

## The Effect of Workshop Training Method and Electronic Teaching Method on Mathematics Learning

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### Abstract

The present study with the aim to investigate the effect of training by using of electronic content and workshop method on math learning of high school students of eighteen region of Tehran has been done. The research method was applied and quasi-experimental with pretest-posttest design and control group. The study population included all girl students studying at second year of high school in public schools of eighteen region of Tehran in the 94-95 school year that by using of sampling method three classes were selected. The first experimental group with electronic content and the second experimental group by using of workshop method were trained that with the control group, who were trained in the traditional way, were compared. To determine the effect of work of education on math learning in the three groups, the analysis of covariance and ANOVA were used. The results showed that math scores in the two experimental groups were higher than the control group. Also, comparing the post test scores of math learning in the two experimental groups showed that the training by using of workshop method more than training with electronic content has effect on math learning.

**Keywords:** electronic content, workshop method, learning

### Introduction

Today, due to the social necessity, education system is one of the big and complex social organizations in every country which has an irrefragible bond with social, cultural and economic growth and development and it has gradually turned into a complicated system. Also, due to developments in human science and experiences and technology development and industrial progress, the increasing development of the education system activities has become a universal issue. Therefore, one of the most important indicators of any society development is the range of the responsibilities of its education system (Safi, 2003).

Educational systems have always been looking for ways to improve teaching methods in different courses; traditional teaching methods have been used in the same way for many years, but in today's world new approaches have been considered for teaching and learning. Since in current methods of teaching math, the students have no opportunity to use imagination and visualization, and experience things, naturally their mental faculties and ideas are not strengthened and they cannot have an active role in this field. In mathematical education there is a need for new approaches. In this regard, on the one hand it is necessary to use the mathematical concepts to teach the students how to live better; for this purpose, the level of general education should be understandable for all of the students and it should also have practical aspects to prepare the students to live a life which is along with technology. On the other hand, the teaching methods that are mostly teacher-centered should turn into student-centered methods, and teachers instead of having a unidirectional transfer of knowledge and information should try to provide a context to let the students produce the concepts themselves (Belski, N, 2004).

### Problem statement

According to the fact that mathematics are one of the basic courses and have intangible concepts for the students, traditional teaching methods have made problems for students learning; therefore, a proper teaching method along with an attractive presentation of knowledge and consistency with the latest modern methods can provide a sustainable learning

for the students. The development of mathematical education process due to the scientific complexities and its connection with the students' way of thinking and comprehension, and also its applications in various economic sectors can lead to the development and production of knowledge and self-confidence. Therefore, mathematical education has been always considered as one of the most important objectives of every country education system.

Among the mathematical learning methods, enabling students and involving them in learning and enhancing their motivation by using new teaching – learning methods and educational media are some of the strategies that are confirmed by experts. By the increasing development of science, the traditional teaching methods are no more able to meet the students' needs to learn. In workshop teaching methods due to the availability of key and original situations, the teaching – learning process is enjoyable for the students. Since the workshop environment consists of various educational tools and accessories that sometimes are made by learners or teachers, the students will get involved in the learning process and as a result teaching and learning will happen at the high levels (Hoseini, 2011). On the other hand, in recent years many researches have been conducted on the importance of the role of educational materials and media in the teaching and learning process. A prerequisite for effective learning is using multiple facilities and resources to facilitate learning and academic achievement in various academic fields. One of these facilities is electronic content that changes the learning process and increases the students' interest and motivation for learning, and finally it facilitates learning and makes it interesting (Shoarinezhad, 2004).

By using e-learning, we can provide the optimal learning environment for different people by different characteristics, if this environment is well designed; it can facilitate and strengthen the review process through double coding. It also can timely try to elicit knowledge and help to provide the proper solution by using that elicited knowledge (Alemi, 1998).

