CHAPTER - I

CONCEPTUAL FRAMEWORK

1.1 INTRODUCTION :

The educational scenario is in a state of flux. The teaching learning process has undergone a drastic change over the years. This is the period of transition and a change. The development of the individual and the nation at large is one of the goals of education. Mathematics is said to be the mother of all sciences. It is also believed that Mathematics reveals the true nature of reality. At a very spiritual level it is also believed that concepts of Mathematics bring an individual closer to God. Mathematics has the ability to develop both cognitive and affective domain of an individual. Mathematics with its diversified beauty and its correlation with various fields has always enabled for a development of a perfect and strong foundation and magnificent structures. Mathematics holds a high status in this earth as well as the whole universe. Without Mathematics, the world is like a big zero in terms of development. Mathematics has the power to not only develop the basic infrastructure in this world but it also enables a person to develop various personality attributes. The problem solving nature of Mathematics enables an individual to be more efficient and helps him or her to be stronger in any circumstances. The determined approach to get a solution develops discipline and determination to do something worthwhile in the world. The true and honest derivation of mathematical concepts teaches how a person can achieve its desired results by having an honest approach. The development in information technology, the various calculations, development of software, and the invention based upon the hypothesis and assumptions hold no place without Mathematics. With the passage of time there has been a change in the attitude of students towards Mathematics and there is a mixed feeling towards it. The students who deal with it perfectly are able to enjoy the true essence of Mathematics, but the students who do not deal with it in an ideal manner, Mathematics becomes

a problem. Mathematics teaching needs to be innovative to regain its beauty and it can be done through many appropriate means and ways.

1.2 NATURE AND IMPORTANCE OF MATHEMATICS

National Curriculum Framework (2005) emphasized on developing abilities of children for mathematisaton as the main goal of Mathematics education. While, the narrow aim of school Mathematics is to develop 'useful' capabilities, particularly those relating to numeracy-numbers, number operations, measurements, decimals and percentages.

The higher aim as mentioned by NCF (2005) is to help a child with useful resources that can enable them to think and reason mathematically to deal logically with the various assumptions and to resolve the abstractions. It includes the way of doing things and the abilities to formulate and solve problems. In this regard, there arises a need for a curriculum that is ambitious, coherent and teaches important principles of Mathematics. It should possess variety of methods, skills requisite to address problems that come from other subjects such as science and social studies in high school. It should be as such that both the teachers and students find it important as well as useful to solve the given problems in a meaningful manner.

Mathematics is a compulsory subject at the secondary stage in various boards of education and it is the right of every student to get the quality education in Mathematics. It is skillful, it is methodical, it is problem-solving and it is artistic in nature. Most of the skills taught in primary school Mathematics are useful. At secondary stage Mathematics related to arithmetic, calculations, geometry and more on numbers are again developing various attributes in a child. If the teaching of Mathematics in school is clubbed with an effective and appropriate methodology, confronting them with the true artistic nature of Mathematics followed by working with the wide numeric-logical applications, then the objectives in Mathematics would be achieved.

The term 'Mathematics' can be defined in number of ways. Generally there are many definition of Mathematics. One of the definitions

highlighted in National Policy on Education (1986), states: "Mathematics should be visualized as the vehicle to train a child to think, reason, analyze and articulate logically. Apart from being a specific subject it should be treated as a concomitant to subjects involving analysis and meaning."

According to Oxford English dictionary (1933) "Mathematics – in strict sense – is the abstract science which investigates deductively the conclusions implicit in the elementary conception of spatial and numerical relations".

In Mathematics pattern and structure are creating wide options for knowing various complexities of nature, the weathers are forecasted, the population growth are predicted, duration of curing diseases are calculated by means of Mathematics; it is about logical analysis, deduction, calculation within these patterns and structures. When patterns are found, often in widely different areas of science and technology, the Mathematics of these patterns can be used to explain and control natural happenings and situations. Mathematics is very much present in our everyday lives. It is very much in action and contributes significantly to the development of the country.

It is defined as the science of quantity and space. It is systematized, organized and exact branch of science. It is the numerical and calculation part of man's life and knowledge. It helps man to give exact interpretations to his various ideas and conclusions. It is a science of logical reasoning and numerical problems. It deals with quantitative facts and relationships as well as with problems involving space and form.

Sidhu (1995) stated that "The study of Mathematics is essential due to its educational values like practical or utilitarian value, disciplinary value and cultural value."

The everyday use of arithmetic and the display of information by means of graphs are commonly seen. These are the basic things in Mathematics which many of the educated population do. There is a different world of Mathematics: Advanced Mathematics which is used widely in many other areas which is not familiar to the world directly. It consist of space world,

the stunning pictures of faraway planets could not have had their salient features and quality without such Mathematics. Journey to the planets could not have been calculated without the Mathematics of differential equations. Whenever there are advances made with supercomputers, mathematical theory instructs the progress.

Hence it can be accepted with a firm note that without Mathematics there will be big void in every body's life as well as nations progress will become zero. Exploring science will become still. Nature of Mathematics is such that it makes huge impact in this living world of ours.

1.2.1 *Objectives Of Mathematics*

According to **Sidhu (1995)** the objectives of Mathematics are stated as under.

- To develop understanding and knowledge of language of Mathematics.
- To develop skill in the use and understanding of Mathematical language.
- To develop and acquire speed, neatness, accuracy, precision in Mathematical calculation, etc
- To learn technique of problem solving
- To develop the ability of mental calculations, to verify, to estimate, to evaluate, to check, etc.
- To make use of mathematical tables and ready references, to develop measuring skills, weighing and surveying, etc.
- To develop logical thinking in students.
- To develop the ability to use the mathematical knowledge in their day to day life.

