



Examining the Technological History of Turkey: Impacts on Teaching Science

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ABSTRACT *This paper examines the past, discusses the present, and makes recommendations the future of educational technology in Turkey. We examine at how the Turkish government has assisted in the implementation of a number of projects aimed at improving the quality of education and the effective use of the technology in education institutions of all level and types and then determines the applications and major problems the using educational technology in Turkey.*

KEY WORDS: *Educational technology, integration technology, science education, Turkish educational system.*

Introduction

Technology has had an impact on almost every aspect of modern life. Yet technology implementation into the science classrooms has not been done and thus, technology has had a limited impact on schools as compared to society as a whole. This is true, even though the skillful use of technology supports the development of process skills such as higher order skills, adaptability, critical thinking, problem solving, and collaboration that are essential to succeed in our rapidly changing information age (Beyerbach, Walsh, & Vannatta, 2001). Today's children need to be immersed in technology experiences which enhance their learning process. Consider that John Dewey, an educational philosopher, wrote almost a century ago. "If we teach today as we taught yesterday we rob our children of tomorrow" (Dewey, 1916). The Association for Educational Communications and Technology (AECT) further underscores this stating "educational technology is a complex, integrated process involving people, procedures, ideas, devices, and organization, for analyzing problems and devising, implementing, evaluating, and managing solutions to those problems, involved in all aspects of human learning" (AECT, 1997, p. 1). One concern that many educators have regarding technology is that many teachers believe that technological tools are simply computers. But computers do not represent the only educational technology available to teachers of science. While computers and their related devices are important and are a relatively new part of technology in the classroom, other types of technology (eg. overheads, televisions, VCR, digital cameras, videodiscs, and traditional science equipment) are readily available but are not used in effective ways. All of these tools, which teachers have to access to, can enhance learning if used appropriately.

All types of technology let us better serve the diverse learning styles of our students and educate them for a wider range of intelligence. There are many good examples of using of technological resources to enhance learning in science classrooms. There is no doubt that the rapid increase in technological resources has had a revolutionary effect on teaching of science (Windelspecht, 2001).

A Revolution in Turkish Education

In Turkey during the 1930's, maps, laboratory equipment, and film strip projectors were the only forms of technological teaching materials for instructional use in Turkish schools. Science teachers used merely printed instructional materials in the schools until the 1940's. However, starting in the 1960's, Turkey began a journey of educational change that continues today. For example, in 1961, the "Teaching Material Center" was founded in Ankara. In 1962, the "Centre for Educational Radio" developed educational radio programs for students (Alkan, 1998). Both of these examples show an early commitment by Turkey to technology integration. However, between 1950 and 1970, most school's technology consisted of only audio cassettes and overhead projectors (Hizal, 1991).

Since the 1970's, the Turkish government has sought assistance to introduce a number of projects aimed at improving the quality of education. These projects include up-grading the curricula and instructional materials; revising student achievement tests; improving the teacher training system; and, increasing the research component in education. However, even with the "revolution" in education since 1960's, technology uses in Turkish science classrooms is still not common.

The question is why. Why hasn't Turkish schools embraced and implemented technology? Of course, in Turkey, there are schools that use technology successfully in teaching. But electronic technology was not integrated until the introduction of the television in the 1970's. Starting in the mid 1970's, network television broadcast Turkey's first educational television project that was developed at the Eskisehir Academy of Economic and Commercial Sciences. The apparent success of this small project showed that the technology could be used for instruction in an educational setting (McIsaac, Murphy, & Demiray, 1988). Many educators and scientists believed that "television" was a very useful educational tool, especially for teaching abstract concepts or ideas, because of transmitting visual and audio signals at the same time. Television has become one of the most effective instructional technologies (Saglik & Ozturk, 2001) used in Turkey and started in the 1970's for foreign language instruction. The main objective was to support students in learning English, Germany and French. In the 1980s, television could not be used efficiently because of political and economic reasons. Beginning with the 1987-88 academic years, the Ministry of National Education (MoNE) began to offer televised summer courses, as a pilot project, in high schools of Denizli for students who did not or could not progress in the regular school year. After the success of this project, television returned as a popular educational tool for the Turkish education system. Before the integration of television in Turkish classroom, lectures were the primary means of transmitting new information to students. The use of television offered the potential of "showing" information to be learned. Television brought the world to classroom, just as motion pictures brought the world to the people of

Turkey. Barkan and Demiray (1990) indicate that "with the help of television, students' learning of new concepts improved about 30%, their attention about 35% and their perseverance about 50%" (p. 5). On the other hand, Turkish educators soon realized that television has some serious disadvantages. When teachers used television in their classroom, teachers faced some classroom management problems. It proved very difficult for teachers to keep students under control, and television does not provide instant feedback for teachers (Mutlu 1995). Although television has disadvantages, the Turkish Ministry of Education has kept using television in Turkish schools because of the success of previous programs.

