Student Achievement: A Literature Review

A Research Paper

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has been approved as meeting the research requirement for the Degree of Master of Arts.

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ABSTRACT

Research indicates that educational technology has a valued status, especially in the promotion of student learning. The theory behind the study of educational technology includes the four paradigms defined by Saettler (1990): the media view, the communications and systems view, the behavioral sciences view, and the cognitive science concept. This theory serves as the basis for the implementation of educational technology by the teachers. Implementing educational technology, in special education and regular education (k-12), has indicated positive influences on student achievement. Greater student achievement would translate to better worker-citizens for the United States, thereby allowing the country to be competitive in the political and economic spheres of the world. Educational technology when applied correctly has demonstrated that student achievement did markedly improve. The method of teaching has changed from a didactic mode to that of a constructivist mode with the support of educational technology. A motivated learner is a lifelong learner, and by using technology in the classroom students can be motivated.
Chapter I

Introduction

Traditionally, education has been achieved through the unsophisticated means of competent teaching and minimal facilities to prepare the young to enter society. According to Milone & Hymes (1996), throughout the history of American public education, “technology-- however defined -- was an afterthought” (p. 10). This suggests good teaching by the teacher was enough to prepare the youth of the United States of America for the future, without the use of technological tools. However, the world today is considerably more complicated, and technological innovations come at meteoric speeds. This unprecedented change in human society brought by these technological innovations challenges the educators to prepare their students in new ways (Milone & Hymes, 1996). Despite the world of rapid change, some reformers have argued that, compared with other social systems, schooling has not changed appreciably (Radlick, 1994). As we look forward to the turn of the next century, a major goal of the educational system is to prepare students to be productive members of the 21st century.

The world that today’s students will face will be vastly different from that of students of the past (Radlick, 1994). The traditional fundamental skills taught in school, such as arithmetic, reading, and writing, are still as important as ever. Students need to acquire some new abilities such as the ability to use technology and to make tools to prepare themselves for coping with life in the changing world.
Technology has had a role in education since the turn of the century, with an addition of revolutionary technology to the traditional teacher-centered model of teaching (Gentry & Csete, cited in Anglin, 1995). The role of technology in education has increasingly developed into that of a more primary role. A report from the Effectiveness of Technology in School 1990-1994 (Sivin-Kachala & Bialo, 1996) said “educational technology has a positive impact on student’s achievement toward learning and toward themselves” (p. 2). Educational technology motivates students to become self-sufficient in the handling of tasks and to improve their learning. Gibbon (cited in White, 1986) stated that of the vast amount of knowledge made available by technology is such that schools need to prepare the students in the collection of data, its analysis and evaluation, and the application of knowledge to solve the problems. Thus, the primary role of educational technology is to facilitate student learning (Newby, Stepich, Lehman, Russell, 1996).

Yet, the task faced by the teacher is the integration of educational technology into the classroom so that it will bring about maximum effectiveness and efficiency in student achievement. This is even more true because technology is the ubiquitous context in which all learners will function in the next century. Technology is also a powerful vehicle for supporting school restructuring. Hopefully, teachers can take advantage of this powerful support vehicle (Radlick, 1994). Hence, it is the responsibility of the teacher to ensure efficient use of the tool-- educational technology.
Furthermore, if all of today’s students enter the workforce, they need to be competent with technology (Milone & Hymes, 1996). The U.S. Department of Labor, in What Work Requires of Schools, contended in 1992 (cited in Milone & Hymes, 1996) that “More than half of our young people leave school without the knowledge or foundation required to find and hold a good job” (p. 17). Although this statement never mentioned the technological skills, it clearly suggested that technology will help people gain an entry into a career.

In conclusion, “Future generations will work increasingly with interactive learning technologies” (Laszlo & Castro, 1995, p. 7) and will depend on how teachers bring technology into the classroom.

Statement of Purpose

The purpose of this review is to investigate the role of educational technology on student achievement. Since educators have used technology in education for over a century, there is a generally positive attitude toward the effectiveness of technology and its integration into teaching. Therefore, it is a reasonable assumption that the application of educational technology for student achievement should occur.

