

Development and Efficiency of Computer-Assisted Instructional Modules for IX Class Students

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Abstract

Educational Technology has made a significant contribution to education by taking into consideration the individual differences of learners and catering to their needs. The emerging trend world over is towards more individualized and flexible forms of learning with an emphasis on individualized methods of instruction. Due to increased Technological advancements and non homogeneous groups of the students in class the need of Computer-Assisted Instruction (CAI) is the demand of the time. In order to develop and find out the effectiveness of Computer-Assisted Instruction (CAI) for secondary school students in Mathematics subject, the present venture is taken up. This paper is based on an experiment to study the effect of a new teaching methodology i.e. Computer Assisted Instructional Technique (CAI) in comparison to Lecture method of Teaching on the achievement of secondary school students in Mathematics subject. The students may excel in their related fields if they are provided Computer-Assisted Instructional (CAI) which is according to Individualized pace.

Keywords: Computer-Assisted Instruction (CAI), Mathematics, Secondary School Students.

Introduction

In the era of globalization and Liberalization, the explosion of technologies is impacting the world in all fields of life. Its impact can also be seen in the field of education. With the impact of modern technological methods interesting and exhilarating learning environment can be created in the classroom. These methods can improve the quality of instruction. Computer Assisted Instructions (CAI) is one of these technological methods which can provide interactive as well as individualized method of instruction in the classroom and to learn the subject like Mathematics, technology is used as a mind tool that can be used to support the deep reflective thinking that is necessary for meaningful learning. According to National Council of Teachers of Mathematics 2008, Technology is useful for learning mathematics in the 21st century and all schools must ensure that they have technological innovation such as instructional T.V, computer, multimedia technology. The use of multimedia technology stimulates interest and increase their proficiency in mathematics. "CAI is one of the multimedia instruction that has been empirically proved to enhance students performance, arouse their interest and reduce the boring and abstract nature of mathematics". (Adegoke 2010; Gambari 2010; Kuti 2006; Mahmood 2002).

Research Problem

Mathematics as a subject doesn't require rote learning, and cramming and it does not completely based on memorization of the concepts. In spite of that, it demands conceptual understanding, practical experience of mathematical concepts, problem solving ability, logics, drill and practice. The traditional didactic method of teaching is no longer adequate to meet the demands of mathematics education in line with National Education Policy 1986. In the light of National Education Policy 1986, to develop the skills reiterated in the policy and to provide practical experience of mathematical concepts, assumption, assertions and rules an appropriate method of instruction or a suitable platform to use such strategies is the need of the hour. Keeping this in mind, the researcher selected CAI as a method for teaching of Mathematics. CAI has been used as an effective and efficient medium of instruction in the advanced countries for formal and non-formal education at all level. In CAI, learners can learn at their own pace and spend as much as time as they need.

Different studies have been conducted on CAI and Lecture method but the proposed work is different from the studies carried out so far. Singh in 1991, Mahajan in 1994, Khirwadkar in 1998, Panda and Choudhary in 2000, Joy and Shiju in 2004, Cepni, Tas and Kose in 2006, Inamdar in 2007, Sah, Raghvendra in 2009, Oguz in 2011, Safo, Ezenwa and Wushishi in 2013, Modi in 2014 and Atmaram and Afsarpasha in 2015 highlighted that the Computer-Assisted Instruction Modules are more effective as compared to lecture method of teaching. And it was found that researches had been conducted in the field of CAI in various science subjects like Physics, Chemistry & Biology but there was a dearth of researches in the field of Mathematics for Secondary and Senior Secondary Classes. Keeping this in mind, the researcher selected CAI as a method for teaching of Mathematics. Also the researchers reported so far indicated positive attitude of teachers as well as students towards CAI. In order to develop and find out the effectiveness of Computer-Assisted Instruction for IX class for Mathematics, the present venture was taken up.

Objectives of the Study

The objectives of this study were to

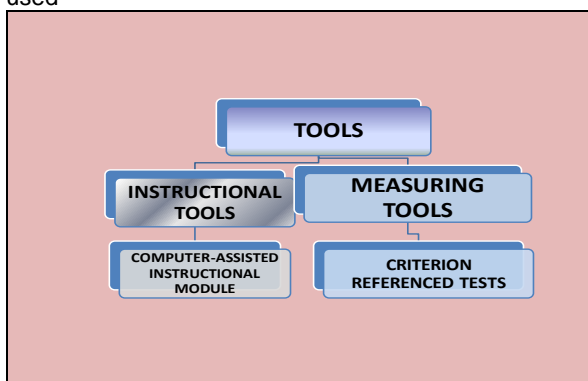
1. To develop instructional modules for Computer-Assisted Instruction in Mathematics for IX class students.
2. To develop and validate the criterion referenced tests for Mathematics to measure the achievement of IX class students.
3. To empirical validate instructional modules for Computer-Assisted Instruction in Mathematics for IX class students to find out the effectiveness of modules.

