PROBLEMS IN LEARNING DIFFERENTIAL CALCULUS: AVENUES ENHANCED LEARNING

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ABSTRACT

The main purpose of this study is to identify the problems of learning Differential calculus in mathematics at higher secondary level of school education in Tamil Nadu by using diagnostic test.and solve the problem by introducing CAI package in learning differential calculus for Plus one engish medium students of three types of schools namely Govt, Govt aided and Municipal higher secondary schools located at Coimbatore district of Tamilnadu. A diagnostic test was planned with questions covering all the chapters prescribed for XI std by SCERT .In order to overcome the learning impediments of plus one students, the investigator developed a Syllabus based CAI package in differential calculus of plus one mathematics and to examine the the package as an alternative method to the Traditional method of instruction for teaching and learning. Using this method the investigator try to find the improvement in understanding the concepts of differential calculus.

Keywords*: Computer Assisted Instruction, Traditional teaching, Mathematics achievement test, Mathematics attitude scale.*

Introduction

At present students of higher secondary schools don't prefer formal learning environment. This calls for the faculty to be technologically empowered, updated and introduce innovative pedagogical methods and practices. The instructional activities in the classroom are based on the transfer of knowledge from the teacher to the learner. Educational technology has been dramatically changed the teaching, learning process now a days. This research focuses on improving the students interest in learning and enjoying the beauty of mathematics thereby arousing the curiosity and enthusiasm in them.

In science based world education and research are crucial to the development process of a country its welfare, progress and security (Education commission 1964-66). Education is an instrument of social change, modernization, development, economic and social development of a country. It gives skill and competency to the individual for a successful living. The education commission states "The destiny of the nation is being shaped in its classrooms"**.** Research in education helps the teachers to become more efficient in their class room teaching. For effective teaching, mastery over the content matter alone is not sufficient; the teacher should have a sound knowledge in pedagogy for selecting and implementing a particular instructional procedure, for a certain learning activity among a given group of learners. Educationists, researchers and teachers should combine together their resources and expertise so as to make available effective education for maximum number of pupils, within a short period of time and at a minimum cost, through the use of appropriate technologies and techniques. Research carried out to achieve this objective, either by professionals or by private individuals will be of immense help to practice in classroom to the teachers facilitating their growth.

Importance of mathematics

Ravindra (2006) " Ours and previous few generations have failed to produce good Mathematics teachers at school level in adequately large numbers" . The corpus of this enormous Knowledge that man built over the last few centuries will be too burdensome to carry into future on the shoulders of ill-equipped school Mathematics teachers. This is so since teaching mathematics to impressionable young minds is a specialized task that many mathematicians may not measure. The reasoning in mathematics possesses a number of characteristics, namely characteristics of accuracy, verification of results, certainty of results, similarity to reasoning in life, originality. All these characteristics automatically become a part and parcel of a child when s/he learns mathematics. Students find it difficult to understand mathematics because of symbols and abstractness. There are many ways of thinking one learns mathematics is an ability to handle abstractions. and an approach to problem solving. In order to achieve this objective and to maximize students learning of mathematics, quite a number of innovative methods have been tried out. Mathematics plays an important role to provide technically skilled manpower in our country. (NCERT, 2000) recommended mathematics as a compulsory subject for all school students till tenth standard. Thus mathematics enjoys a unique status in the school curriculum. Mathematics offers the way of doing things: to be able to solve mathematical problems and to have right attitude of problem solving and to be able to attack all kind of problems in a systematic mannar. Many researches have attempted to compare students' performances being taught by traditional method and computer-assisted instruction method. Traditional mathematics instruction was defined as "teacher-directed instruction using the mathematics textbook, worksheet, hands-on activities, and drill-and-practice activities in large and small groups" and lecture-based classroom teaching (Butzin, 2001; Shults, 2000, p. 13). Computer-Assisted Instruction, on the other hand, "includes the use of the computer for tutorial, drill-and-practice, games, or simulation" (Shults, 2000, p. 25). The method of this study was a quasi-

experimental design with equivalent control and experimental groups. Review of literature revealed that most of the CAI studies and reviews of those studies, as expected were done in the USA, most of which suggested the effectiveness of CAI It must be noted, however, that main focus of those studies are generally easily observable measures such as achievement, not more complex phenomena such as cognition

Problems identified in present education system

1. Aimlessness: Eduction is acquired only to get employment.

2. Defective curriculum: All students have to study one prefixed curriculum, it is traditional without any relation to practical life. The immediate aim is to get through exam.

