CHAPTER III - PLAN AND PROCEDURE OF THE STUDY

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3.01 Introduction

This chapter is the backbone of this thesis as it gives outline of the research design.(Singh, 1982) The research design is the detailed plan of the investigation. In fact, it is the blueprint of the detailed procedures of testing the hypotheses and analyzing the obtained data. Also it is well known fact that prior to start of any research there should be clarity about the plan and the procedure of the study. This is because the researcher will be mentally prepared about the steps to be adopted while carrying out the actual research, time can be management and to overcome the hurdle during the implementation. Methodology decides the nature, plan and procedure of the study. As such it is regarded as the main body of the research. It is desirable to have a proper methodology to design the research plan prior to data collection. In the present chapter, the aspects of the methodology like population, sample, and procedure for development of CAI, construction of tools, data collection techniques and procedure of data analysis have been discussed along with the objectives and hypothesis of the study.

3.02 Plan of the Study

The study used experimental design and Post-test-only control group design was employed for the present study.

The study was conducted in the following phases.

Phase –I: Selection of Sample for the study

The investigator went through the standard VIII mathematics textbook of English Medium, which is prescribed by GSHSEB and she took arithmetic unit (profit and loss, simple interest and compound interest) from the standard VIII mathematics textbook for preparing CAI. She visited schools and requested the principal for granting the permission to conduct the experiment. Two schools(school 1 and school 2) granted permission and also had computer facility therefore these schools were selected for the present study. Investigator observed different division of VIII standard mathematics class of the selected school 1 to know the mathematical ability, grasping level, potential, level of understanding and other relevant learning behaviour of students in mathematics class.

Phase –II: Development of the CAI

As mentioned in phase I based on the observation of school 1 the investigator had enough data to develop CAI. CAI was developed based on the needs of the students, content, keeping in mind mathematical ability and other relevant learning behaviours by the investigator. Actual development of CAI is explained in the next paragraph. It was shown to the experts in the field of Mathematics Education, Technology, English and Mathematics. The experts were informed about the observation regarding level of the students and their mathematical ability. The investigator incorporated the suggestions given by the experts and finalized the developed CAI.

For developing CAI, investigator had taken the arithmetic unit from VIII standard mathematics textbook of GSHSEB English version published in the year 2004, which was followed during the year 2010. Arithmetic unit has the following topics Profit and Loss, Simple Interest and Compound Interest. Keeping in mind the following instructional objectives the CAI was developed.

Instructional Objectives

Instructional Objectives in Taxonomic Categories

1. Students will be able to compare marks by calculating percentage.
2. Students will be able to calculate profit/loss when cost price and selling price is given.
3. Students will be able to calculate profit%/loss% when cost price and selling price is given.
4. Students will be able to calculate selling price when cost price and profit/loss is given.
5. Students will be able to calculate selling price when cost price and profit/loss% is given.
6. Students will be able to calculate purchase price when selling price and profit/loss% is given.
7. Students will be able to identify important instructions on the picking of medicine.
8. Students will be able to calculate percentage of profit during transaction between manufacturer, wholesale dealer and retailer.
9. Students will be able to calculate percentage of profit in the problems involving commission on printed price.
10. Students will be able to calculate percentage of profit and sales price in problems involving commission.
11. Students will be able to calculate percentage of profit when printed price, discount is given.
12. Students will be able to calculate percentage of profit when discount percentage and decided profit percentage on the purchase price is given.

13. Students will be able to calculate combined profit/loss when more than one thing with different sales are involved.
14. Students will be able to calculate interest and amount when principal, rate and time is given.
15. Students will be able to calculate interest and amount when principal, rate in decimal and number of years in decimal is given.
16. Students will be able to calculate interest and amount when principal, rate and number of months is given.
17. Students will be able to calculate interest and amount when principal, rate in decimal and dates are given.
18. Students will be able to calculate principal, when interest, rate and time is given.
19. Students will be able to calculate rate, when interest, principal and time is given.
20. Students will be able to calculate time, when interest, principal and rate is given.
21. Students will be able to calculate compound interest and amount when principal; rate and time are given without using the formula.
22. Students will be able to calculate compound interest using formula.
23. Students will be able to calculate compounded amount using formula.
24. Students will be able to calculate difference between simple interest and compound interest.
25. Students will be able to calculate compound interest in practical problems.
26. Students will be able to calculate principal if year, rate and compound interest is given.
27. Students will be able to calculate rate if year, principal and compound interest is given.
28. Students will be able to calculate rate of compound interest if amount of maturity, principal and number of years is given.
29. Students will be able to calculate time when amount, rate of compound interest and amount is given.
30. Students will be able to calculate principal when compound interest, number of years, and rate is given.

