

The Effect of Computer Use in Science and Technology Lesson on Success and Attitude Towards

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Abstract: Problem statement: Computer being indispensable in our daily lives came into use in all fields of education. Use of computer for education activities became mandatory. This research is an experimental research performed by use of computer in science and technology and is important in terms of serving science education. General purpose of this research is to reveal the effect of computer-assisted teaching practice for subject of heat and temperature in primary school grade 5, science and technology lesson on success attitudes. The answer of this question was sought: does computer-assisted teaching practice prepared for the subject of “heat-temperature” of primary school grade 5, science and technology have effect on success of students, attitudes towards science and technology and attitudes towards computer compared to traditional teaching? **Approach:** Pretest-Posttest Control Group Design was used. According to pre-test results applied in the beginning of research two equivalent classes were determined. While course was instructed by computer-assisted teaching in one class, course was instructed based on constructivist approach in the other class. 5th grade students who studied at a private primary school in the city centre of Antalya in spring term of 2009-2010 education years comprised the sampling of research. Three different assessment tools which were comprised of Heat and Temperature Subject Achievement Test, Science and Technology Lesson Attitude Scale and Computer Attitude Scale were used. Independent and matched t-test and definitional statistical methods were used to analyze the data. **Results:** Computer assisted teaching was observed to increase student success, it was noted that there was no change in students’ attitude towards science and technology lesson and towards computer. This result is the quality of supporting many studies. It has emphasized in many studies that computer-assisted teaching has negative effects. **Conclusion/Recommendations:** Considering the findings, it was determined that attitudes of students towards computer, science and technology did not change. If we regard that attitude emerges as a result of reactions of individuals to objects in consequence of life and experiences, conducting such studies more comprehensive and long-term may be more effective. Computer-assisted teaching increased academic success of students. We can state following recommendations: computer-assisted teaching can be performed at all grades of primary school in science and technology classes, science and technology teachers can be trained in computer-assisted teaching and physical conditions of school can be designed as to allow computer-assisted teaching. Findings of this study will contribute to choose teaching methods proper and effective for developing studies of computer-assisted teaching in the future.

Key words: Science and technology, arithmetic average, Computer Assisted Teaching (CAT), hypothesis, Kolmogorov-Smirnov (K-S), Computer Attitude Scale (CAS)

INTRODUCTION

In this century information is now with us with electronic devices. It is a known fact that recent developments in communications and information technology have increased use of the Internet. The number of computer users with internet access has

started to increase. According to 2008 statistics, the number of users with internet access is 1,966,514,816 and the ratio of this number to world population is 28.7 % the number of users in Turkey is 35,000,000; the ratio of this number to population is 45.0% Internet World Stats. This information shows us that the ratio of people with internet access is higher than world

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average. Accordingly, the amount of computer use in various areas increased. Education is one of these areas. The teacher should choose and implement programs suitable for developmental characteristics of children in his/her classroom and s/he should use the computer to encourage and reinforce all developmental areas of children (Haugland, 2000).

Activities in which students interact with lessons programmed on computer during education process, in which the teacher has the role of the guide and the computer the environment might be defined as Computer Assisted Teaching (CAT). According to another definition Computer Assisted Teaching is the conveying of educational content or activities with the use of the computer (Hannafin and Peck, 1988).

It is well known that teaching can be largely reinforced when it is not done purely theoretically, but instead of visually and interactively. By this means, students can obtain a deeper understanding of the subject being instructed, rather than a merely theoretical knowledge. Algorithmic visualization is based on the basic graphic demonstration capabilities of a personal computer (Dimitrios, 2005).

Technological developments cause changes in every aspect of social life. These changes also affect the structure and function of educational institutions. Many social systems like industry, economy and communication expect educational institutions to train individuals who can use technology. This expectation doesn't only include teaching how to use technology but also using it in educational activities. Science education is a lesson that makes students gain positive behaviors about technology. Therefore, one of the fundamental purposes of science education is to train individuals who can at any time keep up with fast changing and developing scientific era and who can benefit latest technological inventions in all fields and to teach that science is required in every technological inventions and developments.

When students with low success levels take computer assisted science education that is integrated within curriculum, their involvement in science lesson increases. In addition, computer assisted teaching provides students with the advantages of improvement in skills of analysis, synthesis and evaluation. Considering the level and possibilities information technologies have reached today, their contribution to science education will be immense. Students can learn scientific terms and thoughts more easily that are difficult to understand in science education programs in which simulations are used effectively (Taş *et al.*, 2006).

One of the most important aims of science education is also to make students learn terms in a

meaningful context. Much of the research carried out today is on students' learning of scientific terms (Eisen and Stavvy, 1988). The most important reason for this is because students find it difficult to understand scientific and abstract terms (Pezdek and Hartman, 1983).

