

THE EFFECTS AND USES OF EDUCATIONAL TECHNOLOGY IN LEARNING AND TEACHING

Sevilay SAHİN

Gaziantep University, Department of Educational Administration, Supervision, Planning and Economy, Faculty of Education, Gaziantep, Turkey.

Esen TURAN

Gaziantep University, Department of Educational Programs and Teaching, Faculty of Education, Gaziantep, Turkey.

Abstract:

In this study, the effect of technology on learning and teaching in a classroom environment is investigated. It is widely known that, the effect of technology in the classroom is highly productive. But to what extent and under what circumstances it should be applied depend on different factors such as; background knowledge of teachers about the teaching equipments they use, the ability to use this technology, the methods, strategies and techniques about using it, students' perceptions of technology, technological supports offered by the school, etc. As a result, technology is not an end itself, it should be supported by some other mean.

Keywords: Technology, curriculum, learning/teaching

ÖĞRETME VE ÖĞRENMEDE EĞİTİM TEKNOLOJİSİNİN ETKİLERİ VE KULLANIMI

Özet:

Bu çalışmada, öğretme ve öğrenmede eğitim teknolojisinin etkileri ve kullanımı ele alınmıştır. Bilindiği gibi sınıf içinde teknolojinin kullanımının öğrenme ve öğretme üzerindeki etkisi tartışılmazdır. Bu etki programın bütün öğelerini etkilemekte ve daha etkin hale getirmektedir. Fakat bu kullanımın ne kadar ve ne şekilde olacağı çeşitli faktörlere bağlıdır; öğretmenlerin kullanacakları teknoloji hakkındaki altyapı bilgileri, bu teknolojiyi kullanabilme yetenekleri, teknolojileri uygularken kullanacakları yöntem, teknik ve stratejiler, öğrencilerin kullanacakları teknolojiyi kavrayabilmeleri, okulun sunduğu imkanlar vb. Sonuç olarak zengin teknolojik bir ortam tek başına işe yaramamakta, mutlaka söz konusu faktörlerle desteklenmelidir.

Anahtar Kelimeler: Teknoloji, müfredat programı, öğrenme/öğretme

1. Introduction

Learning through real world context is not a new idea. For a long time schools have tried to make efforts to give concrete experiences through field trips, labs and various out-of school activities. But these activities have remained in the form of academic instruction and it has been difficult to incorporate these activities into schools because of different problems.

With the implementation of technology in the learning environment, technology has offered tools for these problems. It represents its capacity to create new opportunities for learning environments by bringing real-world problems into classroom for students to explore and solve. Furthermore, technology not only help students create on active environment to solve problems but also help them find their own problems. In the related literature there are many studies analyzing this issue. Because many new technologies are interactive, it is now easier to create environments in which students can learn by doing, receive feedback, and continually refine their understanding and build new knowledge (Greenfield and Cooking, 1996; Bereiter and Scardamalia, 1993; Kafai, 1995). It can also help people visualize difficult to understand concepts which are difficult to state verbally (Linn et al., 1996).

In the study Mestre et al. (1997) states that classroom communication technologies provide useful feedback to students and the teacher on how well the students understand the concepts being covered and whether they can apply them in novel contexts. In a 2000 study commissioned by the Software and Information Industry Association, Sivin- Kachala and Bialo (2000) reviewed 311 research studies on the effectiveness of technology on student achievement. Their findings revealed positive and consistent patterns when students were engaged in technology-rich environments, including significant gains and achievement in all subject areas, increased achievement in preschool through high school for both regular and students with special needs, and improved attitudes toward learning and increased self-esteem.

O'Dwyer, Rusell, Bebell, and Tucker-Seeley (2005) found that, while controlling for both prior achievement and socioeconomic status, fourth-grade students who reported greater frequency of technology use at school to edit papers were likely to have higher total English/language arts test scores and higher writing records on fourth grade test scores on the Massachusetts Comprehensive Assessment System (MCAS) English/Language Arts test.

In examining large-scale state and national studies, as well as some innovative smaller studies on newer educational technologies, Schacter (1999) found that students with access to any of a number of technologies (such as computer assisted instruction, integrated learning systems, simulations and software that teaches higher order thinking, collaborative networked technologies, or design and programming technologies) show positive gains in achievement on researcher constructed tests,

standardized tests, and national tests.

