USE OF ICT FOR QUALITY EDUCATION IN MATHEMATICS

Subhash G. Pawar
Department of Mathematics
K.T.H.M. College, Nashik

Abstract

The innovative practices with use of ICT can be applied in teaching and learning processes, by teacher in education is important role for development of society. Now a days world teachers need to be equipped not only with subject knowledge and effective teaching methodology, but with capacity to assist students to fulfil the demands of the emerging knowledge-based human being. The aim of the study is to improve the better practices of teaching, learning and applications by using ICT in mathematics. The finding of the study is use of mathematical software in teaching learning methods is better than traditional teaching method for promoting mathematical thinking among the undergraduate students.

Keywords: ICT, Quality Education, Mathematics, Undergraduate Level.

1. Introduction

The research in mathematics education has developed significantly during the last three decades, not only measured by the number of research papers, Ph.D. students, publications, conference, and other type of related activities with research in the world but also in terms of the quality education. Mathematics education is one of an interdisciplinary field of research which is related to supporting science and other branches.

The innovative practices with use of ICT can be applied in teaching and learning processes, by teacher in education is important role for development of society. E-learning is an approach to facilitate and enhance learning both through computer and communication technology. In today's world teachers need to be equipped not only with subject knowledge and effective teaching methodology, but with capacity to assist students to fulfil the demands of the emerging knowledge-based human being. Majority of teachers are still not confident in the use of ICT and requires further training. Therefore teachers require to familiarity with new information and communication technology and need to have ability to use such technology for improvement of quality education. In some schools and colleges access to ICT facilities viz. graphic calculators, is to limited and an appropriate range of software has not been made available. By use of new technology, teacher can perform his task in effectively and efficient manner. New technology enables to make sensible and systematic use of computer, LCD projector, model, software etc. for the teacher. It helps the teacher for the development of students through cognitive, affective and logical thinking abilities.

Mathematical software is the expressions involving relationship either equations or inequalities representing variables and parameters that define a particular phenomenon. Some software have been developed and used in education field for effective teaching processes. Mathematical software is an experimental approach where a problem is solved and continually refined over time in order for more efficient, correct and faster. The ultimate aim of the study is to improve the better practices of teaching, learning and applications by using ICT in mathematics and other subjects, also the development of mathematics education as a research field throughout the world.

2. Objectives

1. To choose Proper ICT base mathematical software
2. To study the effect of mathematical software on UG students

3. Hypotheses

H_{01}. There is no significance difference between mean score of experimental and control group in pre-test.

H_{02}. There is no significance difference between mean score of experimental and control group in achievement test.

4. Topics to Teach

The topics homogenous and non-homogenous system of equations, row-echelon form of matrix, Gauss-elimination and Gauss Jordan-elimination are included in the syllabus of F. Y. B. Sc. class in Savitribai Phule Pune University. This topic is basic for linear algebra course and it is also help to students for developing logical thinking. If basic concepts and strategy for problem solving understand to students of F. Y. B. Sc. then they are motivate for study of linear algebra and higher mathematics. So we choose basic topics from linear algebra for teaching programme.

5. Methodology

As per objectives of the present research study, the experimental methodology is useful for conducting the research study.

Experimental design classified in to three categories.

1) Pre-experimental design.
2) True experimental design.
3) Quasi-experimental design.

From these above three categories, true experimental design is proposed for the present research study, because it is the stronger type of design. In true experiment design the equivalence of the control and experimental groups are selected by random assignment of subjects to control and experimental treatments. Again True experimental design classified in to three categories as follows.

1) The post-test-only, equivalent-group design.
2) The pre-test-post-test equivalent-groups design.
3) The Solomon four-group design.

As per objectives of the present research study, the **pre-test-post-test-only equivalent-groups design** from True experimental design is useful for testing the population mean.

6. Variables

a) **Independent Variables**: teaching by mathematical software

b) **Dependent variables**: test score.

7. Sample for study

In this study the main objective was to verify the effect of mathematical software, hence the most of the important criterion for selecting the college for the purpose of experiment is availability of well equipped computer laboratory with mathematical software.

By using non-probability (purposive) and two stage sampling method we selected first college, This College has a mixed population from the different Socio-economic strata, also Co-education College. And then 20 students of mathematics from F. Y. B. Sc. class in KTHM College are selected by score obtained in previous examination.

Two groups are selected randomly drawn from the selected sample and then assign groups to the experimental or control by tossing a coin.

8. Tools for Study

8.1 In this study following tools are uses by us for collecting the data.

a) Mathematical software *fx-CG20.*

b) Achievement test made by us.

a) **Mathematical software *fx-CG20***

We collect the information about freeware as well as commercial mathematical software. Freeware software downloaded from internet and commercial software were purchased in computer laboratory of mathematics departments by college authority. Among these mathematical software *fxCG-20* was choose for this study. After demonstration, every type of student is operating this *fx-CG20* software. There is no need of power supply and battery back-up operating this software. It is available in calculator form so only four pencil cells are sufficient for operating this software. Teacher can use in regular classroom teaching and also in other place in urban as well as in rural areas.

b) **Achievement test**

Achievement test is conducted for 40 marks and it content 20 questions. All questions are objective and each of them equal weight age of marks. The types of questions are multiple choice and true and false. Out of these 10 are multiple choice and ten are true or false. To ensure accuracy the questionnaire is given for checking to the subject experts. Some questions were modified according to the suggestions of the experts.

