

Full Length Research Paper

The effect of the use of interactive whiteboard on students' motivation

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The purpose of this study is to determine how the use of smart board affects the motivation levels of students. This research was carried out with true experimental group and a control group. The sample of the study consists of 50 sophomore students, studying at the Department of Classroom Teaching of the Elementary Education Division at Gazi University in the 2009 to 2010 academic session. In the experimental group, interactive whiteboards (computer-projector and board connection) were used with 25 students; while in the control group, only computer projector was employed, with 25 students also. The experiment lasted for four weeks. The results indicated a significant difference between the experimental and control groups. In comparing their motivation scale scores after the experiment, a statistically significant difference was observed between the two groups and this difference was in favor of the experimental group.

Key words: Smart board, motivation, designing material, technologies.

INTRODUCTION

With education opportunities given to more individuals, coupled with the need for its regulations in terms of time and place as well as having effective and good quality education make it inevitable for us to employ information and communication technologies in education. It has been observed that the use of technologies in education leads to an increase in the quality of education and effectiveness in teaching; it also activates the students, leading to a decrease in the amount of time teachers spend on realizing their goals in their courses. It is a known fact that the curricula need to be revised and improved in relation to their goals, contents and methodologies in our education system with emphasis on an approach that is centered on teaching students how to reach information and make use of technologies, instead of bombarding them with a great amount of information (Akkoyunlu, 1998).

All materials and equipment that contribute to easy interaction between students and the subject to be taught

are included in the scope of educational technology. The teacher can use all types of materials from chalk, blackboard to pedagogical videos and virtual software. Education technology contributes to the determination of learning strategies by taking an active role in all of these phases (Akpınar, 2004). It is known that the use of information technologies called *instructional technologies* in education results in an increase in the effectiveness of education when they are consciously and deliberately used (Akkoyunlu, 1998). Hence, it is a must that developing and changing information technologies are to be brought into the classrooms for students to gain required skills. Moreover, these possible new technologies should also be adapted into the classroom situations by the teachers in the education and instruction process so that the students possess the required levels of skill.

This is one of the new technologies- interactive boards. The data projector reflects what it receives from the

computer onto the screen of the smart board, and the board turns into a huge computer screen sensitive to finger-touch. Hence, the board turns into an interactive screen that can be controlled by touching with one's fingers or an electronic pen. In this way, it becomes possible to reach all files in the computer and internet. When working with special software downloaded in the computer, it is possible to use the menu options that may vary by the characteristics of the software chosen. It is also possible to add new views and animations into the gallery present in one software. What is performed during a lesson may be recorded by saving the originals offered by the software. It is also possible to return to the pages already covered at wish. The saved courses may be sent to the students who were absent from a lesson, or these courses may be posted online so that the students may review the lessons missed at home. This could result in an increase in the interest and motivation of the students towards the lessons.

Analysis of studies conducted showed that teachers were willing to use the smart board technology and agreed on the necessity of using the smart boards. However, findings from the students' data revealed, that in spite of their good intentions, teachers are unable to use the smart boards efficiently (Glover et al., 2005). In their study, Smith et al. (2005) proposed that the smart boards are multifunctional, provide multimedia, encourage students' participation, increase motivation and enable flexibility.

In a similar study by Becta (2006), it is found that students like interacting on the board by their skillful use of texts and pictures, resulting in their getting more motivated in classes where smart boards are utilized. Lewin et al. (2008) contended that students improved their reading-writing, math and science performances in direct proportion to the time they were instructed via the smart board. Their research also emphasized that teaching and learning always include the interaction among teachers, students and instructional sources. It is also known that some techniques have been developed for the best use of the smart boards (Saban, 2000). McCormick and Scrimshaw (2001) asserted that, for student's motivation to be permanent there is a need for more attractive presentations in terms of the materials to be used, and teachers should also successfully make use of learning methods that are interactive and used continuously.

Geer and Barnes (2007) claimed that traditional boards have been used in education for years, and what the teachers do is just to stand in front of the boards and give the instruction of the classroom. The use of smart boards, however, enables participants to interact with one another in a student-centered atmosphere, and teachers may also give more effective presentations with the help of the smart boards. When students use the smart board themselves, it is observed that they learn competently, which may be considered as the most critical result of

using smart boards in education. Wall et al. (2005) proposed that smart boards possess such multimedia opportunities such as using various softwares, visualization of information in education, making what has been learnt concrete in mind through imagination, using games, providing funnier lessons and assisting in recall. Moreover, these opportunities encourage students to learn by providing an atmosphere of motivation, attention, interest and safety; and the possibility of using color and animation is another opportunity offered by the smart board use.