In the 1980's, computers started to be used by countries throughout the world in almost every field (e.g., business, military, economy, education). The MoNE, in 1984, organized 48 training programs on technology integration and 2,240 teachers were trained in computer literacy and programming with the aim of training more teachers. This project was called the "Computer Aided Education (CAE)" project. However, the CAE project faced some serious obstacles. Primarily, the available software had not yet been integrated with the curriculum. There was also a severe shortage of suitably trained teachers. As a result of these limitations, the hardware (computers) could not be used as originally intended. Finally, a number of the potential vendors dropped out of the project complaining of excessive bureaucracy. Although program implementation was continuing, it was at a much reduced level (less than 40% of target) and with significantly reduced expectations (Yedekcioglu, 1996).

In 1993 the MoNE with the financial support of the World Bank initiated a new project named Computer Experimental Schools (CES). In the CES project, 53 schools located in different regions of Turkey were to use specially equipped facilities for teaching and learning. It was also expected that a computer-mediated communication network linking these schools would provide a technological and pedagogical edge. The initial aim of the Department of Information Technology in Education (DITE), which was running the CES Project (related to evaluation, maintenance, curriculum and training) was to increase interaction among schools through services like e-mail and computer conferencing, plus access to online databases and electronic bulletin boards. Since the CES Project was formulated, achievement has been seen and undoubtedly more will be realized in the coming years. CES has demonstrated that information technology is a powerful tool in the teaching-learning process. This project is like a messenger, which is giving good news for Turks and for the future education in Turkey (Yedekcioglu, 1996; Akkoyunlu & Orhan, 2001).

There is a tendency toward web-based instruction programs in most open universities other educational institutions in Turkey. Web-based education activities, conducted by the Middle East Technical University, are transmitted to students by various universities and include diploma and certificate programs. Since 1998, Anadolu University has provided on-line self-test opportunities for its distance learners. Anadolu University has also been trying to offer on-line alternative courses for its on-campus students in order to see how feasible, effective, efficient, and appealing it is to offer on-line programs. They have also established a foundation for a "virtual" university in 1998. The Higher Education Council's aim was to establish a virtual university in Turkey during to 2000-2001 academic years and several

courses were offered on-line. But sufficient data was not available regarding the effectiveness or appeal of these courses. As with Anadolu University, some other Turkish universities are opening on-line certificate and degree programs. Middle East Technical University (METU), for example, has several on-line certificate programs focusing on information technology, English language, and computer skills. Like METU, Bilgi University (both private institutions) has been providing an on-line degree program called e-MBA for almost two years. In 1996, a video conference system established at Bilkent University through cooperative agreement with New York University offers courses interactively. After 1998, a video conference system was built between East Anatolian Region universities and using technology and distance education has been fulfilled by means of educational technology, television, radio, computer, and camera satellite.

In the 1990's, educational uses of the internet in Turkey were in their infancy period. There were a few attempts to integrate the internet into K-12 schools and higher education institutions in Turkey. Teachers relied on dial up internet connections because their universities (and the government) did not provide fast network connections. In the 1990's the first computer network connection in Turkey was established and during its first six years, several universities dominated the use of this tool. However, since 1996, the internet in Turkey has touched almost all sectors including banking, military, education, and health. Although there have been many attempts to integrate the internet into Turkish primary and secondary school curricula since the mid-1990's, almost all attempts were lost because of the slow working, highly bureaucratic and centralized organization of the MoNE. However, a few private schools and institutions do provide the opportunity for their students to use the internet to communicate with foreign peers or conduct searches for information related to their homework, most of public schools and other private schools focus only on preparing students for the university entrance exam (Aydin, 2001).