Likewise, even the role of the technology in education has been confirmed positively, with new technologies being added to the curriculum. Moreover, some educators fear the abuse of the technology, as stated by Schrage (cited in Ely & Minor, 1994), that additional spending on hardware, i.e. computers, would not educate students.
In addition, the definition of educational technology is still not clear (Gentry & Csete, cited in Anglin, 1995). The initial reaction of many people to the term educational technology -- is it is only a computer. But this view limits the scope of educational technology (Muffoletto, 1994). Hence, the purpose of the paper is to seek through the research on what does educational technology mean in the promotion of student achievement.

Significance of purpose

This paper is a literature review which seeks to produce a working definition of education technology and what are the tangible results of applying educational technology on student learning. The results, hopefully, will help to illustrate what educational technology is and to clarify the role of educational technology, as well as, explain the relation of educational technology to student achievement.

Since the technology is changing rapidly, the glut of information available via the Internet has brought along a renaissance in education in the U.S.A. Information is power and the possession of information is powerful. Muffoletto (1994) indicated that educational technology has become an object of control rather than as a subject. Feenberg (1992) suggested that technology constituted a new type of cultural system that exercises control on the social world.

Moreover, the achievement of the learners has traditionally translated into the qualities of a good worker in the marketplace (Besser, 1994). Thus it would allow the attainment of the national education goals set forth in the Goal 2000 (Office of Educational Research and Improvement, 1995). Greater academic achievement by
American students meets the high expectations of the nation, which ultimately places the U.S.A. in a competitive position with the rest of the world (Muffoletto, 1994).

**Organization of the Paper**

The paper is to divided into four distinct parts with the first part acknowledging the role of educational technology on student achievement. The second part is about the research related to the implementation of educational technology in classrooms. The third part is the literature review. The collation of the various views of educational technology is synthesized, to give a picture of what educational technology is. Case studies of the implementation of educational technology are also included in the literature review, as well as, some studies that discuss the benefits of educational technology on student achievement.

Finally, chapter IV is the conclusion of the paper to suggest how educational technology influences student learning. Also mentioned are some of the dangers of using educational technology in curriculum and what is the future of educational technology.
Chapter II

Methodologies

The methodologies employed by the researchers in this literature review include meta-analysis, surveys, and case studies. The methods employed seek to paint a picture on the effects of the educational technology on the student achievement.

**Meta-Analysis**

The review method of meta-analysis came about in 1976 and the term was coined by Glass (cited in Baker & O'Neil, 1994). He used it in the synthesis of literature on the effects of psychotherapy. It is the statistical analysis of a large collection of results from individual studies for the purpose of the integration of findings for a coherent discussion.

According to Sivin-Kachala & Bialo (1996), meta-analysis is a method of assessment of the effects of technology-based instruction for many studies using a common unit of measurement defined as an effect size (ES). An ES of 0.3 can be interpreted as thirty percent more effective than the control group instruction and an ES of 1.05 would mean a staggering 105% more effective than control group instruction. The ES difference could then be extended to the variable in the various studies and thus lead to a conclusive result in terms of the effects of the variable, common throughout the meta-analysis.
Surveys

Surveys are completed by the people whose opinion is of interest to the researcher. They are usually carried out in the form of questionnaires and/or interviews. Questionnaires consist of a series of questions the researcher has determined whose response would lead to an answer giving coherence to a general situation. The results of a survey would indicate the trend of behavior of a student with the computer. Interviews would give the researchers the opinions of the interviewees. They allow the researcher to gauge, as well, the degree of response by viewing non-tangibles such as the body language of the interviewees.

Case Studies

Case studies allow the researchers to study a single system where interested topic is being applied. An example would be the schools which chose to reflect educational reform by applying educational technology methods of instruction into the classroom. The complete dissection of the system upon completion of the project by the researchers through direct observation methods is part of the discussion. The complete observation of the teaching methods and student responses would lead to an understanding of the statistical results arrived at the completion of the project. The assessment results of the test and control groups provide the researcher with the data to be able to decide if the results agreed with the hypothesis.
Chapter III

Literature Review

Educational technology is comprised of two words, yet, it is difficult to define. As stated by Anglin (1995) technology is valueless; it depends who is describing a part of the elephant at any one time. Muffoletto (1994) stated that technology should be viewed as a thought, rather than hardware. He goes on to indicate that when referring to technology in educational circles, most will refer to the computer. Callahan (cited in Muffoletto, 1994), suggested that technology exists as a set of rational procedures, not a collection of machines or devices, but is a way of thinking or acting. From this point of view, educational technology is one of social philosophy, not just an application of scientific invention. In addition, right now the central problem of education is not learning or having technology, but rather the management of learning (Hoban, cited in Cuban, 1986), and the various procedures, techniques and methods of teaching used in the management of education. In this sense, educational technology plays a key role in educational reform.