Chang, Y and Mao, S, (2010), in their research on the ninth grade students of Taiwan schools in geology lesson have concluded that participation of students along with teacher facilitation can increase learning. Also, the results of the study of Hoopes, M (2009) that has been conducted on a number of students in biology lesson has led to the enhancement of interactions and improvement of learning, and most of the students have preferred the workshop method to the traditional methods.

In another research, Lopez- Morteo, G and Lopez, G (2007) have studied the effect of collaborative e-learning that is a way to motivate students to learn mathematics. In this study, the different aspects of the learning environment have been studied in three short periods of mathematic courses in high school students of Mexico. The results have shown that the use of electronic learning environment will lead to the positive attitude of students towards mathematics. Also, Thurston, A et al, (2010) in a research have concluded that the elementary school students who have learned science lesson with the participatory method are more successful in understanding science lesson. Tran, V and Lewis, R (2012) in their research have studied the effect of cooperative learning on learning math in two groups of students. They have concluded that students who have experienced participatory method had a better learning than the students who have experienced traditional learning.

Babaie (2013) in his research that have been conducted on the effect of software and workshop training on learning and retention of math in third grade middle school students. He has concluded that software and workshop training have affected learning math in the third grade middle school students.

According to the mentioned researches, the study on the effect of "workshop training "that is an active and exploratory method in which the students work by teachers facilitation will discover the mathematical rules; and also "training by using electronic content" method in which information technology is used in teaching - learning process are considered by the researcher of this study. This study is conducted in order to comprehend the importance of active and innovative learning methods, and since there has been few studies on the comparison of these two methods, this research wants to find the answer of this question: Which one of these two types of training methods including electronic content training and workshop training had a greater effect on students learning mathematics?

Despite the development of the application of new educational technologies in the educational system of the country; no deep studies have been conducted on the new teaching methods that are in the form of new technologies and workshop methods for students learning. For this reason, the results of this study can deeply consider the effect of using electronic content and workshop training on the development of students learning, and it will lead to the presentation of effective solutions to improve teaching mathematics in high schools.

This study is conducted in order to compare the effect of using electronic content and workshop training on learning mathematics in high school students.

### Research hypothesis

Compared to the electronic content training, workshop training has a greater influence on learning mathematics.

### Research method

The research method is practical, and it is the type of quasi-experimental that has pre-test and post-test and control group. The study population has included all the high school female students who are studying in public schools of the eighteen district of Tehran city in the academic years of 2015-2016. Among these high schools, three classes have been selected by convenience sampling method. The first study group has been trained with electronic content training and the second study group has been trained with workshop training, and they have been compared with the control group that has been trained with traditional training. In order to determine the effect of training methods on learning mathematics in these three groups, the covariance analysis and one-way ANOVA have been used.

### Research tools

In order to conduct this study, the researcher has used two self-made math tests (pre-test and post-test). One test has been held before the experiment in order to evaluate the knowledge of the students of the two groups (pre-test), and the other test has been held after the experiment (post-test), and finally the differences in the results have been studied. The pre-test and post-test have been designed with 20 multiple questions and based on the chapter of functions from the math book of third grade of high school. Each question had one score, and the minimum score was 0 and the maximum was 20.

For the content validity of the test, in consultation with a group of teachers of mathematics, some multiple questions have been designed. For more reliability, the pre-test-post-test questions have prepared equally. These questions have been reviewed by a group of other teachers and the questions have been approved by them; so these questions have been used as the test questions. In this study, Cronbach's alpha method has been used to calculate reliability coefficient which has been obtained 0.86.

### Data analysis method

In this study, the two statistical activities including descriptive and inferential statistics have been used. In the descriptive statistics, the central indexes such as median, mean and dispersion parameters such as standard deviation and variance have been used. In the inferential statistics, given to the pretest-posttest design the covariance analysis has been used, and based on the research hypotheses in order to compare the mean scores of the three groups, one-way ANOVA has been used.

