Examining Creativity of Students through Smart Board in Learning Mathematics

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Abstract

In present era, students and teachers need possibilities that ease teaching and learning process. Electronic instruments such as computer, software, and smart instruments will increase abilities for students. The purpose of this study is to examine the creativity level of high school students in the learning environment using smart board and compare it to traditional environment. Participants of this study were consisted of girl students at second grade. One girly high school is selected by semi-cluster sampling method. Research method is implemented via quasi-experimental method using pretest and posttest for control and experiment groups which are same at scientific level. Based on the result of this research via Leven and T-tests, it is indicated that there is significant difference between creativity level of the students who learn mathematics using smart board and the students who learn mathematics via traditional method. Therefore it seems that using smart board will ease mathematical learning process.

Keywords: Mathematics, smart board, creativity, education, learning.

1 Introduction

Entering information era and increasing the use of IT (Information Technology), entails a modern education method that doesn't conform to prevalent traditional education in Iran. On the other hands, electronic schools are established all over the world. The first pattern of these schools emerged in England (1996) and Malaysia is recognized as one of the pioneers of this kind of education [6]. Attaran and Van Lar (2001) believed that using these technologies make to create individual learning opportunities for students such as;

1. using computer supplies basic educational requirements to students. As the researches shown when students use computer, they learn efficiently, and;
2. computers create dynamic corporative learning environments. The prevalent education in the schools of the Iran is traditional method that is via auditory training only [3]. NCTM (National Council of

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Mathematics Teachers), (2000) emphasizes on using technology in mathematic classes highly. This council states that there are different technologies for teaching mathematics at schools. In fact these tools provide dynamic environment for the development of mathematical thoughts of students at schools. Using new IT creates potential ability in the technology oriented training which is influential in process of teaching-learning. These technologies make to increase life time and deep learning [7]. Technology-based knowledge is available at many developed countries today. Smart schools are great step for virtual learning and online learning and similar methods are modern forms of learning methods in present century [6]. Ferguson (2001) believes IT expands the ability of the students in problem solving process, the students who face to complex problems in the real world, learn educational materials easily [7]. Technology-based knowledge is available at many developed countries today. Smart schools are great step for virtual learning and online learning and similar methods are modern forms of learning methods in present century [3, 9]. Smart boards are a part of the latest technology world. They are white boards based on windows applications and help a great deal in presentations and other activities. These boards work like touch screens or interactive whiteboards which work with digital pens instead of the traditional whiteboard markers. Smart Boards are easy to use, as they operate just like normal computers. Teachers utilize the smart board to provide multi-faceted lessons for their students by allowing the students to interact with the board in a variety of ways. Through the tools on the smart board and software features, students become engaged in the lesson and may collaborate with each other by working on the same lesson simultaneously [9]. IT helps student till have better creativity in mathematics and enhance the curiosity level. The purpose of this study is to show creativity levels of students via smart board.

2 Literature Review

Reports are published by organizations such as UNESCO (Organization Cultural and Scientific, Educational Nations United), indicated that IT imposed fundamental changes in learning process. Regard to the variety of communities, human, interest and creativities, there is to need for variant learning method and this entails a modern form of flexible educational system (Hadad and Jurich, 2000) [8]. Azizi (2003) in a research entitled "study motivation of progress, mathematical anxiety and performance among students of first grade of high school studies" examined the relation between motivations of progress and mathematical anxiety and also determined the relation of these two variables to mathematical performance. The results showed that there is negative relation between motivation of progress and mathematical anxiety and mathematical performance [5]. Atkhison (2004) compared learning in traditional environment and computer aided learning and studied them to cognitive methods. His reports showed that people with verbal cognitive style has more positive attitudes toward computer aided learning and show better performance in this learning environment rather people with analytical cognitive style that show lower performance in all learning level [2]. Akhavan (2008) has done a study on "status of ICT (Information and Communications Technology), in the field of education and electronic publication at high schools of Tehran" to examine the status of ICT at electronic schools and publications of educational books. It is founded that use of ICT for leaning increases educational progress of students and regard to perspective of students it enhances their learning and skills to use ICT and decreases the role of teacher [1]. Karimi et al; (2012) in a research entitled "examining performance of students in learning mathematics using smart board" examined the performance of high school students in the learning environment using smart board and to compare it to traditional environment. The results indicated that there is significant difference between the performance of the students who learn mathematics via using smart board and the students who learn mathematics via traditional method [10]. According to researches and limitation of research concerning using smart board in learning environment rather traditional learning method, it is intended to address using this educational software within educational environment and examined its role in creativity level of the students.
3 Introduction of Autograph Software and IQ Board Software