- To develop the ability to analyze, synthesize, to differentiate, to integrate, etc. and to check any probability of any situation using mathematical concepts.

1.2.2 *Objectives Of Teaching Of Mathematics At Secondary Level:*

According to the National Curriculum Framework (2000), the objectives of teaching Mathematics at secondary stage are as follows:

- To further enhance the capacity of the students to employ Mathematics in solving problems that they face in their day-to-day life.
- A systematic study of Mathematics has to be started here and continued further.
- The curriculum may include the study of relevant arithmetical concepts, number system, algebra, geometry, trigonometry, co-ordinated geometry, mensuration, graphs, statistics, etc.
- The idea of proof should be developed with thrust on deductive reasoning.
- Emphasis is to be laid on wider application of Mathematics by way of making data based problems pertaining to actual data on population, agriculture, environment, industry, physical and biological sciences, engineering, defense etc.
- Student should attain proficiency in presenting information available in their environment in the form of graphs and charts and be able to do calculation with speed and accuracy.
- Student should acquire the ability to solve problems using algebraic methods and apply knowledge of simple trigonometry to solve the problems of height and distance.
- The history of Mathematics with special reference to India and the nature of mathematical thinking should find an importance.

- Students may be encouraged to enhance their computational skill by the use of Vedic Mathematics.

1.2.3 *The Aims Of Teaching Mathematics Are As Follows (Kumar And Ratnalikar, 2003)*

- To enable the child to solve mathematical problem of everyday life.
- To develop in the child acquaintance with his culture.
- To provide a suitable type of discipline to the mind of the pupil
- To prepare the child for technical professions like accountants, teachers, researchers, auditors, engineers, cashiers, scientists, statisticians, etc.
- To prepare the child for economic, purposeful, productive, creative and constructive living.
- To develop in pupil a sense of appreciation of cultural arts.
- To prepare the child for elementary as well as higher education in science, economics, engineering and psychology.
- To develop in pupil such habit as concentration, self- confidence and discovery.
- To help the child to follow the maxim "work is worship".
- To develop in the child the power of thinking and reasoning.
- To develop the learner's power of expression.
- To enable the child to understand and enjoy popular literature in Mathematics.
- To develop in child a scientific and realistic attitude towards life.

- To bring about all- round harmonious development of the personality of the child.

From the above mentioned objectives and aim, it is evident that Mathematics is as subject which would enable a student to understand the practicability of life.

1.3 TEACHING OF MATHEMATICS IN SCHOOLS: THE PRESENT SCENARIO:

Mathematics is a primordial subject. It has all the key features which enables cognitive development in a child i.e. good memory, understand various shapes and counting at his/her initial days of acquiring knowledge. After the initial levels of learning Mathematics the same child performs calculations that are easy and complex, problems with diverse situations, puzzles to challenge their intellects. A person who enjoys Mathematics is considered to be a person with good intellectual abilities in our society. In school many students enjoy doing the problem solving sums, some students like the arithmetic calculations while some are found engrossed in solving the algebraic equations and there are students enjoying the constructions and mensuration related activities and examples. In a school if the subject is taught in a right manner and if it is able to achieve all the objectives related to teaching Mathematics, the students will enjoy every aspects of Mathematics. The present day instruction in Mathematics to some extent is very mechanical and monotonous. There are schools and institutes which emphasize more on results rather than the process; For the students it is just a number game, they are running behind the subject to score marks rather than developing critical thinking skills. It had been a matter of concern over the teaching of Mathematics in schools.

According to National Curriculum Framework **(**2005),some problems in school Mathematics education relates to a sense of fear and failure among children, hence they give up and drop out of serious mathematical learning. The curriculum is disappointing and not catering the needs of high achievers and slow learners. Problems, exercises and methods of evaluation

are mechanical and repetitive, which only focus on computation. Areas of Mathematics such as spatial thinking are not developed enough in the curriculum. Teachers lack the expertise, confidence, preparation and support.

It is generally observed that Indian classroom have a high teacher pupil ratio. Every learner is different but there is a uniform approach followed by the teacher for all the students. In this way potential of the students are misjudged damaging their mathematical abilities. Instead of having a wide range of activities in teaching of Mathematics like the use of games and practical work, lecture method is the most preferred method of teaching Mathematics. Importance is given to evaluation of Mathematics rather than learning of Mathematics.

The teaching and learning in the school premises is only applicable within the school boundaries, students are unable to use their application skills outside the class rooms. They lack the discipline of Mathematics in their day to day life. The industries want pupil to be able to apply the Mathematics they learn at school to the work place but this notion of transfer may not be as straight forward as it seems. Lave (1988) has summarized the research on out of schools uses of Mathematics and concluded that all learning is closely tied to the situation in which it is found students are unable to use the Mathematics they learn at school outside their classrooms. The Mathematics content which they learn at schools had found less scope of it applications due to its unconventional and monotonous approach, its scope of developing many cognitive and affective aspects in child is getting dry and dry through present Mathematics teaching.

Patel (2009) pointed out that there is a lack of focus in the teaching of Mathematics on higher level of the objectives, underlying the Mathematics subject like critical thinking, analytical thinking, logical reasoning, decision making and problem solving.

With all these disappointing factors in the teaching of Mathematics in schools, there are rays of hope still in the teaching of Mathematics. There are schools were teaching learning of Mathematics and other subjects are done in appropriate manner, there are teachers who are dedicated and possess creativity and uses innovation in their day to day teaching.