Educational Technology

What is technology? The root word “technologia” was used by Greeks as the meaning for a scientific method for achieving a practical purpose or the totality of the means employed to provide objects necessary for human sustenance and comfort (Merriam-Webster’s Collegiate Dictionary, 1993).
Technology also is, as Simon (1983) stated, "a rational discipline designed to assure the mastery of man over physical nature, through the application of scientifically determined laws" (p. 173). There are various definitions of technology. According to Gentry (cited by Anglin, 1995), "technology is the systemic and systematic application of behavior and physical sciences concepts and other knowledge to the solution of problems" (p. 7).

From those definitions of technology, we can learn out that technology is not only a device or a new tool or an innovative machine, but also "refers to any practical art using scientific knowledge" (Saettler, 1968, p. 5). Technology is a way of thinking and acting (Muffoletto, 1994), which could reform any movement of human society, specially in education.

The definition of educational technology. According to Eraut (cited in Plomp & Ely, 1996), the history of educational technology is more than one century old. For an understanding of the how and what is of it requires the understanding of the various thinking and fields of specialization to generate educational technology.

The Association for Educational Communications and Technology (AECT) (1977) suggested the definition: "Educational Technology is a complex, integrated process involving people, procedures, ideas, devices and organizations, for analyzing problem, and devising, implementing, exalting and managing solutions to those problems, involved in all aspects of human learning" (p. 164). This definition was based on the domain of educational technology, which clarified the components of the process of educational technology.
Saettler (1990) claimed educational technology is "...any systematized practical knowledge, based on experimentation and/or scientific theory which enhances the capacity of society to produce goals and services, and which is embodied in production skills organization, or machinery" (p. 4). In 1995 Gentry (cited in Anglin, 1995) also gave this definition: "The combination of instructional, learning, developmental, managerial and other technologies as applied to the solution of education problems" (p. 21).

Those are several explanations of educational technology, but also some related terms are needed to clarify. Such as: Technology in education is not the same as educational technology (Muffoletto, 1994; Thompson, Simonson & Hargrave, 1992). It is the application of technology to any education fields. Another term is: "instructional technology," which is a sub-set of educational technology and also not synonymous with educational computing, even though computers trend to be paramount in education (Thompson, Simonson & Hargrave, 1992).

The four paradigms by Paul Saettler. Over the years, some theories have been identified in education which give the direction for practicing education generally, and educational technology specifically. Most famous of these theories are the systems theory, communication theory, behaviorism, and cognitive theory. All of them were products of an approach called scientific empiricism (Thompson, Simonson & Hargrave, 1992).

The communication and systems concepts define the entirety of the transfer of knowledge via communication in a systematic manner where the information is useful
and clear to the learner. The mode of transfer of information from the teacher to the
learner determines the learning effectiveness of that mode. The effective utilization of
the mode of transfer would contribute to the growth of the learner’s complete
potential.

Behavioral science comprises the academic fields of psychology, anthropology
and sociology, which when applied to the tasks of solving the difficulties of learning
and instruction are the basis of educational technology in the present. The organization
of the curriculum into small units in which the focus is on immediate observable and
measurable learning products by the learners (Thompson, Simonson & Hargrave,
1992). Therefore, the learner is motivated to engage in new forms of behavior of
specific forms at specific occasions. And that the teacher’s role in educational
technology is as the facilitator to reinforce the learning behavior.

The cognitive concept of educational technology embodies the understanding
that learners vary in terms of aptitudes and attitudes. It does not seek to stimulate
behavior in any fashion but rather to seek methods which activate the learner’s interest
in learning and is unique for each learner. The goal is that the learners are activated
towards learning and therefore responsible for their role in the generative learning
process.