8.2 Statistical tools:

In the present study following statistical tools were applied by the researcher to analysis the data.

a) Measures of Central tendency: Mean

b) Measures of dispersion: Variance, S.D. and coefficient of variation (C.V.).

c) t-test

9. Analysis

At the beginning we applied test of 40 marks on above topics to students and observed the data. Experimental group taught by using mathematical software and control group taught by traditional method. After completion teaching programme we applied achievement test and observed data and by analysing data the hypotheses were testing.

1. Testing hypothesis H_{01}

H_{01}: There is no significance difference between mean score of experimental and control group in pre-test.

Title: Summary of the mean score of experimental and control group in pre-test.

Group	Size n	ΣX	Mean($\bar{X}$)	$\Sigma (X-\bar{X})^2$	S.D.	t-value
Experimental	10	245	24.5	42.5	2.2435	-0.1993
Control	10	247	24.7	48.1		

Table No. 1

We use the following procedure to calculate 't' value.

Step 1: For Common variance (C.V.), we have

$$\text{C.V.} = \frac{(X_1-\bar{X_1})^2+(X_2-\bar{X_2})^2}{n_1+n_2-2} = \frac{42.5+48.1}{10+10-2} = 5.03333$$

Step 2: For Common Standard Deviation (S.D.)

$$\text{Common S.D.} = \sqrt{Common\ variance} = \sqrt{5.0333} = 2.2435$$

Step 3: For value of $'t'$, we have

$$t = \frac{(\bar{X_1}-\bar{X_2})}{Common\ S.D.}\sqrt{\frac{n_1\ n_2}{n_1+n_2}} = \frac{24.5-24.7}{2.2435}\sqrt{\frac{10X10}{10+10}} = -0.1993$$

Step 4: For degree of freedom, we have

$$\text{Degree of freedom} = n_1 + n_2 - 2 = 10+10-2 = 1$$

For 18 degree of freedom, the table value of t at 5 % level of significance for one tailed test i.e., $t_{0.05} = 2.101$ and the calculated value of t is -0.1993 and $|t|$ value < statistical table value. The null hypothesis is accepted. Therefore, it may conclude that mean score for promoting mathematical thinking of experimental and control group in pre-test do not differ significantly.

2. Testing hypothesis H_{02}

H_{02}: There is no significance difference between mean score of experimental and control group in achievement test.

Title: Summary of the mean score of experimental and control group in post-test (achievement test).

Group	Size n	ΣX	Mean($\bar{X}$)	$\Sigma (X-\bar{X})^2$	S.D.	t-value
Experimental	10	301	30.0	24.9	1.6072	6.8172
Control	10	252	25.2	21.6		

Table No. 2

We use the following procedure to calculate 't' value.

Step 1: For Common variance (C.V.), we have

$$\text{C.V.} = \frac{(X_1-\bar{X_1})^2+(X_2-\bar{X_2})^2}{n_1+n_2-2} = \frac{24.9+21.6}{10+10-2} = 2.5833$$

Step 2: For Common Standard Deviation (S.D.)

$$\text{Common S.D.} = \sqrt{Common\ variance} = \sqrt{2.5833} = 1.6072$$

Step 3: For value of 't', we have

$$t = \frac{(\bar{X_1}-\bar{X_2})}{Common\ S.D.}\sqrt{\frac{n_1\,n_2}{n_1+n_2}} = \frac{30.1-25.2}{1.6072}\sqrt{\frac{10X10}{10+10}} = 6.8172$$

Step 4: For degree of freedom, we have

$$\text{Degree of freedom} = n_1+n_2-2 = 10+10-2 = 18$$

For 18 degree of freedom, the table value of t at 5 % level of significance for one tailed test i.e., $t_{0.05} = 2.101$ and the calculated value of t is 6.8172 and this value > statistical table value. The null hypothesis is rejected. Therefore, it may conclude that mean score for promoting mathematical thinking of experimental and control group in achievement test differ significantly.

10. Findings

Table no. 1 indicates that mean score for promoting mathematical thinking of experimental and control group in pre-test do not differ significantly. Table no. 2 indicate that mean score for promoting mathematical thinking of experimental and control group in achievement test differ significantly.

11. Concluding Remarks

The theory of textbook material and traditional teaching methods does not motivate student towards mathematics. It imposes great difficulties on them in understanding of concepts and how to relate the topics being studied with real applications. But information and communication technological support teaching method increase the best practices for teaching and learning methods. These methods

promote the mathematical thinking of students at U.G. level and so students automatically motivate towards mathematics.

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