EFFECTS OF MULTIMEDIA INSTRUCTIONAL STRATEGY FOR ENHANCING STUDENTS' LEARNING AND RETENTION IN MATHEMATICS

By

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ABSTRACT

Information and Communication Technology (ICT) has infused in every walk of life effecting the technology fields, such as launching satellites, managing businesses across the globe, and also enabling social networking. The technological tools provide students in discovering, classifying, and enhancing the knowledge towards mathematical concepts and relationships. The purpose of this study is to enhance students' learning in mathematics through teaching multimedia instructional strategy. The study was performed over the 60 IX standard students selected randomly. 30 students constituted the experiment group and 30 students constituted the control group. Multimedia instructional strategy were applied to experiment group and traditional method of instruction were implemented on the control group. Before the treatment both group were diagnosed and pretested and taught through multimedia for experimental group and traditional method for control group. After the intervention both groups were assessed by post-test. After 20 days both groups were tested by retention and then analysed by t-test. The results show that, experimental group students have more retention in learning mathematics. So this is an evidence that technological devices must enhance the students learning mathematics.

Keywords: Effect, Multimedia, Teaching, Learning, Mathematics, Retention.

INTRODUCTION

We are living in a time when technology is changing almost faster than we can adapt it. The National Curriculum Framework 2005 (NCF, 2005) have opined the importance of ICT in school education. With this contextual, major paradigm shift is commanding in education characterised by imparting instructions, collaborative learning, and multi-disciplinary problem solving and promoting critical thinking skills. Government of India has announced 2020 as the decade of innovation. Information and Communication Technology (ICT) has infused in every walk of life effecting the technology fields, such as launching satellites, managing businesses across the globe, and also enabling social networking. The conjunction of computer, communication and content technologies, known as ICT have attracted attention of academia, business, government, and communities to use it for innovative profitable propositions. Day to day it is flattering simpler to use devices, such as desktop, palm top, iPod, etc. 21st century is characterized with the emergence of knowledge based society wherein ICT plays a pivotal role. Reasoning and critical thinking skills are necessary for innovation. Substance of these skills is placed at school level. It is needed that reasonable ICT tools and techniques should be integrated into classroom instructions right form primary stage so as to permit students develop their requisite skills. Most of the tools, techniques, and classes are available in open domain and accessible on web.

Activities learning engage the students in connecting multiple representations for example graphical, numerical, algebraic, and verbal and those that invite

students to analyze or create images, visualizations, and simulations provide wide-ranging opportunities for mathematical investigation and sense making. Teaching that takes full advantage of what technology has to proposal can encourage, foster, and support students' construction of mathematical knowledge in a variety of ways. Technology can also advance in mathematical communication, facilitate more efficient use of mathematical resources, and raise the quality of mathematical products and presentations.

In mathematics education specific technologies, include computer algebra systems; dynamic geometry environments; interactive applets; handheld computation, data collection, and analysis devices and computer based applications. These technologies provide students in discovering and classifying mathematical concepts and relationships. Technologies include communication and collaboration instruments and web-based digital media, and these instruments increase students' access to information, ideas, and interactions that can support and enhance sense making, which is essential to the process of captivating rights of knowledge. From a number of studies the technological tools can support both the learning of mathematical procedures and skills as well as the development of advanced mathematical skills. (Gadanidis and Geiger, 2010; Kastberg and Leatham, 2005; Nelson, Christopher, and Mims, 2009; Pierce and Stacey, 2010; Roschelle et al., 2009, 2010; Suh and Moyer, 2007; NCTM, 2015).

1. Literature Review

Shah and Khan (2015) proved students' achievement in mathematics was increased due to use of multimedia teaching. Result of this study show that Multimedia Aided Teaching is more effective than traditional one. Students' attitude towards science interest increases more if MAT method is used as compared to traditional method of teaching.

Aloraini (2012) identified the impact of using multimedia on students' academic achievement in the college of education at King Saud University. The findings of this study show that there is no statistically significant in their pre-test and there is statistically significant differences between the experimental group and the control group at 0.05 level for the interest of the experimental group in their post-test.

Noroozi, Bian, and Aghabarati (2012) conducted a study on efficacy of multimedia teaching on learning and retention of arithmetic in autistic students. The result indicated that teaching via multimedia has a meaningful effect on the learning and retention of the autistic student.

Liu (2011) conducted a study on integrating multimedia in elementary mathematics to improve mathematical learning. Findings of this study found that the participating teacher and students scored very high on the teacher evaluation rubric survey and student feedback survey, respectively; the participating students scored significantly higher on the quiz at post-test and the end of the implementation that at pre-test.

Ogochukwu (2010) studied an enhancing students' interest in mathematics via multimedia presentation. The result of this indicate that students prefer multimedia presentation to the traditional classroom instructional method.

