CHAPTER III

METHODOLOGY AND PROCEDURE OF THE RESEARCH

3.1 INTRODUCTION

The present research study aimed at ascertaining the effect of Computer-Assisted Instructional programme in comparison with conventional classroom teaching on selected units in Geography for the students of standard VIII. The researcher has selected units from the textbook ‘World Geography- part II’ (physical geography section). The first phase of this study was concerned with the development of Computer-Assisted Instructional programme on all selected units and in the second phase, an experiment was conducted on two divisions of standard VIII to determine the effectiveness of Computer-Assisted Instructional programme. This chapter describes the method and procedures employed in this study.

3.2 THE PROCESS OF EDUCATIONAL RESEARCH -

The process of educational research has certain steps, which are ordinarily performed in a sequential fashion by any researcher while conducting a research.

Following fig. 3.1 represents the process of educational research:
3.3 TYPES OF EDUCATIONAL RESEARCH:

Research method gives an idea to the researcher about various steps for solving the research problem. Preplanned and well-described method provides the researcher scientific and feasible plan for attacking and solving the problem in systematic manner.

Following are the three types of educational research:

(Fig. 3.2 TYPES OF EDUCATIONAL RESEARCH)
Fundamental research is usually carried on in a laboratory or other sterile environment. This type of research, which has no immediate or planned application, may later result in further research of an applied nature. Whereas applied research has most of the characteristics of fundamental research, including the use of sampling techniques and the subsequent inferences about the target population. Its purpose is improving a product or a process of testing theoretical concepts in actual problem situations. Applied research attempts to develop generalizations about teaching-learning processes and instructional materials. (Best & Kahn, 2002, pg. 23) The present research study is an ‘applied research’.

To solve particular research problem, the researcher has to employ specific research design. There are various research designs as follows:

![Diagram of Research Designs](image)

(FIG: 3.3 TYPES OF RESEARCH DESIGN)

Out of the above methods the researcher has adopted ‘Experimental Design’.
3.4 FORMULATION OF RESEARCH DESIGN:

Selection of research design is the most important decision for the researcher. Selection of a particular design is based on the purpose of the experiment, the types of variables to be manipulated and the conditions or limiting factors under which the experiment is conducted.

Experimental research provides a systematic and logical method for answering the question. An experiment involves the comparison of the effects of a particular treatment with other treatment. (Best, & Kahn, 2002, Pg.133) Thus, an experimental design is the blueprint of the procedure that enables the researcher to test hypotheses by reaching valid conclusions about relationships between independent and dependent variables. (Best, 1995, pg.146)

The experimental designs vary in complexity and adequacy depending on such factors as the nature of the subject under investigation, the nature of the data, and the facilities of carrying out the study and specially the research sophistication and competency of the investigator. (Singh, 1999, pg.8) The design deals with such practical problems as to how subjects are to be assign to experimental and control groups, the way variables are to be manipulated, and controlled, the way extraneous variables are to be controlled, how the observations are to be made and the type of statistical data to be employed and interpret data relationship. The adequacy of an experimental design is judge by the degree to which it eliminates or minimizes threats to experimental validity. Following are the important categories of experimental designs –

(FIG.:3.4 TYPES OF EXPERIMENTAL DESIGN)
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For the present research study, the researcher has employed the ‘Quasi-experimental design’.

3.4.1 QUASI-EXPERIMENTAL DESIGN:

Quasi-experimental design involves the selection of groups, upon which a variable is tested, without any random pre-selection process. After this selection, the experiment proceeds in a very similar way, to any other experiment, with a variable being compared between different groups, or over a period of time.

There are various types of Quasi-experimental group design; out of which the researcher has employed ‘The pretest posttest non-equivalent group design’.

3.4.1.1 THE PRE-TEST POST-TEST NON-EQUIVALENT GROUPS DESIGN:

The pretest posttest non-equivalent group design is often used in the classroom experiments when experimental and control groups are such naturally assembled groups as intact classes, which may be similar. The difference between the mean of pretest scores and the mean of post test scores (mean gain scores) are tested for statistical significance. (Best J.W.; Kahn J.V.; 2002, pg.151)

Pretest posttest non-equivalent groups design involves comparison of pre-test scores that allows the researcher to evaluate how effective the randomization of the sample is in providing equivalent groups. The treatment is fully under control of the researcher. The dependent variable measured twice during the study (before and after the manipulation of the independent variable).

The researcher has conducted the treatment on both the groups as follows-
The procedure of treatment was conducted in three steps as-

**Step I: Administration of Pretest.**

The researcher has administered ‘pretests’ on both the groups for measuring the dependent variable i.e. achievement tests.

**Step II: Administration of experimental treatment**

The experimental group received instructions through CAI and the control group received instructions through conventional teaching after the pretest.