Schut (2007) asserted the importance of the smart board as a valuable tool used in many classroom situations. In his study, it has been identified that smart boards are valuable tools as follows: leading learners' attention to the topic to be covered in the lesson, increasing student's interest in the lesson, augmenting interaction in the classroom and also in the development of visuals for instructional use. Results further showed that smart boards provide opportunities for enrichment of the lessons by the use of animation, sounds, pictures and games, and the investigation of students' diaries and interviews also revealed that students attach importance to the use of animations in their lessons. In another study, Moffatt (2000) indicated that students developed more positive attitudes towards math course when it was studied, using smart board. Beauchamp and Kennewell (2010) have found out that the use of information and communication technologies results in an increase in motivation level and encourages student's interest. As already known, motivation refers to the process that starts or proceeds a behavior, encourages an ongoing activity and also channels the activity through a certain direction. Therefore, the concept of motivation is the investigation of the driving force behind human behavior, its persistent continuity in a certain direction and encouragement of a behavior.

Human behavior that is oriented towards achieving a certain purpose is related to meeting a certain need. In considering the great number of human needs, the choice of behaviors directly relates to motivation. Human beings choose between two or more behaviors to achieve their purposes, and they continue this until they go beyond their purposes. The investigation of the reasons for the priorities in choosing the behaviors directly relates to motivation. Such fluctuations in human behavior are important aspects. Humans and animals are accepted as motionless unless they are stimulated (that is, are motivated) (Olsen, 1998). Accordingly, the concept of motivation refers to the act of leading individuals to reveal behaviors that are already apparent in some other different manners by exposing them to some influence before such an influence is exerted (Schut, 2007). In this vein, smart boards are considered as tools with such influences like encouraging student's participation and motivation and also providing an interactive atmosphere. The above shows that the use of smart board has a

positive influence on motivation. However, there are scarce researches that focus on the use of the smart boards at tertiary level. Therefore, the current research tries to shed more light on the effect of using the smart board of the motivation levels of the students in the Classroom Teaching of the Elementary Education Division of the Gazi Faculty of Education.

The purpose of the study

This study aims to determine whether the use of smart boards affects motivation levels. Based on this main objective, the study aims to address the following research questions:

Is there a significant difference between the motivation scale scores of the experimental group students who were instructed with the smart board and those of the control group who were trained via a more traditional method? That is, does the motivation level vary with the type of instructional medium used?

METHOD

Participants

The participants were 50 sophomore students who study at the Department of Classroom Teaching of the Elementary Education Division of the Gazi Faculty of Education. Using the random sampling procedures, 25 of them were assigned to the experimental group while the remaining 25 were assigned to the control group. A personal information questionnaire was administered to both the control and experimental groups to determine whether there was a significant difference between them in terms of their certain characteristics and whether such differences have an influence on the results of the study; and to further regroup the students if needed. The researcher observed all of the four weeks Instructional Technologies and Material Design Course attended by the control and experimental group students. The *Visual Material Design* was chosen as the sample's learning domain. The subjects for the Visual Material Design unit were presented by means of PowerPoint materials prepared by the researcher. The lessons were performed with the use of smart boards (computer-data projector and board connection) in the experimental group, while only computer-data projector connection was used for the control group. These technologies were employed throughout the trial period in all the classroom with no interruption. Data of the study were elicited by means of Achievement Test for Visual Material Design, Retention Test and Motivation Scale towards the Use of Smart Boards in the Instructional Technologies and Material Design Course.

Design

Pretest-posttest true experimental model with a control group design was employed in the study. The independent variable was the use of smart boards, while student's achievement, retention of what has been learnt and motivation level made up the dependent variables of the study. For the purpose of this research, the participants were randomly assigned to the two experimental

conditions: experimental group and control group. The students who work on the Visual Material Design learning domain through smart boards formed the experimental condition, and those who work on the same learning domain through a more traditional medium formed the control condition.

Instrumentation

Motivation scale

In this study, the motivation scale developed by Özerbaş (2003) was used. By applying the instrument to experimental and control groups at the beginning and end of the research, this work aims to determine the changes in the levels of the students' motivation. The pilot implementation of motivation measurement tool was used in different primary schools, in Ankara City center, on the seventh class of 372 ongoing students. The whole scale consists of 30 Likert-type statements of 17 positive and 13 negative ones. In this study, the pilot implementation of motivation measurement tool was used on 213 undergraduate students from the Classroom Teaching Program in Education Faculty at Gazi University in Ankara. As a result of the pilot study, each item in Motivation Scale was evaluated with these five-scales: "Fully agree (5)", "Agree (4)", "Neutral (3)", "Disagree (2)" and "Strongly Disagree (1)". The data obtained were coded by making values from 5 to 1 positive items and 1 to 5 negative ones, respectively. The highest total score (150) is the indicator of positive attitude and the lowest total score (30) is the indicator of negative attitude.