3. Defective Examination system: The Prestige of schools depend sentinel upon their Board exam results and very little on real educational merits of the institution.

4. Wastage and stagnation. Lack of professional guidance and counseling in building confidence, competence and autonomy in learning for academically weak students in schools leads to loss of hope in learning among individuals.

5. Management schools : Private schools are run on profit basis, they can't be expected to render the real service for the cause of education.

We live in the world of competition and lack of time, we need to acquire adequate knowledge about computers and its application in the field of education. In today's education system students and their parents have become staunch believers of the idea that only private tuition can guarantee their children academic success in a subject like mathematics .But their achievement can be made satisfactory by using modern instructional strategies.(i.e) proper use of CAI in the class room teaching.

Primary data

Details of schools selected for the collection of data

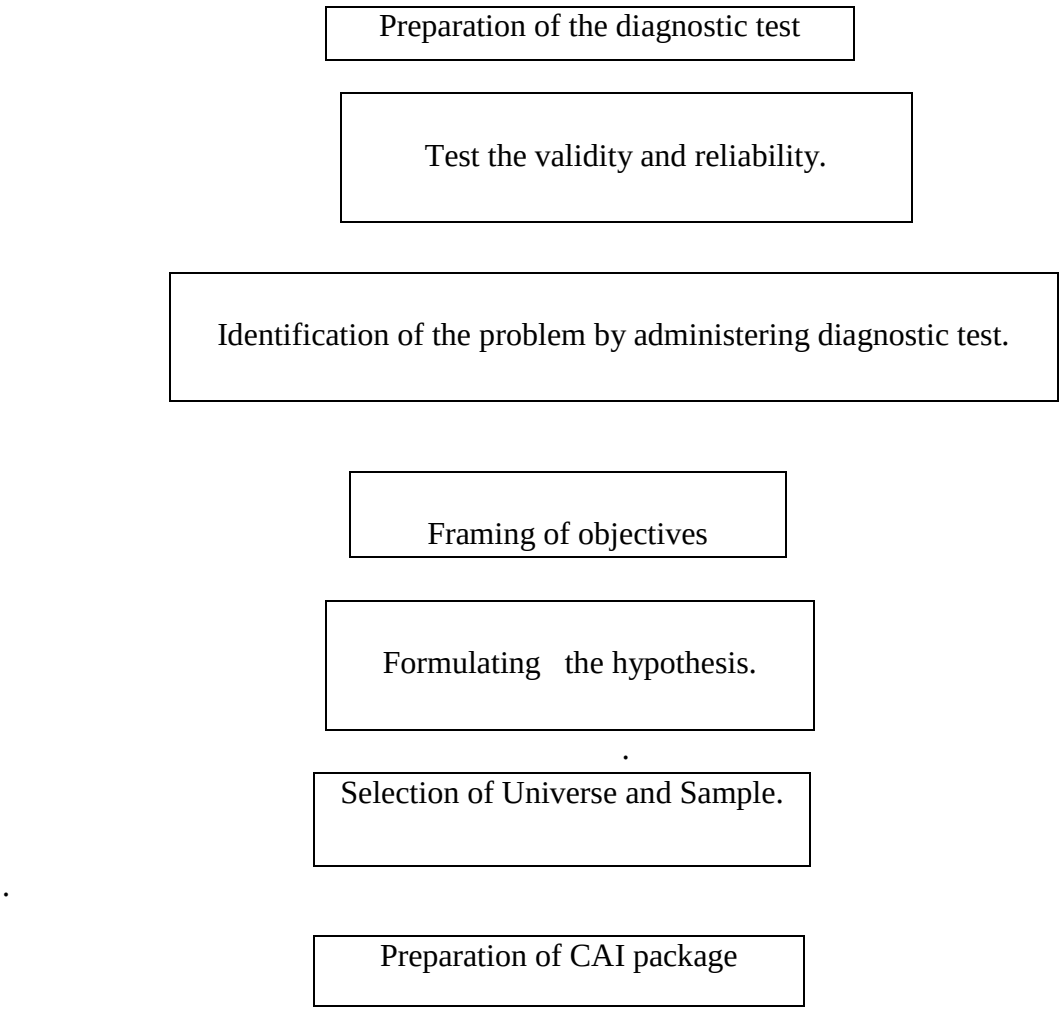
S.No	Name of the schools	Number of students
1	Municipal Boys Hr.Sec.School Pollachi.	60
2	Government Higher Secondary School.Asokapuram	60
3	Government aided higher secondary school(PSGR Krishnammal) Peelamedu	60

