CHAPTER III

METHODOLOGY OF THE STUDY

3.1.0 INTRODUCTION

The main purpose of the present study was to develop and implement an intervention programme based on the value integrated approach in teaching science and technology to standard IX students and to find out its effectiveness. As the present study was experimental in nature, the research design and the methodology of experimental research have been followed for the present study. The details of the methodology have been presented in this chapter. This chapter covers the research design, selection of sample, construction of tools for data collection, development and implementation of programme, process of data collection and methods of data analysis.

3.2.0 RESEARCH DESIGN

As randomization was not used for the selection of both the experimental and control group, quasi experimental design was followed in the present study. The pretest-posttest nonequivalent groups design was selected from the available designs in the quasi-experimental designs for the present study. The design of the present study is presented diagrammatically as follow.

O1	**X**	**O2**
O3	**C**	**O4**

O1, O3= Pre-tests; O2, O4= Post-tests; X = Experiment group; C = Control group

The pre-test was administered to the students of both the groups before giving treatment. Post-test was conducted after the treatment. As the design does not permit to use the parametric tests like ANCOVA (Analysis of Co-variance) where pre-test scores could be used as covariate, the experimental and the control groups were made equivalent on the basis of pre-test score to make the design more effective and to use the non-parametric test i.e. u-test to find out the difference between the means of experimental and control groups.

3.3.0 POPULATION

All the English medium secondary schools of Vadodara city affiliated to Gujarat Secondary and Higher Secondary Education Board (GSHSEB) were considered as the population of the present study. All the students of standard IX and X of English medium secondary schools of Vadodara city affiliated to GSHSEB during the academic year 2012-13 were considered as the population of the present study. There were 52 English medium both grant-in aid and non grant-in aid secondary schools at Vadodara city affiliated with GSHSEB. So all these 52 English medium secondary schools affiliated to GSEB and nearly 9360 students of standard IX and X of these schools of Vadodara city constituted as a population for the present study. (District Education Office (2013), Vadodara)

3.4.0 SAMPLE

The sample for the present study was selected purposively. As per the convenience of conducting the research study, the researcher selected the sample for the present study. Vidhyakunj High School, Vadodara, a grant-in-aide English medium secondary school following GSHSEB syllabus was taken as the sample. The reason for selecting this school was that the school authority were agreed to co-operate and provide the help needed by the researcher to conduct the entire study. There were two divisions in standard IX. Students of division A were taken as the experimental group and students of division B were taken as the control group. There were 40 and 42 students in the experimental and control groups respectively. On the basis of the pre-test achievement score in Science and Technology, the experimental and control groups were made equivalent. After making the groups equivalent, 25 students from division A and 25 students from division B were considered as the sample for the present study.

3.5.0 TOOLS FOR DATA COLLECTION

Considering the objectives of the present study, achievement test in Science and Technology, value conceptual knowledge test, value perception test and reaction scale were prepared to collect the required data for the study. Researcher designed and prepared the said tools. The tools were shown to experts in the field of value education and science education for validation and accordingly their suggestions were

incorporated. The tools were also referred to English language experts for language corrections and accordingly necessary modifications and changes were made as per the suggestions of the language experts. Details of the developed tools are given as follow.

3.5.1 Achievement Test in Science and Technology

Achievement test in Science and Technology was constructed by keeping in mind the content of 9 chapters of Science and Technology to know the achievement of students which was administered prior and after the intervention programme. It was of 60 marks and the maximum time allotted for completing this test was 1 hour. The achievement test comprised of 30 multiple choice questions, 10 very short answer type questions and 5 short answer type questions. Thus, a total of 45 questions were included in the achievement test. The achievement test was divided into two sections viz. objective type questions and subjective type questions. Equal weightage was given to objective and subjective type questions i.e. 30 marks to objective type questions and 30 marks to subjective type questions. Care was taken to include questions of all the points of the selected nine chapters of semester I of standard IX Science and Technology subject A three dimensional blue print was prepared for the development of achievement test which is given in appendix-XIII. On the basis of this blue print, the achievement test was developed. Achievement test in Science and Technology is given in Appendix XIV.

3.5.2 Value Conceptual Knowledge Test

In order to get the conceptual knowledge about the values, a value Conceptual Knowledge Test was constructed based on the values identified from the content of Science and Technology textbook. This test consisted of 100 marks. 5 questions were prepared for each of the selected values. Questions were asked related to the meaning, definition, example and characteristics of each value. Thus, a total of 50 questions were asked in this test for the selected values. Value conceptual knowledge test is given in Appendix XI.