### Research findings

After the completion of the training courses, the three groups have given the post-test. In this study, in order to stabilize the effect of pre-test in the three groups, the covariance analysis has been used. The descriptive indicators in the control group and the other two study groups are presented in Table 1. According to the provided data, there is a huge difference between the pre-test and post-test scores.

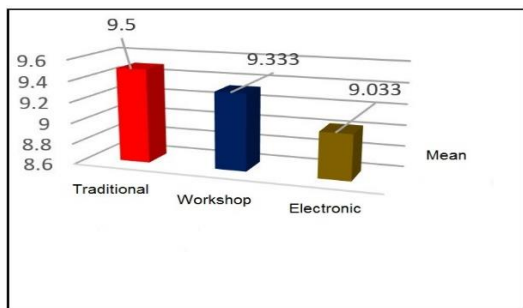
Table 1: descriptive characteristics of the three traditional, workshop and electronic content training methods

|                      |           | Number | Mean   | Standard deviation | variance | range | maximum | minimum | Skewness | Kurtosis |
|----------------------|-----------|--------|--------|--------------------|----------|-------|---------|---------|----------|----------|
| Traditional training | Pre-test  | 30     | 9.50   | 4.377              | 18.810   | 17    | 2       | 19      | 0.045    | -0.816   |
|                      | Post-test | 30     | 11.767 | 3.024              | 9.151    | 12    | 8       | 20      | 0.575    | -0.046   |

|                             |           |    |        |       |        |    |    |    |        |        |
|-----------------------------|-----------|----|--------|-------|--------|----|----|----|--------|--------|
| Workshop training           | Pre-test  | 30 | 9.333  | 4.381 | 19.195 | 14 | 2  | 16 | 0.131  | -1.304 |
|                             | Post-test | 30 | 15.80  | 3.213 | 10.441 | 10 | 10 | 20 | -0.320 | -0.948 |
| Electronic content training | Pre-test  | 30 | 9.033  | 3.614 | 13.068 | 12 | 2  | 14 | -0.273 | -1.032 |
|                             | Post-test | 30 | 13.766 | 3.125 | 9.771  | 11 | 9  | 20 | 0.297  | -0.596 |

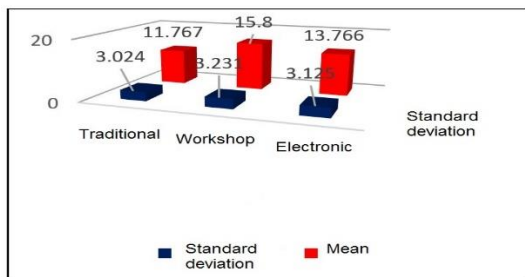
The values that are obtained in the columns of Skewness and kurtosis indicate the normality of data distribution.

Figure 1: Comparison of pre-test scores of the three traditional, workshops and e-learning training methods



Traditional: 9.5, Workshop: 9.333, Electronic: 9.033

Figure 2: Comparison of post-test scores of the three traditional, workshops and e-learning training methods



Traditional: 3.024/ 11.767, Workshop: 3.231/ 15.8, Electronic: 3.125/ 13.766

The achieved significance level from Kolmogorov-Smirnov test in the pre-test of workshop group and the control group has been obtained 0.054 that is greater than 0.05 so the data distribution is normal. Therefore, in the data analysis the parametric test has been used. Due to the significance level of Levine test (0.195) which is greater than 0.05, the data that have been obtained from sampling have the homogeneity of variances. Also, the regression slop with the 0.165 significance level which is greater than 0.05 indicates that the regression slop has been observed.

Covariance analysis results (Table 2) have shown that after removing the effect of pre-test, there has been a significant difference between the mean scores of the two groups in the math post-test; because the significant level has been obtained 0.016 which is lower than 0.05. Therefore, the two workshop training and e-learning methods are significantly different from each other.

