

**CHAPTER – III**  
*Methodology*

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### **Methodology**

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### **3.0. Introduction**

This chapter covers the methodology of the study, which includes design of the study, variables, selection of the sample of the study, design of the teaching model, tools prepared and administered for data collection, procedure followed, details of the pilot and experimental studies and the statistical tools and techniques employed in the study.

The investigator selected the topic “**An experimental study of imparting values through hidden curriculum of chemistry among secondary school students.**”

The main objective of the present experimental study is focused on the development of hidden values using a suitable Model of teaching chemistry among the secondary school students. The purpose of the present research is how far we can inculcate the hidden values through teaching chemistry using the developed model.

#### **The objectives of the study are**

- To identify the values hidden in the chemistry curriculum at secondary school level.
- To develop a suitable Model for Value Development in Chemistry Education (MVDCE) for teaching chemistry to enhance the hidden values among Secondary School students.
- To test the impact of MVDCE on the development of values among Secondary School students

#### **The hypotheses for the present study are**

- There are values hidden in the chemistry curriculum at secondary school level.

- A suitable Model MVDCE of chemistry teaching will enhance the values among Secondary School students.
- The developed model MVDCE of chemistry teaching has greater impact on imparting the values among secondary school students when compared to traditional method of teaching.

**Sub hypotheses :-**

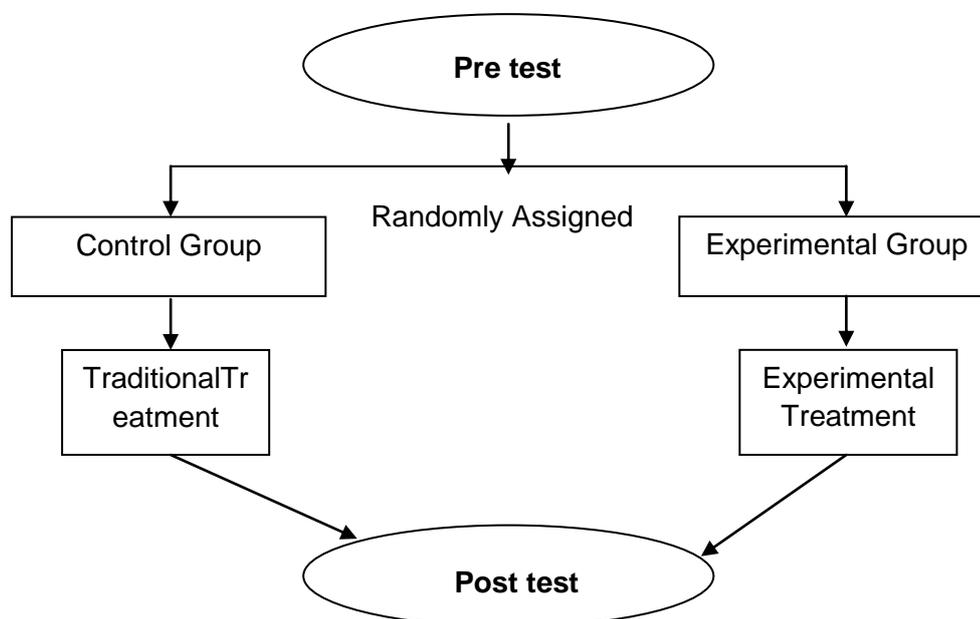
1. There is significant impact of region on the Food and Nutritive Value development through MVDCE among secondary school chemistry students.
2. There is significant impact of gender on the Food and Nutritive Value development through MVDCE among secondary school chemistry students.
3. There is significant impact of region on the Health and Hygienic Value development through MVDCE among secondary school chemistry students.
4. There is significant impact of gender on the Health and Hygienic Value development through MVDCE among secondary school chemistry students.
5. There is significant impact of region on the Medicinal Value development through MVDCE among secondary school chemistry students.
6. There is significant impact of gender on the Medicinal Value development through MVDCE among secondary school chemistry students.
7. There is significant impact of region on the Environmental Value development through MVDCE among secondary school chemistry students.

8. There is significant impact of gender on the Environmental Value development through MVDCE among secondary school chemistry students.

### **3.1. Design of the study**

The researcher selected the true Experimental design. Experimental method and Randomized matching group technique with pre-test -- post-test design were selected in the study. Experiment is a scientific procedure carried out to make a discovery, test a theory, or demonstrate a fact by performing a scientific experiment. To conduct a scientific experiment or to try out a theory, a two group design with a randomized matching group technique with pre-test -- post-test design is selected. On the basis of the pre-test results the Control Group (CG) and Experimental Group (EG) are selected by tossing the coin. The method of teaching chemistry are taken as independent variables for teaching CG and EG respectively in conducting the experiment, whereas the development of values among secondary school students as dependent variable. Region (rural and urban), gender (girls and boys) are taken as background variables. At the end of the treatment to CG and EG, the Post-Test is administered to both the groups to verify the impact of MVDCE.

**Fig.3.1. Schematic diagram showing the design of the study.**



### **3.2. Variables of the study**

The following are the variables selected for the study.

**Independent Variable** :- The developed Model MVDCE of teaching chemistry.

**Dependent Variable** :- Enhancement in the levels of values of Food and Nutritive, Health and Hygienic, Medicinal and Environmental are considered as dependent variables.

**Controlled Variable:** - class, gender, variability, content variability, period, duration, time of teaching, teacher variability, Initial level of values and medium of instruction.

Controlled Variables have the power to influence people's behavior or the course or events, the restriction of something. In this study the class,

gender, content, period and duration of teaching, medium of instruction, teacher variability are used as controlled variables as a standard of comparison for checking the results of the experiment. For CG and EG only X class was taken for the experiment. Hence the class is controlled. The same units Carbohydrates and Proteins; Lipids and Oils; Acids, Bases and Salts; Carbon and its Compounds are taken as content to both EG and CG were taught. Hence the content is controlled. Each of the groups were taught for the same period of 80 days daily for 45 minutes both in the morning and evening and on alternate days. Hence the period, duration, time of teaching were controlled. Telugu is the medium of instruction for the two selected schools. So the teacher followed Telugu medium only. Hence the medium of instruction is controlled. To control the teacher variability the researcher taught all the groups.

**Background Variables:** - Region (Rural and Urban), Gender (Girls and Boys).

Background variables are the part of scene or picture behind the main as figures, information or circumstances influence or explain something. The region and gender among influence a person's education, experience and early life. So region and gender are taken as background variables in studying the impact of MVDCE on the enhancement of values among students.

### **3.3. Selection of predominant hidden values in chemistry curriculum**

An Information Sheet – I (Appendix – I) is prepared and provided to the subject experts, Teacher educators, faculty of RIE, CTEs, DIETs and physical Science teachers in total 100 to find out the predominant hidden values. In this sheet they were asked to write the values that could be developed knowingly and unknowingly among secondary school students by teaching

chemistry. The list given by them included moral value, aesthetic value, vocational value, disciplinary value, intellectual value, utilitarian value, cultural value and psychological value in total 9 values could be developed knowingly. The respondents noted that the food and nutritive value, utilitarian value, medicinal value, environmental value, intellectual value, aesthetic value, health value, hygienic value, disciplinary value and cultural value, in total 11 values could be developed unknowingly among the students. The values developed unknowingly are hidden in the chemistry curriculum. Related values are clubbed on the basis of maximum experts given into 4 predominant hidden values namely Food and Nutritive value, Health and Hygienic value, Medicinal value and Environmental value.