**Step III: Administration of posttest (measurement of independent variable)**

The researcher has administered the posttest on both the groups after the treatment. The mean gain score of pretest and posttest was compared to study the
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effect of the independent variable (CAI program) on the dependent variable (achievement test conducted after the treatment i.e. posttest)

3.4.2 RATIONALE BEHIND THE SELECTION OF THE DESIGN:

The pre-test post-test nonequivalent groups design has certain advantages and limitations as-

On favorable side it permits the researcher to conduct an experiment by self in both the classes, without any assistance since in both the classes the researcher was delivering the instructions.

On the limitation side, the method does not necessarily establish experimental control; it fails to control many non-experimental variables. It is difficult to ascertain whether the pre-test and posttest score results from the influence of the independent variable or other variables. The disparity, if any, may attribute to the fact that students were older, less enthusiastic or more fatigue when they attempt for the second test. Perhaps the difference may be due to extra efforts that students exerted because they were proud to be a participating in the experiment.

Even though the researcher was aware of the above mentioned advantages and limitations in pretest posttest non-equivalent groups design, had chosen this design for following reasons- 

1. The researcher had only one year in hand to conduct the experiment on the selected topic, due to change in syllabus from next academic year.

2. The main objective of the researcher was to develop Computer-Assisted-Instructional Programmes on selected units in Geography for the students of standard VIII and study its effectiveness of in comparison with the conventional classroom teaching. The researcher felt that to achieve this objective the selected research design is the best option to get better results.

3.4.3 VARIABLES OF THE PRESENT RESEARCH STUDY:

- Independent – CAI
- Dependent - Achievement test
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- Controlled variables - teacher, unit and duration

3.4.4 SAMPLE:

The primary purpose of research is to discover principles that have universal application, to arrive at generalizations. The process of sampling makes it possible to draw valid inferences or generalizations based on careful observation of variables within a relatively small proportion of the population. (Best, J.W.; Kahn J.V., 2002, Pg.13)

A population is any group of individuals that have one or more characteristics in common that are of interest of researcher. The population of the present research study was comprised of the group of English medium students from Pune city studying the subject Geography prescribed by Maharashtra State bureau of textbook Production and Curriculum Research.

A sample is a small proportion of a population selected for observation and analysis. By observing the characteristics of the sample, the researcher can make certain inferences about the characteristics of the population from which it is drawn.

The researcher has selected incidental sample of an English medium school from Pune city comprised of two intact divisions of standard VIII. The sample was from ‘Sinhgad Technical Education Society’s, Sinhgad Springdale School, Narhe Campus, Pune -411041’. Total 92 students (46 students from one division each) were selected as sample. Students of one division were assigned as experimental group and from other division were assigned as control group.

3.4.4.1 SELECTION OF SCHOOL:

While selecting the school the researcher had to keep in mind certain aspects such as-

- Availability of the school’s own computer lab
- Medium of instruction had to be English as the program was prepared in English
- Students were needed basic knowledge of computers
- Co-operation of school management
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- Co-operation of the subject teacher and the lab instructor
- Availability of adequate number of computers
- Availability of adequate number of divisions of standard VIII in the school
  
  (See Appendix IX – Photograph 1)

3.4.5 TOOLS OF DATA COLLECTION:

1. Achievement Test on each of the selected units in Geography was used both as pre-test and post-test.

2. Rubric for recording the responses of the students towards the study through CAI.

3. Observation

Before preparing achievement tests on the selected units the researcher has prepared blue print on each unit and framed the questions based on the objectives of knowledge, comprehension, application and skills. The researcher has prepared total nine achievement tests on nine selected units. (Appendix I-Blue print of achievement tests)

3.4.5.1 ACHIEVEMENT TEST-

Achievement tests attempts to measure what an individual has learned-his or her present level of performance. Achievement tests are generally helpful in determining individual or group status in academic learning. Achievement test scores are used in placing, advancing, or retaining students at particular grade levels. They are used in diagnosis of strength and weaknesses. (Best, J.W.; Kahn J.V, 2002, pg. 213)

Achievement test has great significance in all types of instructional progress of an individual. Several vocational and educational decisions depend on the student’s performance in the achievement test.

The researcher has developed nine achievement tests (Appendix II) used as pretest posttest. All the tests comprised of Objective questions, Essay type questions and Skill based questions. These tests were based on the text material included in the textbook as well as the Computer-Assisted-Instructional Program. Total 15 marks test
was prepared on each unit. The researcher prepared blue print and answer key for each test. Blue print of each unit test represents the specification of the items on content and instructional objectives.

The achievement tests comprised of following type of questions:

- Fill in the blanks
- Match the pairs
- Answer in one sentence
- Classify the following
- Give reasons for
- Write short note on
- Distinguish between the following
- Draw the following diagram of

Total nine Achievement tests were developed by the researcher. These tests were designed to measure student’s knowledge, comprehension, application, and skill. The combined percentage of items measuring knowledge, comprehension, application and skills components of all nine achievement tests were 66.67% of knowledge based questions, 11.11% of comprehension based questions, 18.52% of application based questions and 3.70% of skill based questions. These achievement tests (used as pretest and posttest) were comprised of 40 marks knowledge based, 16 marks comprehension based, 36 marks application based and 8 marks skill based questions.

