CHAPTER-III
PLAN & PROCEDURE OF THE STUDY

3.1. INTRODUCTION :

This chapter is related to the plan and procedure of the study. The plan and procedure are the framework or blue print of any research. A sound and logical plan and procedure determines the validity and generalizability of any research work. The main objective of the study was to inculcate values using the integrated approach through teaching of Mathematics at secondary level. The study has been conducted in two sections. Section -I includes the procedure of selection of the course content, identification of values and development of the strategy. Section-II gives details about the population, sampling technique, description of the tools , method of data collection and techniques used for data analysis. .

3.1.1 *Section I : Development Of The Strategy*

Section I of the study includes development of the strategy. This consisted of chapters of Mathematics taken from Mathematics text book of standard VIII, content analysis and value identification, development of activities and preparation of value integrated lesson plans.

3.1.1.1. Step 1 : Identification of Chapters in Mathematics.

This teaching of Mathematics through the integrated approach was required to be done at class VIII level and hence all the chapters of class VIII Mathematics textbook published by NCERT for CBSE syllabus for the year 2011-12, was selected.

The textbook contained 15 chapters. The analysis of the textbook showed that different units included, arithmetic, algebra, geometry and statistics and consumer Mathematics. The chapters based on these units were as follows:

(UNIT - I)Arithmetic: This unit included Chapter with subtopics as follows :

1)   **Rational Numbers :** within this chapters concepts like Set of Numbers, Rational numbers, Properties of Rational numbers, Operations on Rational numbers like Addition, Subtraction, Multiplication and Division of rational numbers, Representing Rational Numbers on a Number line, Inserting or finding numbers between two Rational numbers were discussed.

2)   **Squares and square Roots:** Squares of numbers, properties of squares, interesting patterns, finding squares without multiplication, finding square roots through repeated subtraction, through prime factorization, division method.

3)   **Cubes and Cube Roots:** Cubes, Hardy Ramanujan Number 1728, interesting patterns in cubes, finding cube roots by prime factorization, cube root of a given cube number through approximation.

4)   **Exponents and Powers:** Powers and negative exponents, laws of exponents, numbers in standard form.

(UNIT – II) Algebra : This unit included chapters with sub topics as follows:

1)   **Linear Equations with one Variable :** Solving equations with equation on one side and constant on other side, solving equations on both sides, reducing equations to simple functions, equations reducible to linear forms and applications

2)   **Algebraic Expressions:** Expression, monomials, binomials, polynomials, like and unlike terms, addition and subtraction of algebraic expression, multiplication of polynomials, Identity and Algebraic Identities.

3)   **Factorization:** Factors of natural numbers, algebraic expressions, Factorization by regrouping, identities, division of polynomials using factorization and finding errors in factorization.

4)   **Direct and Inverse proportions :** Direct proportions : [$x_1y_2 = x_2y_1$], Inverse proportions : [$x_1y_1=x_2y_2$]

(UNIT – III) Geometry : This unit included chapters with sub topics as follows:

1) **Visualizing shapes :** Euler's Formula, Faces, Edges and Vertices

2) **Mensuration:** Area of rectangle, circle, square, trapezium, quadrilaterals, and polygons, solid shapes like cylinder, cuboid, cube, Volume of cube, cuboid and cylinder.

3) **Understanding Quadrilaterals:** curves, closed open curves, polygons, classification of polygons, diagonals, convex and concave polygons, regular and irregular polygons, angle sum property of polygon, exterior angles of polygons, interior angles of polygons, Quadrilaterals and types of Quadrilaterals.

4) **Practical Geometry:** Construction using ruler and compass, constructions of quadrilateral using sides and angles, special constructions.

(UNIT – IV)Statistics and Probability: This unit include chapters with sub topics as follows:

1) **Data Handling :** Organising data, Bar graph, double bar graph, class interval, class limit, frequency, tally marks, Histogram, Bars with difference, Circle graphs or Pie Chart, Chances and probability.

2) **Graphs :** Bar-graph, pie-graph, histograph, line graph, linear graph, co ordinate axes, dependent variable and independent variable on graph.

(UNIT – V)Consumer Mathematics : This unit include chapters with subtopics like:

1) **Comparing Quantities:** Ratios and percentages, Increase or decrease percent, finding Discounts, Profit and Loss, Sales Tax/ VAT, Simple Interest, Compound Interest.

3.1.1.2. *Step 2: Content Analysis And Value Identification*

After selecting the chapters for each semester, the content analysis of the chapters was done. During the content analysis of the chapters, the content was broken into topics and further into subtopics. The subtopics were

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arranged in a logical order. The order was simple to complex, known to unknown, and concrete to abstract. Along with the subtopics the values which could be integrated were identified. The values identified were the most frequently occurring values in all the chapters selected.

The following table gives the name of the various chapters, the subtopics and the values identified and integrated with the sub topics.

TABLE 3.1 : NAME OF THE CHAPTER, SUBTOPIC AND VALUES IDENTIFIED.

Ch. No.	Name of the Chapter	Sub topic	Value Identified
1	Rational number	Properties of Rational Number	Team Work and Cooperation
2	Linear Equation with one variable	Linear equation	Equality
3	Understanding Quadrilateral	Regular polygons, Quadrilateral	Regularity
4	Practical Geometry	Construction	Discipline
5	Data Handling	Frequency Table, Pie Charts,	Equality
6	Squares and Square roots	Patterns in Square, Identity	Simplicity
7	Cube and Cube Roots	Patterns in Cubes, Hardy Ramanujan	Determination
8	Comparing Quantities	Profit and loss, Formulas for Compound Interest	Honesty
9	Algebraic Expressions	Expansion, Identities	Equality
10	Visualizing shapes	Cubical shapes	Determination
11	Mensuration	Area & Volumes	Determination, Dignity of

			labour, Co operation
12	Exponents and Powers	Laws of exponents,	Loyalty
13	Direct and Indirect Proportions	Direct Proportions and Indirect Proportions	Dignity of Labour
14	Factorisation	Factors of number,	Co operation
15	Graphs	Bar Graph, Line Graphs, Pie graphs	Equality

3.1.1.3. *Step 3: Development of Activities for Inculcation of Values*

There were various activities developed for the inculcation of values through teaching of Mathematics using the integrated approach. The developed activities included value- based stories, value- based games, value discussions, preparation of models, and field trips.

