

CHAPTER –V SUMMARY

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CHAPTER –V SUMMARY

5.01 Introduction

Education has always been important but perhaps, never more so, in man's history than today. In a science based world, education and research are crucial to the development process of a country, its welfare, progress and security" (Education Commission 1964-66)

This statement is more relevant even after forty seven years in today's world of knowledge explosion but rather increased. Education is a process of overall development of man. Education was given primary importance right from the Vedic period. During that period the Guru used to impart knowledge and mathematics was given due importance, for example Astronomy and Astrology use mathematics. In Vedas it is clearly stated that only through education one can reach the ultimate Reality (God). So, we acknowledge the importance of education. Education has capacity to convert the biological man to social man. Education gives skill and competency to the individual for a successful living. It is an instrument of social change, modernization, development, economic and social development of a country. Education is also viewed as investment and this investment is considered as most vital by all nations. The Education commission states, "The destiny of the nation is being shaped in its classrooms".

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 specialised task that many mathematicians may not measure. Mathematics is a hard task master that demands implicit and whole attention from the disciple. 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. One of the methods is auto-instructional method. It is a method of individualized instruction. One of its forms is CAI (Computer Assisted/Aided Instruction) auto instructional teaching. It is very useful to the teachers and the students as it lessens 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. In this method students read different frames and answer the questions that follow and by this way they learn automatically. Even the learning that takes place through CAI

is accurate and untiring. 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.

5.02 Rationale of the Study

Mathematics is an important subject to be learnt at school level. The National Curriculum Framework for School Education-2000 (NCFSE-2000) reiterates importance of mathematics education as visualized in NPE- 1986. According to NCFSE-2000. One of the basic aims of teaching mathematics in schools is to inculcate the skills of quantification of experiences around the learners who in turn carryout experiments with numbers and forms of geometry; frame hypothesis and verify them; generalize the findings with proof; make decisions applying mathematics; develop precision, rational and analytical thinking, reasoning, competence to solve problems, positive attitudes and aesthetic sense. There is huge gap between prescription and practice of a mathematical curriculum. Most of the time of the classrooms of mathematics is preoccupied with routine teaching and not much time is devoted to learning of mathematics. Hardly a student asks questions in a mathematics classroom implying that the learning rarely takes place in the classrooms. The teacher education colleges in India prepare the mathematics teachers at secondary level and unfortunately some of the teacher educating colleges doesn't have teacher educators who studied mathematics as a subject at degree level or have experience of teaching mathematics at school level. Many of the mathematics teachers do not distinguish between teaching of mathematics and teaching of say, English. Ravindra (2006) in his report on the sixth survey of research in Education states that, "Many of the teachers at secondary level do not understand mathematics well as is evident from the fact that more than 90% in in-service programmes conducted for teachers at Regional Institute of Education, Bhopal and Mysore during 1998-2000 did not answer correctly questions like the following:

- i) Why is it that the product of two negative numbers is positive?
- ii) What is the number after $\frac{1}{2}$?
- iii) Why cannot addition replace multiplication?"

We can imagine about students difficulties if such teachers teach mathematics. Kapoor(1997) stated that, " Quality of research is good, but quantity is poor. In Mathematics education both research and development should go together and it was time that the utilization of

research should be considered as important as research.” Developmental research is important in two ways. First it increases the applicability of educational practices in specific situations, and secondly in generating better insight into the instructional process.

The language of mathematics is difficult to comprehend for many students (because of less verbosity and more symbols). Chel(1990), “Underachievement was due to lack of understanding of mathematics concepts of earlier stages. Thus, weaknesses of students in mathematics at lower stage also hinder their progress in learning mathematics at higher stage. The causes found responsible for underachievement were gaps in knowledge of concepts, difficulties in understanding of mathematics language, lack of openness and flexibility in teaching, difficulty in mathematisation of verbal problems and interpretation of mathematical results, the abstract nature of mathematics, fear and anxiety on the part of the students.” Sashidharan (1992), “the initial deficiencies have a long term damaging effect because the content of education is organized in such a way that learning in each class is depend on prior learning. Weakness of students in mathematics can be major factors, which cause the gap between the expected achievement and actual achievement in mathematics. This hinders to achieve desirable outcomes in the instruction process of mathematics.” Students in secondary school require an education in mathematics that goes beyond what was needed by students in the past. Learning mathematics demands practice. One can learn mathematics in an easy way if the subject is presented in a systematic manner, especially for slow learners who cannot cope up with classroom teaching. If for some reason or other they have not learnt the previous class mathematics thoroughly, it is obvious that they cannot learn the next class mathematics. For example a student who scored 35% in class VII is promoted to class VIII. Since he scored pass mark he was promoted to the next class but he may not have been thorough in all the chapters of class VII mathematics textbook. So in class VIII he finds difficult to learn mathematics. Consider a situation where a student is absent for 3 to 4 days to school due to some reason or other. He cannot understand the next class, as he finds it difficult to comprehend because there is a break in continuity. In another case, mathematics teacher may not be presenting the subject in an interesting manner so students find it difficult to understand. The teaching style of the teacher may not match the learning style of the student. In many Schools it is seen that teachers are constantly changing in an academic year. In the same year students may face two to three mathematics teachers and so they find it difficult to cope up with the subject, especially subjects like mathematics. Moreover classes are overcrowded and teachers have less face-to-face contact with the students.