**3.4.5.1.1 VALIDATION AND PILOT STUDY OF ACHIEVEMENT TEST**

An experienced Geography teacher and a Geography teacher educator validated the test. The list of expert panel has mentioned in (Appendix V) who validated all the tests.

Pilot testing was conducted on the students of VIII standard of another division in the same school. The researcher conducted the test as pilot testing to
ensure the appropriateness and reliability of the test. The researcher considered following points to ensure the criteria-

- The total time required for answering the test
- Preciseness and simplicity of the question in understanding
- Nature of question help in fulfilling objectives of the lesson

Conduction of pilot study helped the researcher in getting exact idea and direction to make necessary changes in the test if any.

3.4.5.2 OPINIONNAIRE:

An information form that attempts to measure the attitude or the belief of an individual is known as an ‘Opinionnaire’. Through the use of questions, or by getting people’s expressed reactions to the statements, a sample of their opinions is obtained. Following are the various methods to get opinion through:

- Questionnaire- open or closed end questions
- Interview
- Asking people to check in a list the statements with which they agree (Opinionnaire)
- Asking people to indicate their degree of agreement or disagreement with a series of statements about a controversial subject (Best & Khan, 2002, pg.245-246)

The researcher has prepared the rubric for recording the responses of the students towards the study through CAI. See (Appendix IV). The researcher has also collected expert’s suggestions regarding the CAI programme on each selected unit. See (Appendix VI)

3.4.5.3 OBSERVATION:

Observation technique is used in qualitative as well as quantitative research. In qualitative research it consists of detailed notation of behaviors, events and the contexts surrounding the events and behaviors. On the other hand, in quantitative research, observation is usually employed to collect data regarding the number of
occurrences in a specific period of time, or the duration, of very specific behaviors or events.

Data collected from observations consists of detailed descriptions of people’s activities, actions, and the full range of interpersonal interactions and organizational processes that are a part of observable human experiences. (Best, and Khan; 2006, pg.184)

Observation technique involves the description of verbal and non-verbal behavior of the sample.

In the present research study, researcher has used observation technique to scrutinize the student’s behavior towards the CAI program as follows–

- The students’ expressions while watching the program
- The way they approach to various slides while learning through CAI
- Student’s behavior with each other
- The curiosity they show towards the program and
- Students’ overall attitude towards the CAI program

3.5 PROCEDURE OF THE PRESENT RESEARCH STUDY:

Fig 3.2 represents the steps followed by the researcher in present research study:
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(FIG.: 3.6 PROCEDURE OF THE RESEARCH STUDY)
3.5.1 SELECTION AND FORMULATION OF THE RESEARCH PROBLEM:

It is an indispensable step in research to find out exact and prime problem with probable solution to work out. The researcher need to locate various important problems and try to get more information which would helpful in exploring the right path in solving the problem and in deducing the exact answer that would be applicable in similar problems as well.

After reviewing various difficulties related to teaching-learning process in Geography, the researcher thought that a new path could be explored to canalize technologically advanced visualizations of geography for the students to enable them to grasp difficult concepts in a better way. Therefore, the researcher has decided to study efficacy of Computer-Assisted Instruction (CAI) in comparison with conventional classroom teaching of ‘The Celestial Sphere and Physical Geography’ for the students of standard VIII.

3.5.2 REVIEW OF RELATED LITERATURE AND RESEARCH:

Since the effective research is based upon past knowledge, review of related literature helps to eliminate the duplication of what has been done and provides useful hypotheses and helpful suggestions for significant investigation. Citing studies that show substantial agreement and those that seem to present conflicting conclusions helps to sharpen and define understanding of existing knowledge in the problem area, provides a background for the research study, and makes the researcher aware of the status of the issue. (Best, J.W. & Kahn J. V. 2005, pg. 37-38)

The researcher has reviewed literature regarding meaning of CAI, History of CAI, Nature of CAI, Mechanism of CAI, and Modes of CAI, learning theories and CAI, Use of CAI in teaching-learning process, advantages and disadvantages of CAI.

Review of related researches helped the researcher in formulating the research design to obtain appropriate result. It also helps in deciding the tools and techniques to be used in present research study. The researcher has reviewed researches based on efficacy of CAI programme in-
• The subject Geography in India
• The subject Geography in Maharashtra
• Researches on use of Computer-Assisted instruction for the subject Geography
• Researches based on the comparison of traditional classroom teaching and CAI
• Researches to test effect of CAI in comparison with other teaching methods
• Researches to test effect of CAI on various attributes of the learner
• Effect of CAI on students’ attitude towards learning
• Effect of CAI on different types of learner
• Testing efficacy of CAI with other modes of CAI
• Effect of CAI and Gender difference
• Effect of CAI on learning time of the learner
• Effect of CAI for teaching various school subjects
• Effect of CAI for teaching various professions

After selecting the units, stating objectives and hypothesis of the present research study the researcher has proceed further with the annual planning.

