MULTIMEDIA APPROACH AND ITS EFFECT IN TEACHING MATHEMATICS FOR THE PROSPECTIVE TEACHERS

By

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ABSTRACT

Multimedia improves the effectiveness of teaching learning process of multimedia in formal or informal setting and utilizing scientific principle. It allows us to sort out the information to analyse and make meaning for conceptualization and applications which is suitable for individual learners. The objectives of the study was to measure the effectiveness of the multimedia approach in teaching Mathematics for prospective teachers and the experimental research is essential for finding out into effective from the population of prospective teachers, the investigator selected 30 students from a college of education in Tamil Nadu. Tools used were Multimedia package for Mathematics prospective teachers developed by D.R. Robert Joan and S.P. Denisia, 2012 and Achievement test in Mathematics developed by D.R. Robert Joan and S.P. Denisia, 2012. In the experimental group, student teachers were taught the subject Mathematics by using this Multimedia package for Mathematics. The control group student teachers were taught using Active learning methodology. Findings of the study showed that there was significant difference between pre-test and post-test scores for the experimental group in learning Mathematics.

Keywords: Multimedia, Active Living Methodology, Active Learning Methodology, Per-Test Scores, Post-Test Scores.

INTRODUCTION

Multimedia integrates video, animation, audio, graphics, and test resources to develop effective presentations. It allows sort out the information, analyse and make meaning for conceptualization and applications which is suitable for individual learners. Only limited studies have been undertaken on multimedia approach particularly for Mathematics.

Multimedia is characterized by the presence of text, pictures, graphics, sound, animation and video; some or all of which are organized into some coherent program. A primary application of the interactive multimedia for instruction is in an instructional situation where the learners is given control so that he/she may review the material at his or her own pace and in keeping with his/her own individual interests, needs, and cognitive processes.

Multimedia approach uses a number of media, devices, and techniques in the teaching learning process. It can convey vast information and provide many sources from which student can access the information which improves teaching learning process. This method provides wide range of activities which gives meaningful learning experience in order to achieve predetermined objectives. Multimedia approach provides the opportunity to gain mastery of competencies and skills. The choice of the media has to be done carefully so that one does not hamper or reduce the effect of the other. That is each, media must complement the other. Multimedia approach will enable the learner to get access to information in dynamic environment.

"Mathematics is an expression of the human mind reflects that active will, the contemplative reason, and the desire of aesthetic perfection is its basic elements are logic intuitions analysis and construction generally and individually"

-Robbins (1961)

Objectives

- To find out the difference between the control group and the experimental group in their pre-test scores in learning Mathematics.
- To find out the difference between the control group

and the experimental group in their post-test scores in learning Mathematics.

- To find out the difference between pre-test and post-test scores for the control group in learning Mathematics.
- To find out the difference between pre-test and post-test scores for the experimental group in learning Mathematics.

Hypothesis

- There exist no significant difference between the pre-test scores of the control group and experimental group.
- There exist no significant difference between the post-test scores of the control group and experimental group in learning Mathematics.
- There exist no significant differences between the pretest and post-test scores of the control group in learning Mathematics.
- There exist no significant differences between the pre-test and post-test scores of the experimental group in learning Mathematics.

Plan and Procedure

The aim of the study is to measure the effectiveness of the multimedia approach in teaching Mathematics for Prospective Teachers, the experimental research is essential for analysing the facts or information. From the population of prospective teachers, the investigator selected 30 students. For this research, the investigator prepared slides in the form of a package viz., Mathematics Learning Package for the instructional purpose. In the experimental group, prospective teachers were taught the subject Mathematics by using this package. In the control group, prospective teachers were taught using Active learning methodology which is the present method of teaching. Before and after this treatment, pre-tests and post-tests were conducted for both the groups and marks were scored and tabulated. Using 't' test the investigator find out the mean score differences separately for the control and experimental group.