Phase –III: Development of the Tools

In this phase two tools were need for the study viz. Scholastic Achievement test and Reaction Scale whose description is given below.

1. Scholastic Achievement test (serving the purpose of post-test) was prepared by the investigator on the basis of content analysis (refer appendix). The test was validated by the experts (test paper is attached in the appendix).

2. Reaction Scale was developed by the investigator to study the effectiveness of the developed CAI and given to experts to check for content validity and language used in the reaction scale. They were given objective of the study and clearly stating the purpose of reaction scale. With the help of experts 54 statements were finalized (Reaction Scale is attached in the appendix).

Phase –IV: Implementation of the developed CAI

To study the relative effectiveness of different modes of teaching arithmetic unit comparable three groups viz. group A, group B and group C of standard VIII students were formed from two English medium schools which were selected in phase 1. Group A was the experimental group (only CAI) and group B was another experimental group (CAI with simultaneous discussion) while group C was the control group taught by conventional method by the schoolteacher. Time taken for teaching three groups by different modes was the same.

School 1 was considered for initial try-out while school 2 was considered for final try-out. In both these schools experimental group A learnt the selected arithmetic unit using developed CAI only, while experimental group B learnt with CAI along with simultaneous discussion held with investigator whenever required by the learners. The control group C was taught by schoolteacher in conventional method. In both the try-outs, the time taken by students of experimental group A, experimental group B and control group to learn the arithmetic unit was 30 periods each. The initial try-out in school 1 was conducted during the period from 1st December 2010 to 31st December 2010 whereas the final try-out was conducted during the period from 17th January to 4th February.

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.

Phase- V: To Study the Effectiveness of the Developed CAI

The investigator administered the achievement test developed in phase III after completion of arithmetic unit on group A, group B and group C students whereas reaction was administered on group A and group B. The scholastic achievement of students of all the three groups were analysed using ANOVA and responses of the students to the reaction scale were analysed using chi-square test to judge the effectiveness of the developed CAI.

3.03 Methodology

True experimental research design was followed in the present study. Details of methodology like, design of the study, population, sample, data collection and data analysis are discussed here as follows.

3.3.1 Design of the Study

True experimental design was followed in this present study. The design was post-test-only control group design.

According to (Tuckman, 1972) the post-test-only control group design is the potentially most useful true design. It can be diagrammed as shown below

R X O1

R O2

This design utilizes two groups, one of which experiences the treatment while the other does not, thus controlling for history and maturation. The appropriate analysis for dealing with data from the post-test-only control group design would be a comparison between the mean for O1 and the mean for O2.

R- The letter R indicates that factor, (for example, selection) have been controlled by using randomization. Etc.,

X-To designate a treatment

O-To designate an observation or measurement

Blank Space- indicates no treatment.

According to (Koul, 2008) two groups, Randomized Subjects, Post-test only control group Design is described as follows

Table 3.1: Post Test Only Control Group Design

Randomly assigned group	Independent variable	Post-test
Experimental	Teaching through CAI	O1
Control	Teaching through conventional method	O2

Advantages

1. The main advantage of this design is randomization, which assures statistical equivalence of the groups prior to the introduction of the experimental treatment.
2. Since no pre-test is used, this design controls for the main effects of history, maturation, and pre-testing. Moreover, there can be no interaction effect of pre-test and independent or experimental variable.

3.3.2 Population of the Study

The population of the study consisted of standard VIII students of English medium schools of Vadodara City following the syllabus of GSHSEB in the year 2010.

