

Impact of multimedia in Teaching Mathematics

Haftamu Menker GebreYohannes^{#1}, Abdul Hadi Bhatti^{*2}, Raza Hasan^{#3}

[#]Lecturers Department of Mathematics and Applied Sciences and Department of Computing, Middle East College, Knowledge Oasis Muscat Campus, Oman

Abstract: In this paper, we are going to examine issues within the new frontier of integrating technology into mathematics education. We present an approach on how to teach mathematics courses by integrating meaningful multimedia technology to foster the learning process. Specifically, this paper focuses on how the integration of multimedia based teaching approach into a Calculus and Numerical Methods module impact on student's performance and their attitudes toward educational technology. Empirical data will be collected from controlled and experimental group students enrolled into this mathematics module which include students' engagement using traditional and multimedia technology teaching and learning process.

Keywords:—Multimedia teaching approach, traditional method of teaching, Calculus and Numerical methods, and academic achievement.

I. Introduction

Research into teaching and learning with new technologies is currently a very dynamic and relevant area of educational system. Many of the traditional instructional design probably offer limited utility when we are teaching complex mathematical concepts; one major limitation of traditional teaching methods is the inability to show three dimensional (3-D) graphics. Multimedia technologies are probability one of the most exiting innovation in the information age. "The rapid growth of multimedia technologies over the last decade has brought fundamental changes to educational system (noryhayati and siew 2004)".it will create suitable learning context which enables learner to control the learning environment.

The use of multimedia in teaching and learning presents impact to institutions of higher education. Multimedia is a multi-sensory that stimulates multiple senses of audiences at a time. "Its interactive nature enables teachers to control the flow of information (Iqbal and khan, 2015)". Multimedia technology affects both aspects of

teaching and learning. It does this in three ways: in how it presents information; in how students interact both with the medium and through the medium with the teacher and other learners; and in how knowledge is structured within multimedia. In this paper we will show a comparative approach between the traditional way of teaching and multimedia based teaching approach.

Definition:

Multimedia refers to any computer-mediated software or interactive application that integrates text, colour, graphical images, animation, audio sound, and full motion video in a single application. "Multimedia learning systems consist of animation and narration, which offer a potentially venue for improving student understanding (Mayer & Moreno, 2000)."

Goals and Theoretical Background of the Module

The Module, Calculus and Numerical Methods, was a Mandatory undergraduate Module for students of Coventry University degree in Middle East College Oman. The main objectives of the Module for students are;

- Formulate a personal sense of what is calculus and what it means to Calculus and Numerical Methods.
- Become more prepared to learn the application of calculus and numerical Methods as a tool in different field of study;
- To grasp basic knowledge of limit, differentiation, integration and numerical approximation methods.
- Develop good mathematical problems solving skills.

Calculus and numerical methods is a 15 credit point module. This module is grounded in basic calculus problems and numerical approximation methods. This module is designed in such a way that it will help students understanding of the concepts of limit, differentiation and integration. Laboratory is also part of Module which is equipped with fundamental Mathematical software's such as MATLAB, MAPPLE as part of the module design.

II. OBJECTIVE OF THE PAPER

- To compare the degree of satisfaction between the control and experimental group.

- To compare if there is significance difference between the traditional teaching methodology and the multimedia based leaning approach.
- To see the advantage of multimedia based teaching approach over the traditional approach.

III. DATA

An experiment of two equivalent groups was designed one group is the experimental group which will include 25 Coventry university Module students of Middle East College (Oman) who are taking the module calculus and numerical methods and the controlled group consisting of similar 25 Coventry university module Middle East college students who are taking calculus and Numerical Methods. The lecture was given to the first group using computer based presentation while the second group using the traditional way of teaching which is the chalk and talk method(lecture method).both groups were subjected to pre& post-tests in the subject tackled by lecture. Both groups were treated for a period of 10 weeks.

IV. DATA ANALYSIS AND FINDINGS

We analysed the data collected after treatment and before treatment for both the experimental and controlled group. We use Independent sample t- test to analyse our data. The data collected was organized using a suitable statistical instrument. The performance of the experimental and the control group before treatment is as shown in the table below;

Table-I

<i>Treatment 1</i>	
N_1 : 25	
$df_1 = N - 1 = 25 - 1 = 24$	
Mean of Treatment 1 : 33.28	
SS_1 : 1497.54	
$s^2_1 = SS_1 / (N - 1) = 1497.54 / (25-1) = 62.4$	
Standard deviation 1	7.89

Table.I Shows Performance of the Experimental Group before Treatment

Table .II

<i>Treatment 2</i>	
N_2 : 25	
$df_2 = N - 1 = 25 - 1 = 24$	
Mean of Treatment 2 : 31.22	
SS_2 : 1327.04	
$s^2_2 = SS_2 / (N - 1) = 1327.04 / (25-1) = 55.29$	
Standard deviation 2	7.43

Table II. Performance of the Traditional Group before Treatment.

As you can see from table 1 and table 2 the mean score of the experimental group is 33.28 and the mean score of the controlled group is 31.22 and the standard deviation of the experimental group is 7.89 while the controlled group is 7.43.in general there is no significant difference on the performance of the experimental group and the controlled group before treatment.

And the t-value calculated is less than the table value $t=0.949 < 2.01$.and hence both groups have the same academic achievement before treatment.