Apart from being taught in school, students get guidance from their parents. Many parents find it difficult to teach higher mathematics, so they cannot guide their wards. In some cases they cannot get help from their parents perhaps because they are occupied with their own work. Nowadays trend has changed, students are going to tuition classes and sometimes they use books such as guides. This shows that formal classroom system is not sufficient to guide them and they cannot learn by self-efforts. Many a times teacher adopts a mechanical method rather than interesting method of teaching. Parents remark that they spend so much money for school fees and also for tuition classes but in spite of that their ward has failed or scored less than expected. In this scenario CAI plays an important role in helping students learn mathematics without stress, so that students become independent and they can learn by themselves, at their own pace.

Knowledge of mathematics plays an important role in student's preparation for all competitive exams and job prospects. Vaisopha (1999) study revealed that students were satisfied and appreciated the CAI program. But study was conducted on V grade students. Rosales (2005) conducted a study on CAI for IX grade students and found that no significant difference between control group students and experimental group students. But the subjects were non-exempted ninth grade students from two schools paired by ethnicity and percentage of socio-economically disadvantaged.

As far as investigator's knowledge there are few studies in mathematics related to CAI and no study was conducted in mathematics using CAI with different modes (only CAI, CAI with discussion) and very few studies is done in the arithmetic unit so investigator wants to study the effectiveness of CAI with different modes.

There are many methods to teach and learn mathematics like Drill work, Assignment etc. CAI is one of the methods to learn mathematics; it is especially helpful to slow learners and gifted learners who can learn at their own pace. Thus CAI leads to a better appreciation and understanding of mathematics and thereby develops a sense of self-esteem and self-confidence among learners this would also help students to lessen their dependency on tuition classes will definitely encourage self-study and thereby encourage self-directed learning.

5.03 Statement of the Problem

Development and Implementation of Computer Assisted Instruction in Mathematics for Standard VIII Students

5.04 Objectives of the Study

- To develop the CAI in Mathematics for Standard VIII GSHSEB (Gujarat State Secondary and Higher Secondary Education Board) students.
- To study the effectiveness of the developed CAI in terms of students' achievement in Mathematics with one of the experimental groups of standard VIII students.
- To study the effectiveness of the developed CAI in terms of students' achievement in Mathematics with another experimental group of standard VIII students along with treatment of simultaneous discussion.
- To study the relative effectiveness of learning mathematics in class VIII among the three groups A, B and C (Where C is the control group and A and B are experimental groups) in terms of achievement of the students.
- To study the reaction of the students belonging to experimental groups about the mode of learning mathematics at the end of the experimentation.

5.05 Hypothesis

- There will be no significant difference in the achievement scores of group C students and group A students.
- There will be no significant difference in the achievement scores of group C students and group B students.
- There will be no significant difference in the achievement scores of group A students and group B students.

5.06 Explanation of Terms

- CAI with Discussion: The learners will learn arithmetic unit with the help of CAI along with the simultaneous discussion led by the investigator with students where ever and whenever needed.
- Reaction of Students: The belief of the students regarding the effectiveness of learning mode of arithmetic unit.

5.07 Operationalization of Terms

- CAI: For this study CAI means Computer Assisted Instruction, which will be a self-learning software package, developed by the investigator after observation of mathematics classroom to understand the student's ability, potential, grasping power and other learning behaviour.
- Achievement in Mathematics: The marks scored by each student in the test constructed by the investigator on the arithmetic unit will be the achievement of that student.
- Effectiveness: In the context of the present study effectiveness refers to relative increase in the scholastic achievement of the experimental group students compared to that of control group students and the reaction of experimental will be considered.

5.08 Delimitation of the Study

The present study was delimited to standard VIII English Medium GSHSEB students and only arithmetic unit of the mathematics textbook in the year 2009 was covered during experimentation of the present study.

5.09 Methodology of the Study

5.9.1 Design of the Study

The present study is experimental in nature. True experimental design was followed in this present study. The design was posttest-only control group design.