Food value, nutritive value, utilitarian value and cultural value, are clubbed under Food and Nutritive value. Food is essential for the survival of all living beings. One must have awareness of the value of food and the micronutrients, balanced diet and safety food package. Healthy food improves health. Now-a-days students are habituated to eat junk food, fast food instead of nutrients, vitaminized and energy giving foods. The awareness of food calories, high energy giving food, knowing about food packaging and safety food package, food spoiling is necessary. Vitaminized and instant energy giving food like honey, cashew and peanuts are to be given importance. A glass of honey water or a pinch of glucose gives energy instantly when there was much hungry and one tea spoon of honey gives relief on overeating. Eating more sprouts in breakfast or in evening snacks reduces obesity. Culture also governs the type of food to eat, and restricts the food as and when any type of ill-health occurs. Food is also used as medicine in following small home remedies instead of over-drugging by the doctors for small ailments also. So to impart these values among the students the researcher

clubbed the food values, nutritive values, utilitarian value and cultural value under Food and Nutritive Value (FNV).

Maintaining good health is tough in present days. Hygiene means the practice of keeping oneself and one's surroundings clean in order to prevent illness and disease. Hygienic value means clean and not likely to spread disease. Maintaining good habits, precautionary measures, healthy habits, identifying reasons for malnutrition and health discipline, awareness on food labels on packages, the Hazardous Analysis of Critical Control Point (HACCP) values and in the selection of boutiques regarding, health are necessary. Music therapy, aroma therapy, body mass index comes under health measures. Everyone must have the awareness on a thing before the use on seeing the faulty advertisements, for example how the shampoo grows the healthy long hair. So health value, hygienic value, aesthetic value are clubbed under Health and Hygienic Value (HHV).

The wealth of India is stored in the enormous natural flora which has been gifted to her. India is virtually the herbarium of the world constitutes more than 2200 species of medicinal and essential oil containing cardamom, cocoa, cinnamon and area nut lemon grace mint; menthe and their values. One intellectual child will utilize these things effectively in his or her needs. Better understanding about medicinal values of fruits, vegetables and environment leads to maintain good health instead of over-drugging with side-effects. Fruits and vegetables are some home remedies which develop natural immunization strength and energy in the body instead of using medicines. Everyone should have awareness to judge the advertisements given in the media. For example how the "Enu" helps in rescue of gastric trouble and how the health effects in the long-run. Taking honey water instead of Enu gives relief instantly from the gastric trouble with no side effects in the

long-run, in addition to that it gives energy. Culture also stresses on some home remedies and some nature cure therapies. Pepper and Tulasi are medicines as well as preventive for chickenpox. In different cultures Herbal treatment, Naturopathy, Ayurveda, Siddha Unani, Homeopathy, Allopathy are developed. Herbal treatment, Naturopathy, Ayurveda, Home-remedies Therapies, are also developed In Indian culture. Medicines were developed from fruits, vegetables, herbs, barks, flowers, stem, roots, leafs, buds in India. So Medicinal value, cultural value and intellectual value are clubbed together as Medicinal Value (MV).

The students must have awareness on global environment, problems like pollution, sanitation, acid rain, affect of green house gases and ozone depletion using eco-friendly material, eco-friendly activities must be taught in the class. The major topics in the area are atmosphere, deforestation, global warming, acid rain, green house effect, ozone depletion, relationship between plants, animals and environment, sustainable development, physical environment, preserving the environment, man under the environment are to be explained. Air pollution, solid waste disposal, preparation of vermin compost are the important topics to be covered. Everyone must have disciplinary values in how to segregate the toxic waste, harmful waste, how to protect and safeguard our environment. Environmental Value, disciplinary value, cultural value are clubbed together as the Environmental Value (EV).

#### **3.4. Major components of selected values**

For identifying the components of the selected 4 major values an Information sheet-II (Appendix-II) is prepared and given to collect data from the same 100 physical science teachers, subject experts, and teacher educators who answered sheet-I. This sheet consists of 4 selected values are given in

column-wise. The respondents were asked to list out the components of each value. The listed components are value of food, nature of food, storage of food, balanced diet, nutritive value of food, food calories, precautionary measures, identifying alternatives, instant energy giving foods, junk foods, food adulterations, adulterated foods identification, protecting natural values of food, food spoilage and food labels. The researcher had taken only 10 components in the rank order presented by experts under FNV. The components “protecting nutritive value of foods”, and “nature of food” are clubbed under the component “Protecting nutritive value of food”. The components “Identification of food adulteration” and “food adulteration” written together under the component “Identification of food adulteration”. The components “value of food”, “food calories” and “food labels” are combined under the component Nutritive value of food. Rest of the components are retained.

**The selected 10 components of Food and Nutritive Value are**

- ❖ Protecting nutritive value of foods
- ❖ Identification of food adulteration
- ❖ Nutritious and instant energy giving foods
- ❖ Identifying alternatives
- ❖ Value of Food
- ❖ Food storage
- ❖ Food spoilage
- ❖ Precautionary measures
- ❖ Balanced diet
- ❖ Identifies nutritious food

The respondents listed out 11 components under Health and Hygienic value (HHV) are identification measures of health, hygiene, cleanliness,

malnutrition, protection of health measures, scientific attitude, precautionary health measures, necessary micronutrients, identification of harmful elements of health, adulteration of moisturizers, protection of hygiene. These are grouped as 10 components under HHV. The component “cleanliness” is combined with “hygiene value” component of HHV. Rest of the components are retained.

**The selected 10 components of Health and Hygienic Value are**

- ❖ Identifying health measures
- ❖ Hygienic Value
- ❖ Malnutrition
- ❖ Necessary micronutrients causes growth
- ❖ Precautionary health measures
- ❖ Hygienic habits
- ❖ Protection of health measures
- ❖ Identification of harmful elements
- ❖ Protection of hygiene
- ❖ Scientific attitude

The components Medicinal value, alternatives to medicines, medicinal value of fruits, medicinal value of vegetables, awareness of medicinal value, identification of medicinal plants, food as medicine, home remedies for curing diseases, precautionary measures of diseases, preventive measures of diseases, pollution causes diseases, reasons of getting various diseases, etc., in total 12 components are listed out by the respondents under Medicinal value (MV). The components “alternatives to medicines” and “home remedies for curing diseases” are clubbed together as the component “alternatives to medicines”. The components “medicinal values of fruits”, “medicinal value of vegetables” and food as medicine are kept together

as the component “medicinal values of fruits and vegetables”. Rest of the components are retained.