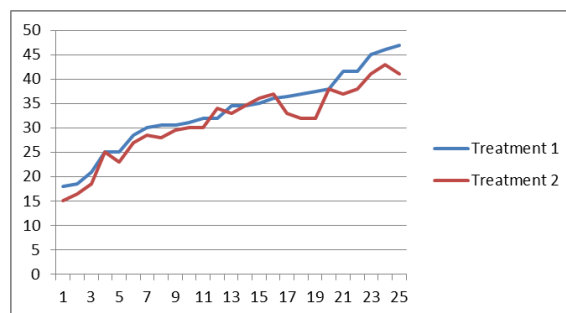


Fig.1 Academic achievement of the experimental and the controlled group before treatment.

As you can see from the graph both the experimental and the controlled group doesnot have significant difference in their performance before treatment.

In order to evaluate the direct impact of multimedia teaching approach over the traditional way of teaching approach. The experimental group was treated for the last ten weeks using the multimedia based teaching of the module calculus and numerical methods. The module does not have a problem of delivery using traditional and the multimedia based teaching approach. The question is on its effectiveness on the achievement of students. Calculus and numerical methods basically uses MATLAB as its way of evaluating limits, derivatives and integration problems. And hence the experimental group was treated by the MATLAB software with suitable concrete problems of basic limits, integrations and derivatives of the module. Some of the presentations are shown below:

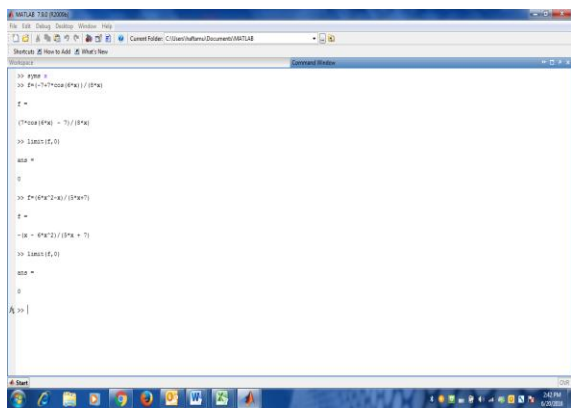


Fig 2.Shows The Experimental Group was Treated using MATLAB

As shows in the figure the experimental group was taught the basic limit problems of the modlue calculus and numerical methods usning matlab.examples was solved and problems was also provided for the students as the same time

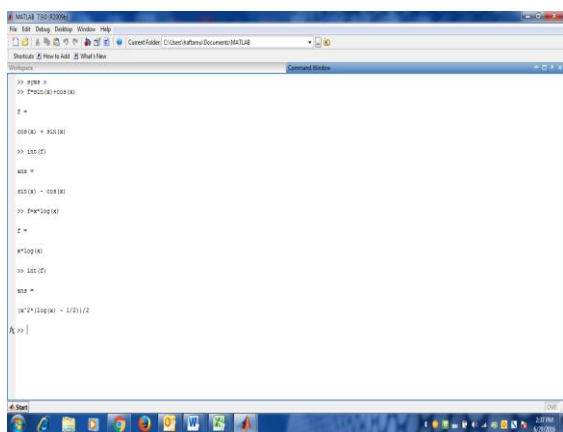


Fig3. Shows the Experimental Group was Treated Using MATLAB.

As clearly indicated from the above figure problems related to integration was provided for the students and was solved as the same time using the the soft ware.The performance of the experimental and the control group after treatment is as shown in the table below;

Group	Controlled	Experimental
Mean	35.64	41.56
SD	8.702	5.832
SEM	1.74	1.166
N	25	25

Fig.4 Show the Performance of the Experimental and the Controlled Group after Treatment.

As clearly indicated in the above table the experimental group significantly performce better than the controlled group.And the t vale is $2.8258 > 2.01$ and hence which shows the significance of the multimedia based teaching and learning activities.hence the difference is statistically significant.

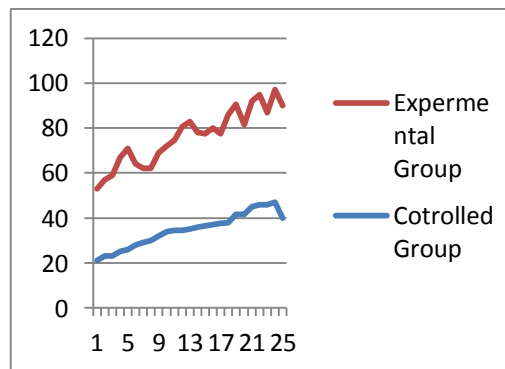


Fig.5 Shows Comparison on the Performance of the Controlled and the Experimental Group after Treatment.

The above figure clearly indicates that the experimental group which is exposed to the multi media based teaching and learning activities performs sginificantly than the controlled group which was taught using the traditional way of teaching.

V. Conclusion

Multimedia based teaching and learning process changes dramatically the performance of the students on the module calculus and numerical methods. The lesson presented on this way is more organized and comprehended. Multimedia is an effective tool for teaching specially modules like calculus and numerical methods which have complex difficult concepts to understand using the theoretical way of teaching. From the above result we can concluded that multimedia based teaching and learning process is more effective than the traditional way of teaching.

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