SCIENCE EDUCATION AND ITS NEED OF COMPUTER TECHNOLOGY

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Abstract: Educational technology has a positive effect on all disciplines of education, student self-learning and learning attitudes. Influence on the effectiveness of educational technology – the nature of the student population, software design, role of teacher, student grouping and level of access to technology. Educational research says computer applications are more effective for teaching Science, enhancing the students' self-esteem, scientific teaching skills. In the present investigation various type of active learning technology tools are used. Thus computer usage in areas seems productive and science may be a promising area.
Keywords: Education, Research, Computer applications, Self-esteem, Teaching skills.

1. INTRODUCTION

Technology has an impact on every aspect of modern life (Turkmen, 2006). However, technology has by passed the classroom (Turkmen, 2006). It is time to more fully integrate technology into the educational settings (Turkmen, 2006) since skillful use of technology supports the development of process skills such as higher order skills, adaptability, critical thinking, problem solving, and collaboration that is essential to succeed in our rapidly changing information age (Turkmen, 2006). If we ask what technological tools in school are, most of people would say first computers and computers represent the only educational technology available (Turkmen, 2006). This, of course, is not true since there are many different kinds of technology in the classroom (Turkmen, 2006). While computers and their related devices (probeware, electronic databases, CD-ROMS, the internet, and multimedia presentations) are part of technology, (Turkmen, 2006) and also overheads, televisions, VCR, digital cameras, videodiscs, and traditional science equipment are too (Turkmen, 2006). Today's kids needed today's learning media to become engaged in the learning process (Turkmen, 2006). This thought was confirmed by a quote of John Dewey, Educational Philosopher, written more than a century ago (Turkmen, 2006). "If we teach today as we taught yesterday we rob our children of tomorrow" (Turkmen, 2006; Dewey, 1916). Technology lets us better serve the diverse learning styles of our students and educate them for a wider range of intelligence (Turkmen, 2006). Memorization of information emphasizes teaching the conclusions of others (Kubicek, 2005) : "schools are reinforcing the message that science education is about remembering the results of other's [professional scientists'] research ['facts'] rather than developing the ability to conduct one's own" (Kubicek, 2005; Claxton, 1991). There appears to be disconnect between the science of the school curriculum and the practice of science.

The studies have suggested that students do not see how science applies to everyday life (Linn and Hsi, 2000), and that there is very little integration of science within everyday thinking among students. Research has shown that even students with the most grade success in science do not necessarily grasp fundamental concepts about nature and science (Kubicek, 2005; Cobern *et al*., 1999). The majority of students do not, however, possess adequate conceptions of the NOS (Nature of Science) (Wang, 2001). Schools have typically employed a didactic approach, with an emphasis on transmitting the content of scientific theories to students (Kubicek, 2005): "teachers dispense knowledge to passive student audiences, with textbooks alone constituting the science curricula; students are rarely involved in direct experiences with scientific phenomena" (Ozturk and Ucus, 2015; Kubicek, 2005; Wise, 1996).

The national policy of education in 1996 has given due emphasis on child – centered education and inculcation of scientific temper in students. Experimental work forms an integral part of science teaching. While the students participating in the experimental work get an opportunity to handle scientific apparatus / equipments skillfully and understand the principles, concepts / processes of science. Hence, experimental work forms an integral part of science teaching. Science teaching should therefore be through demonstrations/ activities and real-life situations. Learning through demonstration also provides first and direct experience and can arouse curiosity and interest with the children. The quality of science teaching in our schools need to be improved greatly.

Technology can assist teachers in inquiry teaching (Bencze *et al*., 2003) and sufficient backgrounds to teach NOS by supporting resource networks. Chatrooms, listservs, e-mail, videoconferencing and other communications methods can support networks for ongoing professional development, peer support groups, and training (Kubicek, 2005). Using computer technology, teachers can more easily access scientists, other teachers who have more experience in implementing computer-assisted inquiry learning, and potentially curriculum developers, educational researchers, and professional trainers (Kubicek, 2005). They can theoretically also access a wide scope of authoritative information about science fairly, easily and quickly, which they can draw from to enhance their knowledge (Kubicek, 2005). Lack of time has also been cited by teachers as a factor inhibiting the teaching of the NOS (Lederman and Schwartz, 2001). Computer software can help teachers free up increases classroom time for the analysis, reflection and discussion which is so important in teaching the NOS. Electronic databases, including those accessible via the World Wide Web, permit students to gather second-hand data quickly and independently, thus freeing students to spend more of their time analyzing, interpreting and predicting than on mechanical tasks of data collection (Kubicek, 2005). Databases which are designed so that student can insert their own data, support record-keeping during the inquiry process (Kubicek, 2005), allowing students to maintain records of their ongoing progress in a variety of representations (Kubicek, 2005). They allow students to record the intermediate products of their investigations, as well as their plans, hypotheses, and observations ((Kubicek, 2005; Edelson, 2001).