Saettler (1990) concludes that the boundaries of educational technology has not
been defined as yet, although the ongoing research into the field has remained stagnant
and failed to investigate other varied sources of study to expand and seek new
paradigms of educational technology. Clark (cited in Thompson, Simonson &
Hargrave, 1992), indicated that many comparison studies on educational technology have failed in part due to the misinterpretation or misrelating of that to a theory or did not relate their studies to theory. In short, educational technology is a management method in which the tools of media, such as CD-ROMs, computers and interactive video are employed using behavioral and cognitive learning strategies and theories to promote greater student achievement.

The role of technology in education. It is clear that technology has become a very important component in human activities. Technology is a tool which shows new performance in human life (Mumford, 1934; Postman, 1992). Yet, technology only is a tool in education which is limited and restrained. Therefore, technology in education has other meanings.

Education, as Muffoletto (1994) stated, is a social institution with a purpose and history, is full of compromises, contests, contradictions and agreements. Therefore, technology in education cannot be construed as progress without human interest. Technology in conjunction with education produces a means for controlling the educational experience.

Educational media alone does not influence the achievement of the students. Media permits the delivery and storage of instructional information and will not determine the learning (Thompson, Simonson & Hargrave, 1992). There are media that one verbal and non-verbal. Non-verbal media are computers, CD-ROMs and the assorted paraphernalia, as well as, the verbal media such as lectures and books. Both media roles seek to instruct the learner. Clark (1983) argued that the media are only
vehicles that deliver instruction to the learners. The quality and quantity of the instruction, therefore learner benefit and achievement, is limited by the content of the vehicle. What is clearly indicated is that learner achievement is due to the instructional methods and not by the medium of delivery. The influence of media on the cognitive skills of the learner (Winn, cited in Plomp & Ely, 1996), is the interaction of symbol systems of the media with the cognitive processes.

Furthermore, as Feenberg (1991) claimed, "...technology constitutes a new type of cultural system that restructures the whole social world as an object of control..." (p. 7). Which suggested technology became a directing influence on human society. Thus, technology in education does not only influence our daily life, but also opens the window of knowing the world (Muffoletto, 1994).

**Student Achievement**

The fundamental goal of understanding student achievement is to provide information that can be used in improving learning and instruction (Linn, cited in Alkin, 1992). Student achievement, using educational technology in teaching and learning, is obviously becoming a hot issue of educational technology research.

However, student achievement testing scores need to be differentiated into the two categories of achievement and aptitude thinking (Linn, cited in Alkin, 1992). Achievement refers to the understanding that accomplishments follow a period of study or practice. Aptitude points to the psychological characteristics of the individuals who are predisposed to learning and thus determines the future.
accomplishments of the learner under the specified instructional process (Snow, 1980; Linn cited in Alkin, 1992).

Educational technology is both able to determine the accomplishments the learners, as well as, their aptitudes towards technological utilization. There are many studies on using technology in education. Research indicated effective use of technology to support instruction in different areas including: language development, reading, writing and communication, science, math, music and so on.

**Reading.** Schultz (cited in Kulik, 1994) examined the effectiveness of a interactive literacy system which combines activities to support reading, writing, speaking and listening. Learners using a literacy based technological system, when compared to similar level learners (grade one) in a period of three months, exhibited significantly greater gains in the basic language skills, such as the understanding of the intricacies of the English language, the method for classification, and comprehension of reading.

A study of research on the effectiveness of a tutorial and practice program to allow young learners to develop awareness of phonetics indicated the program was very effective. Kulik (1994) in his study of technology-based a reading curriculum had a result in which the exposed learners made significant gains. The positive impact was consistent with Kulik’s meta-analysis of twenty studies on the Computer Curriculum Corporation comprehensive courseware system.
Writing. White (1987) advocates the reading of television scripts or screen plays will allow the learners to understand the intricacies between the writing process through translation and adaptation to produce a new product in visual media. Anderson-Inman & Zeitz (1994) suggested that computer outliners and concept mappers make the study process concrete and encourage students to analyze information. They pointed out further that the extrapolation of information from a key word inputted into the computer would generate related topics or ideas into a coherent web of information. This web would become the form of an outline in which additional material was added at a later step in the development process. This process allows the student to think about the different aspects on a single topic, to evaluate the information and decide what information to utilize and incorporate into their writing reports.