Roschelle, Pea, Hoadley, Gordin, & Means (2000) identify four fundamental characteristics of how technology can enhance both what and how children learn in the classroom: (1) active engagement, (2) participation in groups, (3) frequent interaction and feedback, and (4) connections to real-world contexts. They also indicate that use of technology is more effective as a learning tool when embedded in a broader education reform movement that includes improvements in teacher training, curriculum, student assessment, and a school's capacity for change.

In a review of existing evidence of technology's impact on learning, Marshall (2002) found strong evidence that educational technology "complements what a great teacher does naturally", extending their reach and broadening their students' experience beyond the classroom. "With ever-expanding content and technology choices, from video to multimedia to the Internet", Marshall suggests "there's an unprecedented need to understand the recipe for success, which involves the learner, the teacher, the context, and the environment in which technology is used."

Research indicates that computer technology can help support learning and is especially useful in developing the higher-order skills critical thinking, analysis, and scientific inquiry "by engaging students in authentic, complex tasks within collaborative learning contexts" (Roschelle, Pea, Hoadley, Gordin & Means, 2000).

In other studies it has found that integrating technology in the classroom creates a rich, effective and efficient learning environment which improves student performance and learning (Cronin et al., 1990; Funkhouser, 1993; George and Sleeth, 1996; Luna and Mc Kenzie, 1997; Sherry, et al., 2002; Traynor, 2003).

In their study, Duman and Atar (2004) has found that using data show in teaching abstract topic in geography courses has significant effects on student's motivation and academic success.

Ayas (2006) has found that the infusion of technology into educational environments—specifically in the social studies—aligned with constructivist pedagogy bears the potential to inspire new ways of teaching and learning.

Kabadayı (2006) in his study has indicated that significant differences exist between pre-service and their cooperating preschool teachers from their "views on the use of educational technology", "use of activities in preschool classes" and "use of educational technology in preschool classes".

Türkmen (2006), examined the concept of educational technology including a rationale for the use of technology in education from historical perspective and relationship between "**Learning Cycle approach**" and **educational technology in science education**.

Boster, Meyer, Roberto, & Inge (2002) examined the integration of standards-based video clips into lessons developed by classroom teachers and found increases student achievement.

Hiebert (1999) raised a similar point. When students over-practice procedures before they understand them, they have more difficulty making sense of them later; however, they can learn new concepts and skills while they are solving problems. In a study that examined relationship between computer use and students' science achievement based on data from a standardized assessment, Papanastasiou, Zemlyas, & Vrasidas (2003) found it is not the computer use itself that has a positive or negative effect on achievement of students, but the way in which computers are used.

Some researchers, on the other hand, rather than trying to describe the impact of all technologies as if they were the same, they need to think about what kind of technologies are being used in the classroom and for what purposes. Two general distinctions can be made. Students can learn "from" computers_where technology is used essentially as tutors and serves to increase students basic skills and knowledge; and can learn "with" computers_where technology is used a tool that can be applied to a variety of goals in the learning process and can serve as a resource to help develop higher order thinking, creativity and research skills (Reeves, 1998; Ringstaff & Kelley, 2002).

According to Murphy, teachers use DES (Discrete Educational Software) not only to supplement instruction, as in the past, but also to introduce topics, provide means for self-study, and offer opportunities to learn concepts otherwise inaccessible to students (Murphy et al,2001).

Bruce and Levin (1997), look at ways in which the tools, techniques, and applications of technology can support integrated, inquiry-based learning to "engage children in exploring, thinking, reading, writing, researching, inventing, problem-solving, and experiencing the world."

Concisely, technology should be used as a tool to enhance student's educational experience by creating a variety of methods to meet special needs, teach children how to manage information and allow for opportunities to develop higher level thinking skills. This approach leads the occurrence of new paradigms in teaching and learning

from	to
<ul style="list-style-type: none"> • teacher directed • didactic teaching • short blocks of instruction on single subject 	<ul style="list-style-type: none"> learner centered student exploration extended blocks of multidisciplinary instruction
<ul style="list-style-type: none"> • passive or one-way modes of instruction 	<ul style="list-style-type: none"> active and interactive modes of instruction
<ul style="list-style-type: none"> • individual, competitive 	<ul style="list-style-type: none"> collaborative, cooperative work