Review of Related Study

Al-Abbasi, Daniah (2012) conduct a study "The Effects of Modality and Multimedia Comprehension on the Performance of Students with Varied Multimedia Comprehension Abilities when Exposed to High Complexity, Self-Paced Multimedia Instructional Materials".

Poor multimedia comprehenders suffer from a decreased ability in comprehending complex textual and pictorial materials (Maki & Maki, 2002). This deficit will lead to an overloaded working memory and consequently decreased performance (Carretti, Borella, Cornoldi, & De Beni, 2009). The purpose of this research study was to examine the effects of modality and multimedia comprehension on the performance of students with varied multimedia comprehension abilities when exposed to high complexity, self-paced multimedia instructional materials. A 2 x 2 generalized randomized block design with two levels of multimedia comprehension and two levels of modality was employed. The dependent variables were retention and transfer. A sample of 115 students participated in the study. The ANOVA results for the modality factor showed that modality had little or no effect on students' performance in the retention test. However, it had some effect on students' performance in the transfer test. The ANOVA for multimedia comprehension showed that multimedia comprehension significantly affected students' retention and transfer performance; average and above student significantly outperformed below average student. Finally, the ANOVA for the interaction effect demonstrated a significant interaction effect in the transfer measure and not the retention measure. A reverse modality effect was found in the average and above groups. The transfer performance of the average and above group in the unimodal condition was higher than the transfer performance of the average and above group in the bimodal condition.

Iserbyt, Peter; Mols, Liesbet; Elen, Jan; Behets, Daniel (2012) conduct a study "Multimedia Design Principles in the Psychomotor Domain: The Effect of Multimedia and Spatial Contiguity on Students' Learning of Basic Life Support with Task Cards".

This study adds to the literature by introducing multimedia research in the psychomotor area. In this study, 87 freshman students in pedagogy used task cards to learn Basic Life Support (BLS), a psychomotor skill consisting of nine lifesaving actions to be performed in a specific order.

Task cards are printed materials and are often implemented during student-centred learning settings. Based on the cognitive theory of multimedia learning, it was investigated whether the implementation of the principles of multimedia and spatial contiguity on task cards would enhance students' learning of BLS. The multimedia principle states that people learn more deeply from words and images together rather than from words alone. The spatial contiguity principle assumes that learners learn better when words and corresponding images are presented close rather than far from each other on a page. Results in this study show that neither multimedia nor spatial contiguity generated higher learning gains. It was assumed that the low cognitive load of the learning task and the self-paced learning intervention are responsible for this result. For one transfer test, a higher test result was found when the principle of spatial contiguity was applied.

Marina and Aleksandar (2011) studied on "Multimedia approach in teaching mathematics – example of lesson about the definite integral application for determining an area".

This article presents the importance of using multimedia in the mathematic classes by an example of multimedia lesson about definite integral and the results of the research carried out among the students of the first years of faculty, divided into two groups of 25. One group had the traditional lecture about the definite integral, while the other one had the multimedia method. The main information source in multimedia lectures was the software created in Macromedia Flash, with definitions, theorems, examples, tasks as well as in traditional lectures but with emphasized visualization possibilities, animations, illustrations, etc. Both groups were tested after the lectures. Students from the multimedia group showed better theoretical, practical and visual knowledge. Besides that, survey carried out at the end of this research clearly showed that students from multimedia group were highly interested in this way of learning.

Croy (2002) conducted a study on "Students produce with power point using multimedia in high school geometry".

This research was conducted in two geometry classrooms to determine whether the use of a multimedia instructional strategy could increase learning. The multimedia group used the marker board, paper and pencil to make their presentations. Observation, a presentation rubric, and a focus group were used to collect data for this study. Results indicated that both groups of students increased geometry concept learning when they used both a visual and verbal explanation, rather than a verbal explanation alone. The multimedia group scored higher than the traditional group when they were given time to learn how to use power point.

