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# The effect of three different teaching tools in science education on the students' attitudes towards computer

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**Abstract**

The purpose of this study was to investigate the effect of the simulation and laboratory activities, and combination of them as a teaching tool on the students' attitudes towards computer. The quasi-experimental design was used. Control group I in which the real laboratory activities were used, to the control group II in which simulation activities were used and to the experimental group in which both simulation and laboratory activities were used together. Computer Attitude Test (CAT) was used as measurement tool. According the ANCOVA results, using computer simulations indicate a significant effect on students' attitudes towards computer.


*Keywords:* Science and Technology Education, Laboratory Activities, Simulation Activities, Attitudes towards Computers.

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## 1. Introduction

As our world increasingly turns into a digital form, the education system also feels the need and the necessity to adapt itself to this new environment, like all other systems do. Computers, which first entered schools to make the provision of administrative services faster, safer, and continuous, have later gone beyond the boundaries of computer laboratories, and took their rightful place alongside other educational tools in classes (Uluser İnan, 1997). In recent years, many studies have been conducted, in Turkey and internationally, on the use of computers and technology in education to examine the role the computers play in educational/training activities. Literature show that computer assisted education and combining computer simulations and laboratory activities helps improve the academic achievement of the students (Reed, 1986; Geban, Aşkar & Özkan, 1992; Ferguson & Chapman, 1993; Demircioğlu & Geban, 1996; Akdeniz & Yiğit, 2001; Jaakkola & Nurmi, 2007; Zacharia, 2007; Zacharia, Olympiou & Papaevripidou, 2008; Tanel, Önder & Sılay, 2010), and that it contributes to their conceptual development (Zietsman, 1986; Stieff, 2003). For active and efficient use of the computers in Turkey, for a higher quality education, and for the improvement of student achievement, it is imperative that both teachers and students develop positive attitudes towards computers.

In fact, the relation between students' attitude towards computer and student achievement in computer assisted learning environmental is two-sided. The significant effect of computers in education have been widely studied experimentally in past decades, however, there is a dearth of studies on the effect of computer assisted education on the students' attitudes towards computer, which is one justification for this study. For this purpose, the "Electricity in Daily Life" chapter of the science and technology program for 7$^{th}$ graders, designed by the Ministry of National Education of Turkey, was taught in class by simulation activities, by laboratory activities, and by laboratory and simulation activities merged together, and the attitudes of students towards the computers were examined.

## 2. Method

### *2.1. Sampling and Experimental Design*

The participants given in Table 1 were 66 seventh grade students at about 13 years old from an urban Turkish elementary school. The participants in three groups were selected from three public schools. The students had not received any formal education on electricity before the study was carried out.

Table 1 The gender of the students in three groups

| Groups | N[a] | P[b] |
|---|---|---|
| Experimental group | 27 | |
| Male | 13 | 48 |
| Female | 14 | 52 |
| Control group I | 21 | |
| Male | 12 | 43 |
| Female | 9 | 57 |
| Control group II | 18 | |
| Male | 10 | 55 |
| Female | 8 | 45 |

*a N is number of the students who participated in the study*
*b P is percentage of students who participated in the study*

"Pre-test and Post-test Design with Matched Control Group" which was one of the quasi-experimental designs was used in the study. The control group I (using real laboratory activities), the control group II (using simulation activities) and the experimental group (using simulation and laboratory activities together) (Table 2).

Table 2 Experimental design of study

| Groups | Pre test | Method | Post test |
|---|---|---|---|
| Experimental group | CAT | Combining simulation and laboratory activities | CAT |
| Control group I | CAT | Laboratory activities | CAT |
| Control group II | CAT | Simulation activities | CAT |

*CAT: Computer Attitude Test*

## *2.2. Procedure*

The implementation of the study lasted for three weeks and 12 periods on the basis of 4 hours per week in 2009-2010 educational year. Before the implementation, the students were given CAT as the pre-tests. To move to the next stage of study, the results of the pre-tests were evaluated. The pre-test scores indicated the homogeneity within three groups. The students in the control group I, control group II and the experimental group were placed to their learning environments and given information about the course and learning environments. 13 simulations and 11 laboratory activities designed according to of Turkish Science and Technology Curriculum (TSTC) by the researchers. The simulations and laboratory activities organized according to the learning method of inquiry. Therefore, the instructions were made to preserve the same teaching method and the curriculum material. The students in each group worked in a small-group during the course to supply effective learning (Chang & Lederman, 1994; Huber, 2003). In order to measure and compare the effectiveness of the different learning environments, CAT post-test was administered to students a day after the course. Although students worked in a small group during the course, they completed the entire test individually.

Students in control group I assigned to the *Laboratory Environment* tried to learn the basic concepts of circuit and the relationship among them in a traditional classroom, with laboratory equipment kits that included real batteries, bulbs, wires, switches, amperemeter and voltmeter. Students in control group II assigned to the S*imulation Environment* tried to learn the basic concepts of circuit and the relationship among them in a computerized classroom with an online electricity simulation, the 'Electricity Simulation Tool (EST)' (an example in Figure 1). Students in experimental group used both the EST and laboratory equipment kits in computerized classroom to learn the basic concepts of circuit and the relationship among them. Students were first asked to complete the assignment using the simulation; and then they were asked to repeat the assignment with the laboratory equipment kits.