According to Snyder (1993), the change in the writing process where word-processors are used allows poor writers to be interested in writing. Spell checkers allow the students to stop running to the dictionary or teacher because of difficulty in finding a word while engaged in the writing process. He stated that when a solid teaching model of writing is implemented it allows students to achieve better than students without word processors. In the collaborative aspect of word processing as a tool to writing, (D'Agostino & Varone cited in Kozma & Johnston, 1991) the arrangement of the computers into clusters, essentially into a circle, allows the students to enjoy feedback and the independence from each other and the teachers as well as to focus on writing. They go on to state that the results have been dramatic in the comparison between the final papers of learners using word processing and those who did not. These studies
indicated word processing influenced the production of longer, well-written papers which had a greater audience analysis and development of ideas. Kozma and Johnston (1991) in their research and interviews collated an analysis on the improvement of learner writing in higher education. Success in student achievement results from a sound instructional program, coupled with the simple word processor which met the goals of the teachers and the needs of the student.

**Communication.** Communication skills can be enhanced by using technology in small groups and by integrating telecommunications into the classroom (Barron & Orwig, 1997). Recent impact on education involves the merging or integrating of three technologies: communications, computers, and videos (Picciano, 1998). This merging of new technologies in school which provide students the more opportunities to practice, demonstrate and critique communication skills (Wright, 1991).

Matthew (1994), reported on the use of computer-based technologies in teaching limited English proficient (LEP) minority students. These technologies were incorporated to assist in speaking, listening, reading, and writing. Students should increase in self-expression and communication skills.

Another implementation of using technology to practice communication skills was at Ellison elementary school (Milone & Hymes, 1996). The teacher divided the class into groups and each group developed questions on different subject areas. Each group accessed different media to search for answers. Once the research was finished, the students organized the information in the database format and shared it with another school through an interactive television system. Then these answers were critiqued by
each group. During this process, students had many chances to cooperate and communicate with different groups via electronic media.

**Special Needs.** Technology offers many advantages for students with special needs. The study conducted at the Western Pennsylvania School for the Deaf related to the integration of interactive technology into the high school curriculum (Bernauer, 1995).

The advantages of interactive technology is such that it provides visual material for the deaf. This heightened mode of communication, because of the limited audio modality, is particularly effective. Fletcher (cited in Bernauer, 1995) indicated that interactive technology promotes a higher level of student learning than traditional teaching methods in that student participation increased with more active learners than the traditional classroom. It also enabled learners the freedom to progress at their own speed and to capitalize upon their own strengths and learning styles rather than strict conformation to a restrictive environment.

The application of interactive technology into the classrooms of the students indicated the change in their attitudes towards computers in post test situations. The test results although statistically unacceptable, indicated a variation between the experimental group and the control. Biology students who had used interactive learning scored higher than those who did not. The chemistry students had no control group, and thus the study was unable to indicate the effectiveness of interactive technology on the learners, although the students did improve on the teacher test (23%) and the Scholastic Aptitude Test (SAT) science scores (3%).
Peakview Elementary (Wilson, 1994), school employed educational technology into the organizational and teaching strategies. A survey was conducted using Peakview as the primary focus and in comparison to three other elementary schools in the area. Eighteen of the twenty-two of the Peakview teachers agreed in a poll that student achievement is increased when technology was a tool in the teaching. None disagreed with the statement. The overall response to technology employed in the education process of the learners are positive with respect to learner development. A poll asking whether student achievement increased when technology was used by non-Peakview staff resulted in seven who strongly agree, twenty-seven in agreement and sixteen undecided with three dissents out of a total of fifty-four respondents.

The comments of the teachers at Peakview indicated that the students are making better progress in class. For example, writing from Kindergarteners in some instances resulted in that books have been published. Mathematics games help lay the foundation of the basic skills although, there is a need to bolster the skills. Still the games were not drill and practice. Other teachers indicated that the learners were excited about learning, more comfortable with the process of learning and problem solving. The conclusion that the impact on technology on the development of the basic skills of writing and mathematics was positive as reported by the teachers.

Comments by the students (Wilson, 1994) were indicative of an appreciation to be able to access information using technology, indicating the ease of use of the technology by the children. The children did not find it difficult to manipulate the
information from technology and that they had a reduced dependence on the teacher for answers.