Computer technology speaks in terms of educational technology which is defined as hard and software associated with the multimedia computer system. This includes computer systems, printers, Storage media (hard disk, CD-ROM, removable storage, laser video disk), audio visual devices (scanners, cameras, sound capture/generation) and networking (LAN, WAN, Internet). Extensive research and planning are need to guide the education system in its transitions to the use of new technology. There are two specific uses for the technology namely overcoming the scarcity of resources for the teacher and networking shared among teachers. Educational technology as demonstrated as significant, positive effect on achievement through all subject areas in regular and special education situation. Interactive video is most effective and use of online telecommunications for collaboration projects as improved academic skills. Educational technology has positive effects on student self learning and learning attitudes. Influences on the effectiveness of educational technology are the nature of the student population, software design, the role of teacher, student grouping, and level of access to technology (Kubicek, 2005). Today's students can investigate more significant problems and learn more about science readily. The power of the computer to take measurements, to do calculations and to display dynamic information as given as an opportunity not only to recoup the most regretted the loss of scientific literacy among young people, but beyond this event to expand student understanding of the basic scientific concepts and issues that are so vital to our modern existence. It is up to us as teachers to make sure that this opportunity is not wasted. The aim of the present investigation is how to enhance the student's skill and their self-esteem by using a computer based curriculum.

2. METHODOLOGY

The study undertook based on literature review. In the last decade, the change of the teaching process from a formal one, centered on the teachers to an interactive one, centered on the learners needs become compulsory (Suduc *et al*., 2011; Juuti *et al.*, 2009). The educational process evolved from the formal transmission of information to an active process of knowledge acquisition, based more on the studying and understanding of practical aspects of a process then learning of the involved theoretical concepts (Suduc *et al*., 2011). In the context of science education ICT offers possibilities for interaction with nature (Suduc *et al*., 2011; Juuti *et al.*, 2009). ICT tools like multimedia products (pictures, video-products, tutorials) and virtual instrumentation proved to be very efficient in science teaching (Gorghiu *et al.*, 2010).

Various types of active learning technology tools were used in the present investigation. Computer assisted instruction (CAI) will include both hardware and software components of technology including, but not limited to reading software programs, Internet-based programs, SMART Boards, laptops, and desktop computers (Davis, 2009), Multimedia (Sound, animations, video integrated with the computer program, still images) (Kaminska *et al.*, 2016), Microcomputer based laboratory instruction (it is innovative use of new educational technology – virtual lab - to learn physical concepts in the science lab and class room) (Russel *et al.*, 2004), Use of Real time measurement tools (MBL sensors and software, how the students can simultaneously measure and plot graph such physical quantities on position and velocity, acceleration, pressure, temperature and pH) (Thornton, 1992), Classroom or lecture with single computer has been changed into active learning environment), Interactive Video (to select and display pictures with the

minimum search time - Random axis, Still frames, Step frame, slow play) (Fadde and Sullivan, 2013) and Web (Terrazas-Arrelanes *et al.*, 2018).

3. RESULTS AND DISCUSSION

Educational uses of the computer can be classified as tutor, tool, or tutee (Taylor, 1980). Computer assisted instruction (CAI) is a label applied to using the computer as a tutor. Different CAI uses include drill and practice, simulation, gaming, and tutorial dialogue. Drill and practice allow for concentrated remediation in diagnosing areas of weakness. Simulations and games are motivational and highly interactive methods of providing instruction that enrich the educational experience (Ellis, 1984). There are two main categories of ICT use by teachers: supportive ICT use and classroom ICT use (Tondeur *et al.*, 2007). The first category, supportive ICT use, refers to the use of ICT for pro-active teaching and administrative tasks, such as student administration, preparing worksheets, developing evaluation activities, keeping track of pupils' learning progress, etc. The second, classroom ICT use, aims to support and enhance the actual teaching and learning process (Suduc *et al.*, 2011), such as the use of computers for demonstration purposes, drill and practice activities, modeling, representation of complex knowledge elements, discussions, collaboration, project work, etc (Suduc *et al*., 2011; Sang *et al.*, 2010).

Models are another important tool used in science investigations, and are a valuable means of expressing an understanding of a process and of constructing knowledge (Kubicek, 2005). Gilbert *et al* (1998), report that models and model-based reasoning have been found to be important in the development of science concepts and the development of students' understanding of the processes of science.

Inquiry-based learning is gaining increasing support in science education, with a growing number of educators becoming interested in teaching which involves projects or inquiry (Kubicek, 2005; Polman, 1998). The presentation of science as a process of following step-by-step instructions and filling in blanks on worksheets promotes erroneous and impoverished concepts regarding the nature of science (Huber and Moore, 2001). Lederman and Schwartz (2001) describe seven elements of the NOS, including 1) the tentativeness or changeability of science, 2) the role of creativity, 3) the subjectivity of science i.e. influences of currently accepted knowledge and scientists' own biases (Lederman and Schwartz, 2001), 4) its empirical basis, 5) its social/cultural embeddedness, 6) differences between theories and laws, and 7) the nature of observations and inferences (Kubicek, 2005). Teachers can use computer technology in different ways to support their representation of these elements of the NOS (Kubicek, 2005).