**The selected 10 components of Medicinal Value are**

- ❖ Medicinal Value
- ❖ Identification of diseases
- ❖ Alternatives to Medicines
- ❖ Preventive measures of diseases
- ❖ Identifying medicinal values in fruits and vegetables usage
- ❖ Awareness of Medicinal Values
- ❖ Identification of pollution causing diseases
- ❖ Identification of foods alternative to medicines
- ❖ Reasons of getting various diseases
- ❖ Identification of medicinal plants

In the Environmental Value, the components listed by the respondents are environmental value, awareness on environment, identification of environmental pollutants, preventive measures of pollution, control over pollution, understanding environment, right of control over wastage, precautionary measures of environment, protection of environment namely, water, air, and soil pollutants, Reasons for superstitions. All the 10 components are taken as predominant components under Environmental value (EV).

**The selected 10 components of Environmental Value are**

- ❖ Environmental Value
- ❖ Identification of environmental pollutants
- ❖ Preventive measures of pollution

- ❖ Control over Pollution
- ❖ Protection of environment
- ❖ Precautionary measures of environment
- ❖ Awareness on Environment
- ❖ Right of controlling the wastage
- ❖ Understanding environment
- ❖ Reasoning to Superstitions

### **3.5. Selection of suitable class for the development of 4 major values:-**

For the selection of suitable class to develop the 4 hidden values among secondary school students an Information sheet–III (Appendix-III) is supplied and collected data from 100 physical science teachers who are teaching VIII, IX, and X classes. In the information sheet a table is given, containing the 4 hidden values in columns with ratings and classes VIII, IX, X in rows.

The 5 ratings indicate

5 -- maximum extent

4 -- greater extent

3 -- moderate

2 -- low

1 -- very low

The respondents were asked to rate that what extent of the value can be developed class-wise and value-wise. The ratings were summed up class-wise and value-wise. Among the total values, X class was ranked First. So X class was selected for the study.

### 3.6. Selection of Content:-

Regarding the selection of content, an Information Sheet – IV (Appendix-IV) is given and collected data from 100 chemistry teachers teaching X class following Andhra Pradesh State Government syllabus. This information sheet in a tabular form consists of the selected 4 hidden values. All the units (10) of the X class chemistry are given in rows. The 4 identified values with rating are placed in 4 columns. One extra row and one extra column is given for total. The respondents were asked to rate the units under each of 4 value. By adding all the ratings given by the respondents against each value and rating, the four units from X class text book were selected for teaching of her research.

Value	Name of the Unit
Food and Nutritive Value	Carbohydrates and Proteins
Health and Hygienic value	Lipids and Oils
Medicinal Value	Acids, Bases and Salts
Environmental Value	Carbon and its Compounds

### 3.7. Selection of the Sample :-

#### Selection of school sample:-

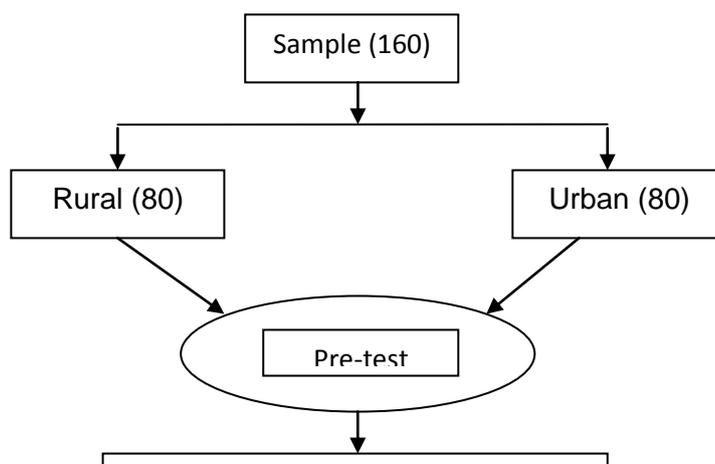
With the help of Educational authorities the two schools namely, RCM High School in Rajahmundry Urban and ZP High school at Gadala, a village in Rajahmundry Rural were selected as purposive sample. Both the schools were selected for research, because the two schools were co-education schools, the students are coming to these two schools from various socio-economic backgrounds of low, average and high income groups. Both the

schools have mixed intelligent group of students and same different social strata.

**Selection of student sample :-**

Intact groups of one hundred and seventy eight tenth class students in experimental Group, and Control Group were initially taken from two schools for the study. Later ten students from one school and eight students from the other school who could not attend the Post-tests, were eliminated from the data. Finally the sample reduced to one hundred and sixty students. The total sample selected for research is 160 students of X class. Out of 160 students 80 from rural and 80 from urban region and out of each of this 40, 20 were Boys and 20 were Girls. The researcher administered the pre-test to all the students of X class. Basing on the pre-test scores those who obtain equal (or nearly equal) scores are paired gender-wise. Randomized matching group technique is used for pairing of students. Randomly selected one student from each pair in arranging the two groups CG and EG. A coin is tossed and noted which group is CG and EG. The EG is given Experimental treatment and the CG is given the traditional treatment. The students of each school were taught chemistry during the time of treatment.

**Fig. 3.2. Schematic diagram showing Sample selected :-**



### **3.8. Tools prepared and administered**

The following 4 tools were developed and administered for the collection of data, namely

1. Pre-test (Attitude Scale – I)
2. Model of teaching MVDCE
3. Prepared Lesson Plans for 30 lessons based on MVDCE for FNV, HHV, MV, and EV.
4. Post-test (Attitude scale –II)

#### **Construction of an Attitude Scale**

Values are expressed in terms of attitudes. So to measure the values an Attitude Scale is planned, prepared and administered. A five point scale was prepared to know the value levels of the students before and after the experimentation.

Each statement in the attitude scale is given five options a, b, c, d and e and was asked to write the appropriate alphabet in accordance with their agreement in the given bracket.

The following ratings are given.

5 -- maximum extent

4 -- greater extent

3 -- moderate

2 -- low

1 -- very low

### **3.9. Tool- I :- Preparation of Attitude Scale – I (Pre-Test)**

To conduct pre-test an Attitude Scale – I (Appendix - V), is planned, developed in general, not based on any school chemistry content. The pre-test attitude scale is prepared to make equal groups, on the basis of their initial value level of the students. Prepared 50 items in total, and 12 items under each value FNV, HHV, MV, and 14 items in EV in the construction of an attitude scale covering 10 selected components from the Information sheet – II, under each value. Among 50 items 24 are negative and 26 are positive. Each item was given 5 options a, b, c, d, e. Positive items are given ratings from 5 to 1, and 1 to 5 in the case of negative. 5 is the highest rating and 1 is

the least. The value levels is jumbled to the 5 options a, b, c, d and e. The students were asked to identify the extent and note the alphabet in the given bracket against each item.

In the Food and Nutritive Value, on the selected 10 components, namely Protecting nutritive value of foods, Identification of food adulteration, Nutritious and instant energy giving foods, Identifying alternatives, Nutritive value of Food, Food storage, Food spoilage, Precautionary measures, Balanced diet, Identification nutritious foods 12 items were prepared, one item on each component of FNV and 2 items each on value of food and identifying alternatives of food.