Sample

For the pilot study, Krishna Public School, Faridabad was selected. 44 students were selected randomly. Two groups were made for the present study. One group of 22 students was taught through computer-assisted instruction modules. Other group of 22 students taught through Lecture Method of teaching.

Tools Used

In the present study, following tools were used



Measuring Tools

Criterion Referenced Tests (C.R.T.s) were developed and used to assess the entry level behavior of the students. These were also used for assessing the achievement level of students after completing each unit.

Instructional Tools

Instructional modules for CAI

Instructional Module for CAI

Instructional modules for Computer-Assisted Instruction were developed on 3 topics of Mathematics subject for IX Class. For this, syllabus as prescribed by NCERT was taken and used on these specified topics Polynomials, Linear Equation in Two variables and Heron's Formula in English medium. Then objectives in Behavioral Terms were written to know the terminal behavior of students. Then Criterion Referenced Tests were prepared. Multiple Choice Questions were made up in all Criterion Referenced Tests. For writing stage, the material was designed in the form of Introductory, Teaching, Practice and Testing Frames and these frames were logically and Empirically Sequenced. These frames were edited by Researcher, Subject matter expert, Language Expert and Expert in the field of self-learning material. For tryout of these modules firstly it was tested on five students individually then it was tested on small groups of ten students and done the correction whatsoever was found difficult for students. After the correction modules were tested on a group of 44 students for Field try out.

Validation of CAI Modules

1. Error Rate on the basis of C.R.T.s (Group learning through Modules)
2. Gain Ratio on the basis of C. R. T.s (Group learning through Modules)

Error Rate on the Basis of C.R.T's

Error rate is generally calculated on the basis of students' responses obtained on each frame of the programme. If the student responded incorrectly to a frame, it was considered as an error. For each unit of module the error made by the individual students on all the responses were noted. And to arrive at the percentage of error, the total number of errors made by all the students was multiplied by 100 and the product so obtained was divided by the product of the total number of students handling the programme and the total number of required responses in the frames as per formula given below:

$$\text{Programme Error Rate in Percentage} = \frac{N_e \times 100}{N_r \times N_i}$$

where, N_e = Total number of errors made by all the students on the programme.

N_i = Total number of students handling the programme.

N_r = Total number of required responses in the programme.

According to this specified formula the error rate was calculated for each of three units which is given in the table 1.1

Table 1.1
Error Rate (CAI Module)

CRT's	Unit	Error Rate in %
1.	Polynomials	14.2
2.	Linear Equations in Two Variables	14.6
3.	Heron's Formula	11.6

Interpretation

Error Rate of all 3 CAI modules was in the range of 11.0 % to 15.0 % which was less than twenty percent. It means the students responded correctly on

85% of the frames of CAI modules. It means that CAI modules were understandable for the students.

Gain Ratio on the Basis of C.R.T's

Effectiveness of a module can also be measured through Gain ratio. It is the ratio between the amount learned and the amount that could possibly learn. The gain ration was calculated by dividing the mean gain between the pre-test and post-test scores by the mean possible gain score. It is formulated as:

$$\text{Gain Ratio} = \frac{\text{Mean of Post - test scores} - \text{Mean of Pre - test scores}}{\text{Mean of full scores} - \text{Mean of Pre - test scores}}$$

Gain Ratio for all three units given in the table 1.2

Table 1.2
Gain Ratio (CAI Module)

CRT's	Unit	Gain Ratio
1.	Polynomials	0.8386
2.	Linear Equations in Two Variables	0.8423
3.	Heron's Formula	0.8632

Interpretation

Gain Ratio of all 3 CAI modules was in the range of .82 to 0.87. It shows that gain ranges from 82% to 87%. It means the CAI modules were very much effective for the students. Thus the CAI modules were considered more effective and feasible for experimentation.

Educational Implications

For Administrators

U. G. C. should encourage Experimental Researches and the researchers in true manner should be provided the required facilities so that quality research could take place. Researchers should be motivated to develop quality CAI material.

For Teachers

Teachers should use CAI modules to meet the challenge of individual differences. With the help of CAI modules, effective learning environment can be created in the classroom.

For Students

Knowledge through Individualized pace CAI Modules help to inculcate self-study habits and self-confidence among students which are very much essential for enhancing learning.

Conclusion

Effective learning and conceptual understanding of material require individual guidance, personal attention and overall individual efforts of the learners. CAI Modules may prove to be a boon for students due to their enriched features. They perform the role of an efficient teacher. Due to increased enrolment of students and knowledge explosion, the need of Individualized pace CAI Modules is the demand of the time.

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