Initial Try out

Investigator collected VII standard mathematics scores of the students from school 1 and three matched groups were formed randomly according to comparable mean and standard deviation of their mathematics achievement, during this process different sections (section A, B and C) of the school were not disturbed. Groups A, B and C were randomly selected by using lottery method for experimental purpose. Section C of school 1 was selected as control group, which was taught by conventional method by schoolteacher. Section B of school 1 was selected as experimental group which learnt through only CAI and named as group A for the study purpose. Section A of school 1 was selected as experimental group, which learnt through CAI with simultaneous discussion and named as group B for the purpose of the study. After completion of CAI on profit and loss, simple interest and compound interest, they were tested by scholastic achievement test prepared by the investigator during phase III.

CAI was further modified according to the suggestions given by the students and observation by the investigator. Modified CAI was used for final try-out.

Final Try out

Three matched groups were formed randomly from VIII standard school 2 students according to comparable mean and standard deviation of their mathematics achievement test prepared by the investigator, during this process different sections (section A, B and C) of the school were not disturbed. Groups A, B and C were randomly selected by using lottery method for experimental purpose. Section B of school 2 was selected as control group which was taught by conventional method by schoolteacher. Section A of school 2 was selected as experimental group which learnt through only CAI and named as group A for the study purpose. Section C of school 2 was selected as experimental group which learnt through CAI with simultaneous discussion and named as group B for the purpose of the study. After completion of CAI on profit and loss, simple interest and compound interest, they were tested by scholastic achievement test prepared by the investigator during phase III.

5.9.2 Population of the Study

All students studying in Standard VIII English Medium school of GSHSEB was constituted the population.

5.9.3 Sample of the Study

VIII Standard students of two English medium school of Vadodara, following GSHSEB Syllabus, form the sample of the study. In order to select the school for sample, the researcher approached different English Medium Schools of Baroda, explaining and requesting the school authorities to grant permission for conducting study. In this case after approaching few schools, the researcher got permission from School 1 and School 2 having the required computer facility. Thus the selection of the schools for this study was done purposively considering the availability of computer facility and willingness of school to conduct the study.

5.10 Tools for Data Collection

Scholastic Achievement test (serving the purpose of post test). Achievement test was prepared by the investigator on the basis of content analysis. The test was validated by the experts. Reaction Scale was prepared by the investigator and was given to experts for their suggestions.

5.11 Data Analysis

Collected data were analysed through appropriate statistical techniques. To study the effectiveness of the developed CAI ANOVA was computed. Reaction Scale was analysed using Chi Square technique.

5.12 Major Findings

The analysis and interpretation of data in the previous paragraphs reveals the following major findings.

5.12.1 Findings from the Analysis of the ANOVA Result for Initial Try-out

Initial try out using inferential statistics ANOVA at .05 level of significance it was found that there was significant difference between the mean achievement score of Experimental Group A, Experimental Group B and the Control Group. Further using Tukey HSD Test it was found that

- i. There was no significant difference between the mean achievement score of Experimental Group A (only CAI) and the Control Group (Conventional Method).
- ii. There was significant difference between the mean achievement score of Experimental Group B (CAI with simultaneous discussion) and the Control Group (Conventional Method)
- iii. There was significant difference between the mean achievement score of Experimental Group A (only CAI) and the Experimental Group B (CAI with simultaneous discussion).

5.12.2 Findings from the Analysis of the ANOVA Result for Final Try-out

Final try out using inferential statistics ANOVA at .05 level of significance it was found that there was significant difference between the mean achievement score of Experimental Group A, Experimental Group B and the Control Group. Further using Tukey HSD Test it was found that

- i. There was no significant difference between the mean achievement score of Experimental Group A (only CAI) and the Control Group (Conventional Method).
- ii. There was significant difference between the mean achievement score of Experimental Group B (CAI with simultaneous discussion) and the Control Group (Conventional Method)
- iii. There was no significant difference between the mean achievement score of Experimental Group A (only CAI) and the Experimental Group B (CAI with simultaneous discussion).

5.12.3 Findings from Analysis of Reaction Scale for Initial Try-out

I. Experimental Group A

Out of total *fifty four* statements bearing positive as well as negative nature, the computed chi-square values of *twenty six* statements were found to have statistically significant *higher values*

than the tabulated value of chi-square at 4 degrees of freedom and at .05 level of significance which shows that there was a significant difference between the observed and expected frequencies and the students were found to have positive reaction and favorable attitude towards the statements carrying such higher values.

The computed chi-square values in *twenty four* statements were *not found to be significant* at 4 degrees of freedom and at .05 level of significance which shows that there was no significant difference between the observed frequency and expected frequency therefore null hypothesis is not rejected. This reveals that reaction is *uniformly distributed* in the 5-point scale.

The computed chi-square values of remaining *four statements* were found to have statistically significant higher values than the chi-square table value at 4 degrees of freedom and at .05 level of significance which shows that there was a significant difference between the observed and expected frequencies and the students *were found to have neutral attitude* towards the statements carrying such higher values.