In 1998, the Turkish Government signed "the Basic Education Program Loan Agreement" with the World Bank. As a first step, the World Bank gave 300 million US dollars in support of the program. If the funds were used successfully to meet the Basic Education Program objectives, a second credit of 300 million US dollars would be given. The objectives of the Basic Education Program include: "Expanding the Scope of Basic Education"; "Increasing the Quality of Basic Education"; "Support for the Program Execution"; and "Monitoring & Evaluation. Included in the "Increasing the Quality of Basic Education Basic Education Program" objective was a focus on information technology. As part of this effort, information technology classrooms were built in at least 2 primary education schools in 80 cities. A total of 2,834 information technology classrooms have been scheduled to be built in 2,451 primary education schools all over the country. This number has been increased to 2,802 with 351 newly constructed schools. At the time of this writing information technology classrooms have been completed in all cities and towns. The World Bank provided the money to purchase computer hardware, office software, and education software for the information technology classrooms. Plans are to build classrooms in 3,000 more schools. Each of the classrooms were supplied with computers, printers and scanners; educational software, games, electronic references; and videos, overhead projectors, televisions, and educational

video cassettes; office software and software for computer literacy. Training courses were also provided focusing on the operation of the computer hardware and software. Three teachers in each primary education school began training on February 21st 2000 (MoNE–World Bank, 1998).

Following the World Bank agreement in 1998, the Turkish educational System was funded by the World Bank for "Project for Globalization in Education 2000". This was important step for the Turkish Educational System. For Turkey as the MoNE aimed to increase educational opportunities for all students. The project was to follow the developments of the "information age" and use instructional technology at each level of the education system to enable to Turkish society to use information and technology. New computer labs were established in 2,451 primary and secondary schools in 80 cities and 921 towns in Turkey. In each school, the technology classrooms were equipped with: computers, printers, and scanners; Microsoft office software, courseware for computer literacy, and for different content area literacy; education and entertainment courseware; electronic references; video, overhead projectors, TV, educational videocassettes, and transparencies. The computer companies sponsoring this project provided one year of free internet access to project schools. In addition, the people living near the schools had a chance to use internet during the weekends. The second phase of this project calls for adding 3,000 schools in which technology classrooms will be built (Akkoyunlu & Orhan, 2001).

In attempting to be pro-active, the Turkish Government set up internet services for schools and developed the MoNE web page so students can learn about their National exam results such as LES, UDS, OSS, TUS, and recent "state of teacher" designations can be seen. Seminars that focus on how to use the information technologies in education are being started for teachers, school directors, and personal who work in the department of education. All trainers have been provided the use of computer-based products (MoNE, 2001).

The Higher Educational Council (YOK) has established a committee named the "National Informatics Committee" (EMK). Their objective is to facilitate academic cooperation by enabling the sharing of educational resources among universities; to increase the effectiveness of education through information technology; and increase the efficiency of higher education (Usun, 2003).

Although Turkish educators know how important and useful technological tools are in the classroom, they do not have ability to use technology efficiently in science classes. Computer penetration in high schools remains extremely low and computer to student ratios are sadly low (100:1), although more than one third of the existing 5,851 schools have at least one computer laboratory. Today over 800 high schools have computer labs, representing only about 15% of the total number of schools. Over 5,000 teachers have taken in-service training from universities. Yet, Turkey is still significantly behind other Organization for Economic Co-operation and Development (OECD) countries. Current OECD research, done over 250 thousands 15 years-old students from 41 countries, showed Turkey is significantly behind many other OECD countries in science and problem solving in math, reading, (Elevli, 2004). Courses for computer literacy, high-level programming and the use of databases and spreadsheets have been appended to vocational and technical high schools' curriculum. In regular high schools, courses on computer litera-

cy and general computing are being introduced. The MoNE is also building a portfolio management information system linking 73 regional education directorates' offices with a center in Ankara to provide information on personnel, educational statistics and facilities. The Education Ministry, Huseyin Celik, declared that the Education Ministry completely changed the K-8 curriculum in 2004. The new curriculum will be implemented in pilot schools in which in Ankara, Bolu, Hatay, Izmir, Kocaeli and Van, for the 2004-2005 school years, European Union (EU) standards were taken into consideration. Celik, said

"Yesterday that in the new school year, individuals would stand at the forefront and would give a student-centered education. Today's paradigm, which subjects topics to white and black distinctions, is now changed. A place must be made for gray, and its tones. For the first time since the 1940's, a holistic and internationally comparative program has been prepared. The new curriculum considers not only training, but also education. The new curriculum provides eight common skills that students previously lacked: Critical thinking, solving problems, scientific research, and creative thinking, and entrepreneurship, communication, using information technologies and using Turkish skillfully. Also, "there will be no schools left without Internet access" (Cetinkaya, 2004).