It is being observed that innovative teaching practices lead to better student's performance. Student performed better in the GCSE examination where the teaching approach was based upon open -ended prospects lasting two to three weeks with content and techniques interspersed as necessary(Bolaer,1997). This indicates a picture of common practice in Mathematics class room that if some innovation or a different strategy is developed it provides a scope for building up cognitive aspect with more dimensions.

Hence many general tactics of problem solving can be taught progressively during the different stages of school : abstraction, quantification, analogy, case analysis, reduction to simpler situations, even guess – and verify exercises, are useful in many problem- solving contexts. Moreover, when children learn a variety of approaches, they also learn which approach is the best and suited to the style of learning. Teacher should use different approaches in his or her teaching process to enhance the teaching learning of Mathematics.

Mathematics has a scope of using various methods in its execution, which are interesting and useful. The methods of teaching Mathematics differ from stage to stage and from age group to age group. Communication of ideas, facts, theories, methods, and development of certain attributes related to it is an important prerequisite in teaching a subject like Mathematics. The various methods used in Mathematics teaching are Lecture, Dogmatic, Inductive, Deductive, Heuristic, Analytic, Synthetic, Laboratory, Project, Topical, Concentric, Problem solving and many more of this kind which are being followed by the Mathematics teachers in their regular teaching process. Mathematics instruction should be focused on meaningful development of important mathematical ideas and highlight the

mathematical meaning of these ideas. This includes how the idea, concept or skill is connected in multiple ways to other mathematical ideas and forms of representation in a logically consistent and sensible manner (Grouws and Cebulla, 2000).

The nature of Mathematics is such that it has values inherent in it and values can be inculcated by the teaching of Mathematics using various innovative approaches.

1.4 VALUES AND MATHEMATICS

There are certain values, i.e., implicit values which are interdisciplinary to Mathematics. The nature of Mathematics as such requires more of analytical thinking. This nature can be very useful in developing the values in students by providing them with various situations. One of the many ways in which value education can be incorporated in schools is through problem solving approach by the teaching of Mathematics. When a problem is presented and the skills required to solve that problem are developed, it motivates the student to learn Mathematics and become more deeply involved in the learning process. Teaching through problem solving enhances logical reasoning.

Values in Mathematics education have the deep affective qualities which education nurtures through the school subject of Mathematics. They are inculcated through the nature of Mathematics and through the individual's experience in the Mathematics classroom. These values equip the individual with cognitive and affective lenses that shape and modify his/her way of perceiving and interpreting the world, and guide his/her choice of course of action. Buxton (1981) and Fasheh (1982), have indicated this in relation to Mathematics teaching practices, while Martin (1988) showed how values could enter into the mathematical modeling process.

Based on the objectives and nature of Mathematics, value inculcation can be done in learners by the teaching of Mathematics.

One of the important aspect of teaching Mathematics according to K.S. Sidhu (1995) is that, Mathematics possess the three main values for which a child is sent to school. They are practical or utilitarian value, disciplinary value and cultural value. The practical value relates to the uses of Mathematics in day to day life by means of counting, measuring, weighing, buying or selling by any person. The disciplinary value in Mathematics is a way to settle in the mind a habit of reasoning .It trains or disciplines the mind to do the things with simplicity, accuracy, originality and certainty of results. The cultural value is to understand the culture, as there is a need to have an understanding in scientific and social principles. The development of this value depends upon the mathematical principles.

Lim and Ernest (1997) proposed that there are at least six categories of values in Mathematics education that can be found to manifest in Mathematics classroom, implicitly or explicitly. The following table 1.depicts these categories:

TABLE 1.1 : DIFFERENT CATEGORIES OF VALUES IN MATHEMATICS EDUCATION

Curriculum Level	Intended (Planned)	Implemented	Attained
Explicit values and	Explicitly planned curriculum values	Teacher espoused (supported) classroom values	Values stated by the learner as acquired
Implicit values	Implicit or hidden values in curriculum	Enacted (implemented) teacher and classroom values	Values evidenced in learner's behaviour

(Source: Lim & Ernest, 1997)

Based on above table, we can say Mathematics has an edge in value inculcation, as Mathematics is a discipline which helps more in the logical development and mental development of a child. The concepts related to these developmental factors could be easily understood if various daily life

situations are integrated with the concepts. If these situations are further integrated with values, it would develop the concept in a much better way. The nature of Mathematics is such that it cannot be taught without situations, there are many situations used to solve different problems. These situations can help in developing values as well as the concepts of Mathematics through value based teaching.

The recent developments in culture and Mathematics, such as Bishop's (1988) research on enculturation, Harris's (1991) research with Aboriginal students, and Powell and Frankenstein's (1997) overview on ethno Mathematics and the politics of mathematical knowledge, have brought the issue of values into limelight, where the awareness was made among non-western mathematical ideas , non-western beliefs and values. It seems that after this only there exist mathematical ideas other than those in the canonical Mathematics curriculum of the West that there has been any concern about values teaching in Mathematics (Howson& Wilson, 1986). Earlier Mathematics was considered a value-free and culture-free subject. This perception has changed as far as the value part is concerned in Mathematics. Values have their own identity and it is one of the key components of basic education in a country like India. There is a very basic need of understanding the values and how it can be integrated through Mathematics teaching in school.

1.5 MEANING AND CONCEPT OF VALUE

The John Dewey's Dictionary of Education (1959) states Value denotes the attitude of prizing a thing, finding it worth, for its own sake or intrinsically. This is a name for a full or complete experience. To value in this sense is to appreciate. But to value also means distinctly intellectual act – an operation of comparing and judging- to evaluate. Values are as unstable as the forms of clouds. Values are things in which people are interested – things they want to desire to be or become; feel as obligatory, worship or enjoy."