3.3.3 Sample of the Study

VIII Standard students of two English medium schools of Vadodara, following GSHSEB Syllabus were selected purposively who formed the sample of the study.

In order to select the schools for sample, the investigator 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 investigator 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.

3.3.4 Procedure for Data Collection

The present study has two major aspects, one was the development of CAI and another was to study the effectiveness of the developed CAI. The procedure for the development of CAI has been described earlier. To study the effectiveness of the developed CAI, a scholastic achievement test (developed in phase III) serving the purpose of posttest was administered at the end of the program to all the groups and reaction scale (developed in phase III) was administered to the experimental groups. Investigator corrected the test paper and got the score of individual students.

3.3.5 Data Analysis

Collected data were analyzed through appropriate statistical techniques. To study the effectiveness of the developed CAI, ANOVA was computed. Reaction Scale was analyzed using Chi Square test. A detailed analysis is discussed in the next chapter.

3.04 Details of Developed CAI

CAI has different slides (detailed description is given below). The slides are developed considering the instructional objectives in above-mentioned taxonomic order. Care is taken to arrange the slides in the increasing order of difficulties. Each slide contains a part of the content. This content was followed by a question, students are supposed to answer this question and they can refer to the answer that immediately follows. Sometimes explanation and examples are given before giving actual questions, so students can understand the subject better and they can learn without difficulty. Attempts were made to simplify and enrich the contents wherever possible. It included drilling/

practice exercise wherever necessary. This sequence of content followed by question and answer is called stimulus-response. Investigator discussed with small group (5 to 7) of VIII standard students near her house who belong to different schools about examples that can be included in CAI and got their ideas. After completion of CAI she asked them to see to check whether the language used and explanation is of their level and whether they can follow without any difficulty. Their comments and their suggestions were properly included in CAI. This was only pilot study. She also checked with her son who was in standard IX and his suggestions were also properly taken care of. All his friends (standard VIII students) suggested including video along with the slide so investigator included video also in CAI. In this manner she checked the language used, sequencing, level of understanding matching with standard VIII students. The completely developed CAI is given in CD along with this thesis.

In the similar pattern the entire topic is developed into 56 frames. After each subtopic is completed there is revision exercise, followed by 'test yourself' and 'answer key'. After completion of the entire sub topic criterion test is provided, this includes all the subtopics followed by answer key. This CAI was shown to two subject experts in the field of mathematics for validating in terms of the content of the subject and clarity of the language used in the material. Finally suggestions given by the experts were incorporated.

Power point presentation (ppt) named "All in one ppt" has 5 slides- one can go to all topics from any one of these last four slides by simply double clicking the required topic.

- Slide 1 with title "ALL IN ONE" and name of the investigator and Guide.
- From Slide 2 one can choose topics viz. introduction, Chapter 5 or Chapter 6.
  - Introduction has two subtopics viz. Percentage (Basic Concept) and Application of Percentage.
    - Percentage (Basic Concept) has fifteen slides. This ppt is prepared on basis of previous knowledge of the students which they studied in VII standard. Percentage is useful in learning the three topics selected for the study. Animation used in this slide in taken from Google.
    - Application of Percentage contains six slides. Some examples related to percentage are given. This will develop student's interest to learn percentage and the related topics. Animation used in this slide in taken from Google.