On oral and communication skills, the children have become adept at using computers to generate reports (Wilson, 1994). Lower achievers have found it useful, according to some teacher comments, to use computers to proofread and edit their reports and are eager to do their reports on computers. It is indicative of the ability of technology to assist the struggling writer.

Ninety-one percent of the teachers surveyed at Peakview indicated that it is advantageous for learners using computers to learn to research and report on a topic. The reflections of the Peakview staff are that increased student presentation are completed via computer, increased independence in pursuing research was also noted.

The students response to the effect of technology on themselves was reflected in a poll of all four schools. Eighty-five of the Peakview students indicated that technology had affected them “a lot”, twenty-nine replied “some” and five to “a little”. The other three schools had two hundred and thirty-three responding students to “a lot”, one hundred and thirty for “some”, and thirty-six for “a little” and five for “not at all”.

The study of intermediate students in terms of choice of the order of using technology, the trend indicated that the children would like to be alone with computer use and following that about one-third of respondents in all four schools indicated a choice of a group of 2-3 persons. The lower ranking of preference included larger groups and declined towards the entire class in involvement. A survey of Peakview
students and students from the other three schools in response to the preference of interaction with another person in computer use indicated seventy-six students from Peakview preferred working with someone else involving computers, twenty-six indicated disagreement and sixteen were undecided. In comparison, two hundred and thirteen students preferred human interaction from the three schools and one hundred and twenty-eight preferred solitary use of computers with sixty-one students undecided.

The attitudes toward technology were generally positive and markedly so in the Peakview student population. The students indicated that learning with and about technology is important. The survey from Peakview grades 3 to 5 indicated a overwhelming response to the preference of using a computer rather than a textbook.

The students from Peakview support the use of technology in the classroom. They like it very much and allows the students to attain a “I can” attitude (Wilson, 1994).

Peakview elementary is a school that models the concepts of reform. The Western Pennsylvania school for the Deaf is intriguing such that it focuses the study on the impact on technology on learners who are disabled in hearing, which places them at an extreme disadvantage in the didactic classroom where they cannot even hear the teacher and no way able to reflect what they learn through oral communication as in the regular classes.

In particular, special education will see markedly improved benefits in terms of student achievement and interest in learning as the visual media component of
educational technology allows visual thinking. The student absorbs the information visu ally and responds in kind and this removes the handicap of the deaf or hearing impaired student as opposed to a hearing student. They are allowed to compete on the same level. The equity of education brought upon us by technology in education is obvious.

**Benefits of Technology in Education on Student Achievement**

Technology alone is not the determining factor in effective education. The important issue is what is done with technology. Since the late 19th century, technology began to be used in education (Muffoletto, 1994). It built a bridge that connected the basic research and theory to practical implementation (Newby, Stepich, Lehman, Russell, 1996). The teacher and student have to shift from the didactic process of instruction towards the constructivist mode of instruction with the use of technology in the classroom. Cobb (cited in Plomp & Ely, 1996) remarked that learning is a constructivist process in which the student actively participates in the process of acquiring information and the associated process of analysis, evaluation and utilization, rather than passively receiving information. He indicated that technology in education brought changes in the classroom. Yet, integrating technology into education indeed impacts the teaching-learning relationship and has some positive effects. However, through these long periods of integrating technology in education, how did it work or is it worthy? Are there any specific benefits on student achievement? These kinds of questions are usually asked by people.
Active learning. Interactive technologies provide the interactive and stimulated learning environment which could motivate students' interesting in learning process. Also this mode is based on student-centered learning. For instance, in a report from Webster elementary school in which the use of new technology in Kindergarten and first grade for writing class (Schneider, 1993). Each student gained in the learning process. Meanwhile, expert students could be given extra media to learn or to use to help other students. By using interactive technology in classroom, students can work at their own pace and capitalize upon their own characteristics to learn actively.

Critical thinking. Teaching students to think is an important goal for the teacher. In addition, two kinds of thinking have usually been the focus of problem solving and critical thinking. Thinking is a process of learning which involves recalling many things that we remember and then decided what to believe or to do (Maurer & Davidson, 1998). For students to engage in proper and effective thinking, they should have skills and tools to practice and allow them to try thinking deeply. However, technology could contribute to thinking activity for students and promote high-level thinking skills (Vockell and Van Deusen, 1989), as well as assist students with their thinking. For example, LOGO is one thinking-oriented software program used in the curriculum.