3.5.3 Value Perception Scale

In order to study the perception of the students about the taken values which were from the content of Science, value perception scale was constructed by the investigator for the standard IX students. 50 close-ended question based on the various daily life situations were framed. Hence the maximum marks for this test is of 200 marks. Four options were given to each question for selection of the answer as per their perception regarding the particular value. The scale was covered 10 values like Equality, Co-operation, Simplicity, Dignity of Labour, Determination, Honesty, Common goal, Discipline, Loyalty to duty, and Team work. Value perception scale is given in appendix XII.

3.5.4 Reaction Scale

To find out the reactions of the students in the experimental group towards the developed programme, the researcher developed a five point reaction scale in order to study the reaction of students towards the value integrated science teaching programme. Twenty-five items having positive polarity were given in the reaction scale. All the twenty-five items were close ended and respondents had to tick mark (√) in the appropriate box ranging from Strongly Agree to Strongly Disagree. The reaction scale was constructed considering the following points regarding developed intervention programme on value integrated science teaching.

- Presentation of content
- Students liking for the developed programme
- Interest of the students
- Participation of students
- Ease in learning the topics of science through the value integrated approach
- Understanding and applicability of knowledge

Considering these points the reaction scale was prepared. The reaction scale is given in appendix XV.

All the constructed tools were referred to six experts in the field of Education and Science teaching to judge their adequacy, language and way of presentation and suggestions. Necessary modifications were done as per the suggestions received from the experts. The final version of the tools were also referred to experts in the field of English language for language correction.

3.5.0 DEVELOPMENT OF INTERVENTION PROGRAMME ON VALUE INTEGRATED APPROCH IN TEACHING SCIENCE AND TECHNOLOGY

Recently the text book of science in standard IX was changed as the text book of science and technology. Hence the subject 'Science' and 'Science and technology' is used interchangeably in the present study. Development of an intervention programme on value integrated approach in teaching science and technology was an important and essential part of this study. In order to achieve the objective 1 of the study i.e. "To develop an intervention programme for teaching of science and technology through integrated approach for the inculcation of values like Equality, Co-operation, Simplicity, Dignity of Labour, Determination, Honesty, Common goal, Discipline, Loyalty to duty, and Team work in regular classroom teaching", each stage in the process of development of the intervention programme is discussed in this section.

The development of instructional materials was done in the different steps viz. selection of content, identification of values, preparation of lesson plans and pilot testing. All the steps followed for the development of intervention programme is discussed below.

Step I: Selection of Contents from GSHSEB Standard IX Science and Technology Textbook

All the nine chapters meant for first semester were taken by the investigator from standard IX GSHSEB English medium "Science and Technology" textbook. These nine chapters were Motion, Force and laws of motion, Gravitation, Properties of matter, Structure of atom, The Fundamental units of life-the cell, Plant tissues, Animal tissues, and Why do we fall ill ? The investigator has identified 10 values which were suitable to integrate in all these nine chapters. Specific contents were chosen from these nine chapters where there were more scope for the development of

the chosen values. All the nine chapters were taught to the sample group during four months i.e. July, August, September and October, 2012. A total of 87 periods (35 minutes) were spend to complete these nine chapters of semester I where nearly 40 periods were devoted to teach those specific value loaded contents with inculcation of these 10 values.

Step II: Identification of Values

There are total 83 values which are essential as human values (Fernandez, 2002) and it can be benefit to imbibe the values into future citizens i.e. secondary school students. However, looking into the units and contents of GSHSEB standard IX science and technology textbook, investigator has identified 10 values viz. Equality, Co-operation, Simplicity, Dignity of Labour, Determination, Honesty, Common goal, Discipline, Loyalty to duty, and Team work which were found suitable for integrating into the Science and Technology content teaching. The investigator also consulted other school teachers teaching Science and Technology at secondary level for suitability of integrating 10 values into the teaching of science.

Step III: Preparation of Lesson Plans

After identifying the values which can be inculcated and which can be taught using integrated approach, lesson plans were prepared keeping in mind the instructional objectives of science and Technology. The lesson plans were prepared considering the spirit of integrated approach of teaching science and Technology and values. 20 lesson plans are given in Appendices I to X, two lesson plans for each values.