Values in an individual makes them fall apart from the rest, it is the values that gives character and recognition to any individual. It is the guiding light

of any human which enlightens the mind and later on the character of an individual. The soul brings life into a body while values bring quality in the body. A value is a relationship between a person and an environmental situation which conjures a concerned response in the individual. According to Mohan (2007) " Mutual survival of people in a progressive society is value based. Human and social values have sustained the humanity ever since advances in civilization gave rise to organized social structures,"

Rokeach (1973) defines an individual value system as an "enduring organization of beliefs concerning preferable modes of conduct or end-states of existence along a continuum of relative importance."

Values are the ideas and beliefs that influence and direct our choices and actions (Gini, 2004)

It is experienced that value has different meanings depending in the context. When a saint preaches about importance of leading a good life, is termed as high thinking valuable lecture. When Mahatma Gandhi and Mother Teresa led a valuable life, here the meaning of value stood for "dignified" or "principled" or "simplicity" or "service to mankind". Value as noted by Taneja (1990) connotes that anything that fulfills the needs, stratifies the urges and helps man in realizing his aspirations.

In economic terms value means something that has a price or denomination, on the basis of which the object can be considered as precious or worthwhile. In other words values are the set of principles or standard of behavior.

According to Dewey (1959) "the value means primarily to prize, to esteem, to appraise and to estimate. It means the act of achieving something, holding it and also the act of passing judgment upon the nature and amounts of values as compared with something else."

Values are regarded as desirable, important and held in high esteem by a particular society in which a person lives; values reflect one's personal attitudes and judgments, decisions and choices, behavior and relationships,

dreams and vision. They influence our thoughts, feelings and actions. They guide us to do the right things. Values are the guiding principles of life, which are conducive to all round development. Values are those standards or codes of conduct conditioned by one's cultural tenets, guided by conscience, according to which one is supposed to conduct himself and shape his life pattern by integrating his benefits, ideas and attitude to realize the cherished ideals and aims of life.

According to Chilana (1987) Indian culture is based on values like kind heartedness, self-control, universal brotherhood, honesty and respect to others faith. The deterioration of these values resulted in indiscipline and destructive mentality. Chilana (1987) suggests that these values shall be incorporated into our curriculum. He stressed the necessity of a value based curriculum.

A value system, contains (a) a set of beliefs about the nature of man ; (b) beliefs about ideals, about what is good or desirable or worthy of pursuit for its own sake; (c) rules laying down what ought and what ought not to be done; and (d) motivates that incline us to choose the right and wrong course.

Values have different views at both the national and international level. Value concepts for different countries are different in terms Asian identity of an individual is different in different place of the globe. In India people have their identity related to their place, region, state, caste, religion and then at the national level and then they have a global identity. Similarly, identity of individuals differs in different parts of this world, so are their views towards the value.

According to the Indian view values involve religion. The Indian Philosophy to the Indians in ancient India was not just a means of satisfying, intellectual doubts, but more of attaining spiritual liberation. The western concept of values revolves around the concept of a person with values like rationality, autonomy and does not just depend on religion.

1.5.1 *Theories on Value Development:*

i) Piaget's Theory

The theory of moral development put forward by Piaget (1960) emerges from action. According to his theory the individuals are in constant touch with the environment, as a result of which they construct and reconstruct their knowledge. Piaget(1960) observed children play and found out that morality also has a development process.

According to Piaget(1960) children are heteronymous in moral reasoning. He put forward two factors on heteronomy. One is child's cognitive structure and the other is relative social relationship with adults. Piaget(1960) noticed that egocentrism of children lead them to project their own thoughts and wishes on others.

He found out that moral reasoning is a developmental process while studying the observation of two children of age ten and thirteen respectively. Later (stage II) child realizes that strict heteronomous adherence to rule males problems and a new development towards autonomous stage of moral reasoning is the resultant outcome. She/he considers rules critically and selectively and applies it on the basis of mutual respect and co-operation. This is a major shift in the child's cognitive structure. This leads ego centrism to perspective taking .i.e., one's own perspective with that of others. Ultimately the child recognizes what is good and what is bad. Piaget(1960) viewed that inter personal interaction has a major role in an individual's moral development. Hence Piaget(1960) stresses on co-operation decision making and problem solving situations in schools, which will nurture moral development in children. This will enable them to work out common rules based on fairness. According to Piaget(1960) the class room teacher must provide the opportunities for personal discovery for problem solving rather than indoctrinating students with norms.

ii) Kohlberg's Theory

Kohlberg(1960) extended Piaget's theory further and determined that moral maturity needed a longer period and would be formed in a gradual process. His main contribution is the six stages of moral development in three levels.

In the first level called 'pre conventional' he puts forward two stages namely (1) obedience and punishment orientation and (2) self-interest orientation. In the second level namely conventional, the stages are (3) inter personal accord and conformity. (4) authority and social order maintaining orientation. The last level three is post conventional. The two stages of post conventional levels are (5) social contract orientation and (6) universal ethical principles.

Kohl berg's study was different from that of Piaget. Even though it was an extension of Piaget's theory, he used a clinical interviewing procedure to study moral development. He used situations of moral dilemmas and asked his subjects to choose between the value of obeying the law and the value of human life.

Kohlberg(1960) experimented on this theory by interviewing boys aged 10 to 16. They were presented moral dilemmas and where made to decide whether to respect and follow the authority, obey the rules or ignore the rules, and respond to the needs and welfare of other people.