After getting permission from the Principal of school, the researcher has started with the work and collected relevant information such as class timetable of both the selected divisions, list of holidays, and tentative dates of the examinations in the academic year from the respective class-teachers for annual planning.

3.5.3 ANNUAL PLANNING OF SELECTED UNITS:

The researcher has prepared annual plan for teaching the selected units of Geography on two divisions of standard VIII. The researcher has selected two teaching methods-

1. Teaching through CAI to the experimental group and

2. Teaching with conventional method to the control group students
3.5.3.1 STEPS INCLUDED IN PLANNING FOR CONVENTIONAL CLASSROOM TEACHING:

The researcher has prepared the annual plan for teaching the selected units to both the groups. For control group, the researcher has planned according to conventional classroom teaching and followed following steps:

- Annual planning of all the selected units by conventional classroom teaching
- Unit planning of each selected unit
- Lesson planning for each period
- Preparation of an achievement test for pretest and posttest on each selected unit
- Verification and checking of each test by geography method master and geography teacher before conduction of pretest
- Preparation of Blue print
- Preparation of answer key of an achievement test on selected units
- Actual conduction of pretest
- Teaching the unit through regular classroom method
- Conduction of posttest after teaching unit
- Evaluation
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(FIG. 3.7 ANNUAL PLANNING FOR CONVENTIONAL CLASSROOM TEACHING)

After the preparation of annual plan, the researcher has verified and checked it by the subject teacher and method master.

3.5.3.2 LESSON PLANNING FOR CONVENTIONAL CLASSROOM TEACHING

For preparing the lesson plan on each unit the researcher has considered following steps as:
Before actual classroom teaching, the researcher had prepared an achievement test on each selected unit and verified by the geography method master and geography teacher. The researcher made necessary changes in the tests as per suggestions acknowledged by the method master and subject teacher. Then the researcher had prepared blue print and answer key for each test. The researcher had assigned pretest for each selected unit before actual classroom teaching. Same achievement tests were given as posttest. The researcher followed this method for all the nine units selected for the study.
3.5.3 STEPS OF ANNUAL PLANNING FOR TEACHING THROUGH COMPUTER-ASSISTED INSTRUCTIONAL PROGRAMME:

- Annual planning of selected units for research study through CAI method of teaching
- Unit planning of each selected unit
- Content analysis of each selected unit
- Lesson planning of each period of teaching of selected unit
- Collection of relevant material, information for the development of CAI programme on each selected unit.
- Preparation of Power Point presentation for each selected unit
- Pilot study of each Power Point Presentation of selected unit by geography experts
- Preparation of an achievement test for pretest and posttest on each selected unit
- Verification and checking of each test by geography method master and geography teacher before conduction of pre test
- Preparation of Blue print
- Preparation of answer key of an achievement test on selected units
- Conduction of pretest before PowerPoint presentation of each unit
- Actual conduction of PowerPoint presentation of each unit in lab
- Conduction of Posttest on each unit after teaching
- Assessment of the test
The researcher had prepared the annual plan for teaching the experimental group through Computer-Assisted Instructional Programme on selected units from the physical geography section of the textbook ‘World Geography-Part II’. After the preparation of annual plan the researcher has verified and checked it by respected subject teacher and method masters.
3.5.3.4 UNIT PLANNING FOR THE SELECTED UNITS -

The researcher has prepared unit plan on each selected unit. While preparing unit plan the researcher has considered various aspects such as novelty and difficulty level of the content, teaching experience to be provide, examples to be given, activities to be assign to the learner etc.

3.5.4 DEVELOPMENT OF COMPUTER-ASSISTED INSTRUCTIONAL PROGRAMME -
As no proper CAI programme, covering the selected units of the subject “World Geography-Part II” of standard VIII was available; the researcher has developed computer-assisted instructional Programmes on each unit. The researcher had decided to develop the Computer-Assisted Instructional (CAI) Programme in English.

Before transforming the text material into CAI program the researcher had considered following positive aspects of classroom teaching to put those aspects in the CAI program:

- Strong interaction between the teacher and the student
- Students receives immediate feedback by the teacher
- While explaining the content, the teacher intersperses her teaching with questions to gauge students’ understanding.
- Teacher dictates notes and asks the students to copy down some important points.
- Use of question answers provides students with systematic, organized material for revision.
- Meaning of new words or terms explained with extra references.
- Difficult concepts revised thoroughly as and when required while teaching unit.
- Teacher asks some intricate and open-ended questions that made students to think their own and present their opinion in their own words.
- Teacher provides related information of local incidence as an illustration, to assist students’ better perceptive.