- | | |
|--|-----------------------------------|
| • teacher as knowledge dispenser | teacher as a facilitator or guide |
| • ability grouping | heterogeneous grouping |
| • assessment of knowledge, specific skills | performance based assessment. |

Through these paradigms technology influence the quality of learning as follows:

- Students can take more active role in the learning process
- Teachers can present course content in a variety of formats
- Students and teachers can employ techniques that recognize a variety of learning styles
- A broader array of resources can be brought to the classroom and the students
- Opportunities for interactions between teachers and students and among students can be increased
- The productivity of those who support learning environment can be increased
- Novice learners can be engaged in the same kinds of activities as experts.
- Time and space boundaries of the classroom can be expanded
- Technology stimulates reflection and critical thinking
- Technology encourages students to be producers not just consumers of information. (Teaching and Learning with Technology Promises and Pitfalls .htm.2005)
- Technology encourages cooperative learning and stimulates increased student-teacher interaction
- Students can gain higher self esteem and achievement when trained in collaborative learning

Courses for which computer-based network are used to increase student-student and student- teacher intreaction, to increase student-teacher inreaction with lower-performing students. Many students who seldom participate in face-to-face class discussion become more active participants online.

Technology and Curriculum

Since technolog has realistic affects on learning and teaching processes, its impact can be seen on the components of curriculum in different rates. In the article by Radlick (1994), the impacts of technology on the components of curriculum in the traditional and reconstructed classrooms (which is described as technology integrated classrooms) are given as in the Table 1:

Table 1. Curriculum

Traditional Classroom	Reconstructed Classroom	Role of Technology
Textbooks and pre-packaged materials	Primary source materials and real world projects	CD-ROM's and internet access to resource materials
Subject oriented Emphasis on covering content domain	Skill oriented. Opportunity to explore and develop understanding of particular areas through projects and themes	Multimedia projects that integrate information from many sources. Contact with real practitioners via Networks
Focus on isolated facts, recognition and recall	Application of analysis and synthesis within a real project	Network collaboration, use of computer tools, probes, simulations
Text focused materials	Multimedia focus	Q>ROM, multimedia, simulations
Individual disciplines	Interdisciplinary-focus in integration through themes and projects	Access to information and resources via network –interaction with real scholars and projects. Multimedia systems
Rigid curriculum outlines, based on disciplines, drive instruction	Student understanding drives instruction	Networking and computer tools

Table 2. Teaching and Learning

Traditional Classroom	Reconstructed Classroom	Role of Technology
Students as receiver and consumer of information. Passive learning Didactic learning theory where teaching is planned structured and delivered by the teacher. Teaching here is equated with telling, learning is equated with listening, and knowledge is conceived of as being delivered or poured in to students	Students as active constructor / producer of information. Hands on learning Constructivist learning theory where students build relationships and collect new information as they interact with the world. The teacher acts as the facilitator.	Technology tools e.g. databases and text processing for student projects. Simulations and probes
Individual learning	Individual as well as collaborative learning-social construction of knowledge	Technology tools including networking allow production and interaction, presentation and sharing
Teacher-centered and controlled. Role of teacher is that of "a sage on a stage"	Student-centered student empowered with grater control. Role of teacher is that of "a guide on the side" or facilitator	Technology tools, simulations and telepresence
Teacher presents material-teacher as worker	Student creates and presents material-student as worker with teacher facilitating learning	Network projects, involvement in community projects. Use of technology tools to create and present information
Isolated classrooms and teachers	Cooperative learning. Teaching and learning community.	Group software such as electronic mail and shared writing environments.
Teaching to average level of class. Verbal and textual presentation	All students engaged in learning at their own level. Multi-modal teaching to diverse learning modalities	Real world network projects and computer tools. Multimedia including interactive video
School separate from real world	School part of real world of work	Students interact via network/Inmentoring Project with scientists. Telepresence, simulations. And virtual reality.