On the selected 10 components of HHV, namely Identifying measures of health, Hygienic Value, Malnutrition, Necessary micronutrients causes growth, Protection of Hygiene, Hygienic habits, Protection of health, Identification of harmful elements, Precautionary health measures, Scientific attitude 12 items were prepared, one item on each component of HHV and 2 from each on the components Identifying measures of health and hygienic value.

In the MV, on the 10 components namely Medicinal Value, Identification of diseases, Alternatives to Medicines, Preventive measures of diseases, Identifying medicinal values in fruits and vegetables, Awareness of Medicinal Values, Identification of pollution causes diseases, Identification of foods alternative to medicines, Identifying the diseases-Reasons of getting various diseases, Identification of medicinal plants, one item on each component of MV and 2 items each on identifying medicinal value and identification of medicinal plants.

On the 10 components of EV namely environmental value, Identification of environmental pollutants, Preventive measures of pollution, Control over Pollution, Protection of environment, Precautionary measures of environment, Awareness of Environment, Right of controlling the wastage, Understanding environment, Reasoning to Superstitions, 14 items were prepared, one item on each component of EV and 2 from each on environmental value, precautionary measures, understanding environment, and control over pollution. .

Pilot study was conducted for the Attitude Scale-I by administering on 50 students of X class in Government High school. To establish the validity and reliability of the tool, each of the items of the present attitude scale was tested by the chi-square technique. To retain the significant item in the final pre-test chi-square was used on 50 items (Appendix-VII). 40 items which were significant were retained in the final pre-test by rejecting 10 items which were no significant. The Difficulty Index and Validity Index are calculated, and enclosed in Appendix -VIII. The item discrimination of each of the 40 items of pre-test was enclosed in Appendix - IX. The key was prepared and kept under Appendix – VI. Any research tool or instrument whether it is a test or scale or an attitude scale should satisfy certain pre-requisites in order to use it for the purpose for which it is intended. The most important pre-requisites in this regard are the reliability and the validity. A detailed discussion in the following paragraphs is made on the reliability and validity of the tool used in the present investigation.

### **Establishment of Reliability and Validity of the Attitude Scale-I (Pre-test)**

#### **Reliability**

A tool is reliable if it produces the same results, when it was applied on different occasions. Reliability of the test is the consistency with which a test measures a trait for which it is intended. According to Garrett, "A test is called reliable when we have reasons for believing the score to be stable and trust worthy". There are four procedures in common use for computing the reliability co-efficient of a test namely Test-retest, Alternate or parallel forms, Split-half technique, and Method of Rational equivalence.

The reliability co-efficient calculated for the Pre-test attitude scale-I is 0.75 shows the test so constructed is highly reliable.

### **Validity**

The meaning of the term validity is truthfulness. If a test measures what it desires to measure, then we can say the test is valid. Validity refers to the extent to which a test measures what we actually wish to measure, and how well it does so. The procedure followed determining validity of the pre-test is the content validity.

### **Content Validity**

The validation of content judgment is most satisfactory when the sampling of items is wide added judicious and when adequate standardization of groups is utilized. This pre-test prepared on the content judgment, with the help of the subject experts. So the pre test is valid.

### **3.10. Preparation of Tool – 2 :- Model for Value Development through chemistry Education (MVDCE)**

Teaching is a thought of something that comes rather naturally to people who know their subject. It is thought as a simple process that produces simple outcomes. Teaching is an intriguing, important and complex process. It is true that teaching is a process by which teacher and students create shared environment including sets of values and beliefs which intern colour their view of reality.

Bruner emphasized four major features of theory of instruction in effective teaching (i) Predisposition towards learning, (ii) Structured body of knowledge, (iii) Sequences of material to be learnt, and (iv) The nature and pacing of reward and punishment. It means that a theory of instruction in teaching is concerned with how what one wishes to teach can best learnt, with improving rather than describing learning.

#### **Theoretical Basis for NVDCE**

- The learning experiences suggested for students in the school by Indian Education Commission (IEC, 1964-66) such as library, laboratory, fieldtrips, science fairs and in other places.
- Jean Piagets experiments in Science Curriculum on students which developed the attitudes, curiosity, logical thinking, and thought provoking ability among the students.
- Science Facilities suggested by Ruth Anthoni to do Science activities in the school and out–side the school for any age group children in one year. The investigator included many number of activities in developing the new strategy of teaching chemistry.
- The social resources like environmental games, field trips, Project works, Science Paper – cuttings, day to day experiments in life suggested by Freeman and Dalling in chemistry teaching.

- The co-curricular activities, experiments for learning, visiting, observing, using the social and natural resources and environment are very useful in learning chemistry by Heiss.E.D; O' Burn.E.S, Hoffman, C.W..
- Philosophical Basis of the study :- Jean Piaget did some experiments on students basing on Science Curriculum. Results of Piaget's experiments on students developed the attitudes, curiosity, logical thinking, and thought provoking ability among students. Modern Educational Technology and practice have been grown largely out of work of Pestolozzi, Frobel and Herbert. Teaching methods inevitably constitute significant aspects of the human effort to educate. Developing attitudes, curiosity, logical thinking, and thought provoking ability strategies like Brainstorming, Quiz, seminars, Discussion between peer-group, teacher-student were selected for the study.

Sociological Basis of the Study :- It describes the students and teachers roles and relationships and the kind of norms that are encouraged. So co-operative learning, Group learning, collaborative learning are selected

Psychological Basis of the Study :- Instruction and Nurturant Effect describes the direct and implicit results of instructions. Principle of Reaction explains the procedure in which the teacher deals with the reactions of the students. Basing on this student presentations, reasoning, and learning by doing were selected.

### **Definition of a Model of teaching**

From the dictionary meaning the model is a pattern of something to be made or reproduced and means of transferring a relationship or process from its actual setting to one in which it can be more conveniently studied. In a point

of view of teaching, a model of teaching is a plan or pattern that can be used to shape curricula, to design instructional material and to guide instruction in the classroom and other settings. The most important aim of any model of teaching is to improve the instructional effectiveness in an interactive atmosphere and to improve or shape the curriculum.

### **Different teaching Models**

There are varying instructional goals for different classes and different subjects. Referring Bloom's taxonomy of educational objectives which are categorized into three domains, cognitive, effective, and psychomotor", to achieve these educational objectives or goals, different teaching strategies must be practiced by the teacher. Model approach to teaching was proposed by a number of educationists and psychologists.

Flander put his interaction analysis as a model of teaching. Glaser developed his stripped down model of teaching which after some modification is well known as basic teaching model. He divided instructional material in his model into four components. These are instructional objectives, the entering behavior of the students, instructional procedure, and the performance and assessment.

### **Components of Model of teaching :-**

Any Model of teaching consists of the following components.

1.Syntax :- It describes the phases of the model. Each model has different strategies.

2.Social System :- It describes the students and teachers roles and relationships and the kind of norms that are encouraged.