The researcher made it point to incorporate these positive aspects of classroom teaching in CAI program. To transform the text material into CAI programme researcher proceeded as mentioned below:

- The researcher assumed that learning might be enhance by elucidating unfamiliar terms and words and by making students encounter different learning experiences
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to activate their thought process. Text material alienate into segments in PowerPoint Presentation suitable for learning. Terms and words representing unfamiliar concepts in the text explained. Different types of questions based on text constructed to enhance and assess student learning. Importance was given to make learning more effective and cover the domains like cognitive domain (such as knowledge, comprehension etc.), affective domain (such as receiving and valuing etc.) and psychomotor domain (such as drawing). A conscious effort made while constructing PowerPoint presentation to enable the students assesses their knowledge and comprehension of the text. Some items such as asking student’s opinion regarding the topic included which encourage the students to apply their knowledge and comprehension.

- There was no criterion available to decide the proportion of items measuring knowledge, comprehension and application components of achievement. The researcher worked out the required proportion of emphasis for various levels of domain by classifying the objectives of teaching selected units in Geography in terms of Bloom’s Taxonomy. Text material in the Computer-Assisted Instructional programme was the same as in the textbook. Necessary elucidations to the terms, concepts to include in the programme validated by a panel of experienced Geography teacher, two Geography teacher educators and one Geography expert.

- Selected text material, elucidations of the unfamiliar terms and concepts transform into the Computer-Assisted Instructional (CAI) Programme through computer software PowerPoint and computer software packages like flash, 3D Studio etc. These software packages are interactive and user friendly. With the help of these software packages researcher has composed the Computer Assisted Instructional programmes. In each of the program, the text material was present in various slides with hyperlinks for explanations. The researcher has made the provision of evaluative questions for the students after each segment to get the immediate feedback.
Along with the above positive aspects, the researcher has noted certain limitations of traditional/conventional teaching method to minimize the risk of failure and increase the quality of CAI programme. Limitations of traditional method of instruction are- 

- It finds difficult in applying the fundamental principles while practically teaching in the classrooms 
- It is a group technique 
- The objectives are not well defined 
- The subject matter is not well organized 
- The individual differences of the learners are not cared for 
- The classrooms are crowded where large number of students are sitting 
- It is very difficult for the teacher to give immediate feedback to each and every individual 
- The students remain passive 
- The subject matter presented to the students in big chunks. They may or may not understand it properly (Tara C.&Pahuja, N. P., 2004, pg. 193) 
- Very less opportunity provided for learners self-learning 

After studying all the above mentioned limitations, the researcher has tried to minimize by adding various alternatives that would help to overcome these limitations while preparing the CAI programme. 

**3.5.4.1 STEPS IN DESIGNING AND DEVELOPING COMPUTER-ASSISTED INSTRUCTIONAL PROGRAMME:**

Developing a programme according to the needs of an individual is highly difficult task. Computer-Assisted instructional programme i.e. self-instructional programme is educational material from which the students learn. This programme is a sequence of small steps of instructional material (called frames).
Developing a programme is a cyclic process that never ends. This contains five different phases:

- Preparation
- Constructing or writing the programme
- Try out and revision
- Validation and
- Evaluation (Tara C. & Pahuja, 2004, Pg. 206-208)
**Phases of Preparation of Computer-Assisted-Instructional programme**

1. **Preparation**
   - Selection of the topic
     - Importance
     - Difficulty level in teaching
     - Need and reinforcement of the learner
     - Own teaching experience
   - Writing assumptions about the learner
     - Learners’ interest
     - Mental makeup
     - Liking and disliking
     - Attitude
     - Aptitude
   - Writing objectives in behavioural terms
     - General objectives
     - Specific objectives
   - Writing entry behaviour of the learner
     - Change in behaviour of the learner towards the programme
   - Developing specific outline of the content to be programme
     - Content-concepts
     - Extra information
     - Activities
     - Evaluation technique
   - Preparing a criterion test

2. **Constructing or writing the programme**
   - Writing draft frame
     - Previous knowledge
     - Sequence
     - Subject matter
     - Study of various learning theories for preparation of slides
     - Simple to complex
   - Editing the draft frame
     - Suggestions by subject expert
     - Suggestions by method master
     - Suggestion by subject teacher
     - Making changes according to suggestions

3. **Tryout and Revision**
   - Pilot study on few students
   - Observation of student’s expressions and response
   - Student’s opinion regarding the programme
   - Making changes in the programme

4. **Validation**
   - Checking and Opinion regarding the programme by subject expert

5. **Evaluation**
   - Achievement tests
   - Rubric
A. PREPARATION FOR DESIGNING AND DEVELOPING COMPUTER-ASSISTED INSTRUCTIONAL PROGRAMME:

1. SELECTION OF THE TOPICS/UNITS:

Exact selection of the topic is the most essential thing because on its utility depends the success of the programme. While selecting the present research topics/units the researcher noted the area of difficulties faced by the students in learning the selected subject. Based on previous experience in geography faculty, the researcher was aware of the difficulty level of the selected unit from teaching point of view. The researcher also studied the difficulties faced by other teachers in teaching selected topics/units and took the firm decision to work out on the units from Physical Geography section.

The researcher has selected the units from textbook of “World Geography” of standard VIII included in the syllabus of ‘Maharashtra State Board of Secondary and Higher Secondary Education’.