Table 3. Assessment

Traditional Classroom	Reconstructed Classroom	Role of Technology
Paper and pencil, multiple-choice tests. Explicit assessment at point in time.	Performance-based, more authentic assessment. Continuous assessment of progress, which is embedded in to learning observations	Simulations with options for student response. Application of knowledge in real projects.
Focus on facts and recall-content, which is covered.	Focus on organization and presentation of knowledge-emphasis on higher level skills of analysis, synthesis and application of knowledge	Capturing exemplars of student work in to electronic portfolios
Target for assessment is the teacher or undefined test markers	Focus is on peer review, parents or reviewing audience	Networks for sharing student work and multimedia presentation systems
Individual performance assessed	Both individual and group performance assessed-collaboration part of assessment	Computer groupware, including networks

2. Discussion

Although technology influences quality of learning as students’ taking more active roles in the learning process, teachers’ presenting course content in a variety of formats, students’ and teachers’ employing techniques that recognizes a variety of learning styles, bringing broader array of resources to the classroom, stimulating reflection and critical thinking, expounding time and space boundries of the classroom, facilitating collaborative and cooperative learning etc., (Teaching and learning with technology: Promises and Pitfall, integration of technology is a slow process). Truly integration technology into teaching and learning is a slow, time consuming process that requires substantial levels of support and encouragement for educators. Even in technology poor-schools the process takes even longer (Lemke and Coughin, 1998).

Technology integrated into classroom may provide teachers with teaching of abstract concepts and problem solving as well as basic skills, independent work, teamwork and collaborative inquiry, adaptation of instruction to accomodate students learning styles and special needs, higher expectations of students and presentation of more complex materials, less teacher lectures, more student-centered classroom. (Cradler, 1996) However; it is surprising to see how many teachers do not use technology at all. In other words, while some teachers have natural proclivity toward using technologies, others do not. Some teachers may embrace changes more easily but others resist it.

There is a mutual interaction between technology and teaching. That is, effective use of technology requires changes in teaching; in turn the adaptation of a new teaching strategy can be a catalyst for technology integration (Byrom and Bingham, 2001). Effective use of technolog mostly requires changes in the methodology of teachers which

they have applied in their teaching. This means they have to embrace strategies for student-focused learning, they have to tailor students learning needs, develop students' problem solving and critical thinking skills and provide opportunities for collaborative learning. Because only pedagogically sound teaching and appropriate technologies lead to improvements in learning. From the points of students, the integration of technology in learning requires some critical skills (Kay and Honey, 2005);

- Students must have skills to express themselves not only through paper and pencil but also audio, video, animation design.
- Students must have ability to crunch, compare and choose necessary data among the glut of data available in electronic formats.
- Students must pass on understanding of the power, limitation, and underlying assumptions of various data representation systems.
- Students must be able to manage the multi-tasking, selection, and prioritizing across technology applications that allow them to move fluidly among communities of practice, assignments, etc.
- Students must have an understanding of how to apply what they know and can do to new situations.
- Students must know and use strategies to acknowledge identify and negotiate risks.

Before the technology is integrated in the classroom, the educational goals for students should be determined. Because as Cuban states only with clearly-determined goals can educators be intelligent about how much they want to spend for what purpose and under what conditions.

After determining goals, it is important to provide Professional development to teachers to help them choose the most appropriate Technologies and instructional strategies to meet these goals. For this reason teachers must be offered training in using computers but their training must go beyond that to the instructional strategies needed to infuse technological skills into the learning process (Ringstaff and Kelley, 2002). In other words, teachers need sustained assistance not only in the use of the technology but in their efforts to integrate technology into the curriculum (Kanaya and Light, 2005).

As Baker emphasizes evaluation is a planning tool that should be considered at the beginning of any technology. Since the overall focus of evaluation measures will be necessary to evaluate student learning outcomes. These evaluation is hard to establish because it is related to the complexity of technology integration, the difficulty of inferring important information about complex cognitive processes from direct observation and the rate of technology development that challenges evaluators' skills to keep pace (Painter, 2001).

All of these issues discussed above are important in integrating technology to improve student achievement. Educational technology is not, and never will be, useful on its own. But if decisions are made strategically keeping these factors in mind, technology can provide important benefits in creating new circumstances and opportunities for rich and exciting learning.

There is no doubt that technology will always be criticized. Some believe that technology reduces student-student engagement in active participation. Others believe technology reduces important human contact. But as a conclusion statement, one can conclude that effective use of technology can have different critiques depending on personal values and perspectives of what is good and bad in learning. The two most important factors which meet the criticism of technology use in learning and teaching are to have teachers with skills and knowledge about appropriate and effective use of technology and also integrating these skills knowledge into curriculum and using them in according with knowledge about about learning to make students learning more comprehensive and authentic.

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