***Level I – Pre-conventional Morality*:**

Stage 1 (Obedience & Punishment Orientation) Individuals focus on the direct consequences of their actions on themselves.

Stage 2 (Naïve Hedonistic & Instrumental Orientation/ self-interest driven) supports the "what's in it for me" position, in which right behavior is defined by whatever is in the individual's best interest.

Level II – Conventional Morality: **Conventional Rules & Conformity**

Stage 3 (Good Boy Morality) The self enters society by filling social roles. Individuals are receptive to approval or disapproval from others as it reflects society's accordance with the perceived role. They try to be a "good boy" or "good girl" to live up to these expectations, having learned that there is inherent value in doing so.

Stage 4 (Authority & Morality that Maintain the Social Order) It is important to obey laws, dictums and social conventions because of their importance in maintaining a functioning society.

Level III – Post conventional Morality: Self Accepted Moral Principles

Stage 5 (Social Contract Driven) The world is viewed as holding different opinions, rights and values. Such perspectives should be mutually respected as unique to each person or community.

Stage 6 (Universal Ethical Principles Driven) Moral reasoning is based on abstract reasoning using universal ethical principles. Laws are valid only insofar as they are grounded in justice, and a commitment to justice carries with it an obligation to disobey unjust laws.

It is evident that Kohlberg(1960)'s developmental theory has an unquestionable role in moral development in schools. The emphasis is on creating suitable situation and its effective utilization by teachers.

iii) Turiel's Domain Theory

Among many studies and theories, one of the most productive studies is that of Turiel (1983) and his colleagues. He drew a distinction between the child's developing concepts of morality, and other domains of social knowledge such as social convention. Turiel (1983) put forward many examples to substantiate his Domain theory. According to him, morality is structure by concepts of harm, welfare and fairness. Turiel (1983) argues that a set of age related affairs people make at different point in

development to coordinate their social normative understandings from several different domains.

Turiel (1983) focused on universal features of human moral understanding. So teachers must take care not to promote a particular religion but concentrate on the basic moral core of all major religious systems. Major contribution of the domain theory was 'domain appropriate' value education. Here the main responsibility is of the teacher. She/he should analyze and identify the moral or conventional nature of social values. This gives focus on student anxiety regarding the domain of the issue. Teachers will be enabled to lead students through complex issues which will cut across more than one domain.

Kohlberg's theory is within a single development framework whereas Turiel's domain theory posits a great deal of inconsistency in the judgments of individuals across contexts.

(iv) **Morris Massey(1988)** has described three major periods during which values are developed.

1. The Imprint Period. Up to the age of seven, we are like sponges, absorbing everything around us and accepting much of it as true, especially when it comes from our parents. The confusion and blind belief of this period can also lead to the early formation of trauma and other deep problems. The critical thing here is to learn a sense of right and wrong, good and bad. This is a human construction which we nevertheless often assume would exist even if we were not here (which is an indication of how deeply imprinted it has become).

2. The Modeling Period. Between the ages of eight and thirteen, we copy people, often our parents, but also other people. Rather than blind acceptance, we are trying on things like suit of clothes, to see how they feel. We may be much impressed with religion or our teachers. You may remember being particularly influenced by junior school teachers who seemed so knowledgeable—maybe even more so than your parents.

3. The Socialization Period. Between 13 and 21, we are very largely influenced by our peers. As we develop as individuals and look for ways to get away from the earlier programming, we naturally turn to people who seem more like us. Other influences at these

1.5.2 *Nature and Classification of values:*

There are values categorized in different types like social values, economic values, human values, aesthetic values, religious values, universal values.

Values are not static in nature, it is a dynamic concept. It changes with time and space. It possesses both cognitive and affective dimensions. Values steer our life's journey. Values are modes of organizing conduct. Values are influenced by emotions. Values can be derived from several sources. Anything which has utility has value. Values are helpful for survival.

Based upon the nature and concept of values these values are further classified below:

Value is a broad concept, as discussed above about value being divided in to different types like social, personal, national, ethical, aesthetic, etc. **NCERT (1979)** has listed 83 values under 3 categories like, (1) Social values (2) Ethical values (3) Spiritual values. They are as under.

1. Abstinence, 2.Appreciation of cultural values of others, 3.Anti-untouchability, 4.Citizenship, 5.Consideration for others, 6.Concern for others, 7.Co-operation, 8.Cleanliness, 9.Compassion, 10.Common cause, 11.Common goal, 12.Courage, 13.Courtesy, 14.Curiosity, 15.Democratic Decision making, 16.Devotion,17. Dignity of the individual 18.Dignity of manual work, 19.Duty, 20.Discipline, 21.Empathy,22. Endurance, 23.Equality, 24.Friendship, 25.Faithfulness, 26.Fellowfeeling, 27.Freedom, 28.Forward look, 29.Good manners, 30.Gratitude, 31.Gentlemanliness, 32.Honesty, 33.Helpfulness, 34.Humanism, 35.Hygenic living, 36.Initiative, 37.Integrity, 38.Justice, 39.Kindness, 40.Kindness to animals, 41.Leadership, 42.Loyalty to duty, 43.National unity, 44.National consciousness, 45.Non-violence, 46.Obedience, 47.Peace, 48.Proper

utilization of time, 49.Punctuality, 50.Patriotism, 51.Purity, 52.Quest for knowledge, 53.Resourcefulness, 54.Regularity, 55.Respect for others, 56.Reverence for old age, 57.Sincerity, 58.Simple living, 59.Social justice, 60.Self-discipline, 61.Self-help, 62.Self-confidence, 63.Self-respect, 64.Self-support, 65.Self-study, 66.Self-reliance, 67.Self-control, 68.Self-restraint, 69.Social service, 70.Solidarity of mankind, 71.Sense of social responsibility, 72.Sense of discrimination, 73.Socialism, 74.Sympathy, 75.Secularism and respect for all religions, 76.Spirit of enquiry, 77.Team work, 78.Truthfulness, 79.Team spirit, 80.Tolerance, 81.Universal truth, 82.Universal love, 83.Value for national and civic property.