3. Principles of Reaction :- It explains the procedure in which the teacher deals with the reactions of the students.

4. Support System :- It deals with the use of other teaching aids, human skills and capacities and technical facilities.

5. Instructional and Nurturant Effect :- It describes the direct and implicit results of instructions.

6. Application :- It deals with further applicability of the model for different curriculum and classes.

7. Scenario building :- Scenario building is a practical tool, which helps to develop thinking forward strategies, and can help to frame the future.

Keeping in view of the above components researcher prepared the MVDCE model.

#### **Syntax of the Model MVDCE :-**

1. Teacher Exposition
2. Brainstorming
3. Group Work
4. Discussion
5. Developmental activities
6. Scenario building
7. Culminating activities
8. Seminar

**1. Teacher Exposition:** - The teacher establishes a careful setting out of the facts or ideas involved in the content. The teacher presents part of a moment in which the main themes are first. The preliminary information is to be presented by the teacher in the whole class. Next he or she divides the students into groups for allotting the works to them. The students work in

groups and present the information. The teacher culminates the activities presented by the students to conclude and establishes the follow up work.

**2. Brainstorming :-** Brainstorming is a group creativity technique which was designed to generate a large number of ideas for solving a problem. The proposed groups could double their creative output by using this method. Brainstorming is a process of creating solutions to problems. It works by focusing on problem, and then deliberately coming up with as many solutions as possible and by pushing the ideas as far as possible. like environmental problems, etc. Selecting a problem related to the concerned value in the whole class. All the students are to be divided into small groups to discuss to solve the problems, for example identification of malnutrition in HHV, Identification of medicinal values in fruits and vegetables in MV, Identification of pollutants in the environment in EV, lastly giving less weight and providing more energy foods in FNV. The students discussed in groups and presents the matter group by group to solve the problems.

**3. Group work :-**On the basis of the preliminary information presented by the teacher in the whole class, and on the problem selected in the Brainstorming phase, the students discuss within the groups, and prepare the particulars required for presentation.

**4. Discussion :-**Discussion was conducted in whole class, individual, large groups, small groups and in pairs. For example discussion on types of soaps usage in HHV, calorific values of foods in FNV, about tonics on MV, How and what types of trees to be grown in to protect the EV. These methods are effective in getting the students to think constructively while interacting with the rest of the group.

**5. Developmental activities:-**The developmental activities help to improve the content with activities. It is a smooth transaction of ideas and content between the teacher and the students. The developmental activities are problem solving, experimentation, role play, games, songs, preparation of models. The teacher facilitates his support in the form of providing the teaching aids necessary material to students to gradually improve and to conclude the lesson. Developmental activities improve the intellectual abilities, creative thinking, logical thinking and reasoning, and identification of the subject usage in the daily life in attaining expected outcome or goal of teaching. The students work in groups to arrive at solution and give reasons

**6. Scenario Building:-**Scenario's are useful to give a glimpse of future directions in the field of education. Scenarios can help to "frame the future" and analyse how today's decision can have an impact on the school of tomorrow. Scenario building is a practical tool, which helps to develop forward – thinking strategies. It also stimulates reflective and collaborative thinking skills, which result in the possibility to imagine alternative futures. The aim of scenario building for example, students think for the protection of water and, environment for the future, health and hygienic values to be habituated in future, about medicines and medicinal values of environmental availabilities, future values of food.

**7. Culminating Activities:-**The students present their solutions group-wise. The other groups interact upon solution presented by group. On the basis of the student presentations, and on the interaction, the teacher culminates the work of the students.

**Conclusion and follow-up work:-**By giving the follow-up work to the students and telling the values on the lesson teacher concludes the lesson.

**8.Seminar:** - The word seminar is derived from the Latin word seminarium, meaning “seed plot”. Seminar is, generally, a form of academic instruction. Seminars were conducted in the classes. Topics were given to students group wise, one week before. All the students help in collecting the information and preparing the paper to present. For example the precautionary measures in protecting the environment in EV, Hygienic measures in HHV, Identification of food adulterations in FNV.

**Social system used in MVDCE :-**In Social system co-operative learning, Group learning, and collaborative learning are used.

(i). Co-operative learning :- In the MVDCE model students involve in cooperation needed activities for example Quiz, seminars, in preparing science fair models, dramatization, interaction sessions were conducted in EG, for effective cooperative learning.

(ii). Group learning :-To organize group learning Brainstorming,

Environmental games

Environmental songs, and science clubs were organized. Science clubs were organized by the students for guest lectures on hidden dangers and hidden toxins in the day to day products.

(iii).Collaborative learning:-To encourage students in collaborative learning dramatization on protecting the environment, preparation of science fair models for example the environment in the past, present and in future, conducting experiments, and seminars.

**Principles of reaction used in MVDCE :-**Teacher deals with the reactions of the students. Basing on the advertisements and usage of items in daily life, teacher deals with the reactions of the students, and in the selection of items

by Role play, dramatization. For example the usage of shampoos, Enu, polythene covers and plastics, eating junk foods were discussed with the teacher to establish the reality in using these things.

**Supporting system used in MVDCE** ;-Support system included teaching aids and technical facilities support and enhances the results in teaching. Field trips and preparing Albums in 4 values were organized. To improve human skills and capacities, the students performed experiments for example the quality testing of soaps in HHV, effect of eucalyptus oil in obtaining relief from cold in MV , Value of taking sprouts in FNV were conducted. Technical facilities like web sites, computer, internet, preparing science fair models used in knowing the latest developments in attaining 4 major values.

**Scenario building used in MVDCE** :-Scenarios are useful to give a glimpse of future directions in the field of education. Scenarios can help to “frame the future” and analyses how today’s decision can have an impact on the school of tomorrow. The students think for the future of the environment, future foods values, medicinal values, environmental crises.

**Instructional and Nurturing effect used in MVDCE**:-Nurturing effect means care for and protect a child or a plant while they are growing and developing. The teacher must have a feeling or belief for a long time and describes the direct and implicit results of instructions. To establish this effect the researcher tried this model of teaching for pilot study in Government High school. Basing on the tryout, the researcher used this model of teaching chemistry to EGs in the present experimental study.

**Application used in MVDCE** :-From the treatment of the model MVDCE, it is established that it can be tried in other units of chemistry also.

**Assumptions formulated**

Basing on the above theories and suggestions by ICC and experiments conducted by the Piaget, the investigator has included the following in her assumptions in developing the new strategy.

- Inclusion of co-curricular activities in the strategy for more number of participation of students in the class based on the assumptions of Heiss.E.D; O' Burn.E.S, Hoffman, C.W..
- Field trips, Projects and experiments encourage the student to understand the value of science by the opinion of Daling and Piaget.
- The environmental games, Paper-cuttings, Science Olympiad and information given in the reference books, develop the thinking ability of the students by knowing about their surroundings and the usage in their daily life.