- *Story Telling*

Short stories on different values were collected from different sources. They included news-papers, story books, magazines, films, television, online and other sources. Some stories were also scripted by researcher. These stories were narrated by the researcher while teaching various sub-topics integrated with values. A brief account of the stories used for value inculcation with mathematical topics and name of values have been mentioned below. The narration of these stories would help in developing understanding and the desired perception towards the values of equality, honesty, co-operation, simplicity, honesty, dignity of labour, regularity, team work, loyalty and discipline

- **Story 1.Hare and the tortoise**: This is a story which narrates the incident after the original story of hare and tortoise race, where initially the hare lost the race. After that incident they ran the race three times.

Initially in the first and second race both the hare and the tortoise ran individually and wins the race alternately. In the final race they ran as a team and win the race and this exhibits the importance of team work.

Content in Mathematics: Rational numbers

Values integrated : Team Work.

- **Story 2 : Story of Milkman's generosity :** This is a story about a researcher himself becoming a milkman. He narrates an incident on one fine day where he helps two poor children by providing them a fixed quantity of milk. This is from his daily quantity of milky supply which is 1 litre. He mixes water in the remaining milk and makes it 1 litre. This is an act of dishonesty ,and is also about a researcher who used to sell milk during his college days which shows the value of dignity of labour.

  Content in Mathematics : Profit and Loss, Percentage, Ratio and Proportion

  Value integrated : Dignity of Labour, Honesty

- **Story 3: Lord Rama and Shabari Story :** This is the story of Lord Rama who meets Shabari along with his brother Lakshaman. Lord Rama is offered berries which are cleaned and tasted by Shabari first. Lord Rama accepts it and eats it whereas Lakshman avoids it. The moral of the story is that God considers all human beings as equals.

  Content in Mathematics : Linear Equations

  Value integrated: Equality.

- **Story 4 : Story on numbers :** This story is all about numbers, its beginning and how different types of numbers were introduced to the world. It depicts how initially the primitive man gave the concept of Natural numbers. This also tells how Aryabhata's discovery of 'O' helped the man kind to get whole numbers. Later the nomads settled

near river bank did business and concept of lending burrowing started. This gave the concept of integers. After that when wealth, properties were collected by humans and they divided it by using the concept of fraction, then came the rational numbers. This story made by the researcher for linking all numbers and various incidents in obtaining the new number sequentially.

Content in Mathematics : Number System, Set of Numbers

Value integrated : Team Work.

- **Story 5: Story on Quadrilateral Family :** It's a mathematical story of quadrilateral and different types of quadrilateral. Here it was shown that how few changes made in one quadrilateral leads to the formation of a new type of quadrilateral. This story was linked to three generations with quadrilateral belonging to the generation of grandparents and parallelogram and squares as members belonging to parents and their children respectively. In this story the concept of discipline and regularity was passed on from one generation to another, which was made evident from quadrilateral to square.

  Content in Mathematics : Understanding Quadrilaterals

  Value integrated : Regularity.

- **Story 6: Rotten Potatoes :** It is a story about a researcher giving instruction to children to carry potatoes. One day the researcher after seeing a lot of fights happening around in classroom told her students that they will do one activity. Each students depending upon the number of enemies he or she had was asked to carry that many number of potatoes in his bag. They were asked to take this bag everywhere they went. Finally they were frustrated with the odor of the rotten potatoes they were carrying which represented negative thoughts. The moral of story is more the number of enemies or negative thoughts are there in a person's life, more unhappiness and misery will be faced by them.

Content in Mathematics : Factorisation

Values integrated : Co operation

- **Story 7: Hardy Ramanujan Number : 1729 :** This story is about the work done by two mathematicians on the number 1729 which happens to be actually a taxi cab number. In this Hardy comes across a number and gets puzzled and Ramanujan provides a solution to it. Later on both of them get determined to find some interesting combinations with this number.

  Content in Mathematics : Cubes: Hardy Ramanujan Number

  Value integrated: Determination.

- *Value Games :*

  Various games related to values using mathematical concepts were designed and conducted. The games used were making the square, picking up a bottle, Rubik's cube and measuring playground. Most of the games were designed by the researcher and conducted by the researcher. This activity was designed with the aim to develop understanding and desired perception about the different values like team work, co-operation, simplicity and determination.

- **Game 1 : Making Squares With Students**

  Topic : Square of a number

  Value : Simplicity.

  Procedure : This game focuses on learning of a mathematical concept i.e. square of numbers. To begin with, six students are called out from their places. They are again asked to make uniform groups where the first student will make a group including himself of 4 members, second will make a group of 6 members, and similarly other students will make group of 7, 8, 9 and 10 members. The task is that they get arranged themselves in squares. This square should not have any gaps in between, which means that all rows should have equal number of students in it.

  Secondly, two students are to be called out from their place and they are supposed to make square of 4 students in one line. They have to maintain uniformity while calling out the students. So the students start calling other students and complete the task assigned. The researcher continues this activity till all the students of the class have been involved in making squares. This is a simple game to draw out the value of simplicity in finding squares. This activity will clarify the concept of squares.

- **Game 2 : Picking the bottle**

 **Topic : Quadrilateral**

  Value : Team work.

  Items required : Straw - 2 packets, rubber bands - 1 packet, cello-tapes and a bottle.

  Procedure : The students are divided into three groups with 14 students in each group being the maximum. All the groups are given one item

each, the first group is given packets of straw, the second group is given a packet of rubber bands and third group is given cello-tapes.