Table 2: covariance analysis

| Source                            | sum of squares | Degree of freedom | Mean Square | Fisher  | Sig.         | ETA   |
|-----------------------------------|----------------|-------------------|-------------|---------|--------------|-------|
| Revised model                     | 119.104        | 2                 | 59.582      | 6.420   | 0.003        | 0.184 |
| Cutting                           | 1466.209       | 1                 | 1466.209    | 157.979 | 0.000        | 0.735 |
| Pre-test (control variable)       | 57.147         | 1                 | 57.147      | 6.157   | 0.016        | 0.097 |
| The independent variable (Groups) | 57.493         | 1                 | 57.493      | 6.195   | <u>0.016</u> | 0.098 |
| Error                             | 529.019        | 57                | 15.239      |         |              |       |
| Total                             | 13761.000      | 60                |             |         |              |       |
| Modification of total             | 648.183        | 59                |             |         |              |       |

According to the results of one-way ANOVA (Table 3), the mean difference between the two workshop and electronic groups has been obtained 2.03333 which indicates that the mean score of workshop group is greater than the mean score of electronic group.

Table 3: one-way ANOVA analysis

| Group 1     | Group 2     | The mean difference between groups 1 and 2 | standard error | Significance level | 95% confidence |               |
|-------------|-------------|--|----------------|--------------------|----------------|---------------|
|             |             |  |                |                    | Lower bound    | upper bound   |
| electronic  | workshop    | -2.03333                                   | 0.80778        | 0.036              | -3.9595        | -0.1072       |
|             | Traditional | 2.00000                                    | 0.80778        | 0.040              | 0.0739         | 3.9261        |
| Workshop    | electronic  | <u>2.03333</u>                             | 0.80778        | 0.036              | 0.1072         | <b>3/9595</b> |
|             | Traditional | 4.03333                                    | 0.80778        | 0.000              | 2.1072         | 5.9595        |
| Traditional | electronic  | -2.00000                                   | 0.80778        | 0.040              | -3.9261        | -0.0739       |
|             | Workshop    | -4.03333                                   | 0.80778        | 0.000              | -5.9595        | -2.1072       |

## Discussion and conclusion

According to the obtained significance level, after removing the effect of pre-test, there has been a significant difference between the mean scores of the two groups in the math post-test. Therefore, workshop training method enhances math learning more than e-learning method. Also, it can be seen that, there is a significant difference between pre-test and post-test of both e-learning and workshop training groups. Given the mean difference of each group, we can conclude that workshop training has the greatest mean difference in the pre-test and post-test scores of the students. A few researches have compared the two electronic and workshop methods. The results of this study are consistent with the research of Babaie (2013) on the evaluation of software and workshop training methods on learning and retention of math lesson in the third grade middle school; he has concluded that workshop training was more effective on learning math lesson in the third grade middle school than e-learning. But this study is not consistent with the results of the study of Hadidi et al, (2015) that has been conducted on the effect of e-learning and workshop training on the enhancement of the knowledge of taking care of pregnant women in Kerman city; because in this study, both of the methods have increased this knowledge equally. The study population, the object of study and the number of samples can be the reasons for the inconsistency between the results. The ideal aim of this study was to compare the effect of using the two workshop training and electronic content training methods on learning mathematics among high school students. In comparison between the two workshop training and electronic content training methods, it has been concluded that there is a significant difference between these two methods in terms of students learning; therefore, we should deeply think about choosing the modern teaching methods. According to the conducted ranking on the differences of learning among students, and according to the fact that workshop training is more effective on learning; it is recommended to use this method as an accurate method in schools to let the students have a better understanding of mathematics. This study was conducted on the context of the math books, so be careful in generalizing the results to other lessons. It is recommended to the schools to hold workshops for all of the lessons. And also, workshop training and electronic content training methods should be taught to the teachers. With the help of consultation and cooperation with educational technologists, specialists in electronic content production and the experts of

math lesson planning in the country should produce strong electronic contents and give them to the specialist teachers. The researchers should study the effect of training by using electronic content and workshop training methods on the level of learning in other subjects.

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