Factor analysis was conducted to study the structural validity of the original study. As a result of the factor analysis, factor values of substances were observed to vary between 0.49 and 0.87. That factor value is high shows that the scale consists of items that are associated with each other with a high level of student's motivation. As a result of the factor analysis, the scale is identified as one-dimensional and the explained variance is 41.7%. The variance of the common factor of the items was found to be between 0.82 and 0.50. (KMO) coefficient for the scale was found as 0.850 in the original study. However, in this study, it was found as 0.915. In this study, a single scale factor of total variance is calculated as 66.423%. As a result of the study on the reliability of the original study, Cronbach Alpha internal consistency was found to be 0.88. After three weeks, the scale was applied again to 372 students in the sample based on test-retest method and the Cronbach Alpha internal consistency was found to be 0.91. In this study, the Cronbach Alpha internal consistency for the whole scale was found to be 0.920.

Instructional material and related procedure

Before the experiment period, control and experimental group students were subjected to pretests to determine their level of motivation. Motivation scale was administered also as a posttest in order to determine the motivation levels of the students after the experiment took place. The experimental group was trained for four hours for the use of the smart board. The subject matter, Visual Material Design was covered by the researcher in the experimental group class by using the smart board. In the control group class, however, the same subject was worked on by using traditional methods. The experiment lasted for four weeks. The material prepared by the researcher for the Visual Material Design learning domain was used in both control and experimental lessons during the experiment period. The seventh chapter of the Instructional Technologies and Material Design Textbook (Yalin, 2009) was taken into consideration while preparing the material of the study. A PowerPoint presentation including activities, examples and

Table 1. Description of motivation level in relation to pretest, posttest and retention scores.

+	Group	M	SD
Pretest	Experimental (n=25)	89.92	24.96
	Control (n=25)	92.40	17.20
Posttest	Experimental (n=25)	115.68	15.82
	Control (n=25)	97.52	11.56

animations was developed in the light of the objectives shown in the unit introduction part of the textbook.

Various software and programs with different operational purposes were also exploited in the preparation period of the instructional material. The animations, some of which were prepared by the researcher himself and some of which were ready made materials, were developed using programs such as Macromedia Flash Professional 8, Swish 2.0, Adobe Premiere 6.0, ACDSsee 4.0 and Paint. The main program used for the lesson presentation was the Flash program accompanied by the others. ACDSsee 4.0 and Paint were also employed to format the pictures and graphs in the main program. Experts were consulted for the material to be appropriate to the objectives, applicable to the material's visual design, and for the harmony of its colors and appropriateness of its animations. Students actively took part in the activities designed in the light of the objectives specified. For instance, in preparing materials while working on the topic of elements and principles of instructional design, students got the results step by step by answering the questions and writing down the answers on the blanks arranged on the materials. In the experimental condition, this activity was performed by the help of the recording function of the smart board. The PowerPoint presentation used in the study was delivered to both groups of students so that they had no reason for using their notebooks.

One of the objectives of the Visual Material Design topic refers to the development of the skills of using the elements of design (lines, shapes, space, texture, dimension and color etc.). Another objective relates to the forming of a material design model by using the principles of the design (integrity, balance, emphasis, alignment, and proximity etc.). Students in the experimental group may refer to the PowerPoint presentation prepared by the researcher, and in this way they learn the required information and skills they need for their own works. This PowerPoint presentation includes information on the elements and principles of visual material design and some other related definitions, forms of use, examples and also information on help needed for future designs. Such an activity makes students to think and thus to discover the best correct way to form a material design model. With such practices and information gained, students may easily answer the questions included within the presentation. Forming another new material design with what has been gained in this course forms the last step of the program. The experiment lasted for four weeks (16 h).

Data analysis

Two-way within-subjects ANOVA was used to investigate if there is a significant difference between the experimental and control groups in terms of their motivation levels. For mixed type of measurements, two factor ANOVA is used for independent measures based on groups, or for repeated measures based on time in order to test the main effects or interaction effect to be gained through the experiment (Büyükoztürk, 2010). The Statistical

Package for Social Sciences (Version 15.0) was used to analyze all the data. An alpha level of .05 was utilized for the study.

RESULTS

This part will discuss the findings in relation to the main and sub-research questions and their relevant implications.