A square area is formed with the help of benches and a bottle is kept in the centre of the square. The students are asked to takeout the bottle with the help of objects given to them without entering the inner area. The groups are supposed to work in co- ordination to complete the given task. This game focuses on the developing the value of team work using mathematical logic related to diagonals of a square.

- **Game 3 :Rubiks cube solving**
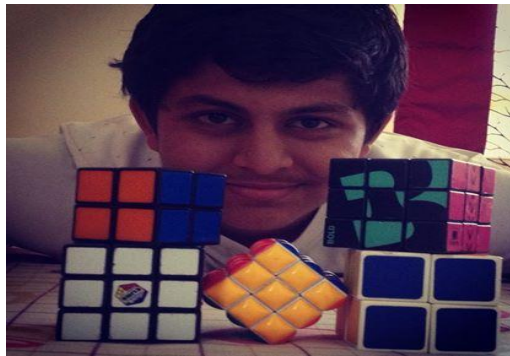
Topic : Visualizing solid shapes

Value : Determination

This is an activity given as a home assignment during the diwali break, the students are asked to solve the Rubik's cube by putting in their best effort. They are supposed to find the method of solving the Rubik's cube in the fastest possible manner. The student are supposed to solve this individually as well as in groups. The students who are unable to find the solution will be doing the presentations related to Rubik's Cube. This activity will enable them to know about the various concepts related to cubes like edges, faces, vertices along with the understanding and the perception of the value determination.

- **Game 4:Measuring Play ground :**

Topic : Mensuration : Area and Volume.

Value: co-operation

Items required : Measuring tape, Scale, Books, Pen, Pencils, Strings roll.

Procedure : This is a play way method of understanding the mathematical concepts. The students will do a group activity outside the classroom. The students are given their respective groups a day in advance and they are asked to bring certain items. There is a basketball court, a badminton court, a tennis court and also one assembly stage outside in the playground of the school, The courts have markings which is ideal for 2D shapes whereas the assembly stage and pillars of the basket -ball court are ideal for 3D shapes. The respective groups of students are given the task to find out the area of 3 courts and to find the area and volume of the assemble stage as well as the basket- ball court pillars.

- *Preparation Of Models :*

The preparation of models were related to the mathematical concepts. This activity had students designing the models. They made models based on the topic given by the researcher. These models demanded a collective effort of students. Thus the researcher used this activity to develop and perceive values like co- operation and team work.

Topic : Model making on cubes, cuboids, cylinders and examples in text book

Chapter: Mensuration

Value : Co operation& Team work.

Procedure: It is an activity which was used in the chapter of mensuration which dealt with lots of mathematical 3 D shapes. Here, apart from making simple 3-D shapes the students are supposed to identify the problem sums where in a physical structure could be identified. Later, the group did a

presentation of their work showing the model and what calculations were done and how they obtained the desired result.

- *Educational Field Trip :*

    It was a part of the school annual plan, the researcher asked the group to make a project report of the various things which had mathematical application during the field trip. The researcher had asked the students to note down the mathematical structures found in the places visited during the trip. He had also asked the students to know how Mathematics was used in various ways right from the planning till the sight- seeing stage.

- *Value Discussion :*

  The discussions on the ten values integrated with the various sub-topics were held. The discussion in detail were held on the ten values taken in the study are equality, regularity, cooperation, dignity of labour, team work, honesty, simplicity, determination, discipline and . The discussions were very interactive which focused on meaning, definition and characteristic of each value which have been given below.

- *Equality :*

  Meaning: Equality basically means access or provision of equal opportunities, where individuals are protected from being discriminated against. Discrimination in equality can occur in race, gender, health, religion, family structure, age, politics, disability, culture, sexual orientation or in terms of believes.

  Definition : The state of being equal, especially, in status, rights, and opportunities

  Characteristics of Equality: People who believe in equality treat every person equally irrespective of age, disability, ethnicity, gender. They are always helpful, caring, co-operative in nature. They believe in one God concept or respect all religions ideology.

- *Regularity:*

  Meaning : Being regular in doing work. Regularity means doing similar action or behavior frequently.

  Definition : It is an act in doing the same thing or action at the same time each day or on a regular basis.

  Characteristics : The main features of regularity are punctuality, being systematic in approach, following disciplined behavior, managing time and having good coordination with others.

- *Co-Operation :*

  Meaning: Co-operation means living in accord with others. People should be helpful to one another. They should accept other people's point of view.

  Definition: It is the process of working or acting together. In its simplest form it involves things working in harmony, while in its more complicated forms, it can involve something as complex as the inner workings of a human.

  Characteristic: The main features of co- operation are togetherness, service attitude, empathy, understanding, volunteering for the benefit of others and Self-motivation.

- *Dignity of Labour:*

  Meaning: Dignity of labour means that one respects all jobs/positions equally and does not consider one superior to another.

  Definition: It is an attitude of respect that one has towards any level of work. When doing the work there is no considering of whether the job is big or small.

  Characteristic: Dignity of labour has 'respect for work' as one of its main characteristics, along with honesty and sincerity towards any work delegated to a person.

- *Team Work:*

  Meaning: 'Team work' is an art of people coming together and working together for achieving goals, objectives or completion of any task. The goals may be set by an organization, entity or may be the members of the team itself. Team work is also exhibited in doing any leisure work for fun. It is seen in all age group. It has no barriers any person can be the member of a team. It is not work specific, culture specific, gender specific or class specific.

Definition: 'Team work' is, when two or more individual comes together for achieving a certain goal or doing a task, showing a good co ordination and understanding by using their inherent talent and utilizing and recognizing the talent of others in a cordial manner."

Characteristics: Only growth and benefit of the team is of prime importance, personal gains are a bog loss for the team. Members' adaptability according to the team's requirement is an important feature. Co operation, understanding, collaborative approach are some of the significant components of team Work.

- *Honesty :*

Meaning: Honesty refers to a facet of moral character and connotes positive and virtuous attributes such as integrity, truthfulness, and straightforwardness, including straightforwardness of conduct, along with the absence of lying, cheating, theft, etc. Furthermore, honesty means being trustworthy, loyal, fair, and sincere.