Method Adopted in this Study

The experimental method was adopted to compare the effectiveness of Multimedia approach over the Active Learning Methodology.

Experimental Design

The experimental design employed in this study was the randomized pre-test post-test design. Teaching strategy is the independent variable which has two levels, viz., the Multimedia approach and Active Learning Methodology of teaching.

In this study the experimental group learns Mathematics using Multimedia approach and the control group learns Mathematics by Active Learning Methodology. The dependent variable is the Achievement of students in Mathematics.

Achievement Test in Mathematics

An achievement test has an inevitable part in an experimental study. The investigator conducted an achievement test for both experimental group and control group to find the effectiveness of mind map teaching.

To prepare the test, weightage Tables 1-4 were prepared on the basis of objectives, content, form of questions and difficulty level. The question paper was prepared according to the blue print.

Maximum Marks : 50

Maximum Time : 45 minutes

Design of an Achievement Test

Population

The population for the present study was all the Prospective Teachers of Kanyakumari District.

Sample Selected for the Study

Sample of the study consists of sixty (60) prospective teachers selected from a College of Education in Kanyakumari District. The group was divided into two. One is the experimental group and the other is the control group. Each group consisted of 30 students.

Tools Used

The tools used in the present study were

- Multimedia package for Mathematics Prospective Teachers, developed by D.R. Robert Joan and S.P. Denisia, 2012
- Achievement test in Mathematics, developed by D.R. Robert Joan and S.P. Denisia, 2012

Development of Multimedia Package (for Experimental Group)

The Multimedia package was prepared as 4 units. It consists of 76 slides with animations, pictures, video and audio.

Development of Lesson Plan (for Control Group)

Teachers should follow certain specific steps in writing lesson plan based on Active Learning Methodology.

Statistical Techniques Used

Suitable descriptive and inferential statistical techniques were used in the interpretation of the data such as Arithmetic Mean, Standard Deviation and 't' test.

Analysis of the Data

Hypothesis – 1

There is no significant difference in the pre-test scores of the control and experimental group.

Table 5 shows that the Mean and Standard Deviation for the control group (N= 30) is 51.33 and 18.85 respectively. The Mean and Standard Deviation for the experimental group (N=30) is 55.07 and 17.75 respectively. Here the calculated 't' value (0.79) was found to be less than the table value (1.96) at 0.05 level of significance. The 't' was not significant statistically. Therefore, the Hypothesis-1 that, "There is no significant difference in the pre-test scores of the experimental and control group" was accepted.

Hypothesis – 2

There is no significant difference in the post-test scores of the control and experimental group in learning Mathematics.

Table 6 shows that the Mean and Standard Deviation for the control group (N= 30) is 57.67 and 15.54 respectively. The Mean and Standard Deviation for the experimental group (N=30) is 76.80 and 16.25 respectively. Here the calculated 't' value (4.66) was found to be greater than the table value (1.96) at 0.05 level of significance. The 't' was significant statistically. Therefore, the Hypothesis-2 that,

Sl. No	Objectives	Marks	Percentage
1	Knowledge	14	28
2	Application	10	20
3	Understanding	16	32
4	Skill	10	20
	Total	50	100

Table 1. Weightage to Objectives

Sl. No	Form of Question	No of Items	Marks
1	Objective	20	20
2	Short answer	5	10
3	Essay	5	20
	Total	30	50

Table 2. Weightage to form of Questions

Sl. No	Difficulty Level	Marks	Percentage
1	Easy	20	40
2	Average	20	40
3	Difficult	10	20
	Total	50	100

Table 3. Weightage to Difficulty Level

Objectives	Knowledge			Understanding			Application			Skill			Total
	O	S.A	E	O	S.A	E	O	S.A	E	O	S.A	E	
Natureof Mathematics	-	-	-	-	-	-	-	-	1(4)	-	-	-	4
Methods	4(1)	1(2)	-	2(1)	1(2)	1(4)	2(1)	1(2)	1(4)	3(1)	-	-	25
Mathe-maticians	2(1)	-	-	2(1)	1(2)	1(4)	1(1)	-	-	-	-	-	11
Teaching Aids	2(1)	-	-	-	-	-	1(1)	-	-	1(1)	1(2)	1(4)	10
Total	10			16			14			10			50

Note: figure outside brackets indicate the number of questions and within brackets indicate marks. O= objective type SA= short answer type E = essay type.