Since the educational environment is equipped with computer, electronic contents should be produced to use this tool. For this reason, Autograph Software and IQ Board Software have been used. IQ Board Software is a powerful yet easy-to-use tool that brings your lesson and conference to life especially designed for interactive teaching and presenting. Using this software is used for smart boards. Some features of this software are following as:
1. Easy to use and concepts,
2. Graphical and attractive environment,
3. Required numerous tools for any field,
4. Contented to the ability to add content to the library,
5. Working to other tools in the environment,
6. Video recording option automatically without the need for low-volume transfer and dissemination on the Internet,
7. Drawing two dimensional and three dimensional geometric shapes, and
8. Drawing trigonometric functions, formulation, graphs [8].

Autograph is software that is developed in the England (1990) by efforts of several teachers. It is dynamic software designed for mathematical classes of high and universities in two standard and advanced level and covers two-dimensional and three-dimensional geometry, statistics and probabilities. It allows users to imagine the topic on the page. Standard level is designed for high school students who have not enough self-esteem mathematics and enable them to understand taught subjects and solve its problems without need to calculation. Advanced level which involves calculation options and includes the probability of distribution and three-dimensional equations and it is used to university mathematics. Some features are as follows:
1. A portable software,
2. Drawing different kinds of functions and curves using standard function along ability to set the speed of drawing,
3. Increasing speed and accuracy of drawing different graphs at the same time and allow to compare them to each other stage by stage (Fig.1),
4. Calculation of different statistical distributions based on received data,
5. Capability to draw two-dimensional and three-dimensional graphs,
6. Displaying geometric transformations on the objects and the shapes,
7. Capability to draw different graphs in polar coordinates, and
8. Capability to draw different statistical graphs [7].

Figure 1: Snapshots of Trigonometric Functions and drawing graphs at the same time
4 Hypothesis

There is significant difference between creativity of students in learning mathematics through smart board rather traditional learning.

5 Methodology

Regard to this research that examines the influence of using smart board in teaching mathematics than traditional teaching among the students of second grade of high school, quasi-experiment method is used for the implementation of this research and pretest and posttest on both control and experiment group are taken. At first step, pretests were taken for both groups to determine scientific level of students. Then one group was chosen to be taught by smart board randomly. Math textbook of second grade of high school is considered to teach through smart board. After instruction via smart board, posttests were taken for both groups to compare them to each other. The conditions of research were completely under control environmentally and behaviorally so the experiment method couldn't be used.

6 Research Instrumentations

Smart board and Abedi's creativity test are the instrumentations of this research.
1. Smart board is an interactive, electronic whiteboard that brings technology to classrooms. It can be connected to a computer and computer screen can be demonstrated on it. These smart boards along with video projectors provide the possibility of multimedia teaching in classrooms. Smart board works in two modes; writing and mouse. In state of writing, any writing or drawing in windows or other software environment can be made and saved into computer. When using mouse, all activities that a user can do on the computer by mouse can be done on touch screen board. This tool has emphasized under teachers of mathematics, and;
2. Abedi creativity test. Creative Abedi test has been developed base on Torrance Test. Abedi (1986) has tried to provide the scale for measuring creativity level. In addition to having an acceptable level of reliability and validity, performed in relatively short time period also. He provided the creativity test that was consisted of 75 questions (multiple-choice) based on the concept and definition of the Torrance test. This test has validity that equals 0.78, [11].

7 Participants

Statistical population of this study was consisted of all girl students at second grade of high school in Robat Karim city. There are five state girly high schools in Robat Karim city. One girly high school is selected thereby simple cluster sampling method randomly. Since the selected high school has two second grades, one classroom is randomly selected as control group and the other as experiment group. There are 30 and 32 girl students for control and experiment groups respectively. In general sample of the study was consisted of 62 girl students.

8 Collecting Data Method

For collecting data, two groups of second grade at high school are selected randomly. One group is selected randomly as control group and subjects of "Functions" is taught traditionally within three months. The other group is selected as experiment group and subjects of "Functions" is taught traditionally and subjects of "Absolute Value" and "Trigonometric" are taught through using smart board and educational software. After teaching was finished, pretests were taken. Exams show the same educational status of both groups. After implementation of plan, posttests were taken. The results of posttests are considered as
criteria for determining influence of teaching via smart board rather traditional teaching to demonstrate mathematical performance of student for both teaching methods.