### **The features of Teaching Strategy**

#### **3.1.The table showing the features of Teaching Strategy & Comparative overview of the Traditional and New strategy followed in the Development of Instructional Units.**

S.No.	Particulars	Traditional Strategy	New Strategy
1.	Domains in rank order	Cognitive domain followed by Psychomotor and Affective domain.	Affective domain followed by Cognitive, and Psychomotor domain.
2.	Teaching Techniques	Maximum use of Lecture method, Text book oriented and explanation based.	Brain storming, exposition, interactions, pair-discussions, small group discussions, large group discussions, whole class discussions, student presentations, learning by doing, seminars, curricular and co-curricular activities,

	Learning Process	Competitive learning and Individual learning	giving examples, environmental games and songs, experiments, reasoning and learning by doing, seminars and observation.  Co-operative learning,  , Group learning, and Collaborative learning
3.	Teaching Aids	Mainly Black – Board, Charts, Text-book, Demonstration	Black – board, charts, graphs, magazine cuttings, maps, chemicals, laboratory equipment, Websites, Internet, Vedeo's, computer, Improvised apparatus, Demonstration and Experimentation.
4.	Evaluation	Oral and written questions at the end of the lesson on content.	Continuous evaluation through questions, observation with simultaneous feed back, group assignments, group-discussions, small group, whole group and class presentations, reinforcement, the desirable behavioural changes of the students.

### **3.11. Expected Outcomes of the MVDCE Treatment**

Through Brain storming, explanation question and answers, group discussions, student presentations, importance is given to learning by doing activities, giving examples, environmental games, environmental songs, experiments, scenario building, reasoning, observation, the student acquire the hidden values in the subject. From the activities like Black – board, charts, graphs, magazine cuttings, maps, chemicals and laboratory equipment the student could understand the hidden treasure of chemistry. Continuous evaluation through question answer and simultaneous feedback, group assignments, group-discussions and class presentations and reasoning gives the sustainability of hidden values among the students and helps in long remembering. The level of the 4 major namely food and nutritive, health and hygienic, medicinal and environmental enhanced by teaching chemistry through the developed model MVDCE among the students. The students stop eating junk foods as they spoil their health, identify the nutritive values of food, food spoilage, protecting the nutritive value of food taking balanced diet, identifying a pinch of glucose gives instant energy in fast running, and lead is there in the lipstick, frequent drinking of cool-drinks and excessive salt uses lead to stones in kidneys, medicinal plants around us can be used as home

remedies and frequent usage of room fresheners leads to respiratory diseases due to their aromatic nature. Coriander juice flushes the toxins from the kidneys. The inhalers used by asthma patients and the medicines used by the patients undergoing kemo-therapy are more dangerous. Home remedies are more useful than over-drugging for small ailments like fever, cold and cough, headache, body-pains and small wounds. Preserve and protect the water for present and future without any wastage. The children avoid to go to most polluted places like traffic signals in busy places.

**3.12. Preparation of Tool No. 3- Preparation of Lesson Plans on the 4 major values in 4 units of x class chemistry using chemistry the model MVDCE**

**Plan of Teaching : Preparation of Instructional Plans**

30 lesson plans were prepared usingMVDCE model for theecperimental group for the enhancement of four Hidden Values in chemistry teaching.

Instructional units for 4 Units were prepared using new Model of teaching, traditional method. Essentially the 4 units selected on the enhancing of four hidden values namely, FN, HH, M, and E are holistic in the nature and a variety of techniques of teaching materials and Evaluation Procedures. The inter–relationships between different elements of the lessons (aims, methods, materials, and evaluation) were worked out in detail. 30 lesson plans were prepared in selected 4 units of X class syllabus on 4 major values for teaching x class chemistry. Model Lesson Plans on 4 major values were enclosed under Appendix–XV A, XV B, XV C, and XV D.

<b>UnitNo.</b>	<b>Chapters</b>	<b>Value</b>	<b>No. of Lessons</b>
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I	Carbohydrates and Proteins	Food and Nutritive	7
II	Oils and Fats	Health and Hygiene	7
III	Acids, Bases and Salts	Medicinal	8
IV	Chemistry of Carbon Compounds	Environmental	8

### **Structure of the Lesson and Lesson Planning**

A lesson consists of the content to be taught and the instructional strategy employed in teaching of the content. A lesson plan is the actual plan of action and is the key to effective teaching. Advance knowledge gives the chemistry teacher an idea of how to introduce the topic, how to develop various key concepts, how to bring about a correlation between various concepts of the daily life and how to conclude the lesson. For evaluation of the students performance and himself, the chemistry teacher must know the objectives of the lesson.

Good defines a lesson plan as an “Outline of the important points of a lesson arranged in the order in which they are to be presented to students by the teacher.”

Lester. B. Stand defines a lesson plan as ‘A plan of Action” implemented by the teacher in a classroom.

According to International Dictionary of Education, “Lesson plan is the outline of important points of a lesson arranged in order in which they are to be presented to students by the teacher.

### **Sequential Steps in Traditional Method of Lesson Plan**

- Preliminary Information
- Teaching Material for Instruction

- Content Analysis
- Instructional Objectives and Specifications
- Introduction/ Motivation
- Presentation
- Recapitulation
- Assignment

In the traditional method of teaching the above steps were followed and used the lecture method, synthetic method and lecture demonstration method.

### **Sequential Steps in MVDCE Model of Lesson Plan**

- I Teacher Exposition
- II Brainstorming
  - i Group work
  - ii Discussion session
- III Developmental activities
  - i Scenario Building
- IV Culminating activities
  - Conclusion and follow up work

**I. Teacher Exposition :-** The teacher establishes a careful setting out of the facts or ideas involved in the lesson. The teacher presents part of a moment in which the main themes are first. The preliminary information was presented by the teacher in the whole class. The teacher in this step, prepares the students to receive the new knowledge by introducing the topic in an interesting manner. The curiosity of the learners should be aroused and sustained. The teacher creates the environment in the class on the lesson so

that the student thinks on the lines on the content and feasible for selecting the problem. This is a warm-up session, to expose novice participants to the criticism- free environment. For example hazardous chemicals in foods, air, water, soil, and in environment, and radiation which have adverse affects on the harmony of life. In these problems how chemistry is hidden and how chemistry helps in overcoming these problems and attaining the harmony of life.

**II. Brainstorming** :-A simple problem is brainstormed relating to the content of the lesson. It works by focusing on the problem then deliberately coming up with as many solutions as possible and by pushing the ideas as far as possible. Brainstorming is a process for developing creative solutions to problems and a great way of generating the ideas. Ideas on the content of the lessons should only be evaluated at the end of the brainstorming sessions. One can then explore solutions further using conventional approaches in leading the lesson. Group brainstorming tends to develop fewer ideas, but takes each idea further, and needs formal rules for it to work smoothly. The students work in groups and discuss on the problem selected on the content leads in the development of the lesson serve as a useful exercise for team building. The teacher observes the students, clarify the doubts and supports as collaborator in supplying the teaching aids and supporting material, for effective benefit.

**i. Group work** :-On the basis of the preliminary information presented by the teacher in the whole class, and on the problem selected in the Brainstorming phase, the students discuss within the groups, and prepare the particulars required for presentation.