These schools were purposively selected because these schools have sufficient infrastructures.

Statement of the problem

There are different innovations that are being applied in the delivery of curriculum content to students. Research evidence shows that the use of CAI could bring about improvement in students' achievement, speeds up learning rate, enhances better retention, and encourages the development of better attitude. However, there is need to really find out, whether the use of computer assisted instructional package on differential calculus in mathematical curriculum will produce any difference in the performance of students differential calculus in mathematics.

Research paradigm



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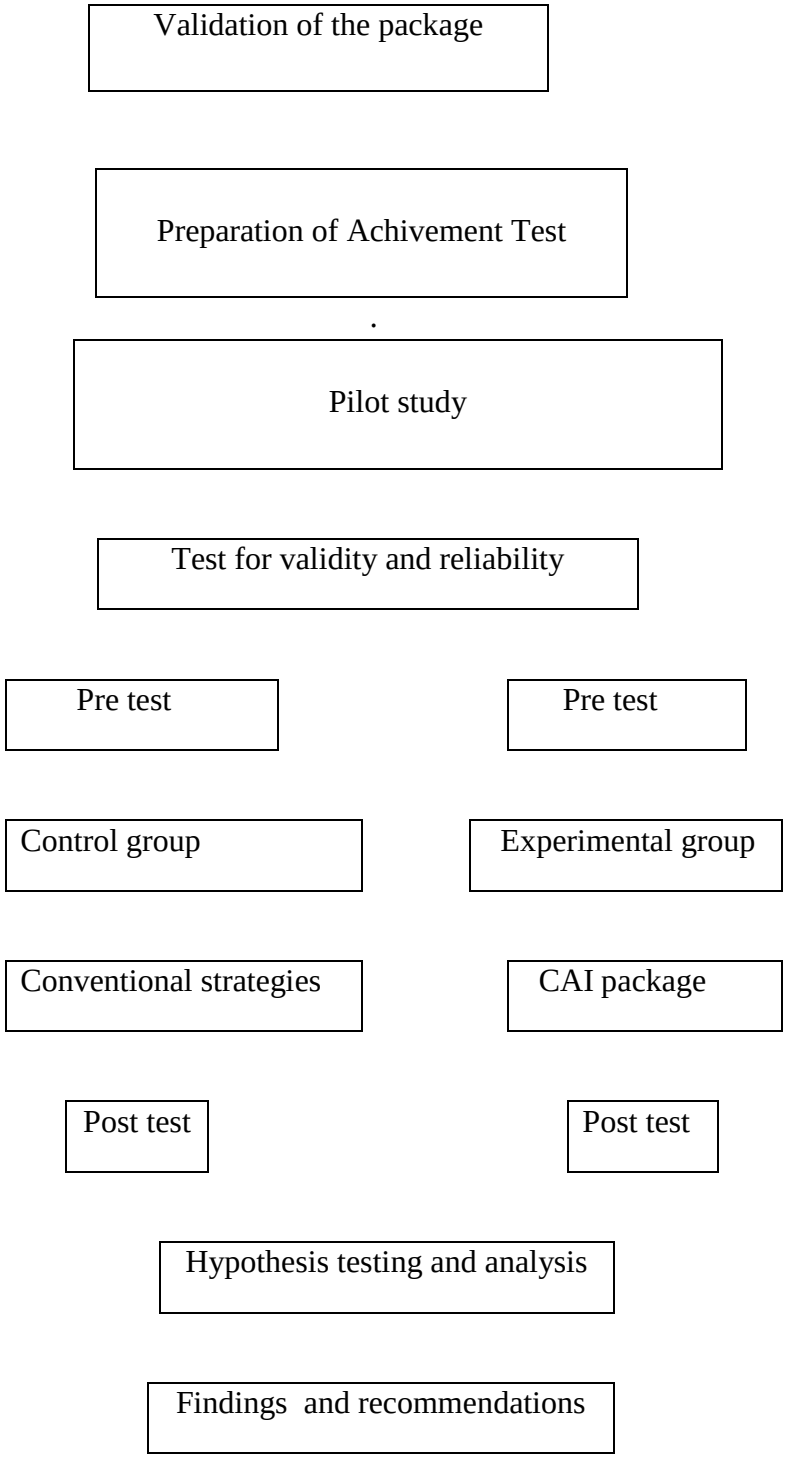