II. Experimental Group B

Out of total *fifty four* statements bearing positive as well as negative nature, *the computed chi-square values of twenty five statements were found to have statistically significant higher values than the chi-square table values* at 4 degrees of freedom and at .05 level of significance which shows that there was a significant difference between the observed and expected frequencies and the students were found to have positive reaction and favorable attitude towards the statements carrying such higher values.

The computed chi-square values in *twenty four* statements were *not found to be significant* at 4 degrees of freedom and at .05 level of significance which shows that there was no significant difference between the observed frequency and expected frequency therefore null hypothesis is not rejected. This reveals that reaction is uniformly distributed in the 5-point scale.

The computed chi-square values of remaining *five statements* were found to have *statistically significant higher values* than the chi-square table values 9.49 at 4 degrees of freedom and at .05 level of significance which shows that there was a significant difference between the observed and expected frequencies and the students *were found to have neutral attitude* towards the statements carrying such higher values.

5.12.4 Findings from Analysis of Reaction Scale for Final Try-out Experimental Group A

Out of total *fifty four* statements bearing positive as well as negative nature, the computed chi-square values of *twenty seven* statements were found to have statistically significant higher values than the chi-square table values 9.49 at 4 degrees of freedom and at .05 level of significance which shows that there was a *significant difference* between the observed and expected frequencies and the students were found to have positive reaction and favorable attitude towards the statements carrying such higher values.

The computed chi-square values in *twenty four* statements were not found to be significant at 4 degrees of freedom and at .05 level of significance which shows that there was *no significant difference* between the observed frequency and expected frequency therefore *null hypothesis is not rejected*. This reveals that reaction is uniformly distributed in the 5-point scale.

The computed chi-square values of remaining *two* statements were found to have statistically significant higher values than the chi-square table values 9.49 at 4 degrees of freedom and at .05 level of significance which shows that there was a *significant difference* between the observed and expected frequencies and the students were found to have neutral attitude towards the statements carrying such higher values.

The computed chi-square values of *one* statement was found to have statistically significant higher values than the chi-square table values 9.49 at 4 degrees of freedom and at .05 level of significance which shows that there was a *significant difference* between the observed and expected frequencies and equal number of students were found to have positive reaction as well as equal number of negative reaction towards the statement.

Experimental Group B

Out of total *fifty four* statements bearing positive as well as negative nature, the computed chi-square values of *thirty one* statements were found to have statistically significant higher values than the chi-square table values 9.49 at 4 degrees of freedom and at .05 level of significance which shows that there was *significant difference* between the observed and expected frequencies and the students were found to have positive reaction and favorable attitude towards the statements carrying such higher values.

The computed chi-square values in *nineteen* statements were not found to be significant at 4 degrees of freedom and at .05 level of significance which shows that there was *no significant*

difference between the observed frequency and expected frequency therefore *null hypothesis is not rejected*. This reveals that reaction is uniformly distributed in the 5-point scale.

The computed chi-square values of remaining *four* statements were found to have statistically significant higher values than the chi-square table values 9.49 at 4 degrees of freedom and at .05 level of significance which shows that there was *significant difference* between the observed and expected frequencies and the students were found to have negative attitude towards the statements carrying such higher values.

5.13 Conclusion

- In both the tryouts it was found that CAI was as effective as conventional method therefore it can be concluded that CAI can be used as substitution for conventional method wherever and whenever necessary.
- In both the tryouts it was found that CAI with simultaneous discussion was effective than the conventional method therefore it can be concluded that CAI should be developed in mathematics at primary school level in the topics students find it difficult to learn in the classroom teaching and can be used along with the conventional method.
- In Initial Tryout CAI with simultaneous discussion was effective than the only CAI and in Final Tryout CAI with simultaneous discussion was as effective as only CAI. The students in the Final Tryout was intelligent and computer savy than the Initial Tryouts therefore it can be concluded that the need for presence of teacher depends upon the entry level of students.
- The overall reaction of the experimental group students in both the tryouts was positive towards developed CAI therefore it can be concluded that students liked learning mathematics through CAI.

5.14 Suggestion

The present study may bring new area to be studied by the future researchers. The content which was not covered by the present study can be taken up for further study. CAI can be developed in other subjects too. Most of the schools have computer facility and this facility can be used to learn other subjects. CAI should be developed in other topics of class VIII mathematics textbook. CAI should be developed in other subjects of class VIII mathematics textbook. CAI should be developed for higher secondary mathematics text book. CAI should be developed with the help of new emerging software or computer language. A study should be conducted with variables other than those that were not covered in the present study. CAI should be developed with facility of on line

discussion with the students. An in-depth and comprehensive study should be conducted using qualitative and quantitative techniques, more data should be collected in all possible data collection techniques and accordingly data analysis should be performed to draw conclusions. Spoken tutorials can be developed using Camp studio software and effectiveness of the developed programme can be found out.