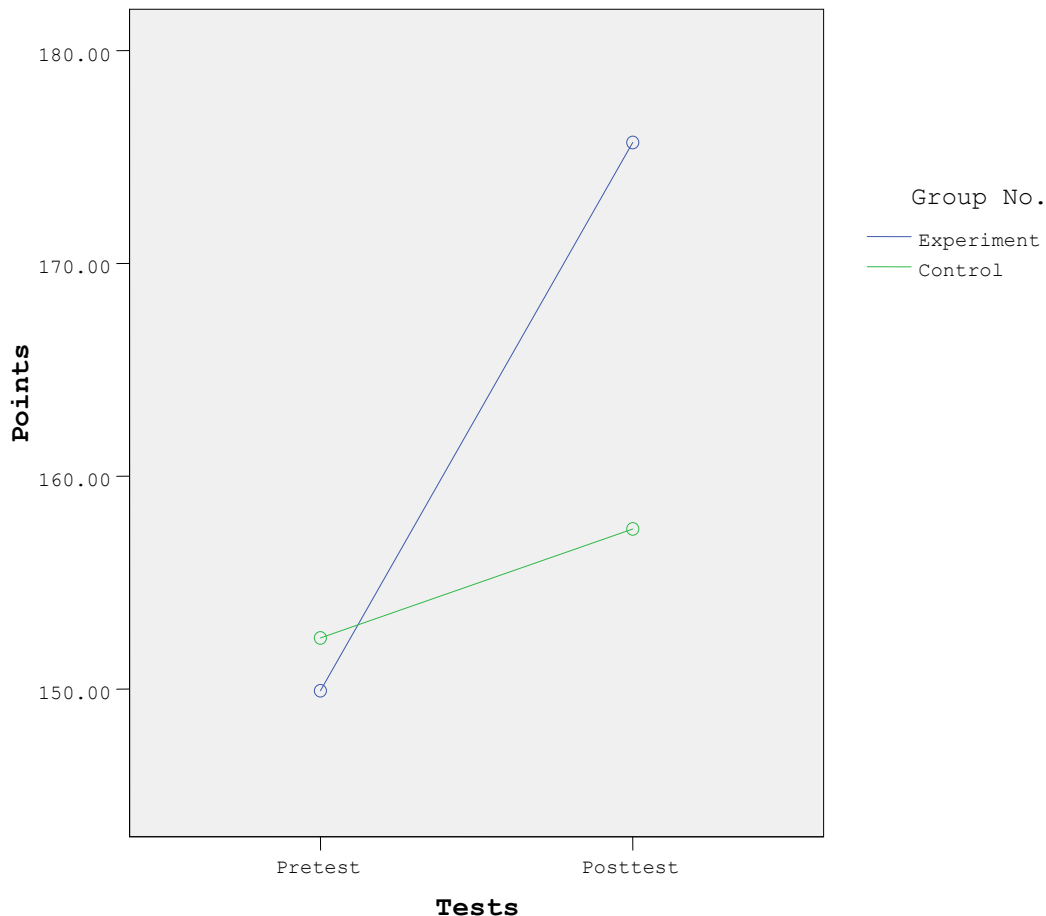
When we examine Table 1 showing descriptive statistics of means of motivation pre-test and post-test of groups, we observe that the mean of pre-test scores of the students in trial group is ($X=89,92$) close to the means of pre-test scores of the teacher candidates in control group ($X=152,40$). When we examine the means of post-tests of both groups, we identify that the mean of the post-test scores of the students in trial group ($X=115,68$) is higher than that of post-test scores of teacher candidates in control group ($X=97,52$). When we examine the data given in the table, we can infer that the means of the students in trial group increased gradually in the process from the pretest conducted before the trial to posttest conducted after the trial. However, the means of students in control group changed very little between pretest and posttest. This is shown graphically in Figure 1.

As shown in Figure 1, there is some degree of difference between the experimental and control group students with regard to their motivation levels in the pretest and posttest conditions. This significant difference in the means for motivation levels leads us to suggest that the smart boards are effective instructional materials for the motivation of learners. The results of the two-factor ANOVA conducted to see if the differences in the motivation levels of the students from pretest to posttest are statistically significant are presented in Table 2.

The analysis revealed a significant interaction between group (experimental or control) and measurement (pre or posttest), $F(1,48) = 16.90$, $p < .001$, which means that the motivation levels of the students in the experimental group in which the smart boards are employed and control group in which a more traditional instruction is performed differ in the measurement, pretest and posttest. To put it differently, the effect of group (experimental-innovative or control-traditional) depends on the time of measurement (before or after trial). In Table 2, one can see that the use of smart boards may be an influential factor of the experimental group participants, which means that the use of smart boards resulted in differences in the motivation levels of the students as the trial proceeded, with the levels of motivation increasing after it. In also comparing the post test motivation scores of the experimental and control groups, a mean difference of 18.16 was observed. This difference is found to be statistically and significantly meaningful for the experimental condition. Thus, it may be appropriate to conclude that the instructional medium using smart boards is more effective than the more

Table 2. ANOVA summary table for motivation level.