The use of CAT in science education is quite suitable considering especially the content of science lessons. The reason for this is because there are too many scientific terms and principles in science education and when preparing lesson software these terms can be visually presented to students using appropriate teaching methods and CAT activities help complex subject and concepts to be taught easily, enable abstract concepts to be concretized and give students the chance to learn individually (Geban and Demircioğlu, 1996).

Various findings were reached about studies on the effects of computer assisted teaching over student success and attitude. According to a research by Yalçınalp *et al.* (1995) it was observed that both success and attitude of computer assisted teaching students in chemistry lessons increased meaningfully compared to those who didn't get computer assisted teaching. According to a research carried out by it was observed that computer assisted teaching had a significant effect on science and technology lessons. On the other hand, according to a research done by Wainwright the contrary result was found out (Wainwright, 1989). In this research students' success who took computer assisted teaching lessons were lower than those who didn't take computer assisted teaching. It was stated that in addition to increasing students' general success, computer assisted teaching helped students to develop higher level thinking skills and thus students learned with an insight rather than from recitation (Renshaw and Taylor, 2000).

Some research revealed that working on a computer develops a positive attitude towards computer (Can, 2010). Attitudes towards computer should be known at first in order for computer to get the place it deserves at schools and to be used effectively. With computers taking their places in education process at schools, recognizing the attitudes of individuals who will take part in these processes is vital in taking necessary precautions about possible problems (Bindak and Çelik, 2006).

MATERIALS AND METHODS

Research model: Randomized control-group pretest posttest experimental design was used in this research. One of the groups was experimental group and the other was control group. While students in experimental group had computer assisted lessons, students in control group had constructivist lessons as stated in the

curriculum. Measurements were carried out both pre-experiment and post-experiment in both groups.

Study group: One of the 5th grade classes which received education at a private primary school in Antalya city center during 2009-2010 education year was chosen as the control group and another as experimental group. Study group was comprised of 48 students in total; control group being (n = 26) and experimental group (n = 22). 13 of the students in control group were female and the other 13 were male while 12 of the students in experimental group were female and 10 male. Students' ages in both control and experimental group were the same.

Data collection tools: In order to collect data, three different assessment tools, which were Heat and Temperature Subject Success Test, Science and Technology Attitude Scale and Computer Attitude Scale, were used.

Heat and Temperature Subject Success Test (HTSST): Heat and temperature subject success test questions were comprised of the aims of "heat and temperature" subject in science education program and of concepts which were chosen suitably according to students' acquisition. While the questions were prepared, two multiple choice items for each behavior thus 40 questions in total were formed according to relevant literature. Questions had 4 distracters. Questions prepared was checked and edited by two field expert academic members, an assessment and evaluation expert and a Turkish Language and Literature expert. Pre-trial of this test was conducted on 35 5th grade students who had been studying at a private primary school in Antalya city centre. The test was graded 1 and 0 and item difficulty index and item selectivity index were estimated. One item that belongs to each and every behavior with item difficulty and item selectivity indexes at desired levels was chosen and final form of 20 items was prepared. KR-20 reliability coefficient on final form was found 0.91.

Science and technology lesson attitude scale: Science and technology lesson attitude scale used in the study was developed by Ören and Tezcan, (2009). Science and technology lesson attitude scale used in the study included 22 items. Cronbach alfa internal consistency coefficient was calculated and found .93. Scale was likert type assessment scale. Some of the statement in the questionnaire was positive and others were negative. For each statement "I totally agree", "I agree", "I don't have an idea", "I disagree", "I totally disagree" answers were placed with which students

could express their ideas. Results were evaluated by giving positive statements grades of 5, 4,3,2,1 and negative statements 1, 2,3,4,5.

Computer Attitude Scale (CAS): "Computer Attitude Scale" used in the study was developed. In the scale there were 26 positive and negative statements that determined students' attitude towards computer. Items in the scale were graded in 5 point likert scale "I totally agree" (5), "I agree" (4), "I partially agree" (3), "I disagree" (2), "I totally disagree" (1). CAS Cronbach α reliability coefficient was calculated 0,93 .

The preparation of heat and temperature lesson software: Lesson software to be used in application part of the research was prepared using 3D Flash Animator. The software is comprised of concepts which were chosen to comply with "heat and temperature" subject aims and student acquisitions in 5th grade science education program. The software was prepared by Information Technologies Department of the private school where the research was conducted under researchers' control, opinions and recommendations of relevant field experts were sought and necessary corrections were made following their suggestions.