**ii. Discussion** :-Discussion was conducted in whole class, individual, large groups, small groups and in pairs. For example discussion on types of soaps

usage in HHV, calorific values of foods in FNV, about tonics on MV, How and what types of trees to be grown in to protect the EV. These methods are effective in getting the students to think constructively while interacting with the rest of the group.

**III Developmental Activities :-** The developmental activities help to improve the content with activities. It is a smooth transaction of ideas and content between the teacher and the students. The developmental activities are problem solving, experimentation, role play, games, songs and preparation of models. Developmental activities improve the intellectual abilities, creative thinking, logical thinking and reasoning, and identification of the subject usage in the daily life. Some of the developmental activities used in the model were

**Problem solving activities:-** Problem solving activity is another method of discovery learning. Problem solving takes place only when the student's previous knowledge is insufficient to enable him to provide an acceptable solution and solution becomes possible only when he acquires knowledge which does not have before. The students' sense, recognize, concentrate, guess hypothesis, examine and evaluate, judge and re-check the conclusions and test their validity of the problem related and directed to find an appropriate solution in building up the lesson.. It is important to include problem for which the teacher does not have a preordained answer. For example how the traces of bomb blast in Hiroshima and Nagasaki years ago effects the subsequent generations, how the toxins enter our body how the present medicines effect the health.

**Experimenting:-** Through experimenting ideas are proved or disproved, and predictions confirmed or denied. Experimentation involves manipulating data and assessing the results to discover some scientific principle or truth

students need to understand that they conduct experiments on acid rain, instant energy giving foods and medicinal values of eucalyptus oil in curing the cold etc.

**Role Play:-** Role play are typically short, lasting for maximum 15 minutes. The best ones are those in which two or more students engage in a dialogue, about a specific event or circumstance, keep directions which the teacher or more students provide to a maximum; this is a wonderful opportunity for students capitalize on their creativity. Songs on vitamins, value of food, disease causes deficiency.

**Games:-**Games improves the attitudes of health, growth, better nourishment of the children. Students are very much interested in the co-curricular activities like games, seminar, gardening and field-trips. Games gives good energy and observation, linking to scientific explanation, willingness to change opinions, acceptance probabilities to the students. So games play an important role in children's FNV, HHV, MV and EV. Students play games on protection of trees and on environment, yogic cure for diseases, games therapy in good nourishment and growth of the body, games on value of food (Vaignanikavaikuntapali on food and health), games to improve hygienic values among students and precautionary measures.

**Songs:-** Music therapies are organized in faith in the possibility of solving the health problems, and in curing some diseases like mental ill-health, songs on vitamins, balanced diet, nutritious food and on environment gives harmony in life because of its quality that the smoothness, amplitudes, notes and with rhythmic sounds. Songs attracts the minds and change the willingness and opinions of a person in a better way. This is the naturopathic therapy in Indian

culture. By singing with the linking for scientific explanation the student internalize these values.

**Supporting system** :-Support system includesteaching aids and technical facilities support and enhances the results in teaching. Teaching aids give direct contact, which involves doing, clarify difficult concepts, establishes relation, correlate and coordinate concepts, preparing albums and field trips. To improve human skills and capacities, the students perform experiments. The teacher supports the students by giving the required material,magazine cuttings, website papers, apparatus and charts containing the tables with information. The students utilize the teaching aids to arrive at a solution and finalize their solution in solving the problem on the content of the lesson.Each group present their results in the class, the results predicted and recorded. Theinteraction related to the modes of thinking and reasoning and is called scientific inquiry.

**Scenario Building** :- Scenarios are useful to give a glimpse of future directions in the field of education. Scenarios can help to “frame the future” and analyses how today’s decision can have an impact on the school of tomorrow. Scenario building is a practical tool, which helps to develop forward – thinking strategies. It also stimulates reflective and collaborative thinking skills, which result in the possibility to imagine alternative futures. The aim of scenario building for example, students think for the protection of water and, environment for the future, health and hygienic values to be habituated in future, about medicines and medicinal values of environmental availabilities and future values of food.

**IV. Culminating Activities** :-Basing on interactions of the students and on presentations and discussions, the teacher writes salient points on the black-

board. From the discussions by the students with the help of the teacher, establishes relation with scientific explanation. For example the neem destroys microbes, mango leaves destroy the microbes generated by the over crowds, and the radiated aromatic compounds with low boiling point enter the lungs during pradakshinas and absorbed the moisture in the lungs caused for getting cold. Likewise by giving the scientific explanations the teacher culminates the activities with reasoning. This scientific explanation gives strength to the lesson with the hidden value of chemistry.

**(i). Conclusion and Follow up Work :-**For better living and living with harmony every one must need chemistry in daily life. As a follow up work to strengthen the scientific explanation and value of chemistry in daily life, the teacher explains that the experimentation for arriving the truth and in cooperative learning in Group Discussion helps in solving the problems. To obtain sound mind in a sound body, and better living the value of chemistry is more essential. With this the teacher concludes the lesson.

### 3.2. Table showing the description of lessons Teaching aids used, Units.

Discription	Food and Nutritive Value	Health and Hygienic Value	Medicinal Value	Environmental Value
Unit	Carbohydrates and Proteins	Oils and Fats	Acids, Bases and Salts	Chemistryof Carbon Compounds
No.of lessons	7	7	8	8
Names of lessons	1.what are carbo-hydrates 2.Importance of carbo-hydrates 3.Preparation of Sugar 4.Test of sugar 5.Preparationof Alcohols	1. Uses of oils and Fats 2.Hydrogenation of Oils 3.Industrial Prepa-ration of Soap 4.Uses of Soaps	1.Preparationof Acids 2.Preparation of Bases 3.Properties of Acids 4.Properties of Bases 5.Arrhenius Theory 6.Ionization of water	1.Allotropiesof C- Diamond 2.Allotropies of C- Graphite 3. Oxides of Carbon, Carbon Monoxide, Carbon dioxide

	6.Amino acids 7. Proteins	5.Qualitative Test of Soap 6. Uses of Detergents 7. Steps in the Preparation of Soaps and Detergents	7.Concentration of Hydrogen ion-pH of solutions 8. Strength of Acids and Bases, Neutralization-HeatofNeutralization	4.Inequality of Carbon-Resources of Carbon 5. Hydrocarbons-Alkanes 6.Alkenes 7.Alkynes 8.Carbon compounds with other functional groups
Strategies employed	Experiments, websites on food values and nutritive values, games, Prep. of albums, interaction	Experiments, website, papercuttings, dramatization, model prep.	Websites, medicinal plants, conducting experiments, prep. of models, science clubs, games, learning by doing	Envir.games, discussion method, field trips, science clubs, prep. of models, uiz, interaction, curricular and co-curricular activities
Teaching aids used	FNV tables, charts on nutritive values, magazine cuttings, chemicals, lab. Equipment, BB, web. Material on food toxins, games	Health charts, malnutrition, reasons, chemicals Lab. equipment, BB, web. material on health toxins, games	Charts on MV of fruits, and vegetables, on alternatives to medicines, chemicals, lab equipment, BB web-pages on medicines, games, songs, pH & litmus paper	magazine cuttings on pollution, chemicals, lab. equipment, BB, Charts on EV,

The main unit was divided into subunits. The Subunits were divided into lessons. Components selected for the hidden values particularly developed in that unit were designed, and linked with selected activities. The activities selected for teaching were Environmental Games, Dramatization, Seminars, Discussion Method, Field Trips, Role Play, Science Clubs, Preparing Science fair models, Collection of Paper cuttings and related material from books, Science Olympiad information and Preparation of Albums, Conducting experiments used basing on the requirement and suitability of the lesson. The structure of the lesson was enclosed in the appendix - XV.