Source	SS	df	MS	F
Group	1536.64	1	1536.64	3.11
Measurement (Pretest and Posttest)	5959.84	1	5959.84	37.83 ^a
Group × Measurement	2662.56	1	2662.56	16.90 ^a
Error	7562.60	48	157.55	
Total	41424.56	99		

^a $p < .05$.**Figure 1.** Visual representation of the mean scores for the experimental and control groups in relation to motivation levels.

traditional instructional means.

DISCUSSION

It can be said that the use of smart boards draws student's attention, increases their motivation towards learning and encourages their interests (BECTA, 2003; Glover et al., 2005; Shenton and Pagett, 2007; Slay et al., 2008; Erduran and Tataroğlu, 2009). Students' report showing that their grades have increased with the use of

such instructional medium contributes to this opinion. The results from the current study contribute to the belief that the use of smart boards attracts students and encourages their active participation in the lesson.

It can also be said that smart boards had a positive influence on the experimental group participants, that is, their motivation behaviors before the trial varied from their motivation behaviors after the trial, which have great increase. This finding is consistent with Beauchamp and Kennewell's (2010) study, which revealed that the use of information and communication technologies leads

to an increase in student's motivation and encourages attention. However, inflexibility of the readymade software programs and the inefficiency on the part of the software developers are some of the problems information and communication technologies are unable to cope with, and this situation in turn leads to a very superficial development in students' interest and motivation. It is also claimed that the approach followed by the teachers in the use of information and communication technologies is another important aspect; and for learning to take place in the whole class, the ways of how to make the best use of the information and communication technologies need to be explored by pursuing an instructional approach that augments high interaction in class.

A significant difference has been observed in the motivation posttest scores between the experimental group and the control group students that are instructed via only computer-data projector system, and this difference is in the countenance of the experimental condition, which is consistent with the finding proposed earlier by Glover and Miller (2001). This finding is believed to result from the effectiveness of the instructional medium in which smart boards are employed and being an important factor in increasing the motivation level. It is seen that the instructional medium using smart boards is more effective on students' motivation than the more traditional instructional medium.

In line with the finding above, it can be said that a high motivation level leads to high students' performance. In their study on the introduction of smart boards into the educational cycles, a type of critical review study, Smith et al. (2005) indicated the potential of the smart board and its positive influence on education. They put forth that the smart board is a tool that improves and supports instruction. Furthermore, another result of the study revealed that smart boards are effective tools that provide multimedia, encourage students' participation, increase motivation and enable flexibility. In a study performed by British Educational Communications and Technology Agency (BECTA), it is seen that students like interacting physically on the board by making a skillful use of texts and views, and this level of interaction makes them get more motivated towards classes with smart boards (BECTA, 2003). Accordingly, it has been proposed that smart boards attract students, and students enjoy using the smart boards in their courses. It is also seen that students prefer the instructional medium, using smart boards to a more traditional instructional medium. Another finding reveals that both students' achievement and interest in the courses increase in the medium in which smart boards are utilized.

Conclusion

The limitations and the findings of the study open a number of avenues for the application of instructional

medium involving smart boards and further research in this area. Perhaps, one of the biggest problems of the Turkish education system is students' inability to focus on a topic and getting motivated. The use of instructional medium involving smart boards may resolve this problem at least to some degree. Hence, students are required to get motivated by the use of the smart boards in all levels of our education system. It has been observed that the smart board is a tool that might be used in teaching and that it encourages students' participation and motivation and provides an interactive atmosphere. Research has shown that the smart board is a very good presentation tool. However, this tool needs to be effectively employed by the teachers. Such a situation emphasizes the need for a change in teachers' education and pedagogy. Therefore, teachers, who are expected to successfully use smart boards as instructional medium, should be provided with face-to-face interactive and practice-oriented training on the use of smart boards. Such training should not necessarily center on the hardware dimension of the smart board; they should also include training about which skill level is needed for a topic and how the smart board should be used.

Note

Used in this study The effect of the use of interactive whiteboard on students' motivation data on simultaneously applied to the same workgroup The effect of using interactive whiteboards in the course of teaching technologies and material designing towards student achievement and retention were obtained from the data used in the research.

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