- Chapter 5 has two subtopics viz. Basic Concept of Profit and Loss and Profit and Loss.
  - Basic Concept of Profit and loss contains twenty slides. This deals with the concept that they learnt in VII standard. This helps the students to quickly revise the syllabus which they learnt in VII standard. Animation used in this slide in taken from Google.
  - Profit and Loss contains 60 slides this deals with the present topic of VIII standard. Some of the slides are taken from the website http://www.powershow.com/view/1564fa-ZmU3Z/BOMBAY_CAMBRIDG_GURUKUL_powerpoint_ppt_presentation This contains subtopic; explanation of each subtopic followed by questions and immediate answer, student can evaluate their learning by themselves. There are some breaks in between to refresh their mind. From 10^{th} slide on can go to more problems and answers for more practice and as recapitulation. In the end there are MCQ's student can solve and then they can check their answer by clicking the answer they choose. If the answer is correct then slide showing laughing face saying **CORRECT** will appear as reinforcement. If the answer is wrong, then **SORRY** slide will appear with back ground sound. Students can click **solution** to know the correct solution. There are more than 20 questions. From End slide one can go more problems.
- Chapter 6 had three subtopics viz. Simple Interest, Introduction to Compound Interest and Compound Interest.
  - Simple Interest contains 37 slides, first few slides with introduction of the topic. Some of these slides are taken from the web site www.swtc.edu:8082/.../Ch%208%20**Simple**%20**Interest**%20Section%..., mathscienceeducator.weebly.com/uploads/1/2/5/.../**simple_interest.pp**... highered.mcgraw-hill.com/sites/dl/free/0073377538/.../**Chap**010.**ppt .**
    - From slide 24 one can go to 'word documents' for more practice.
    - To the ppt called **more problems in Simple Interest.**

    In the end there are MCQ's student can solve and then they can check their answer by clicking the answer they choose. If the answer is correct then slide

showing laughing face saying **CORRECT** will appear as reinforcement. If the answer is wrong, then **SORRY** slide will appear with back ground sound. Students can click **solution** to know the correct solution. There are more than 10 questions. From End slide one can go to reference URLs for more understanding of the topic.

- Introduction to Compound interest contains 17 slides. Some slides are taken from the website www.cod.edu/.../Math%201100%20-%20Chapter%2013-15.**ppt.** Compound Interest is introduced through some basic examples and with explanations. From this explanation students can understand about the basic concepts of compound interest and difference between simple interest and compound interest.
- Compound Interest contains 72 slides starting with the introduction of the concept, derivation of compound interest formula, comparison with simple interest, calculation of compound interest without formula and introduction to the formula. More than 15 related questions with break in between are given. In the end there are MCQ's. Students can solve these questions and then they can check their answer by clicking the answer they choose. If the answer is correct then slide showing laughing face saying **CORRECT** will appear as reinforcement. If the answer is wrong then **SORRY** slide will appear with back ground sound. Students can click **solution** to know the correct solution. From End slide one can go to reference URLs for in-depth understanding of the topic.

- Slide 3 has connection to the topics viz. URL's You can surf the following site's to get more information, Revision before Examination, Watch Video, Take Sample Test and Take Test.
  - There are Video's related to the topics students can watch and understand the topic in depth and this different mode of presentation of the same topic will increase the interest among them and they can learn with very little stress, in fact they can enjoy and learn. These videos are downloaded from internet.
  - There are tests students can take them before actual test, they can get immediate feedback from them, and they can decide whether they need some more preparation or not and how well they are prepared for the topic.

- Slide 4 has topics viz percentage (basic concepts), Application of percentage, Basic concept of profit and loss, Profit and loss, Simple interest, Introduction to compound interest and Compound interest.
- Slide 5 has the following topics viz. URL's, You can surf the following site's to get more information, Revision before Examination, Watch Video, Take Sample Test and Take Test.

3.05 Actual Implementation of CAI

For the implementation of the CAI the investigator had taken the necessary permission from the School 1 and School 2 for initial and final try outs from the respective principals to carry out the experiment. Investigator requested the mathematics teachers for not to cover the syllabus before the experiment starts and actual procedure was discussed with them. A brief introduction about CAI was given to the mathematics teachers of the respective schools.

For initial try out two experimental groups and one control group were selected as discussed earlier. They were taught for one month for one period per day. Investigator went to the school in advance before starting the programme to install the CAI in all computers through the server. Investigator personally checked all computers whether they are in proper condition so that no disturbance will be there during the actual experimentation period. She also checked all computers whether CAI is working or not and also inserted password so that nobody can open it other than the investigator.

Investigator explained the students about the experiment and requested their cooperation throughout her study. She also explained the importance of the study and also requested them not to share notes etc with other groups. Investigator discussed with the mathematics teacher about every day program and divided the everyday program (the portion to be covered), so that both the group students learn the same portion every day. In order to assure experimental mortality investigator requested the whole class to be present till the program is completed and explained the importance of their presence and how it would be useful for the study. Attendance was taken every day and reported to the respective teacher.