All the selected units include such a content, which if explain with the help of video clips, actual photographs, animated clips etc. may help to enhance the quality of teaching and learning of the subject. Taking the review of related literature the researcher felt that, through Computer-assisted instructional programme it is possible to explore multi intelligence power of the learner.

2. WRITING ASSUMPTIONS OF THE LEARNER:

The researcher felt that, it is essential to consider learner as a prime focus of attention before starting with the programme. Therefore, the researcher considered various aspects of the learner such as-

- Learners’ interest
- mental makeup
- Liking and disliking
- Attitude
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- Aptitude

While preparing the programme the researcher listed out the areas of interest of the learners. This provide the exact idea for the researcher, to make right decisions regarding the provision of various learning experiences and presenting the content in an interesting and attention-catching manner in front of the learner. Interesting and attention-catching introduction automatically creates the mental makeup of the learner. Learner’s readiness helps in developing right attitude towards self-learning. For testing the aptitude of each learner it is necessary to provide various activities in the programme.

The researcher felt that, writing assumptions of the learner help in developing the efficacy of the programme and in deducing appropriate conclusions regarding its efficacy.

3. WRITING OBJECTIVES IN BEHAVIORAL TERM

Writing the objectives includes the general and the specific objectives of the programme. It is very essential to set objectives before starting the work. The researcher considered the general objectives and the specific objectives for each selected unit in the lesson note of those units. These objectives help in deciding the way of presenting, explaining, and evaluating the content in the programme.

General objectives were about students’ cognitive, affective, psychomotor and interpersonal development. The researcher studied various learning theories (cognitivist, behaviorist and constructivist) to make the programme as effective as possible. The researcher thought that considering these objectives before starting with the programme might help to enhance to enrich the quality of teaching learning process and help to increase the efficacy of the programme.

Specific objectives were about the overall mission objective and enabling objectives. The researcher made some deliberate efforts in the programme to calculate learner’s overall change (mental, psychological, attitude, aptitude) and the enabling capacity (higher order abilities such as problem solving, thinking, concluding,
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handling). To test these abilities the researcher assigned various activities in the programme.

STATING THE OBJECTIVES OF THE LESSON- As each lesson is taught with the objective in mind, similarly all the lessons chosen for the research study. Each lesson when taught by regular classroom teaching method has also objectives but these objectives seems to be limited as the researcher felt that when same lesson taught through computer-assisted instructional programme it can achieve more objectives.

For example- Lesson: 5- Earthquakes and Volcanoes- The researcher stated following objectives while teaching the unit-

<table>
<thead>
<tr>
<th>Objectives:</th>
<th>Students can tell -</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definition of earthquake</td>
</tr>
<tr>
<td></td>
<td>Causes of earthquake</td>
</tr>
<tr>
<td></td>
<td>Seismograph and</td>
</tr>
<tr>
<td></td>
<td>Types of seismic waves</td>
</tr>
<tr>
<td></td>
<td>Effect of earthquake</td>
</tr>
<tr>
<td></td>
<td>Locate earthquake zones on map of India.</td>
</tr>
</tbody>
</table>

4. WRITING THE ENTRY BEHAVIOUR OF THE LEARNER-

Writing the entry behaviour of the learner includes the study of the learner’s previous knowledge, mental make-up, liking disliking, age, understanding capacity etc. and detail study of the topic that has to present in front of the learner. Researcher has decided to develop the programme on the selected units of the text book ‘World Geography’ of standard VIII prescribed by the ‘Maharashtra State Board of Secondary and Higher Secondary Education’, so it was necessary to study the objectives set by the government regarding the study of the selected content in this book. The researcher has followed the curriculum handbook of the secondary school specifically the objectives of teaching learning these units. The researcher has made
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use of teachers’ handbook of the Geography book that helps in preparing the lesson plan of each unit selected for the research study.

5. DEVELOPING SPECIFIC OUTLINE OF THE CONTENT TO BE PROGRAMMED.-

Before starting the development of the programme on each unit researcher made demarcation of the portion of that particular content. This involves the outlining of Definitions, concepts, examples, new terms, activities that were included in the selected unit. This outlining of the content helps in providing the exact idea about the extent of extra information, examples, charts, pictures, diagrams, images, video clips and the evaluation technique that has to mention in the programme.

6. PREPARING A CRITERION TEST:

Preparing the criterion test helps in indicating the success of the work of programme material. The researcher has fixed up a sort of standard to test the programme and include the evaluation whenever needed.

The researcher has mentioned the learning outcome of each unit in lesson plan and accordingly cited the slide containing evaluative questions followed by immediate feedback in the programme wherever needed.