2. Statement of the Problem

With computers and the internet now widely available, the multimedia packages can provide further resource support for students involved in off-campus. People without numeracy skills suffered worse disadvantage in employment than those with poor literacy skills. Without the basic arithmetic information human beings are not able best perform in the society, so the investigator considered the problem for the present study to check the effectiveness of teaching and learning through traditional and multimedia approaches.

3. Need for the Study

A major advantage for using multimedia and other technology in the classroom is the ability to bring in images, sounds, and videos without leaving the classroom. Computer programs and internet sites can also give students experiences that might ordinarily be unsafe, such as views from climbing mountains in a geography lesson or a dissection of a rare animal. Usage

of individual computers give students the opportunity to view information or materials up close. Students who learned from materials containing both text and graphics produced 55 percent to 121 percent more accurate solutions to problems, according to David Taylor at the University of Maryland. The use of images, with words, diminishes the overwhelming nature of text and helps the student to manage the cognitive load, which increases retention. Specifically, graphics are found to support retention because, important elements are focused on via placement, layout, and colour. Beginning of prior knowledge is engaged quickly with visual analogy, and mental models are created easily as diagrams can enhance understanding of how a concept works. Additionally, learning is made easier because simulations allow students to visualize real-life situations, and motivation is increased as students are able to see the relevance of skills (Seattlepi.com, n.d.).

4. Objectives of the Problem

- To prepare the Multimedia Instructional Package for learning mathematics for the high school students.
- To find out the effectiveness of learning mathematics through Multimedia Instructional Strategy over existing method.
- To compare the performance of learning mathematics through MIS of the experimental group and the control group before the treatment.
- To compare the performance of learning mathematics through MIS of the experimental group and the control group after the treatment.
- To find out the significant difference of the gain score of experimental and control group.
- To find out the retention of learning mathematics through MIS in experimental group.

5. Hypothesis of the Problem

- There is no significant difference in the performance of learning mathematics through MIS of experimental group and the control group before treatment.
- There is no significant difference in the performance of learning mathematics through MIS of experimental group and the control group after treatment.
- There is no significant difference of gain score of experimental and control group in learning mathematics through MIS.
- There is significant difference of post-test and retention test of learning mathematics through MIS in experimental group and control group.

6. Research Design

6.1 Method

The study was aimed to enhance students learning in mathematics through teaching multimedia instructional strategy in learning mathematics, it was necessary to compare the outcome of the study of experimental and control group. So that the researcher had chosen quasi-experimental method for the present study.

6.2 Sample

The study was carried out on a sample of 60 high school students of Salem district. The randomly selected sample is divided into two groups, namely experimental group and the control group. Each group consists 30 students.

6.3 Tool

In this study, the researcher used questionnaire (MCQA) for diagnosis test, pre test, post test, and retention test.

Multimedia Instructional Package was prepared by the researcher. It consist the content of number system in IX standard Tamilnadu book. It has Audio, Audio and Video, and Image.

6.4 Data Collection Procedure

Both groups are tested before treatment through MCQA. Multimedia Instructional Strategy is taught to the experimental group, whereas the traditional method of teaching to the control group. After treatment, both groups are post-tested through MCQA. From the post-test results of both groups, the effectiveness of the new treatment is determined.

6.5 Statistical Techniques

This study finds out the effectiveness of Multimedia Instructional Strategy in learning mathematics. It is important to find out whether there was any significant difference between the two groups. Test of significance of

difference between means and t-test were calculated for statistical analysis.

Gain score is calculated by below formula,

Gain Score = Post test - Pre test

7. Result and Findings

7.1 Before Treatment

Table 1 shows the mean scores of pre-test in experimental group and control group. The calculated t-value 0.07 is less than the table value 2.00. It is not significant at 0.05 level. Therefore experimental and control groups do not differ in their initial performance. Therefore the hypothesis is accepted. It means that the two groups were more or less of the same ability of learning mathematics through MIS before treatment.

7.2 After Treatment

From Table 2, it is clear that the calculated t-value 2.23 is greater than the table value 2.00. It is significant at 0.05 level. This shows that there is a significant difference between the means of the post-test score of learning mathematics through MIS in the experimental and control groups. Therefore the two groups differ in their performance. The mean score shows that experimental group is greater than control group, i.e. 22.87>19.57. So it can be concluded that the multimedia instructional strategy has more effectiveness than the present method.

Earlier to the present study, many researchers like (Ghodke, 2013; Liu, 2013, Malik, 2011; Milovanović, Takaĉi, Milajić, 2011) had conducted studies and proved that the performance of the students was improved through multimedia teaching techniques. The present study also supported the findings of earlier studies, i.e. the result obtained for achievement measures indicated that multimedia teaching had significantly promoted reaching in mathematics.