9 Data Analysis Method

Statistical methods have been used to data analysis for this research. At Descriptive statistics, indexes such as mean and standard deviation are indicated and in inferential statistics, Kolmogorov–Smirnov test is used to the study of normality of means and comparison for both groups. For determining the differences between variances and means, leven and independent samples T–tests at $\alpha=0.05$ are used.

10 Findings

In this section, it describes the features of variables. The data are given in Table 1, As it is shown, mean of experiment group is more than control group. Value of standard deviation of pretest for experiment group is the highest value which shows more distribution.

![Table 1: Descriptive statistics of control and experiment groups](image)

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>$N$</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group pretest</td>
<td>32</td>
<td>96.3</td>
<td>2.2</td>
</tr>
<tr>
<td>Control group posttest</td>
<td>32</td>
<td>96.4</td>
<td>2.3</td>
</tr>
<tr>
<td>Experiment group pretest</td>
<td>30</td>
<td>97.11</td>
<td>2.3</td>
</tr>
<tr>
<td>Experiment group posttest</td>
<td>30</td>
<td>103.7</td>
<td>2.3</td>
</tr>
</tbody>
</table>

To study of the normality and selection of proper hypothesis test, Kolmogorov–Smirnov test is used. Regard to Table 2, since P- values (0.72, 0.77, 0.93, and 0.84) are more than 0.05 so the data are normal and parametric tests can be used.

![Table 2: The result of Kolmogorov–Smirnov test](image)

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>$N$</th>
<th>$Z$</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group pretest</td>
<td>32</td>
<td>0.69</td>
<td>0.72</td>
</tr>
<tr>
<td>Control group posttest</td>
<td>32</td>
<td>0.66</td>
<td>0.77</td>
</tr>
<tr>
<td>Experiment group pretest</td>
<td>30</td>
<td>0.53</td>
<td>0.93</td>
</tr>
<tr>
<td>Experiment group posttest</td>
<td>30</td>
<td>0.61</td>
<td>0.84</td>
</tr>
</tbody>
</table>

According to Table 1 and Fig. 2; mean of creativity level is nearly same for both groups for pretests. As it is shown, mean of creativity level is the highest value than control group.

![Figure 2: Diagram of creativity level of students in control and experiment groups](image)
Before testing hypothesis, it is studied the difference between level for both groups in pretests. In Table 3, according to equality of variances based on leven's test (0.05<0.95), it clears that variances of both groups are equal. Also, the results of T-test indicated that there is not significant differences between two groups in pretest (0.05<0.81). Therefore, knowledge and creativity level of both groups are same.

<table>
<thead>
<tr>
<th>Pretests</th>
<th>Leven's Test For Equality Of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>p-value</td>
<td>t</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>0.03</td>
<td>0.95</td>
<td>0.23</td>
</tr>
<tr>
<td>Equal variance Not assumed</td>
<td>0.23</td>
<td>59</td>
<td>0.81</td>
</tr>
</tbody>
</table>

As it is indicated in Table 4 it obvious that variances of both groups are equal (0.05<0.97) for posttests. In addition, the results of T-test shown that there is significant differences between two groups in posttests (0.05>0.02). Therefore there is significant difference between performance of students in learning mathematics through smart board rather traditional learning.

<table>
<thead>
<tr>
<th>Posttests</th>
<th>Leven's Test For Equality Of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>p-value</td>
<td>t</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>0.01</td>
<td>0.97</td>
<td>2.2</td>
</tr>
<tr>
<td>Equal variance Not assumed</td>
<td>2.2</td>
<td>59</td>
<td>0.02</td>
</tr>
</tbody>
</table>

11 Conclusion

Interactive smart boards incorporate to teach so that every student will have an opportunity to grasp the essential information for his education. It encourages students to embrace technology in their learning. This not only benefits the student in the short term providing access to a wider base of knowledge, but it also helps them to stay on the cutting edge of technology as the years progress so they may learn the essential skills to take a viable role in the future workplace. Using electronic educational environment and smart board, teacher could use multimedia educational materials such as film, picture, slide and educational software in planning lessons; teaching-learning process and evaluation to enhance quality and durability of education while in traditional learning environment lesson plans include instructions, curriculum and class tests and confine to teacher. The result of this research shows that a dynamic learning environment is essential for flourishing individual talents and creativity of students and improvement of student's performance. Some suggestion has been made as follows to further studies: 1) some research must
conduct on the kind of attitude and motivation of students concerning using smart board and generally equipping schools via electronic devices, 2) research with same topic on large number of girl and boy students must conduct and their performances have to compare, and 3) this research must do on several mathematical subjects of math textbooks. There are limitations in this research such as; this research is limited for mathematics textbook and it is implemented to girl students of high school.

References