Ten Elements (Values) as suggested by the NPE (1986)

1. History of India's freedom movement, 2. Constitutional obligations, 3.Classical content essential to nurture natural identity, 4.Indian common cultural heritage, 5.Equalitarianism, 6.Equality of sexes, 7.Protection of Environment, 8.Removal of social barriers, 9.Observance of small family norms, 10.Inculcation of scientific trends.

India is rich in its culture, so we have many religions and these religions also have their set of values. There are certain values common to all religions like Hinduism, Sikhism, Jainism, Buddhism, Islam, and Christianity.

Forty such values are enumerated below by Dhananjay (2012) which are the traditional values that inherited from the past. They include harmlessness, truth, non- stealing, brahmacharya (Abstinence), non-accumulation of things ,purity, contentment, austerity, scriptural study, devotion to God, spiritual wisdom, dispassion , self-discipline, control of the senses, endurance, piety, forgiveness, courage, compassion, consideration for others, sublimity, Arjava is the modern terminology which refers to 'simple living', unselfishness, Amanitva- Freedom from hypocrisy, Absence of the back is biting spirit, straight forwardness, humility , fortitude spirit of service, satang (Good Company), Japa-Meditation, freedom from malice, fearlessness , even mindedness, absence

of egoism, friendliness, charity, devotion to duty includes values like sincerity, integrity, honesty, loyalty to duty etc., tranquility, contended and perspicuous. Dhananjay (2012) classifies the above mentioned values into academic values ,moral values, socio- political values, scientific temper, global values ,human rights and environmental values.

1.5.3. *Value Deterioration: The Present Scenario*

Today Indians are all over the world make India feel proud of them. Indians are continuously making their contribution in International market. India is making progress and has occupied a prominent place in the global scenario. The society which is getting constructed today is a more economically developed society. The industries are getting a better set up, the retail markets, the BPO sector, SEZ; etc show better economic development. However growth in India is not inclusive and a large number of people are striving for their basic meals. The society hence need to sharing the economy among all the people through balanced ways to develop an equity among all.

The brilliant performance of India as an emerging world economic power provides a palliative and even an incentive for unscrupulous behavior. In the mad rush of money, power and for getting ahead, the individual has often been pushed aside and relationships are sacrificed. Along with the economic development in India, politics has spread its roots in the country very firmly. With the rise in economic power and politics in India, morality and spirituality has taken a back step. Corruption is one of the out-come of this value crisis. Corruption is talked and heard about everywhere we go. Corruption has had made its roots stronger in the society and all other evils like injustice, exploitation and violence co-exist with it. The value crisis in the society is due to lack of ideal leadership, neglect of affective domain in education and corrupt practices in the society. Dubey (1992).

There is a change in value system in schools and there are changes taking place in social values and their educational implications. Further, incidences like leakage of entrance exam papers, mal-practices in exams,

admissions for seats in engineering colleges and medical sciences are the instances of a value deteriorated society in the education field. Education today is being termed as industry, where schools get converted to five star rated setups, commercialization of educational institutions, brand developments, etc., further add up to the deterioration.

Values are getting deteriorated by the family atmosphere in present scenario, socio-economic status of a child, broken family , family size showed students getting poor adjustment, activism and high personal and materialistic value getting developed instead of true values,' (Bhatnagar,1984).

The technological breakthrough due to industrialization, westernization, and urbanization has neglected the ascribed statuses by weakening the unity and integrity of the joint family and caste group that leads to the negligence of the role and status of the elderly persons. Moreover, the emergencies of achieved properties like wealth, education etc., in distorted forms, has colonized the state of mind of the youths by adopting the individualistic value of the West (Mishra, 1987).

In our country there is a rapid degradation of our cultural heritage which is considered to be the mirror of our values, morals, customs, etc. There is a misconception of notion of modernity, in the changed social set up, our definition of good morals stand questioned.

It is hence no surprise that the government of India and the ministry of HRD are keen to promote value education in schools.

There is a deterioration of values leading to value crisis in the society. The need for value education has never been as strong as it is today.

1.6 VALUE EDUCATION AND POLICY DOCUMENTS

Various recommendations of different Education Commissions, Committees and other documents in context of value based education at secondary level have been presented:

The University Education Commission (1948-49): The recommendations included that at the school level, especially at middle school level students should be taught good stories based on morality and religious principles, biographies of great personalities with their great achievements. Stories and biographies should be published with reverence and in good manner.

The Secondary Education Commission (1952- 53) : Recommendations of the Secondary Education Commission included, value education will have to be made the base of education. Education should develop those tendencies and characteristics in the citizen through which they may fulfill the responsibilities of citizenship by playing their part effectively in the social reconstruction and economic development of their country. It also suggested to develop traits like good opinion, clarity in speech and writing, cleanliness, socialistic discipline, co-operation, tolerance, true patriotism, world citizenship's as necessary to be developed in the citizens. Teaching method should not only inculcate knowledge but also desirable values, proper attitude and working habits in the students. Students should be given training of discipline which may develop characteristic of leadership. Students should understand the cultural heritage and have knowledge of social value.