Pre-Test	No. of Samples	Mean	Standard Deviation	t-test
Experimental	30	19.5	0.81	0.07
Control	30	19.6	0.97	

Table 1. Compare the Performance of Learning Mathematics through MIS of the Experimental Group and Control Group Before Treatment

Post Test	No. of Samples	Mean	Standard Deviation	t-test
Experimental	30	22.87	6.42	2.23
Control	30	19.57	4.91	

Table 2. Compare the Performance of Learning Mathematics through MIS of the Experimental Group and Control Group After Treatment

7.3 Comparison of Gain Score in the Experimental and Control Groups

Gain scores were obtained by calculating difference in the post test and pre-test scores of each student in the two groups. The gain scores were tabulated and then the mean and standard deviation were calculated. The difference between two mean scores was found out and tested for significance. The result obtained is given in Table 3.

The calculated t-value is 3.10 which are greater than the table value 2.00. So, it is significant at 0.05 levels. This shows that there is a significant difference between the mean gain score of the two groups. Since the mean gain scores are higher for the experimental groups, it can be concluded that multimedia instructional strategy is more effective in teaching mathematics.

7.4 Comparison of Post Test and Retention Test Scores in Experimental Group

From Table 4, the calculated t-value 0.12 is less than the table value 2.00. It is not significant at 0.05 level. This shows that there is no significant difference between the means score of the post-test and retention test of learning mathematics through multimedia in the experimental group.

8. Summary

Past few years, multimedia learning has become very

Gain Score	No. of Samples	Mean	Standard Deviation	t-test
Experimental	30	0.1162	11.627	3.10
Control	30	0.0317	0.0189	

Table 3. Test of Significance of the Gain Scores in the Experimental and Control Groups

Experimental Group	No. of Samples	Mean	Standard Deviation	t-test
Post Test	30	22.87	6.42	0.12
Retention	30	23.23	6.51	

Table 4. Significant difference of Post-test and Retention Test in learning mathematics through MIS in Experimental Group

important and interesting topic in the field of teaching methodology. Researchers conducted by Mayer (Mayer, 2001, 2005) and Atkinson (Atkinson, Mayer, and Merrill, 2005) resulted in establishing the basic principles of multimedia learning and design, which were confirmed in this research, too. Students' responses, highly comprehensible animations from multimedia lessons are the best evidence that a picture is worth a thousand words. Many research works in different scientific fields, including mathematics, have proven that multimedia makes learning process much easier.

When taught mathematics to the IX students through either traditional and interactive multimedia, in both the cases remarkable differences were found between their pre-test and post-test scores. Overall, if the authors compare both the methods with respect to the marks achieved by them through post-test, it was evident that students performed better on post-test in comparison to their pre-test marks when they were taught through multimedia method. Also, more consistency was found between the significant difference of pre-test and post-test marks in case of multimedia method (Sharma, 2015).

As retention (Table 4) is concerned multimedia strategy of teaching is far better than conventional method of teaching strategy. This is probably due to the fact that teaching through multimedia is individualised and an activity based learning. Moreover, in this method the students are able to get instant feedback. In this method, students psychologically get reinforcement at every right step which is not possible in conventional method. Multimedia instructional method of teaching has the extra benefit for the help of students in the form of animation, graphics, pictures, sound, charts, tallies etc., which is not there in conventional method (Sharma, 2015). When students were taught through both strategies, it was found that the acquired retention was better in case of multimedia strategy.

Conclusion

Hence, it is concluded that both the method taken under this study are quite effective for teaching mathematics. Out of these two methods, multimedia instructional strategy was found to be more suitable with respect to the marks achieved by them. When achievement of students was compared on post-test taught through conventional method of teaching and multimedia strategy, then there is a significant difference found in scores of the above two groups. Experimental group students performed better than traditional direct method groups students on post-test. Thus multimedia strategy of teaching mathematics proved to be better than conventional method of teaching.

The present study is focused on effectiveness of multimedia to enhance learning and retention on the high school students. The outcome of this study is that teaching through multimedia instructional package is more effective than traditional method of teaching. This method increases the interest of students to learn and multimedia method of teaching can be used effectively in improving the academic achievement of students in mathematics. This the authors can predict by the analysis of this study. In synchronization with several similar studies, results showed that this method can be effective, especially for school students where they can be motivated by graphics and animation.

However, this is not a proposal for replacement of traditional education. Rather, teaching through multimedia can provide a very useful alternative for traditional method. It also helps to reduce possible bias in the results, groups of both students will be selected randomly. Future studies should also include studying some other factors, particularly possible drawbacks, of using those educational package on students. Hence measures have to be taken by educationalist, administrators to adopt this method, i.e. multimedia method of teaching to all level of schools.

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