Analysis of data: The fact that sub-groups showed, in systems they belong to, normal distribution on measurement related to the dependent variable indicates that hypothesis is difficult to realize in educational and behavioral sciences and thus the fact that this variable is ignored will not have an important impact on the results on condition that sub-groups which were formed according to group variable is 15 or more. Moreover, before the analysis whether pre-test and post-test grades showed normal distribution or not was checked using Kolmogorov-Smirnov (KS) test and found ($p>0.05$) for all pre-test and post-test grades. This finding showed that scale grades were normally distributed and parametric tests could be used.

Application: Before the application the test which was prepared in order to determine the levels of control and experimental groups that were chosen randomly was used as pre-test. One week after the pre-test was given, with students in control group heat and temperature subject was taught using traditional teaching methods according to curriculum in six hours for two weeks; and with students in experimental group heat and temperature subject was taught using Computer Assisted Teaching methods according to curriculum in six hours for two weeks. The same researcher taught in both groups. In experimental group animations and interactive applications that were prepared on Flash Animator were practiced by each student on their

individual computers in computer lab. Besides, these animations were backed up by Microsoft PowerPoint slides and training software CDs. After the subjects were taught the test which was given to compare experimental and control groups were given to students as post-test. In addition, during application process in-class observations were considered and this information was made use of in conclusions and suggestions sections of the research.

RESULTS

When Table 1 is examined, arithmetic average of students in control group is ($\bar{X}=11.00$) while arithmetic average of students in experimental group is ($\bar{X}=10.50$).

Table 1: T Test results of htssst pre-test grades of students in experimental and control groups

N	\bar{X}	SD	DF	t	p	
Control group	26	11.00	1.46	46	1.60	0.55
Experimental group	22	10.50	2.46			

Table 2: T Test results of htssst post-test grades of students in experimental and control groups

N	\bar{X}	SD	DF	t	p	
Control group	26	16.50	1.95	46	9.73	0.03
Experimental group	22	18.50	1.22			

Table 3: T Test results of science and education lesson attitude scale pre-test grades of students in experimental and control groups

N	\bar{X}	SD	DF	t	p	
Control group	26	70.35	12.21	46	-0.40	0.69
Experimental group	22	71.64	9.82			

Table 4: T Test results of science and education lesson attitude scale pre-test grades of students in experimental and control groups

N	\bar{X}	SD	DF	t	p	
Control group	26	69.81	12.42	46	-1.49	0.14
Experimental group	22	73.91	3.85			

Table 5: T Test results of computer attitude scale pre-test grades of students in experimental and control groups

N	\bar{X}	SD	DF	t	p	
Control group	26	90.50	15.33	46.00	0.56	0.58
Experimental group	22	88.18	12.68			

Table 6: T Test results of computer attitude scale pre-test grades of students in experimental and control groups

N	\bar{X}	SD	DF	t	p	
Control group	26	92.42	16.56	46	1.0	13.27
Experimental group	22	87.91	9.66			

Although arithmetic average of students in control group was higher, it was found that the difference between them was not statistically meaningful [$t_{(46)}=0.1.60$; $p>0.05$]. In other words, it could be said that HTSST test success levels of experimental and control groups were statistically equal. This result revealed that students in control and experimental group were similar.

When Table 2 is examined, the difference between experimental and control groups was meaningful [$t_{(46)}=9.73$, $p<0.05$]. Post-test average of Heat and Temperature subject test success grades of students in control group is ($\bar{X}=16.50$) while average of success grades of students in experimental group is ($\bar{X}=18.50$). This result indicates that the difference stems from students in experimental group. According to this result, it could be claimed that Computer Assisted Teaching increases success in science and education lessons.

When Table 3 is examined, arithmetic average of Science and Technology Lesson Attitude Scale pre-test grades of students in control group is ($\bar{X}=70.35$) while arithmetic average of Science and Technology Lesson Attitude Scale of students in experimental group is ($\bar{X}=71.64$). The difference between Control and Experimental post-test wasn't found statistically meaningful [$t_{(46)}=-0.40$; $p>0.05$]. This result indicates that there is no meaningful difference in Science and Technology Lesson Attitude Scale pre-test grades of control and experimental group.

When Table 4 is examined, arithmetic average of Science and Technology Lesson Attitude Scale post-test grades of students in control group is ($\bar{X}=69.81$) while arithmetic average of Science and Technology Lesson Attitude Scale post-test grades of students in experimental group is ($\bar{X}=73.91$). The difference between pre-test and post-test grades was found statistically unimportant [$t_{(46)}=-1.49$; $p>0.05$]. This result indicates that there is no meaningful difference in Science and Technology Lesson Attitude Scale post-test grades of control and experimental group.