Table 4. Blue print

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	Standard error of difference
Control	30	51.33	18.85	3.44	0.79	4.728
Experimental	30	55.07	17.75	3.24		

Table 5. Data and Results of t- test for the Comparison of pre-test Scores of Control and Experimental Group

"There is no significant difference in the Post-test scores of the control and experimental group in learning Mathematics" was rejected.

Hypothesis -3

There is no significant difference between the pre-test and post-test scores of the control group in learning Mathematics.

Table 7 shows that the Mean and Standard Deviation for the pre-test of control group is 51.33 and 18.85 respectively. The Mean and Standard Deviation for the Post- test of control group is 57.67 and 15.54 respectively. Here the calculated 't' value (1.42) was found to be greater than the table value (1.96) at 0.05 level of significance. The 't' was significant statistically. Therefore, the Hypothesis-3 that, "There is no significant difference between the pre-test and post-test scores of the control group in learning Mathematics" was accepted.

Hypothesis – 4

There is no significant difference between the pre-test and post-test scores of the experimental group in learning Mathematics.

Table 8 shows that the Mean and Standard Deviation for the pre-test of experimental group are 55.07 and 17.75 respectively. The Mean and Standard Deviation for the post- test of experimental group is 76.80 and 16.25 respectively. Here the calculated 't' value (4.95) was found to be greater than the table value (1.96) at 0.05 level of significance. The 't' was significant statistically. Therefore, the Hypothesis-4 that, "There is no significant difference between the pre-test and post-test scores of the experimental group in learning Mathematics" was rejected.

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	Standard error of difference
Control	30	57.67	15.54	2.84	4.66	4.104
Experimental	30	76.80	16.25	2.97		

Table 6. Data and Results of t- test for the Comparison of Post-test Scores of Control and Experimental Group

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	Standard error of difference
Pre - test	30	51.33	18.85	3.44	1.42	4.46
Post - test	30	57.67	15.54	2.84		

Table 7. Data and Results of t- test for the Comparison of Pre- Test and Post-Test Scores of the Control Group

Findings

- There was no significant difference in the Pre-test scores of the experimental and control group students.
- There was significant difference in the Post-test Scores of the experimental and control group.
- There was no significant difference between the Pre-test and post-test scores of the control group.
- There was significant difference between the Pre-test and Post-test achievement scores of the experimental group. That is experimental group Prospective Teachers have achieved high in Post- test than the Pre-test.

Educational Implications of the Study

The results of the study proved that Multimedia based modular approach is more effective than the Active learning methodology in teaching of Mathematics to the Prospective Teachers.

The present study revealed that the experimental group are better than the control group in their achievement. This may be due to the fact that multimedia package with pictures animation and explanations of the concepts in Mathematics helped the learners to understand the concepts clearly.

Conclusion

From the findings the following conclusions were arrived at Control group and experimental group do not differ significantly in their pre-test scores. Control group and experimental group students differ significantly in their post-test scores. Control groups students differ significantly in their pre-test and post-test scores. Also Experimental group students differ significantly in their pre-test and post-test scores.

Groups Compared	N	Mean	SD	SEM	Calculated 't' value	Standard error of difference
Pre - test	30	55.07	17.75	3.24	4.95	4.39
Post - test	30	76.80	16.25	2.97		

Table 8. Data and Results of t-test for the Comparison of Pre-Test and Post-Test Scores of the Experimental Group

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