Motivation. Motivating students in learning is an important issue in education. Technology can enliven students by making learning exciting and efficient. An example at Nashoba Regional School District in Massachusetts (Milone & Hymes, 1996), the English teacher, Nancy Cook, has a problem teaching students who use five different alphabets and speak six languages. She lets the students use a word processor to create
a biographical encyclopedia for the class. After one semester, students could write several pages in fluent English. Meanwhile, by using this simple technology, students are more attentive and have an increased motivation, as well as, being more likely to engage in learning.

**Cooperative learning.** Technology can be used to enhance and encourage cooperative learning. A small group of students can use one computer or, through a network, students can create a collaborative project. Each student read a short paragraph and question on screen and composed a response to share or exchange the ideas through electronic mail. In this case, technology helped students move from individual isolated work towards learning as a collaborative activity. The result showed students feel more interested and excited in writing and willing to spend more time in practice using this tool.

**Communication skills.** The technological revolution in the late 20th century is developing more advances communication tools. People today are linked to one another by computer networks or telecommunication tools. This link also connects students and teachers in national and international exchanges. Through the networks, teacher and teacher; student and student; teacher and student can share ideas, exchange information.

Furthermore, they can gain access to extraordinary resources that they can use for more wide purposes, from pursuing a hobby, to joining chat groups, to finding a job.
Individualization. Students come from different backgrounds with different personalities and different learning styles. Technology could let students learn by using technology individually, students can learn and develop at different rates (Peck & Dorricott, cited by Milone & Hymes, 1996).

Bernauer (1995) stated, technology enables students to capitalize upon their own strengths or learning styles rather than learning via a single approach. This is especially true for the lower achieving students or special needs students. They will feel more comfortable in learning situations by using technology.
Chapter IV

Discussion and Conclusion

The effects of technology in education have been wholly positive on student achievement. The tangible effects have been shown that there is increased student achievement through the cognitive and behavioral influences brought about by the nature of the media on the learners. The learners have shown a positive inclination to the utilization of media in education. Teachers involved in the application of educational technology are excited by the growth prospects on their students. These is an increase learner confidence. There is a shift towards a social and constructivist approach to learning.

The increased utilization of educational technology methods in the classroom has led to a stronger yield of achievement in classrooms. The objective of the Goal 2000 (National Governors' Association, 1996), is met in part by the increased ability of the students in America's public education classroom to learn more and at the speeds according to their abilities. It does not slow a high achiever down nor does it declare a slow achiever a lost. Educational technology ensures equity in education. Learners have a chance to advance their learning beyond the confines of the textbooks or the ability and knowledge of the teacher. The yield of knowledge when students are busy learning different things would be increased as opposed to the traditional organization of learning. Educational technology is exciting for the teachers specially when they can see and feel the improvement of their students, even slow achievers.
The real value of bringing technology in schools is to help students achieve at higher levels and become more active, confident and motivated learners (National Governors’ Association, 1996).

There are dangers of educational technology in terms of over reliance on the media for information and giving up the printed material. That the ability to spell might be lost would be a terrifying idea for English teachers. Still many may argue on the point that language is an evolving discipline. The over reliance on spell checkers is bad only when the students expect the spell checkers to correct their entire paper.

The computer, or technology, can do no wrong. It is the misconception that teachers need to address when educational technology is to be successfully used in the classroom.

Another issue is the role of teacher in classroom. Many teachers agree that computers have some positive advantages as far as educational enhancement is concerned. Even though the teachers know educational technology is a useful tool which will help to motivate student learning and stimulate their interest. But, some teachers are anxious about using new technology in their classroom. In addition, teachers have favorable attitudes, under certain conditions, to use technology in their classroom but the school can’t give them sufficient training or equipment. This is the other problem when we discuss the implementation of education technology in classroom.
In conclusion, educational technology is the management disciplines, the psychological aspects of learning and the environment of learning that will play their parts in student achievements.

Student achievement is markedly so in terms of the regular learners when educational technology was applied, that the goals of Educate America Act are attainable and allow the United States to produce worker-citizens that are able to hold their own against competition from the rest of the world. Lifelong learning requires a motivated learner, educational technology allows the production of lifelong learners.
Chapter V

References


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