Definition: Honesty is speaking truth. Honesty is straightforward conduct. Honesty is being sincere, truthful, trustworthy, honorable, fair, genuine, and loyal with integrity.

Characteristics: People having honesty are firm believers of telling the truth despite consequences to them, voice their opinion in a kind, thoughtful way, Show and share their feelings, know their classmates and researchers care and want the best for them, feel and react without guilt, express themselves positively as well as critical. When confronted with a situation, think of others.

- *Simplicity:*

Meaning : It is Simple living which encompasses a number of different voluntary practices to simplify one's lifestyle. These may include reducing one's possessions or increasing self-sufficiency. In students life, It usually relates to the burden which a thing puts on someone trying to explain or

understand it. Something which is easy to understand or explain is simple, in contrast to something complicated. simplicity can be used to imply beauty, purity, or clarity. Simplicity may also be used in a negative connotation to denote a deficit or insufficiency of nuance or complexity of a thing, relative to what is supposed to be required.

Definition : It is the state or quality of being simple.

Characteristic: shows true nature , originality in view, peace loving, idealistic and realistic in nature , simplicity exists in thoughts, behavior, outlook and many more like these.

- *Determination:*

Meaning: Determination is simply not giving up. No matter how hard things get, or how badly a person want to just give up, the ability to keep on going irrespective of all odd factors shows the determination in a person. Determination is not giving up. Determination is not letting go. Determination is falling on your face and getting back up.

Definition: The quality of being determined; firmness of purpose. The process of establishing something exactly by calculation or research.

Characteristics: People with determination have awareness of personal strengths and weaknesses. They possess the ability to set goals and make choices. The also possess the ability to be assertive at appropriate times. They do have the ability to interact with others in a socially competent manner . They are persistent.

- *Discipline:*

Meaning : It is systematic instruction intended to train a person, sometimes literally called a disciple, in a craft, trade or other activity, or to follow a particular code of conduct or "order".

Definitions : Training or conditions imposed for the improvement of physical powers, self-control, etc.

Characteristics: People who are disciplined are goal oriented. He/she is a person that has established a goal and is willing to achieve that goal at the expense of his or her individuality. Strong willpower, possessing self-control, motivated for self-discipline.

- *Loyalty:*

Meaning: It is something Intrapersonal concept related to doing the right and ethical actions or behaviour related to person to person or country or group of person or ideas or causes.

Definition: A state or quality of being loyal. It is a feeling of allegiance. It is faithfulness or a devotion to a person, country, group, or cause.

Characteristics: People who are loyal are selfless person, they have good mental strength. They keep the country, family and organization's goals at priority than their personal goals.

TABLE 3.2 Synotic View of Activities conducted for value inculcation

Ch. No.	Name of the Chapter	Value Identified	Activities
1	Rational number	Team Work and Cooperation	• Story Telling: Hare and Tortoise • Discussion on value
2	Linear Equation with one variable	Equality	• Story Telling: Lord Rama and Shabari • Discussion on value
3	Understanding Quadrilateral	Regularity	• Story Telling : Story on Quadrilateral Family. • Game : Picking the bottle • Discussion on value
4	Practical Geometry	Discipline	• Activity of Geometric Construction • Discussion on value

5	Data Handling	Equality	• Discussion on value
6	Squares and Square roots	Simplicity	• Game : Making a Square with students • Discussion on value
7	Cube and Cube Roots	Determination	• Story Telling: Hardy Ramanujan Number • Discussion on value
8	Comparing Quantities	Honesty	• Story Telling : Milkman's generosity • Discussion on value
9	Algebraic Expressions	Equality	• Discussion on value
10	Visualizing shapes	Determination	• Game: Solving Rubik's Cube. • Discussion on value
11	Mensuration	Determination, Dignity of labour, Co operation	• Game : Measuring Play ground • Model making : 3D shapes • Field Trip • Discussion on value
12	Exponents and Powers	Loyalty	• Discussion on value
13	Direct and Indirect Proportions	Dignity of Labour	• Discussion on value
14	Factorisation	Co operation	• Story Telling: Rotten Potatoes • Discussion on value
15	Graphs	Equality	• Discussion on value

3.1.1.4.   *Step 3: Preparation of lesson plan:*

All the lesson plans include entry behaviour, objectives, Integrated approach, methods like discussions method, lecture method, inductive method, deductive method, problem solving method, value discussions regarding meaning, definitions, characteristics of values, activities like story- telling, presentations, model making, educational trips and games

3.1.1.5. *Step 4 : Implementation of the Developed Strategy:*

The developed strategies were implemented in the Mathematics class of class VIII during the academic session 2011-12 by the researcher. The Mathematics class was six times a week in the class time-table. The duration of the class was of 40 minutes.

3.1.2.

Format Of Lesson Plan

LESSON PLAN OF CHAPTER :5 'DATA HANDLING'

Entry Behaviour:

Students have some prior knowledge of numbers, average, midpoint of two numbers,etc,.

Students are aware about equality.

General Objectives:

1. Students will be able to acquire the knowledge of Bar, Pie , line graphs and Histogram.
2. Students will be able to acquire the knowledge of constructing the graphs.
3. Students will be able to acquire the knowledge of Co-ordinate geometry
4. Students will be able to apply their knowledge about solving problem sums related to Simple
   interest and time and distance for graphs.
5. *Students will be able to develop the conceptual knowledge of the value equality.*
6. *Students will be able to develop a desired perception on the value co-operation and will be*
   able to practice equality in their daily life.

Media: Black board,

Method: Lecture cum discussion.

Approach: Integrated Approach.