Validation of the package
Preparation of Achivement Test
.
Pilot study
Test for validity and reliability
Pre test
Pre test
Control group
Experimental group
Conventional strategies
CAI package
Post test
Post test
Hypothesis testing and analysis
Findings and recommendations

Research design

The design of this present study is Quasi-Experimental with equivalent groups.

Symbolically

01 X 02

03 C 04

Where 01, 03 - Pre tests

02, 04 - Post tests

X- Application of experimental treatment

C - Application of control treatment

The experiment was conducted at XI standards. The experimental group was taught by the newly developed Methodology CAI Instructional Strategy and the control group was taught by the Conventional Method of teaching.

Content of teaching units.

1.Functions

(i)Domain, range, types of functions

2. Limits and continuity of functions

3. Concept of Differentiation

(i) Physical meaning (ii) Geometrical meaning

4 Application of Differential Calculus in Practical problems

Variables

Gender - boys & girls

Locality of Schools- Urban and Rural

Types of Schools - Municipal ,Government and government aided schools

Independent variables

Independent variables are the conditions (or) characteristics that the experimenter manipulates or controls in his or her attempt to ascertain their relationship to observed phenomena. In this present study treatment using conventional model for control group, treatment using CAI Method of teaching for experiment group, Types of Schools ,Locality and Gender are considered as Independent variables

Dependent variables

Dependent variables are the conditions (or) characteristics that appear , disappear or changes the Independent variables . In this present study Diagnostic test score ,Pre-test score,Post test score and Retention test score(achievement test scores) in differential calculus are dependent variables

Intervening variables

Certain variables that cannot be controlled or measured directly may have an important effect on the outcome. These modifying variables intervene between the cause and the effect. Hesitation, attitude, motivation , anxiety, demographic variances , SE status and education of parents are some of the intervening variables.

Problems of teachers handling higher secondary mathematics at present.

The knowledge base required to compete at the universal level has become so wide that the content placed in the higher secondary level is beyond the grasp of mediocre students. The teachers therefore prefer lecture method to overcome the time constraint in completing the vast syllabus while the students prefer the method of memorizing the concepts without understanding.

Problems faced by students in learning differential calculus.

Among various topics student is confronted with the concept of limit, involving calculations that are not performed by simple arithmetic and algebra. They can only be carried by indirect arguments.. Whatever method is used , a dissatisfaction with the study of topic has emerged among students at plus one level.

The concept calculus creates a number of cognitive difficulties while teaching in traditional method such as;

- The limit process uses infinite concepts where the terms are mysterious to the learners.
- The idea of " N getting arbitrarily large" , implicitly suggests concepts

of infinite numbers.

- There is a confusion over the passage from finite to infinite, in understanding " What happens at infinity"
- Restricted mental images of functions.
- Difficulties in translating practical problems into calculus formulation.
- .Difficulties in manipulation or lack of it.
- Difficulties in understanding complex new ideas in a limited time.
- Difficulties in selecting and using appropriate representation.