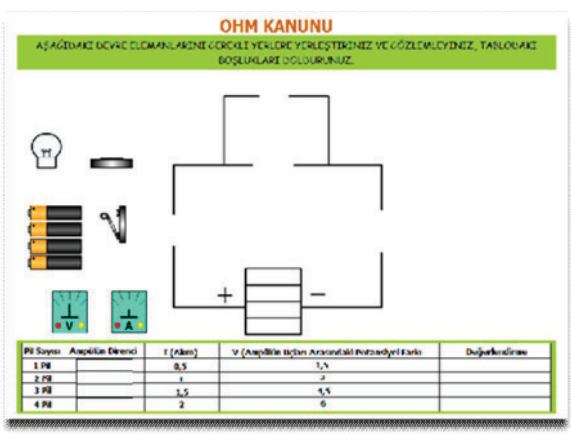


Figure 1. A sample of electricity simulation tool

### *2.3. Data Tool and analysis*

The questionnaire (CAT) developed by Aşkar and Orçan (1987), which has a reliability coefficient of α = .89, was filled by the students prior to the classes as the pre-test, and after the treatment, as the post-test. The scale, which was a five-point Likert type scale, consisted of 13 positive and 11 negative items, and the possible responses of strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree were provided.

The data were evaluated in SPSS package program. It was accepted that there was .05 degree of significance. One-factor ANCOVA was used to determine whether there was significant difference among the post-tests of the groups. In order to determine the differentiation way of the post-tests, Bonferroni, one of the multiple comparison test, was used.

## 3. Result and Discussion

The research question of "Are there any meaning differences about students' attitude between experimental groups, the control group I and the control group II?" results are given table 3, table 4 and table 5.

Table 3. Descriptive statics according to post test

| Group | N | Mean | Revised Mean |
|---|---|---|---|
| Experimental Group | 27 | 104.59 | 104.65 |
| Control Group I | 21 | 87.43 | 85.03 |
| Control Group II | 18 | 100.28 | 101.65 |

Table 3 indicates the revised mean which regarding the pre test. According to this, CAT post-test scores of the experimental group were calculated as 104.59; of the control group I was as 87.43; and of control group II was 100.28. Depending on these scores, it could be considered that the control group I had the lowest mean score of the post-tests. The revised CAT post-test mean scores were 104.65 for the experimental group; 85.03 for the control group I; and 101.65 for the control group II. If the groups were ranked from top to down according to CAT mean scores, it could be stated that the group with the highest mean score was experimental group and control group II and control group I followed this group respectively**.**

Table 4 indicates the result of the analyses of covariance (ANCOVA) on the dependent variable which was the post test scores and the covariate which were the pre test score.

Tablo.4. ANCOVA source table of post test scores by treatment

| Source | Sum of Squares | df | Mean Square | F | P |
|---|---|---|---|---|---|
| Pre-test | 1423.307 | 1 | 1423.307 | 14.857 | .000* |
| Groups | 869.138 | 2 | 434.569 | 4.536 | .015 |
| Error | 5748.158 | 60 | 95.803 | | |
| Total | 11858.864 | 65 | | | |

*p< .05

According to the ANCOVA results, there was a significant difference between post test scores of the groups in experimental group, control group I and control group II ( $F_{(2, 60)} = 4.536$, $p<.05$.).

Table 5. Summary data from post – hoc test

| Learning environment (I) | Learning environment (J) | Mean Difference (I-J) | Std. Error | p | 95% Confidence interval for difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Control group II | Control group I | 16.515 | 3,261 | .000* | 8.483 | 24.547 |
| | Experimental group | -3.10 | 3.006 | .920 | -10.504 | 4.304 |
| Control group I | Control group II | 16.515 | 3.261 | .000* | -24.547 | -8.483 |
| | Experimental group | -19.615 | 2.973 | .000* | -26.937 | -12.292 |
| Experimental group | Control group II | 3.100 | 3.006 | .920 | -4.304 | 10.504 |
| | Control group I | 19.615 | 2.973 | .000* | 12.292 | 26.937 |

*p< .05

According to the results of Bonferrroni test (Table 5), significant difference was found between the mean scores of the control group I and control group II; and between control group I and experimental group. No significant difference was found between control group II and experimental group.

This finding supports other studies which have also found that using computer improves the attitudes of students' towards computers (Keser, 1999; Yenice, 2003; Hançer &Yalçın, 2007; Akçay, Tüysüz, Feyzioğlu & Oğuz, 2008). So far, researches have shown that computer aided teaching material can be effective on student's attitude on courses.

## 4. Conclusion and Suggestion

The purpose of this study was to investigate the effect of the simulation and laboratory activities, and combination of them as a teaching tool on the students' attitudes towards computer. The results showed that the mean score of the group which had the simulation activities only and the group which had both the simulation and the laboratory activities have significantly differed from the mean score of the group which had the laboratory activities only. The difference was in favor of the group that had the simulation activities only, and the group that had both the simulation and the laboratory activities. These results show that use of computer simulations in educational/training activities improves the positive attitudes students have towards the computers. So far, researches have shown that computer aided teaching material can be effective on student's attitude on some courses. This research has revealed that computer aided teaching material improve positive attitude on the students. Therefore, all schools should be highly computerized; all teachers should be able to use effectively the computer to enhance their working methods.

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