Presentation :

Date	Content	Specific Objectives	Teacher's Activity	Student's Activity	Evaluation
06.08.11	Data, types of data	Students will be able to define data	Teacher will discuss about the data regarding various aspects related to country.	Students will listen and provide data as per the questions asked by teacher	What is data?
		Students will be able to state about various data	Teacher will ask students about the number of religion and name them.	Students will answer it as there are 7-8 religions in our country namely : Hindu, Muslim, Sikh, Christianity, Jainism, Buddhism, Zorastranis and one more is there.	
			Teacher quotes : Hindu muslim sikh isaai aapas mein sub bhai bhai.	Student listens	
			Teacher the number of population would be different but we cannot rule out that our country is rich in culture due its multi religious set up, multi languages, multi regions and so on. What are the different types of languages in our country? How many languages are there?	Hindi, Gujarati, Marathi, Malayalam, Tamil, Punjabi, Bengali and so on there are …	How many languages are there in our country?
			The term population is again data, India is second in terms of population next to China, we can say this based on data is recorded every sec and there are lots of data like that which is useful.		
			Teacher again ask about the number of girls in top 10 list of board result.	Student answers it as 6 girls.	

			Teacher ellaborates that there was a time when women used to be very learned but as time progress certain mind set up stopped their education and today once again they are coming upto the level of a man and now both of them shares almost equal status in every field of development.	Students will listen to the teacher	
		Students will be able to speak orally on equality.	Teacher says : It is the era of Equality, all were equal in the equal in the eyes of god and all are equal to day, every person in this world has all the rights to live happily irrespective of any religion, caste, sex, culture,etc	Everybody is equal irrespective of caste ,creed culture	What do you mean by the value Equality?
			Teacher will provide a task of collecting data related to our country like: population, number of religion, Number of states, Number of languages, ratio of women is to men in different parts of the country, literacy rates and so on…	Students notes down the task in their diary	Find data related to population, number of states, etc
08.08.11	Pictograph, Bar graph, double bar graph		Teacher will discusses about data used in students life like height, weight marks, etc gives various examples also explains concept of pictograph, bar graph and double bar graphs	Students understands and solves the question given by teacher	Interpret from the bar graph following results.
09.08.11	Represenatation of data using frequency tables and tally marks	Students will be able to draw fequency table and determine the frequency of the given data	Teacher to teach the concept of frequency, tally marks and find the mean of the data, uses a situation to highlight equality and these concept		

			Teacher asks students "how many of you all would like to help poor children. How many feels that they are not equal to you or they are different from you. How many believes that there is some difference between two people of different community or caste.	Students will give their responses.	
			Now lets take an example so imagine that you all are going out from the school for a picnic in some rural place and there you find some poor children in the streets and on seeing them you all feels to collect some money buy them some toys. The cost of the toys available had different range of cost it had ranges like 10, 15,20, and so on. Now those student who had the feeling of equality and love of concern towards the children disregard to the status, caste or creed steps forward to help them.	(ten students raise their hands)	
			Teacher speaks to students "How many of you would be interested to help I want 20 students from this class those who may help in that type of situations?"	Students will raise their hands	
			Teacher will suggest every body to contribute in multiples of 10	Students will agree	
			Teacher ask to the student 1,how much money he would like to spend (to Student 1)	Student 1 replies 20 Rupees .	
			Teacher to the next student: What about you?	Student 2: 50 Rupess.	
			Teacher collects data from all the 20 students and writes in a box form all the data collected then he find the range of data and does divide in terms of class interval and explains the concept of frequency and tally marks	students one by one provides all the data	

	Range of the data	Students will be able to find the range of the data.	Also the range of the money which we had can be known through the difference between the highest number and the lowest number.	*Here the students knowingly or unknowingly understands the value of equality and seeing 20 students other also develops a feeling that all are equal and the equality concepts should be there.*	What is range?
		Students will be able to define equality.	Teacher says that all the students are having a good value of equality, it is indeed a good class and ask the definition of equality.	Its is a value saying all are equal irrespective of caste, creed, culture, gender, etc.	Define equality?
		Students will be able to speak orally on the characteristics of the value Equality	Teacher then question about the characteristics of a person with equality	They are un biassed, they are having good co operation, they believe in all Gods, they are true people, they respect opposite sex, etc	Give characteristics of a person with equality?
10.08.11 to 13.08.11	Histogram, pie chart, Probability and chances.	Students will be able to draw histogram and pie chart for the data. Students will be able to solve questions related to probability and chances.	After that, few examples on making frequency tables were done and teacher will continue with other topics of the chapter on subsequent days and will do discussion on value equality wherever possible.	Students follows what teacher teacher the subsequent days	Draw histogram, make frequency table of the given data and find the mean of the data.

letters in blue shows value integration with mathematics & value based activity.

Recapitulation:			
	1	Draw a histogram on the data provided
	2	List down the characteristics of person with equality
	3	Find the mean of first 5 prime numbers

Home assignment : Collect data related to the India and its various religion, sex ratio, education in india, sports achievements, etc.

3.2.   SECTION II :

3.2.1.   *Research Design*

Experimental research design was followed in the present study.   Experimental research provides a systematic and logical method for answering the question. Experimenters manipulate certain stimuli, treatments or environmental condition or behaviour of the subject is affected or changed. Their manipulation is deliberate and systematic.

It was Quasi-experimental design. The Pretest-Posttest Non- Equivalent-Control Group Design was followed in this research. Best and Kahn (1996) describes, 'this design is often used in classroom experiments when experimental and control groups are such naturally assembled groups as intact classes, which may be similar'. The design of the study is shown graphically which is as follows. :

Pre-test Post-test Groups

Experimental Group	O_1	X	O_2
Control Group	O_3	C	O_4

X = Treatment ; O_1O_3 - Pre-test ; O_2O_4-   Post-test ;   C=No Treatment.

3.2.2   *Population*

The population for the present study consisted of all class VIII students studying in English medium schools affiliated to CBSE in Vadodara district in the state of Gujarat.

3.2.3.   *Sample*

The sample for the present study was selected by the convenience sampling technique. Two divisions of class VIII of the school named Bharatiya Vidya Bhavan's V.M. Public school at Vadodara were selected. Out of the three divisions of class VIII

present in the school, class VIII B and VIII C were selected for the present study. Class VIII C formed the experimental group while class VIII B formed the control group.