Sri Prakash Committee (Suggestions of Religious and Moral Education Committee) 1959: At secondary level the recommendations suggested that students should be taught important principles great religions of the world. In holidays and after school hours social-service groups should be organized to develop the feeling of social service in the students as co-curricular activities.

The Education Commission (1964 - 66): The recommendation suggested that at school level students should be taught basic moral, social and spiritual values viz. truth, honesty, social responsibility, compassion, tolerance, respect for the aged, sympathy for the poor etc, and these values to be made an integral part of school programmes. A few hours a week to be set aside in the time table for value education. All religions of the world should be given proper place in the school syllabus. For the whole country,

similar books for the same subject should be prepared on national level by religious expert. At primary level, basic values and life related problems should be taught from the selective stories of great religions of India and world. At secondary level aforesaid problems and values should be considered by teachers and students. The story of great religious and spiritual leaders should be taught in higher classes of secondary level. The problems of great religions of world should be studied in the last two years at secondary level.

National Policy on Education (1986): The recommendation suggested that along with formulation of basic principles of education by NPE. The principle related to value education was: "To inculcate character, moral, spiritual values along with scientific temperament in students." The basic mantra of NPE is that at a certain level, all students should be provided good and similar education without any discrimination on the basis of religion, race, caste, creed, sex, place of birth. It is clearly mentioned in National Education Policy that value education should not be confined to the classroom and to the syllabus.

Programme of Action (1986): In the action plan of NPE special attention was given to work list of education like moral values and civil sense. For complete education up-to secondary level all aspects of education are widely described. In that value based education is emphasized as an indispensable or integral part of school curriculum.

Aacharya Rammurti Committee (1990): This committee reviewed the national education policy. This committee stressed that education should provide an atmosphere for the establishment of values. The Rammamurti Report has accepted the necessity of value for the progress of the society and has expressed worry about decline of moral values.

Yashpal Committee (1991) : The recommendations were every school should make organized efforts for the development of some essential qualities in all the children like regularity and punctuality, cleanliness,

importance of manual work, duty and urge to serve, equality, co- operation, responsibility, truthfulness, nationality oneness.

National Curriculum Framework (2000) states Value inculcation must be given due importance. While every teacher has to be a teacher of values, every activity, unit and interaction must be examined from the view point of value identification, inculcation and reinforcement so as to evolve an appropriate strategy for judicious implementation."

National Curriculum Framework (2005) states Peace education must be a concern that permeates the entire school life-curriculum, co-curriculum, classroom environment, school management, teacher pupil relationship, teaching learning processes, and the entire range of school activities.

Based on all these recommendation, it is quite evident that value education is a key component in a student's life

1.6.1 *Value Education: Meaning And Concept*

The Education Commission (1964-66), the National Policy on Education (1986) and the Ramamurthy Commission Report (1990),National Curriculum Framework(2000)and National Curriculum framework(2005) and recommended that imparting of value education should be an integral part of the entire educational process

Value education means inculcating in the children a sense of humanism, a deep concern for the well- being of others and the nation. Value education is wider, practicable and adoptable than religious education or moral education as no specific faith or religion is reflected through ethical, moral, social, cultural or spiritual values (Venkataiah and Sandhya, 2002)

Joint Study on Moral Education in Asian Countries (JSMEA, 1981) listed the objectives for value education .The objectives focused on full development of child's personality in its physical, mental, emotional and spiritual aspects, inculcation of good manners and responsible and co-operative citizenship, development of respect for the dignity of the

individual and the society, inculcation of a spirit of patriotism and national integration. They also stressed on development of a democratic way of thinking and living, development of tolerance towards and understanding of different religious faiths, development of human brotherhood at the social, national and International levels, giving help to children to have faith in some supernatural power and order that is supposed to control this universe and human life and enabling children to make moral decisions on the basis of sound moral principles.

In schools the value education can be given to students while integrated with all the subjects directly and indirectly through the activities like morning assembly, playground, field trips and various other school events like annual day, sports day and cultural programmes. Therefore, it is imperative that value education be integrated in the school curriculum.

Value education has the capacity to transform a diseased mind into a very young, fresh, innocent, healthy, natural and attentive mind. The transformed mind is capable of higher sensitivity and a heightened level of perception. This leads to fulfillment of the evolutionary role in man and in life.(Venkataiyah,2002)

1.6.2 *Need and Importance of Value Education in Schools*

The National Policy of Education,(1986) speaks of the need for value education and has stated that there is a growing concern over the erosion of essential values and on increasing cynicism in society has brought to focus the need for readjustments in the curriculum in order to make education a forceful tool for the cultivation of social and moral values.

In our culturally plural society, education should foster universal and eternal values, oriented towards the unity and integration of our people. Such value education should help eliminate obscurantism, religious fanaticism, violence, superstition and fatalism.

Value education is not just important factor in our country but also in other countries as well. UNESCO lays emphasis on this subject in different ways. Value education has become quest of ethics in every aspect world -wide.

The National Council of Educational Research and Training (1979) considered moral erosion a major issue and put forward a ten year programme for the moral rejuvenation. It wanted to lessen the inequality of sex, caste, religion, language, regionalism and race. They wanted to promote value and character building through various programmes.

When children come to this world they are unaware of many things and try to seek knowledge about the world and things around them from their parents, brothers, sisters, neighbors, and teachers and are fully dependent on other human beings. They lack maturity and responsibility. Gradually they need to become wise and responsible citizen and self- dependent and take the world forward by guiding the new generation. Education plays a crucial role here. Education is able to instill a sense of maturity, responsibility and self -dependency in the student.