Computer technology can contribute to a better understanding of abstract concepts by facilitating observation of certain phenomena, and providing the means for students to experiment with these phenomena (Kubicek, 2005). This is useful in that it increases the cognitive connections between data and the real world it attempts to represent (Kubicek, 2005). Some examples of online tools which present such possibilities include EarthKAM (www.earthkam.ucsd.edu), a program that gives students direct access to a digital camera on the International Space Station so they can download real-time images of the earth. The Visualizing Earth Project (www.vsualizingearth.ucsd.edu) provides access to visualizations and remotely-sensed images. In addition, it incorporates image analysis tools, and design features such as control over view angles and distance calibration, allowing students to actively manipulate image and data displays (Kubicek, 2005; Barstow, 2001). The BioLogica program (http://biologica.concord.org) offers tools for investigating and manipulating representations of genetics (Tsui and Treagust, 2004). ThinkerTools (www.thinkertools.soe.berkeley.edu) allows middle school students to visualize the concepts of velocity and acceleration. In controlled studies, researchers found that middle school students who used ThinkerTools (Roschelle *et al.*, 2000) outperformed high school physics students in their ability to apply the basic principles of Newtonian mechanics to real-world situations (Kubicek, 2005; Roschelle *et al.*, 2000). The program Space for Species (www.spaceforspecies.ca) makes it possible for a student (Klemm and Tuthill, 2003) to track animal migration patterns and habitat changes online, and to then use this information to answer authentic inquiry questions (Kubicek, 2005; Klemm and Tuthill, 2003). The Jason Project (www.jasonproject.org) uses computer simulations to enable a student to explore the Galapagos Islands habitat (Klemm and Tuthill, 2003), and the Exploring Earth program (www.classzone.com/books/earth_science/terc) allows students to see volcanoes erupting, weather storms forming and dissipating, ocean currents flowing in global patterns, and the latest images from spacecraft exploring other worlds (Kubicek, 2005; Barstow, 2001).

The interactive video approaches developed in this project (Fadde and Sullivan, 2013) used video of near-peer preservice teachers to trigger the observations of both experts and novices, with the experts' observations used to guide preservice teachers' classroom awareness (Fadde and Sullivan, 2013). Both interactive video approaches can be used in traditional classroom settings (Fadde and Sullivan, 2013) to

generate group discussion and can also be developed as standalone, self-paced learning activities that can be delivered on a learning management system, such as Blackboard, or an electronic portfolio system, such as LiveText (Fadde and Sullivan, 2013). With high-stakes video-based assessment of classroom teaching on the rise and technologies for video recording, sharing, and commenting becoming easier, this time is fruitful for teacher-educators and researchers to experiment with new ways of using video earlier and better in teacher education (Fadde and Sullivan, 2013).

Microcomputer-Based Laboratory (MBL) sensors and software students can simultaneously measure and graph such physical quantities as position, velocity, acceleration, force, temperature, light intensity, sound pressure, current and potential difference (Thornton, 1992). Using these MBL tools provides a mechanism for more easily altering physics pedagogy to include methods found to be effective by educational research (Thornton, 1992).

There are several resources of communication: photos, pictures, diagrams, movies, animation, 3D animation, narratives, music and sounds (Kaminska *et al.,* 2016). Multimedia in teaching Science allow (National Science Education Standards, 2006): make more attractive learning process, consolidate the knowledge, focus students on knowledge transfer, illustrate the phenomenon hard to imagine and impossible to carry out, increase the effectiveness of teaching Science, stimulate the activity of cognitive and creative (eg. simulations) (National Science Education Standards, 2006), complete the actions of students (Kaminska *et al.,* 2016).

The comparative study revealed that in-service and pre-service teachers' self confidence in technological pedagogical and content knowledge (TPACK) in relation to their teaching experience, expertise, technology usage, and gender. The results showed that both pre-service and in-service participants exhibit the highest self-confidence level in the technological content knowledge domain (Fishman and Davis, 2006). While pre-service teachers had the lowest score in TPACK, in-service teachers had the lowest score in the technological knowledge domain (Fishman and Davis, 2006).

4. CONCLUSION

The relationship between teaching and technology are important aspects that the teachers need to keep in mind when integrating technology in their classrooms. The reviewed results of the present study concluded that today's education need preservice teachers to experience technology, to teach students with using technological tools, and to use inquiry-based learning environments in schools and colleges. There are so many resources available to teach and it would improve teaching methods and making teachers more efficient. The teachers should implement this technology in their classroom. Briefly, Science and technology supports the development of process skills such as critical thinking and problem solving that is essential to succeed in our rapidly changing information age.

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