Continuous evaluation through questioning simultaneous feedback, group assignments, group-discussions and class presentations help in the

sustainability of hidden values among the students and for lasting long remembering.

### 3.13. Tool – 4 :- Preparation of Attitude Scale – II(Post-Test)

To conduct post-test an Attitude Scale – II (Appendix - X) is planned, prepared and administered. Post-test was prepared on the following 4 selected units of X class chemistry identified from Information Sheets, II, III, and IV.

Unit No.	Name of the Unit	Selected Value
I	Carbohydrates and Proteins	Food and Nutritive
II	Oils and Fats	Health and Hygiene
III	Acids, Bases and Salts	Medicinal
IV	Chemistry of Carbon Compounds	Environmental

The attitude scale-II (post-test) is prepared on the same lines of preparation of the pre-test (Attitude Scale-I) and on the same components of the 4 major values, Food and Nutritive, Health and Hygiene, Medicinal and environmental, followed in the pre-test.

In the Food and Nutritive Value, on the selected 10 components, namely Nutritive value of various foods, Identification of food adulteration, Identifying causes of diseases, Identifying alternatives, Value of Food, Food storage, Food spoilage, Precautionary measures, Balanced diet, Food package 13 items were prepared, one item on each component, of FNV and 2 items each

on Nutritive value of various foods, Identification of food adulteration and food spoilage.

On the selected 10 components of HHV, namely Identifying measures of health, Hygienic Value, Identification of deficiencies in malnutrition, Necessary micronutrients causes growth, Keeping surroundings clean, Hygienic habits, Protection of health, Identification of harmful elements, Health Protection and Scientific attitude 13 items were prepared, one item on each component of HHV and 2 items each on Hygienic habits, Protection of health Hygienic habits, Protection of health, and hygienic value.

In the MV, on the 10 components namely Medicinal Value, Identification of diseases, alternatives to medicines, preventive measures of diseases, Identifying medicinal values in fruits and vegetables usage, awareness of medicinal Values, Identification of pollution causing diseases, Identification of foods alternative to medicines, Identifying the diseases-Reasons of getting various diseases, Identification of medicinal plants, 13 items were prepared, one item on each component of MV and 2 items each on Identification of diseases, Alternatives to Medicines, and medicinal value.

On the selected 10 components of EV, namely Environmental Value, Identification of environmental pollutants, Preventive measures of pollution, Control over Pollution, Protection of environment, Precautionary measures of environment, Awareness of Environment, Right of control over wastage, Understanding environment, Reasoning to Superstitions, 12 items were prepared, one item on each component of EV and 2 items each on Environmental Value, Identification of environmental pollutants.

Prepared 51 items in total, and frequent discussions with the subject experts of chemistry for the suitability and effectiveness of items. Among these 51

items, 13 items in each value Food and Nutritive, Health and Hygiene, Medicinal, and 12 items on Environment, in the construction of an attitude scale, the researcher had taken the 10 selected components under each value from the Information sheet – II. Among them 24 are negative and 27 are positive. Each item was given 5 options a, b, c, d, e. Positive items are given ratings from 5 to 1, and 1 to 5 in the case of negative. 5 is the maximum rating and 1 is the very lowest extent. The value extent is jumbled to all the items. The students were asked to identify the extent and note the alphabet in the given bracket against each item.

Pilot study was conducted for the Attitude Scale-II by administering on 50 students of X class in Government High school. To establish the significance of the tool, each of the items of the present attitude scale was tested by the chi-square technique. Among 51 items, 40 items were found to be significant at 0.01 level are included in the tool and the remaining 11 items were not significant at 0.01 level are rejected from the tool. The chi-square values of the items in post-test were enclosed in Appendix – XII. The Difficulty Index, Validity Index values are calculated, and were kept in Appendix – XIII. The item discrimination of Post-test is kept under appendix - XIV. In the need analysis, only the 40 items are valid. The Post-test (Attitude Scale – II) was enclosed in Appendix IX. The key was prepared to the Post-test, and is kept in Appendix – XI. The reliability and the validity of the tool is established. A detailed discussion in the following paragraphs is made on the reliability and validity of the Post-test.

### **Establishment of Reliability and Validity of the Attitude Scale**

On the similar lines followed in the pre-test, the reliability and validity were found out for post-test also.

## **Reliability**

The Reliability coefficient is calculated for the post-test attitude scale – II is 0.82 shows the test so constructed is highly reliable.

## **Validity :-**

The validation of content judgment is most satisfactory when the sampling of items is wide added judicious and when adequate standardization of groups is utilized. This post-test (Attitude Scale - II) prepared on the content judgment, with the help of the subject experts. So the post-test is valid.

Finalized post-test was administered to all the groups, for the collection of data

### **3.14. Procedural Details**

This research work is based on “two-group-random-pre-test and post-test – true experimental design”. A set of relevant and appropriate procedures were adopted for procuring reliable and valid data. The administration of tools, collection of data and all the necessary information were done during the school time only. The procedures adopted during this study are presented below.

The pre-test (Attitude Scale–I) was prepared, validated and administered on the sample of X class in rural and urban to identify the initial levels of values of students. On the basis of pre-test scores, two similar groups, Experimental Group and Control Group were established by using Randomized matching Group technique.

A model MVDCE was developed for teaching chemistry to X class students for enhancing the selected 4 major values FNV, HHV, MV and EV.

Prepared 30 lesson plans in 4 units of X class chemistry using MVDCE model and Traditional method of teaching.

Experimental Group and Control Group were respectively taught 4 units of X class chemistry using the MVDCE model and traditional method of teaching for a period of 80 days. The researcher provided adequate teaching learning material to the students of both EG and CG during teaching.

At the end of the treatment post-test Attitude Scale-II was administered to all the groups.

The results were analyzed.

### **3.15. Statistical Techniques employed in the study**

Various statistical techniques were used to analyze the data. Descriptive statistics was used to summarize the pre-test scores and post-test scores. ANOVA was used to study the impact of MVDCE and Pearson Product moment correlation was employed to test relationship between values. The details and analysis carried out along with the findings and discussions are presented in the following chapter.

## **CHAPTER - IV**

### **ANALYSIS AND INTERPRETATION OF DATA**

#### **4.0. Introduction**

The data was dealt under three sections namely, Section-A Preliminary Analysis, Section-B Differential Analysis, and Section-C Co-