Objectives of the study

The main objective of the study is to find out the effectiveness of CAI in teaching mathematics at higher secondary level in terms of the student's performance in the achievement tests in mathematics with specific reference to certain selected variables. Other specific objectives are

1. To identify hard topics by conducting Diagonostic test perceived by the students of class XI for developing CAI package.
2. To develop Syllabus based computer software Cai package in mathematics for class XI on the lesson " Differential calculus"
3. Validation of CAI package for differential calculus.
4. To evaluate the effectiveness of CAI package for differential calculus.

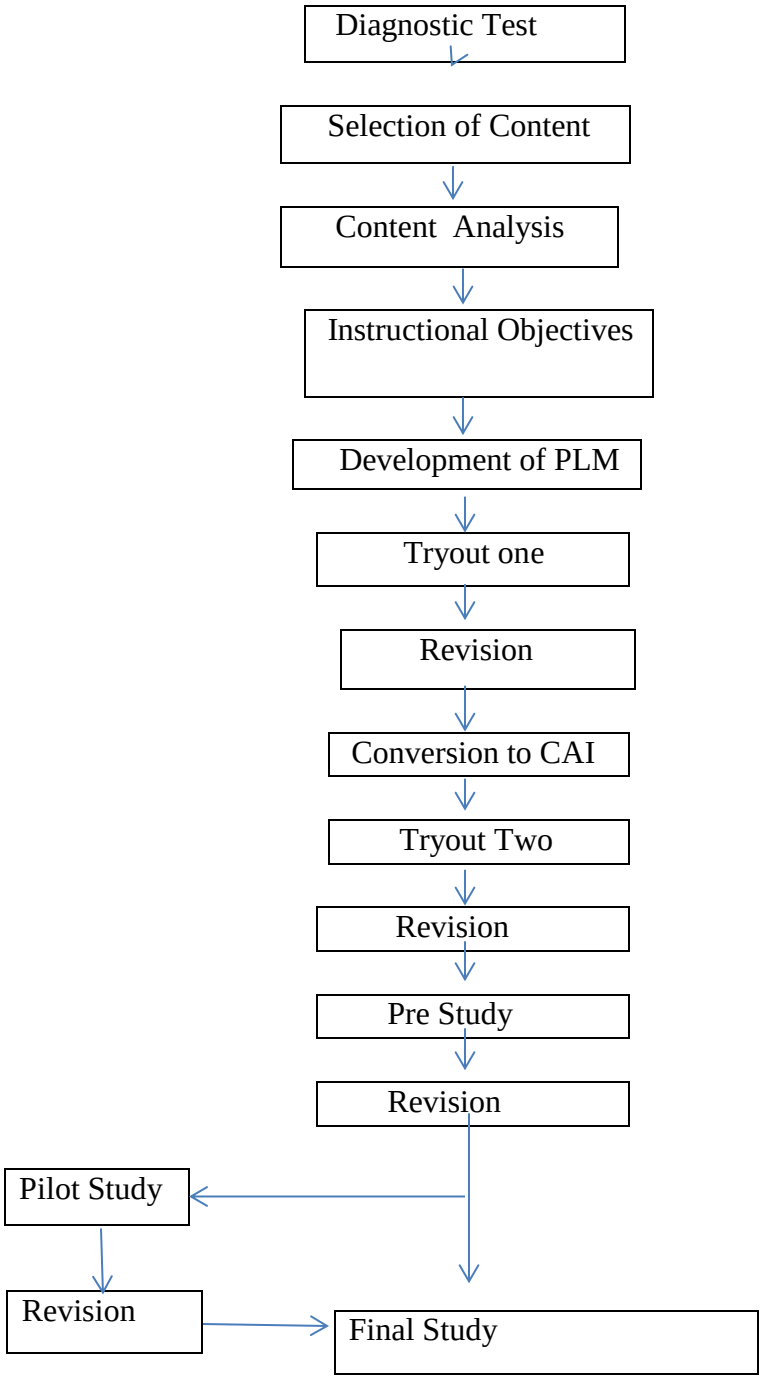
The Tools for this study are

- Diagnostic Test(DT)
- Mathematics Attitude Scale(MAS)
- Mathematics Achievement Test (MAT)
- Computer Assisted Instructional package(CAI)