There were 42 students in VIII B and 43 students in VIII C. An achievement test administered to both the experimental and control group as a pre- test. One to one matching was done taking into account the equivalent scores obtained by students of both groups in the achievement test. The mean score of the experimental and control group was found to be 11.77. The standard deviation for the experimental and control groups was found to be 5.210.Therefore the groups were perfectly matched. After one to one matching, the sample consisted of 26 students in experimental group and 26 students in the control group.

3.2.4.   *Tools and Technique:*

The following tools were constructed for the present study by the researcher.

Value Knowledge Test: This tool is used to collect data for objective 3. In order to test the conceptual knowledge of the students about the ten values, a value knowledge test was constructed .The values taken were equality, co-operation, simplicity, dignity of labour, determination, honesty, discipline, loyalty, regularity and team work . The value knowledge test had a total of 30 questions. There were three questions asked on each value. The questions were asked on three dimensions. The questions were related to the meaning, the definition and the characteristics of each value.

 The question number 1-3 were on meaning, definition and characteristics of the value equality. The Question number 4 – 6 were on meaning, definition and characteristics of the value honesty. The Question number 7 – 9 were on meaning, definition and characteristics of the value simplicity. The Question number 10 – 12 were on meaning, definition and characteristics of the value determination. The Question number 13– 15 were on meaning, definition and characteristics of the value dignity of labour. The Question number 16 – 18 were on meaning, definition and characteristics of the value co-operation. The Question number 19 – 21 were on meaning, definition

and characteristics of the value loyalty. The Question number 22 – 24 were on meaning, definition and characteristics of the value discipline. The Question number 25 – 27 were on meaning, definition and characteristics of the value team work. The Question number 28 – 30 were on meaning, definition and characteristics of the value regularity. The time allotted for answering the questions was 80 minutes(2 periods) for both pre-test and post- test.

Marking Scheme: The value knowledge test had a total of 70 marks for all the ten values. A maximum score of 7 was assigned for the three questions in each value. For the first question which was on the meaning of the value a score or 2 was assigned. The second question was on the definition of the value for which a score of 2 was assigned. The third question was on the characteristics of the value for which a score of 3 was assigned.

Validity of the value Knowledge Test: The value knowledge test was shown to the experts in the field of education for its validation of its content and appropriateness. The tool was appropriate and there were no comments made by the experts. The list of experts who validated the tool value knowledge test is attached in appendix -I. The validated tool is attached in appendix- V.

TABLE 3.3 : QUESTION NUMBERS AND THE VALUES IN VALUE KNOWLEDGE TEST

Question Numbers	Value	Question Numbers	Value
1-3	Equality	16-18	Co-operation
4-6	Honesty	19-21	Loyalty
7-9	Simplicity	22-24	Discipline
10-12	Determination	25-27	Teamwork
13-15	Dignity of Labour	28-30	Regularity

Value Perception Scale : This tool was used to collect data for objective 3. In order to test the perception of students about the ten values taken in the study a value

perception scale was constructed by the researcher. The values taken were equality, co-operation, simplicity, dignity of labour, determination, honesty, regularity, discipline, loyalty and team work. There were 50 items in the value perception scale. For each value five items were formulated by the researcher. These five items on different values focused on the different components and characteristics of the selected value. The five situations of each item ranged from strongly positive polarity, positive polarity, neutral polarity, negative polarity and strongly negative polarity. The situations were not in the above mentioned order, they were jumbled up to avoid pattern error. Students had to tick mark (√) in one appropriate situation out of the five situations. The time allotted to give the responses was 80 minutes(2 periods) both for pre- test and post- test.

Marking Scheme: Marking Scheme was done on the basis of scale product technique by giving scores to each response category in the usual Likert Fashion. The situations related to each value showing different polarities were given scores ranging from 1 -5. The strongly positive polarity response was given a score of 5 , the positive polarity response was given a score of 4,theneutral polarity was given a score of 3 the negative polarity response was given a score of 2 and the strongly negative polarity response was given a score of 1.

TABLE 3.4 : COMPONENTS OF VALUES AND THEIR RESPECTIVE ITEM NUMBERS IN VALUE PERCEPTION SCALE.

Sr. No.	Values	Item Nos.	Components of values included
1	Honesty	1-5	**Truthfulness, Courtesy, Good manners, Ethics, Good conduct**
2	Co-operation	6-10	**Coordinator, Understanding, Concern for others. Courteous, Empathy**
3	Determination	11-15	**Hard work, perfection, Goal oriented, practice righteousness,**
4	Simplicity	16-20	**Appearance, behaviour, cleanliness.**

5	Equality	21-25	**Religion, Class, Caste, Gender, Appearance.**
6	Dignity of Labour	26-30	**Hard working, Co- operative nature, Respectful.**
7	Regularity	31-35	**Punctuality, Consistency, systematic, disciplined.**
8	Loyalty	36-40	**Patriotism, Responsibility as a citizen, student and member of society, son, brother, friend, etc.**
9	Discipline	41-45	**Systematic, punctual, sincerity, rules following.**
10	Team work	46-50	**Leadership, Motivator, Initiator, co-operative nature. Facilitator.**

Validity Of The Value Perception Scale: This perception scale was given to 3 experts in the field of education for validation. It was validated for its content and language appropriateness. The experts made suggestions regarding modifying few situations. They gave few situations for certain items. The suggestions given by the experts were duly incorporated by the researcher. There were 60 items in the value perception scale and after validation there were 50 items in the value perception scale. The order of the situations were jumbled upon as per the suggestions. The list of experts name who validated the tool value perception scale is attached in appendix II. The validated value perception scale is attached in appendix VI.

Reliability of the value perception scale: The researcher found the reliability of the value perception scale using the Cronbach's alpha coefficient. The value perception scale was administered on 150 students of class VIII other than the experimental and control group. This value perception scale was administered in the month of April during the academic year 2011-12.