Investigator discussed with the students, explained them how to use CAI and cleared their doubts. Proper instructions were given to the students to go through the slide in a systematic manner. Students are allowed to skip any slide if they understood or to go back to the same slide so that fast learner can learn fast and slow learner can learn in their own speed. Pace of learning for

different students were different. There were few naughty students who played with the slide and were doing something else when not monitored. They were scolded at some times for their act. Many students liked the way of presentation and they gave their valid suggestion for further improvement and they liked when investigator gave her email id for online discussion. They also suggested that investigator should develop CAI for some difficult topics which they really find it difficult in actual classroom situation. They also told that this mode of presentation they liked and asked investigator to be their teacher. Most of the students are of the opinion that they need teacher along with the presentation for better understanding. They also suggested that some stories, dramas etc should be included to make the presentation livelier. They wrote some dialog to be included in CAI. It was quite interesting experience for the investigator and she really liked it.

Tests were taken after completion of each topic and results were discussed with the students and necessary feedbacks were given to monitor their progress. After completion of profit and loss, simple interest and compound interest, they were tested by scholastic achievement test prepared by the investigator on the basis of content analysis. Again test results were discussed with the students and results were given to the respective teachers. Mathematics teacher liked the presentation and she also needed the presentation to show it to control group students after experiment was completely over. A copy of presentation was given to the students for further reference.

Same procedure was adopted for final Try-out. School had enough computers and all computers were in working condition throughout the study. There were separate computers for each student. Before starting the experiment many students had doubt whether they can learn by themselves using CAI. Even mathematics teacher also had the same doubt. Investigator explained how she prepared the CAI and all the Psychological theories adopted like principle of small steps, with learners pace etc. She also said that it was effective in initial Try-out and how students happily responded to CAI. Every day at 8.00 a.m. investigator started the class for one group of students. Other section students went for prayer. Next class entered in Zero period and previous batch of students had PT during that time, simultaneously control group students had mathematics period. In this manner the whole programme was arranged without any confusion. Students responded positively during the programme. They also found few calculation mistakes, investigator corrected those mistakes immediately. All students enthusiastically participated in the whole study but they liked to discuss in small groups, very few students went through the slide individually. They liked to go through the slides in groups rather than individually. They were discouraged to discuss in groups

and individual learning was encouraged. During those time investigator explained the importance of the study and also explained that she wanted to know whether students can learn individually without others help. She also explained that this is an auto instructional material and students are supposed to learn by themselves. In total they enjoyed the whole programme and cooperated with the investigator. Investigator enjoyed the whole experience because firstly students liked CAI and secondly a sense of self satisfaction and achievement was felt by her because the whole programme was developed by her. All students expressed their feelings about the developed CAI they said that they sometimes don't like the monotonous learning in conventional method and sometimes they are forced to learn when they really don't want to. In this method they can learn whenever they like to learn, whenever their mind is receptive and with their own speed, unlike conventional classroom where teacher teaches in same speed to different kinds of learner. They wanted to interact with the teacher along with the slides whenever they are facing with the difficulty. Investigator felt that there should be video conferencing along with this method so that they can interact on line whenever necessary. CAI can act as a support but cannot replace the presence of teacher whether physical presence or virtual presence of a teacher is essential.

Investigator gave tests after completion of each topic and also discussed the results with the students for feedback purpose, so that students can judge themselves about their learning and also can improve or redo the same topic. They were taught for thirty period for each group. After completion of profit and loss, simple interest and compound interest, they were tested by scholastic achievement test prepared by the investigator. Investigator also discussed with the students about their result and result was submitted to the respective teacher. After completion of the programme CAI was shown to the control group students they also enjoyed CAI. Students said that they wanted soft copy of CAI investigator allowed them to take in their pen drives.

3.06 An Overview

This entire chapter provides a clear direction to the investigator about the plans and procedures followed during the experimentation. It has dealt with details of methodology and lastly for setting the steps for and interpretation of the data. Such an analysis will lead to conclusion, which is the essence of the work. The detailed analysis and interpretation of result is discussed in the following chapter.