Diagnostic test(DT) is able to identify the hard spots in maths for plus one students in Coimbatore District.30 students took part in Diagnostic test, it was observe that there were certain topics that the students did not answer correctly. Hence the investigator recognized the neccessity to formulate a CAI package to help students to overcome their learning impediments Mathematics attitude scale (MAS) was developed by the researcher to estimate students's attitude towards mathematics. This scale was composed of 50 items with a 5-point Likert-type

scale,25 of which were positive items(1= strongly disagree, 5= strongly agree).Mathematics Achivement Tests(MAT) are used to identify the effectiveness of the treatment through a pre-test,post –test and a retention test.

Development of CAI



Advantages of CAI in learning mathematics

Mathematics and computer are both important in today's life as; they open the gate of ample opportunities in this modem world.. Computer helps in improving the knowledge of mathematics. Computer helps in making classroom teaching lively. Computer can play vital role in learning process as it can work with the imagination of students. Any concept in mathematics can be explained with the help of pictures and visual image can help in understanding the concept at ease. There are three categories of the applications of computers in the field of mathematics education: computer assisted instruction (CAI), student' educational programming and general purpose educational tools such as spreadsheets, databases and computer algebra systems (CAS). According to Suppes et al. (1968) the change that was to come through computers could only be compared to the fact that how books had changed the way of people looking at the world. Computers would change the face of education in a very short period of time by eventually removing the teacher from the classroom scene.

In order to overcome the difficulties faced by the students, teacher should adopt different methodology in teaching of mathematics like drill method, using different audio visual aids, computer aided instruction, mathematical club etc. CAI (Computer Assisted/Aided Instruction) is one of the instructional teaching method . It is very useful to the teachers and the students as it reduces the burden of teaching and learning and it makes teaching and learning interesting. It also helps the students to learn at their own pace and at their own convenience. It motivates the students and increases the enthusiasm of the students. The most beneficial part of CAI is it provides the mixture of wide range of visual, graphics and pictures to make the teaching learning more interesting. CAI helps the teacher to provide an experience s/he can give many examples and illustrations and can make the concept clear. Concept can be explained using Word Problem, Play, Audio Visual aids, three-dimensional figures etc.

Educational implications

The following are the educational implications of the present study.

1. Research evidence suggests that the Computer Assisted Instruction (CAI) improves the student performance in mathematics, particularly if used in combination with the other techniques.
2. Immediate feedback helps the students verify their learning.
3. Self-pacing is possible, if the tutorial mode is used.
4. The higher cognitive abilities are achievable with the right mode.
5. Computer Assisted instruction is more successful in critical sagacity of the logic, of various subjects and inspires the student in creative thinking and judgment making.
6. Good teachers are freed from the humdrum of routine class-room activity and they are in a position to devote their time to more creative activities.

7. Some educationists fear that the Computer Assisted instruction will deteriorate the quality of instruction. On the other hand, the use of it has improved the quality of education in general.
8. The use of Computer Assisted instruction has brought a revolution in the social setting of the classroom. Many emotional and social problems have been eliminated and problems of discipline have been automatically solved.
9. Computer Assisted instruction helps the teacher to diagnose the problems of the individual learner.

Conclusion

Mathematics teachers should organize Seminars, Paper presentations, Numerical aptitude test according to the academic level of the students in selective areas in mathematics to increase their positive attitude towards mathematics.Teachers can make use of Computer Assisted Instruction for selective topics in the School Curriculum along with the Conventional teaching. Mathematics teachers should assign Computer based mathematical projects to increase the positive attitude of students towards Computer and their achievement in Mathematics. The researcher believe this study will have a contribution in the effort of identifying some of the major aspects, which hinder the teaching and learning of differential Calculus in mathematics with the help of CAI package and thereby towards possible solutions. It could be also used as an initial work for those who are interested to do further studies in this area.

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