When Table 5 is examined, arithmetic average of Computer Attitude Scale pre-test grades of students in control group is ($\bar{X}=90.50$) while arithmetic average of Computer Attitude Scale pre-test grades of students in experimental group is ($\bar{X}=88.18$). The difference between Control and Experimental pre-test grades was not found statistically meaningful [$t_{(46)}=0.56$; $p>0.05$]. This result indicates that there is no meaningful difference in Computer Attitude Scale pre-test grades of control and experimental groups.

When Table 6 is examined, arithmetic average of Computer Attitude Scale post-test grades of students in control group is ($\bar{X}=92.42$) while arithmetic average of Computer Attitude Scale post-test grades of students in experimental group is ($\bar{X}=87.91$). The difference between pre-test and post-test grades was not found statistically meaningful [$t_{(46)}=1.13$; $p>0.05$]. This result indicates that there is no difference in Computer Attitude Scale post-test control group grades and experimental group pre-test grades.

DISCUSSION

In this research the impact of computer assisted teaching on students' attitudes towards science and technology lessons, on students' attitudes towards computer and on students' success were studied using experimental design method. Before this research, it was seen that there was no difference between attitudes of groups towards science and technology lesson and academic success of groups. Following conclusions were obtained in the end of research: Computer-assisted teaching increased success of students, No difference was in question for the attitudes towards science and technology lesson of group that computer-assisted teaching was applied and group that traditional teaching method was used and no difference was in question for the attitudes towards the computer between the group that computer-assisted teaching was used and the group that traditional teaching method was used.

CONCLUSION

According to the results of success test given in control and experimental groups, groups were found similar before computer assisted teaching was carried out and after computer assisted was carried out the difference was on behalf of experimental group. This finding shows that computer assisted teaching increases student success. It is observed that this research complies with many others already carried out. In a research Özmen (2008). came to conclusion that CAT increases student success and influences memorability in a positive way. According to the results of their research which Geban and Demircioğlu carried out, computer assisted teaching which is given along with traditional class teaching is more effective in terms of science education success. This research also complies with the research we carried out.

It was claimed by some researchers that computer has also negative effects. For example Wainwright stated that traditional teaching methods were more effective than CAT (Wainwright, 1989). On the other

hand, some researchers state that there is no difference between traditional teaching methods and CAT in terms of their influence on success (Tjaden and Martin, 1995). Researchers who put these claims forward carried out their researches under conditions of insufficient hardware and software. Finally, various data has shown that there is not a considerable difference between traditional teaching and CAT (Coye and Stonebraker, 1994). These kinds of differences are often encountered in educational researches. The fact that research methods, assessment tools and environments are different makes it difficult to make an objective comparison. Different results might be encountered even in an identical research. Today, the fact that the capacity of technological products and software meets the need to a certain degree has increased efficiency in science education.

It was observed that there was no difference between science and technology lesson attitude pre-test and post-test grades of experimental and control groups. Therefore, it can be said that computer assisted science and technology teaching did not cause a positive or negative attitude. No difference in attitude was spotted in the group where traditional teaching method was used. It has been known that CAT activities are effective in motivating students and increasing their desires to take part in lab activities (Colletta and Chiappetta, 1989).

No difference was noticed in control and experimental group over computer attitude pre-test post test grades. This situation might have been caused because the students might not have taken another lesson under the name of computer lesson or because they might not have been using computer in their education extensively. Studied carried under scope of computer assisted teaching mostly shows that students develop a positive attitude towards computer. No change in attitude was observed among the group where traditional teaching methods were used. Akçay *et al.* (2008) found a meaningful difference between control and experimental groups in a research they carried out the research that Güler and Sağlam (2002) carried out shows similarities with this research. At the end of computer assisted teaching, students with no experience were observed to develop a negative attitude towards computer (Hashim and Mustapha, 2004).

Under the light of findings gathered, considering that we define attitude as positive or negative reaction of individuals towards objects or situations which individuals take interest in and which is formed by experiences in life (Hashim and Mustapha, 2004), it is thought useful to do comprehensive and long-lasting studies, to observe whether attitudes disappear in

following years, to determine what student success and attitude will be, to evaluate, by application of the same study to all science education subjects, students' attitude towards science and technology lesson and computer besides their success in science education.

Computer-assisted education can be used in education environments in different ways. For instance, it can be used for remote education (Dimitrios, 2005).

Computer use in different classes during the primary education period will contribute to the correct use of computer of these students in the advanced age. Ahmad (2009) focused on three points in the study in 2009 as skill, knowledge and motivation of computer usage of adults. They found out that adults having these three skills obtained more knowledge.

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