Cronbach's alpha coefficient was used to find out the reliability of the tool. This model enables to find the internal consistency,(Cronbach,1951).It gives the reliability of the domain/content of the scale. A new scale was constructed to measure the perception of values so it is a measure for a new concept. So this reliability test

measuring items through domain sampling method was considered appropriate. The Cronbach's Alpha score obtained was (0.938). Thus the reliability of the tool was found to be high which indicates that there was an item total consistency which. Hence the scale was found reliable and could be used. The Cronbach's Alpha scores on each value separately were calculated which indicated inter-item consistency for each value. The reliability scores for the values range from moderate to substantial, it has been presented in the table below.

TABLE : 3.5 CRONBACH'S A SCORE FOR EACH VALUE

Value	Cronbach's α score	Value	Cronbach's α score
Equality	0.596	Co-operation	0.631
Honesty	0.481	Loyalty	0.716
Simplicity	0.629	Discipline	0.661
Determination	0.662	Teamwork	0.719
Dignity of Labour	0.701	Regularity	0.672

Achievement Test: The achievement test was used to collect data as per objective 3. The achievement test in Mathematics was constructed by researcher. This test was constructed keeping in mind the content of all 15 chapters of the class VIII Mathematics text book. The pattern of question paper was similar to the question paper constructed in the school. The chapters included were rational numbers, linear equations, understanding quadrilaterals, practical geometry, data handling, squares and square roots, cubes and cube roots, comparing quantities, mensuration, graphs, direct and inverse proportions, Powers and Exponents, visualising solid shapes, algebraic expressions and factorisation. It was a hundred marks paper. It had question related to knowledge, understanding and application level provided with adequate weightage to each respective components. All the questions asked were taken from the textbook. There were 25 questions in all. All questions were compulsory to be solved by the students. Internal choices were given where the students had to select one question out of the two given questions. The question paper had 3 sections A, B and C. Section A consisted of very short answer type questions. Section B consisted of

short answer type. Section C consisted of long answer type questions. The time allotted for the test was 3 hours.

Marking Scheme: The total marks of the test was of 100 marks. There were 3 sections A, B and C. Section A had 10 question with each carried 3 marks. Section B had 10 questions with each carried 4 marks. And section C had 5 questions with each question carried 6 marks. Marks were given on the basis of the steps followed in solving the problems and arrival of the correct answer.

Validation of the Achievement test: The prepared tool was shown to the experts in the field of education and Mathematics teachers of the same school for its validation. The tool was validated for the appropriateness of the content and language. The list of expert's name who validated the Achievement test is attached in the appendix – III. The validated tool is attached in appendix VII.

Observation : Observation was used as a technique to collect data for objective 3. The researcher decided to use this technique to observe all the behaviours of the students related to various values. The observation would be done on the value practices exhibited by the students during the school hours and even outside the school hours such as during field trips. The researcher would note down their actions or any noticeable behaviour related to values in a diary.

Reaction Scale : The reaction scale was used to collect data for objective 4.

A 5 point reaction scale was prepared by the researcher for the students of the experimental group .The aim of the reaction scale was to take the reaction of the students towards the value integrated approach of teaching Mathematics. The reaction scale had 20 items. These items were related to different components like the effectiveness of the integrated approach, effectiveness of the activities conducted, relevance of the stories integrating with mathematical concepts and values, examples used for Mathematics content, participation of the class, understanding and perception of values, value practice, explanation of values, classroom management, time management, learning experiences, integration of Mathematics with values.

Marking Scheme: Each statements had 5 alternatives mentioned in the scale. The five alternatives ranged from strongly agree, agree, undecided, disagree and strongly disagree. The scores were as follows: Strongly agree (5), agree (4), undecided (3) and disagree (2) and strongly disagree (1).The students were required to tick ($\sqrt{}$) on one alternative for each item.

Validity of the Reaction Scale: The prepared tool was shown to the experts in the field of Education for validation. The tools were validated in terms of relevance of content and appropriateness of language. The suggestions were incorporated by the researcher. There were 30 items in the reaction scale and after validation the reaction scale consisted of   20 items. The list of expert's name who validated the tool reaction scale is attached in the appendix IV. The reaction scale is given in appendix-VIII.

3.2.5.   *Data Collection Procedure :*

The data were collected using above mentioned five tools. The data collection was done in different phases. The data was collected during the academic session June'2011 to May'2012.The data was personally collected by the researcher during this academic session.

Phase I :Pre-Test Phase

Phase I was conducted during the month of June '2011. The permission was seeked from the principal of the school to administer the pre-tests. During this phase pre- tests were administered on both the control and the experimental group. The achievement test was administered to both control and experimental group on the first day of the new academic session. The time allotted for the test was 3 hours. Most of the students finished answering within 1 hour and 2 students of control group and 1 student from experimental group took more time than others. They took around 2 hours to submit the answering sheet.

The value perception scale was administered on the experimental and control group on the second day. The time allotted for this test was 2 period i..e. 80 minutes. Most of the students completed the test in less than 60 minutes.

The value knowledge test was administered to both the experimental and control group on the third day. The time allotted for this test was also 80 minutes (2 periods).The data from the pre- tests which included the achievement test, value knowledge test and value perception scale were collected.

Phase II :Experimentation Phase

This phase was conducted during the academic session June'2011 to May'2012. There were 205 working days during this academic session. There were two terms during this session following an annual term pattern. There were 7 periods of the subject Mathematics in a week of 40 minutes duration. In this academic term there were 141 days of teaching mathematics out of which 35 days of teaching Mathematics was done using integrated approach for value inculcation. The total hours of teaching Mathematics was calculated to be 94 hours out of which Mathematics teaching with integrated approach for value inculcation was done in 23 hours and 20 minutes.