B. CONSTRUCTING/WRITING THE PROGRAMME:-

Constructing the programme is very significant part of the present research study. While constructing the programme it is essential to consider the important features of computer as well. One feature of the computer that appears to merit attention is the control it gives the designer over display capabilities that allow for stimulus elaboration (graphic and print devices that have the effect of enhancing learning and retention). Another feature is the possibility it affords for elicitation of responses and the provisions of elaborative or adaptive feedback. Integration of both the features enhances the quality of CAI (Rao, 2005, pg.225).
1. **TESTING OF PREVIOUS KNOWLEDGE**

Testing of previous knowledge and catching attention of the learner from the beginning is of great importance. For testing students previous knowledge researcher has made use of various techniques such as-

- Asking question based on previous knowledge
- Asking thought provoking question
- Showing topic related picture/image/photograph/animated text etc.
- Providing attention catching statement
- Made use of topic related background/colour combination etc.

Following slides represents the inclusion of above techniques as:

2. **STUDY OF SUBJECT MATTER**

It is essential to study the subject matter in detail before starting for the presentation. To make the presentation more effective it is necessary for the programmer to consider all its important features, its difficulty level, its correlation with other subjects, its effect on the life of human being etc. and its importance in future. Considering all these aspects of related subject, helps in collecting relevant data and in sequencing each slide in a logical manner.

3. **SEQUENCE**

Putting the whole content that has to learn by the learner in a logical order is essential. By placing unknown concept linked with known may enhance leaning. Long-term memory depends on the way in which the learner has adopted the short-term memory. One of the major objective of teaching learning is whatever is learned by the learner must be useful for his/her future career. This can be possible only through meaningful learning.

4. **SIMPLE TO COMPLEX**
CHAPTER III - METHODOLOGY AND PROCEDURE OF THE RESEARCH

This is the most important maxim of learning. Whatever the learner has to learn should put in front of him/her in such a way that the learner could accommodate and assimilate the new concepts easily. They should be able to understand these concepts in detail so, that they may remember these for the whole life. They should be able to apply knowledge in their life. Then only their learning can be consider as meaningful learning. Therefore, it is necessary to put the new knowledge from simple to complex form.

Determining what is to learn is the first step of constructing the instructional programme. Before thinking about how to instruct, the designer needs to identify the kind of learning outcome expected by the learner to acquire. There are five main kinds of learning outcomes identified by Gagne as-


The researcher decided to analyze the content thoroughly before starting with Programme.

3.5.5 CONTENT ANALYSIS:

Preparation of rough plan on every topic according to the requirement of the content and student’s needs help the researcher to prepare the programme properly. It helps the researcher to get an exact idea about the range of information to provide in the selected programme. It also helps the researcher to think about the activities to be assigned to students.

To collect the relevant information, pictures, diagrams etc. researcher had to visit various Internet sites. Researcher also tried to find information through various other sources such as discovery books, reference books, dictionaries, Encarta and so on.

After going through various references researcher prepared a rough plan on each selected unit. The researcher tried to put relevant and necessary information included in the textbook according to the students need. Researcher added extra
information with hyperlinks. The researcher tried hard in and included various activities in the programme that would involve weak as well as intelligent students in it.

**Content Analysis of the Unit:** A detailed content analysis of each unit in terms of points to be taught, new terms, concepts, rules, principles, examples to be given, learning experiences to be provide the learner through audio, visuals sounds and animations, real-life photographs that are required to explain the content were considered by the researcher.

**The researcher has considered following important aspects of the learner:**

- Previous knowledge of the learner
- Age, capacity and needs of the learner
- Various learning experiences that can be provided through teaching the content
- Planning of activities to inculcate - cooperation, neatness, dignity of labour, social awareness, respect for others
- Planning of assignments to enhance- self-confidence, higher mental abilities, leadership qualities, decision making power, Creative thinking skills, positive attitude, self-study skills
- Planning of providing examples to enhance- interest in the subject and personality development

**To fulfill all the above aspects the researcher has made use of:**

- Thought provoking questions
- Fact finding information
- Examples other than textbooks
- Hyperlinks of the slides with content related video clip, word file
- Various activities such as-word puzzle, jokes, concept map, mind map, drawing and coloring the picture,
- Use of animated clips, photographs, maps, graphs, diagrams, sketches, colourful pictures, cartoons, flow charts, acronyms and synonyms of new word, advance
organizer, essential quote, content related stories, assignments such as preparation of scrape book, project to collect extra information on the content, writing their views in the diary, simple practical etc.

Following slides from CAI programmes represent the above mentioned criteria:

**3.5.6 VALIDATION OF CAI PROGRAMME BY SUBJECT EXPERTS AND SUBJECT TEACHER BEFORE TEACHING:**

After completing the Power Point presentation on each unit, the researcher has validated the CAI presentations by Geography expert, Geography teacher and the Geography Method master and received their expert comments and suggestions on each programme and made relevant changes before actual teaching with CAI to the experimental group students. For viewing photograph of geography teacher and method masters watching CAI programme see (Appendix IX Photograph 2 and Photograph 3)

**3.5.6.1 Pilot study of CAI Program:**

A pilot study of the CAI program on each unit conducted on handful of students of standard VIII of other division of same school and some students from the other school. The pilot study is like feedback for the researcher to make necessary changes. The researcher made necessary changes in the programme after receiving the suggestions given by experts.