Step IV: Pilot Testing

After developing the initial draft of the intervention programme, it was put into a field try-out to find out its suitability for real field investigation. The pilot testing was done with the objectives to find out the difficulties faced by students if any in understanding the contents of Science and Technology through value integrated approach and to see if the intervention programme has any effect on the students' achievement level in Science and Technology. There were three tools to test the effectiveness of the developed intervention programme viz. Value Conceptual

Knowledge Test, Value Perception Test and Reaction Scale. Along with these tests the achievement test in science and Technology was used to know the impact of the value integrated approach on the achievement of students in science and Technology subject. Before experimentation, the developed programme was validated. For this purpose, the investigator has shown the programme to the secondary school Science and Technology teachers and experts in the field of education to know the suitability of the programme. The suggestions received from the experts were taken and accordingly the programme was modified. Pilot testing was done in another English Medium school of the same trust i.e. Aditi School in Vadodara city. Standard IX students were taught Science and Technology by the investigator with the help of the developed value integrated approach for 10 consecutive classes. Before teaching through the value integrated approach to the pilot group, the investigator explained to the students of pilot study about the purpose of the programme. The group were given freedom to express their views on the value integrated Science and Technology teaching. The students were also told to feel free and ask the investigator if they face any difficulty in understanding the contents of Science and Technology taught by the investigator through the value integrated approach. On the basis of the pilot testing the required modifications in the lesson plans were done and the final programme for integrated approach of teaching science and Technology was ready for the experimentation.

3.7.0 IMPLEMENTATION OF PROGRAMME

The pilot study helped the investigator in finding out the difficulties faced by the students in understanding the Science and Technology contents through the value integrated approach. The programme was also validated as per the suggestions of the experts. The investigator had finalized the programme based on its pilot testing and the suggestions of the experts in the field and kept the programme ready for the final experiment. For implementing the value integrated intervention programme for the final experiment the investigator approached the existing school where he is working i.e. Vidyakunj High School, Vadodara. Both the Experimental and Control group were selected from this school. Division A of standard IX was selected as experiment group while division B was selected as control group for the experimentation. After selecting the school, the experimental and control groups, the investigator

administered the pre-tests on all the students of both the sections. There were 40 students in section A and 42 students in section B. After the administration of the pre-tests, the investigator compared the scores of the students of both the sections and based on equivalent scores of the students, 25 students from each section were selected as a sample for final experiment. The investigator taught the experiment group students with the help of developed intervention programme on value integrated Science and Technology teaching. The control group students were taught the same topics by another science teacher in the traditional method. The investigator explained the student of the experimental group about the developed programme on value integrated approach and the purpose of the programme. The experimental group students were given liberty to use their ideas, understanding and creativity to inculcate the values in the lessons. Each lesson has the limitation as well as possibility to integrate the value. The students were given freedom to share their ideas and knowledge about the particular value among each other and to provide feedback or suggestions on particular value integrated in Science and Technology teaching. The experiment took six months.

3.8.0 DATA COLLECTION

For realization of the objectives of the study and to test the null hypotheses, the required data were collected personnel by the investigator. In order to collect the data, the sample students were told about the purpose for which data were collected and instructions were given by the investigator to the respective respondents during the data collection. Before the implementation of the intervention programme, pre-test was administered to the students of both the group: control and experimental group in the form of value knowledge test, value perception scale and achievement test in Science and Technology. At the end of the experiment the investigator administered the same tests as post-tests i.e. value knowledge test, value perception scale and achievement test in Science and Technology on both the groups. The developed reaction scale was administered on the experimental group to know their reaction towards the value integrated approach to teach science and technology at the end of the experimentation.

3.9.0 DATA ANALYSIS

To realize the objectives of the present study quantitative method of data analysis was used. To achieve the objective III data were analysed quantitatively with the help of mean, standard deviation and u-test. The data for the objective IV has also been analyzed quantitatively with the help of frequency and intensity index. The non-parametric Mann Whitney U-test was used to analyze the data as the sample was taken purposively as it is considered as the most powerful non parametric equivalent of t-test of parametric family.

Intensity Index (II) is an uncommon statistical technique used in the present study to get the intensity of reaction of the respondents for each statement and the average intensity of reaction for the total programme in a five point scale. The following formula was used to calculate the Intensity Index (II) for a given statement.

II for Statement A=[(F1×5)+(F2×4)+(F3×3)+(F4×2)+(F5×1)]/(F1+F2+F3+F4+F5)

When, the scale values of 5,4,3,2 and 1 are assigned for the scale points of Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA) and Strongly Disagree (SDA) respectively on a given statement "A".

And Frequencies for SA, A, UD, DA and SDA are F1, F2,F3, F4 and F5 respectively.

Average Intensity Index (II) is the sum of intensities for all the statements divided by the total number of statements.

The data obtained from the experiment of the integrated approach were analyzed objective wise as below. The detailed analysis of the data is given in chapter IV

Table 3.2: Objective wise Analysis Techniques used

Sr. No.	Objective	Tools used	Analysis Method Used	Statistical Techniques Used
1	3	Value Conceptual Knowledge Test, Achievement Test, Value Perception Scale	Quantitative	Mean, SD, SE Mean, U-test
3	4	Reaction Scale	Quantitative	Frequency and Intensity Index