The goal is to for teachers to be on the cutting edge and provide a student-centered curriculum which will focus both on as well as deeper learning and understanding. The new curriculum will provide eight common skills that students previously lacked: Critical thinking, problem solving, scientific research, and creative thinking, entrepreneurship, communication, and using information technologies. The first aim of Ministry of Education is to provide 40,000 schools with internet facilities at which time there will be no schools left without Internet access.

Although little research has been done on these reforms efforts in Turkey, the Finance and Development magazine, which is being published by the International Monetary Fund (IMF) and the World Bank declared that the Anadolu University in Turkey is one of top ten mega universities for distance education in the world (Potashnik & Capper, 1998). For example, Dr. Usun managed a survey on the undergraduate students' attitudes towards educational uses of the Internet. The aim of this study was to determine the attitudes of undergraduate students toward the educational uses of the Internet. Usun found that the Turkish students believed:

1. The Internet is as important as other research tools;
2. Using the Internet is easier than using library;
3. Using the Internet makes learning fun;
4. They accessed the Internet more at school than at home; and,
5. Their knowledge of the Internet is essential for surviving college.

Students most frequently said that they would access their course materials if they were on the web and indicated that they would take a required class on Internet use, if given a choice (Usun, 2003). According to the findings of the limited studies in Turkey, the major problem areas for technology are:

- Lack of financial resources;
- Lack of appropriate planning;

- Lack of adequate software and hardware and the cost constraints (Yedekcioglu, 1996); and,
- Forgetting about technological tools of the past (Cagiltay, 2001).

Conclusion

Today Turkey remains the only Islamic country where secularism is one the basic principles of both the government and legal system. Turkey has been developing since Ataturk's reforms with the aim of modernization of Turkey. The primary purpose of science education is to help students become scientifically literate. There have been many attempts to integrate technology into Turkish primary, secondary and higher education system since 1990. If technology is to become an integral part of K-12 and higher education, then it must also become an essential part of instructional tools and teacher preparation programs.

When we are compared with other developed countries, educational uses of the technological tools in Turkey are still in the infancy period. Formal educational programs are controlled by the MoNE and all formal education programs' curriculum is a part of subject-centered, not student-centered design and is not focused on society-centered issues, for the most part, the focus is on superficial coverage and rote learning of the material in approved textbook series used within particular classrooms or schools. Teachers transmit knowledge, but learning is superficial and most teaching occurs through lecture and large group discussion. Lecture and large group discussion are the main instructional techniques in Turkish formal education programs. However, in recent years, since 1997, Turkey has started to change curriculum and policy that guides all education programs. One major aspect of these reforms has centered one of technology. Turkish researchers have found that educational technology has much more beneficial than its disadvantages, like American researchers. Although some problems have been encountered in the process of educational technology integration, such as financial problems, hardware problems and not enough expert people, we are going to move forward with creative solutions, and we are following step by step this process of application of educational technology.

Recommendation

Turkey's population is relatively young. If she is to take advantage of its youth, well-developed state policies on the use of technology in education are necessary. Such policies should address issues of technology use not only in schools but also in homes as well. Technology alone will not improve the quality of education, but when integrated with appropriate curriculum and instruction; it can be a powerful educational tool. Teachers must be prepared to use technology in ways that encourage student engagement ultimately student learning as measured in a variety of ways. When, used appropriately, technology can help students become active, independent learners with access to seemingly unlimited information. I believe that children receive the greatest benefits from technology in the classroom when the lesson is directly connected to the classroom curriculum. Technology allows for active learning and discovery and can apply learning to real situations for a real purpose. As well, computers become part of classroom activities, rather than a separate tool room or only to be visited infrequently. It becomes part of learning

rather than peripheral to learning. Teachers should consider whether technology helps students "understand the role and importance of technology in the real world (Bernhard, Lernhardt and Miranda-Decker, 1999)," even in kindergarten children may benefit from technology if care is taken that computer and other technologies used do not replace time spent on important foundation skills rather assist in appropriately building these skills. Turkish educational curriculums should include subject-centered, student-centered, and society-centered designs. The newest program that includes constructivist-based teaching methodologies and pre-service teacher education that includes student teachers spending considerably more time in the schools than in the past should be started to permeate higher education and primary education in the new millennium.

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