The final presentation was copied on the CD (Compact Disk) and presented to the experimental group in the computer lab according to the class timetable.

**3.5.6.2 ADMINISTRATION OF PRE-TEST:**

The first pretest on unit one were administer on 16\textsuperscript{th} Jun. 08 on both the groups (experimental and control) before the implementation of the CAI program. The duration of pretest per unit was 30 minutes (one period). The unit test on each selected unit was given to both the divisions before actual teaching through Computer-Assisted Instruction and actual classroom teaching. For viewing the
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students attempting for the achievement test in the class see (Appendix XI photograph 4)

3.5.6.3 ADMINISTRATION OF CAI PROGRAM:

The CAI programs made by the researcher on all selected units administered on experimental group according to the timetable. The school computer laboratory has 35 computers and these computers interconnected through LAN. The researcher copied the programme on each computer through ‘network neighborhood’ facility at the time of teaching of each unit. The CAI program made by the researcher (on each selected unit) was divided into two or three parts, and these parts were administered on the experimental group students according to the class timetable. The researcher conducted an interactive session with the experimental group students in between these periods. At the time of interactive session, the students of experimental group were dividing into two groups. Each group was expected to ask at least five questions to other group. The questions were based on the topic learnt on previous day. The researcher has arranged this activity with the intention of helping students to recollect their previous day’s work.

In the Computer-Assisted-Instructional (CAI) program, the researcher asked the experimental group students to discuss certain points related to the unit and share the information with each other. At the time of each period, two students were sharing one computer. The researcher has made this provision to bring about better interaction among the students. The researcher felt that viewing the program all alone might become boring. Doing so in pairs would increase motivation and generate interest towards the subject. For viewing students learning through CAI programme in computer lab see (Appendix IX-Photograph 5)

3.5.6.4 TEACHING TO CONTROL GROUP STUDENTS:

The researcher has taught all the selected units to the control group students by conventional teaching method. To view the researcher teaching to control group by conventional method see (Appendix IX photograph 6)
CHAPTER III-METHODODOLOGY AND PROCEDURE OF THE RESEARCH

3.5.6.5 ADMINISTRATION OF POSTTEST:

Posttest on each selected unit administered on the selected groups (experimental and control) after completing the teaching of unit. The achievement test use as pretest also use as posttest. Time duration for posttest was the same as pretest i.e. 30 minutes (one period). The post-test was conducted after teaching of each unit, for the students of experimental and control group.

Observation of students while administering the CAI programme:

At the time of treatment period the researcher’s role was to-

- Keep record of students’ attendance
- Keep record of the student’s observation about their expression while watching the Computer-Assisted Instructional Programme
- Keep record of students’ discussion in pairs regarding the Computer-Assisted Instructional Programme
- Observe the behavior of students in a group, in the lab, and keep record of their interest, responsibility and attitude towards learning with CAI.

3.5.7 ADMINISTRATION OF RUBRIC:

After the treatment of each unit experimental group was asked to fill the rubric made by the researcher. The researcher has collected the opinions of the experimental group students regarding CAI programme to test the efficacy of CAI programme (in the form of qualitative analysis) see rubric in Appendix IV
### 3.6 TIME FRAME:

**THE TIME FRAME OF THE RESEARCH WORK IS AS FOLLOWS:**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Year</th>
<th>Month</th>
<th>Work</th>
<th>Nature of work</th>
<th>Time in hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>Feb 07 to May 07</td>
<td>15 hrs. in a week</td>
<td>Preparation of CAI programme</td>
<td>240 hrs.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Jun 07-July 07</td>
<td>1-2 hrs. per unit</td>
<td>Pilot testing</td>
<td>15 hrs.</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Aug 07-Dec. 07</td>
<td>5 hrs. in a week</td>
<td>Changes in CAI programme on all nine selected units</td>
<td>100 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>2008-09</td>
<td>Jan. 08-Apr. 08</td>
<td>2-3 hrs. in a week</td>
<td>Preparation of blue print, achievement test and answer key of each selected unit, validation of achievement test by subject teacher and method master</td>
<td>40 hrs.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>May-08</td>
<td>1 hr. daily</td>
<td>Preparation of Annual plan, unit plan and lesson plan</td>
<td>25 hrs.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Jun. 08-Mar. 09</td>
<td></td>
<td>Administration of pre-test, treatment and post-test on both the groups, collection of data</td>
<td>36 teaching periods on both the divisions (36 hrs.)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Apr. 09-May. 09</td>
<td></td>
<td>Analysis and interpretation of Qualitative data</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>May-09-Jun. 09</td>
<td></td>
<td>Review of related literature and researches from various sources</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 3.1: TIME FRAME

**ANALYSIS OF DATA:**

The researcher has used both quantitative and qualitative analyses, to study the efficacy of Computer-Assisted Instructional Programme. Analysis and interpretation of data discussed in detail in chapter IV.