During this phase the experiment was conducted. The experimental group consisted of students who were taught Mathematics using the value integrated approach by the researcher. There students in the control group who were taught Mathematics using the traditional method by the school math teacher The traditional method followed in the control group largely consisted of the Chalk and Talk method. The Integrated Approach for teaching of Mathematics was not followed. However the different methodologies of teaching Mathematics consisted of the Lecture method, Discussion method, Inductive method, Deductive method and Problem –Solving method. The various mathematical concepts were not integrated with values. There were no narration of stories related to values, no value games conducted and no value discussions done. The researcher used lesson plans where mathematical concepts were integrated with values. The integrated lesson plans were made for each chapter with values integrated to various topics. The researcher used different methods of teaching Mathematics like lecture cum discussion method, problem solving method, deductive method, and inductive method amongst others. Different activities which included were storytelling, value games, value discussion, presentation, preparation of

models and field trips while using the integrated approach for value inculcation through teaching of Mathematics.

Table :3.6 : Synoptic View of Value Integrated Lesson Plans

Date	Ch. No.	L. No.	Topic Covered	Values Taught	Time Duration
04.07.11	1	1	Numbers system	Team Work	40
05.07.11	1	2	Rational Numbers and Properties	Team Work	40
06.07.11	1	3	Rational Numbers and Properties	Team Work	40
12.07.11	1	8	Rational Numbers	Team Work	40
13.07.11	3	9	Regular Polygon	Regularity	40
15.07.11	3	11	Angle Sum Property of polygons	Regularity	40
19.07.11	3	15	Quadrilaterals	Regularity	40
20.07.11	3	16	Quadrilaterals : Game	Regularity	40
21.07.11	2	17	Linear equation	Equality	40
22.07.11	2	18	Solving linear equations	Equality	40
29.07.11	4	25	Practical Geometry	Discipline	40
30.07.11	4	26	Practical Geometry	Discipline	40
06.08.11	5	33	Data Handling	Equality	40
09.08.11	5	35	Data Handling: Mean	Equality	40
16.08.11	6	41	Squares	Simplicity	40
20.08.11	6	45	Properties of Square	Simplicity	40
29.08.11	7	53	Cubes: Hardy Ramanujan Numbers	Determination	40
21.09.11	9	60	Polynomials	Equality	40
22.09.11	9	61	Algebraic Expression	Equality	40
12.10.11	10	70	Visualising solid shapes	Determination	40
16.11.11	10	71	Visualising solid shapes	Determination	40
05.12.11	8	74	Comparing Quantities	Honesty	40

06.12.11	8	75	Comparing Quantities	Honesty	40
16.12.11	12	86	Powers and exponents	Loyalty	40
19.12.11	12	89	Powers and exponents	Loyalty	40
21.12.11	13	91	Direct Proportion	Dignity of labour	40
24.12.11	13	95	Direct Proportion	Dignity of labour	40
04.01.12	14	105	Factorisation	Co operation	40
06.01.12	14	106	Factorisation	Co operation	40
09.01.12	14	110	Factorisation	Cooperation	40
17.01.12	14	113	Factorisation	Cooperation	40
18.01.12	15	114	Graphs	Equality	40
19.01.12	15	115	Graphs	Equality	40
28.01.12	11	125	Mensuration	Dignity of Labour	40
04.02.12	11	132	Mensuration	Dignity of labour	40
Total time in minutes					1400
Total time in hours =		*23 hours and 20 minutes*			

Phase III : Post-Test Phase

Phase III was conducted during the month of April' 2012. The post-tests were administered on both the control and the experimental group. It was conducted in the similar order followed during the Phase I. The Achievement Test was administered on both the control and the experimental groups. It was administered on the first day of the third week of April'2012. It was conducted after the completion of the Mathematics course at the end of academic session. The time allotted for the test was 3 hours. This time almost every student took the entire 3 hours for response. There were few who completed the paper before time. But most of them utilized the full quota of 3 hours.

The value perception scale was administered on the experimental and control group on the second day of the third week of April'2012. The time allotted for this test was 2 period i.e. 80 minutes. The students again gave their response within 60 minutes of the given time.

The value knowledge test was administered to both the experimental and control group on the third day of the third week of April'2012. The time allotted for this test was also 80 minutes(2 periods).The experimental group took more time for this test and controlled group again completed the test within 40 minutes and was not keen in giving the responses, whereas experimental group managed to take more interest and answered with more interest.

The reaction scale was administered on the experimental group on the fourth day of the third week of April'2012.The time allotted for this test was 40 minutes. The students finished the test within stipulated time given.

The data from the post-tests which included the achievement test, value knowledge test, value perception scale and reaction scale were collected.

Phase IV:

The students were observed the whole year for value based behaviour. The behaviours were noted down in the diary of the researcher

3.2.6.   *Data Analysis:*

The data collected during the different phases were analysed. The analysis of the data were done objective wise which is given below:

Data Analysis related to objective 1 : "To develop strategies for teaching of Mathematics through integrated approach for the inculcation of values like Equality,

Co-operation, Simplicity, Dignity of Labor, Determination, Honesty, Regularity, Discipline, Loyalty, and Team Work". There was no statistic used for this objective.

Data Analysis related to objective2 : "To implement the strategies for teaching of Mathematics through Integrated approach for the inculcation of the values." There was no statistics used for this objective.

Data Analysis related to objective3: "To study the effectiveness of the value integrated approach of teaching Mathematics in terms of value conceptual knowledge, value perception and value practice along with the achievement in Mathematics."

The value conceptual knowledge, value perception, value practice for each value and for all values as a whole and achievement in Mathematics were taken separately for analysis. The value conceptual knowledge, the value perception and the achievement in Mathematics were analysed quantitatively by using the Mann Whitney U-Test. The value practice was analysed qualitatively based upon the observations made by teacher in his diary.

Data Analysis related to objective4: "To study the reaction of students towards the value integrated approach". A reaction scale was used for collecting the data. Frequency, Intensity Index and Average Intensity Index were calculated.

The following chapter is on data analysis wherein the analysis has been done objective wise.