The development of a student is a wider concept. It includes the physical, mental and emotional, economic, social development. One of the important aspects is character development is value development. Character is based on true values inculcated through value education. Value education has been constantly been taking place in the schools whether the teacher deliberately teaches it or not. Values can never be learnt like other subjects, we can just identify that these are the values and get a good conceptual knowledge about various values. Education is a process of bringing about desirable changes in the behavior of an individual in his/her knowledge, skills, attitudes and values. The school seeks to achieve this through its curriculum which is nothing but the sum total of all its organized activities. Curriculum thus essentially has a value basis. Teachers and schools, therefore, are engaged in value education although without explicitly considering its goals and methods. Value education need to be imparted in schools systematically and methodically by using various approaches and methods.

Sheshadri (1992) envisage a variety of learning encompassing the complex process of value education, The learning ranges across- awareness and understanding, sensitivity, appreciations and concern, responsible choice and decision-making, willingness and commitment to action. They suggest a range of techniques and activities such as : reading, listening and discussion activities; visual and multi-sensory experiences; enacting, modeling and role play type activities; dealing with value dilemmas; value clarification and learning by living activities.

1.6.3 *Status Of Value Education In Schools Today*

Many schools impart value education in some form or the other, but it lacks focus. Some schools offer value education in the name of Moral Science.

The deterioration of values in the society is also due to the lack of value education in schools today. The schools have an important role to play in value inculcation. There is a significant change in self-respect, wisdom, and a sense of accomplishment in secondary school students as a result of value education, (Kapoor, 1995).

Most teachers feel that parents expect schools to provide values education, though they seem undecided as to whether students really want to know what is right and wrong. Most teachers feel that their schools reflect the dominant values of the communities which they serve, but admit that their schools lack clearly-defined goals for values education programs. Teachers feel less qualified in value education. Very few teachers set aside a special time during the day to teach values (Whitney, 1986). There doesn't seem to be much change in the situation even today.

There is often dissatisfaction with education in India and elsewhere, because it lacks the provisions for education in values in general and the moral and spiritual values in particular. That is the reason why many thinkers, educationists, committees and commissions have recommended imparting of education in values, particularly moral and spiritual values, But in spite of the recommendations, value education had remained almost a non-starter in India Lack of proper conviction in value education, and

opposition to moral and spiritual education by some people are the major causes of this state of affairs (Kar, 1996).

If we look around our present education system, the focus of our education is on towards the main subjects like Mathematics, Science, Social Science, Languages, etc. Many schools and many teachers have never considered value education as an important subject. Most of the teachers are unaware of the methods involved in teaching and learning of values, or in developing a perception towards values. It is also known that all the subjects have some or the other value components. These aspects have largely no been given importance. In fact there are several approaches and methods which the teachers can use in their teachings to develop and strengthen different value system among students to inculcate values specifically or simultaneously with other subjects. .

1.7 APPROACHES AND METHODS IN TEACHING OF VALUES:

Value education is an important aspect in education It should form an integral part of general instruction.

Venkataiah and Sandhya (2002) admit about value education that. "Value education means inculcating in the children a sense of humanism, a deep concern for the well-being of others and the nation. Through value education we like to develop the social, moral, aesthetic and spiritual sides of a person which are often undermined in formal education". This observation establishes that value education can be imparted in two ways which include: (1) Class Room Teaching Learning Process; (2) Practical Activities

In the process of imparting value education there are various approaches and methods which can be used for inculcating the desired values in students.

Some major approaches suggested by Kar (1985) include the conventional approach, value clarification approach and cognitive developmental approach to value education and which have been presented below:

1) Conventional Approaches to Value Education , in this the approaches such as value/moral education, character education, education in values through exhortation etc. which can be commonly described as conventional approaches to value education.

2) Value Clarification Approach to Value Education : L.E.Raths, M.Harmin and S.B.Simon are the original proponents of value clarifications approach. This approach deals with through self -observation and self- analysis, to find which values which only he or she can judge as valid or invalid.

3) The Cognitive – Developmental Approach to Moral Education: Lawrence Kohlberg and his associates are the profounder of the Cognitive – Developmental Approach to Moral education. In this on the basis of Dewey's level of moral development and Jean Piaget's stages of moral reasoning Kohlberg evolved his concept of moral development consisting of different levels like pre-conventional, conventional and post conventional and further these levels into stages.

1.7.1 *The Integrated Approach :*

Knowledge is like a vast ocean, it has to be channelized into streams with proper strategy and fill the reservoirs of our nation. The knowledge gained is the biggest wealth gained and it has to be imparted in an interesting way and not in boring monotonous sessions. At present students enjoy stories of English in the midst of Science chapters or talks on Politics along with the learning of Commerce, Economics and they enjoy the market jokes and situations while doing Mathematics. It is all about integration or collaboration of various topics in the main stream. The Integrated Approach is one such important tool which a teacher can use to impart education by correlating different subjects by themselves and with other subjects.

From the various experiments conducted in psychology, Gestalt psychology proved that mind is a unit. The mind receives the knowledge as a whole not in parts. The whole knowledge is stable in the mind.

An Integrated curriculum was introduced in U.S.A in the year 1985 by a committee of the National Education Association. This type of curriculum is based on the unification theory. The combination of various units like linking various aspects to a particular topic will generate more creativity and interest in the subjects. These strategies would enable to develop more activities related to the teaching and learning of various subjects.

According to Veer (2004) .the integrated curriculum is an activity- centered curriculum. Group- controlled instructions are employed in this type of curriculum. It is also known as activity-oriented curriculum. The knowledge of all subjects is imparted by relating to life.

There is no specificity related to a particular subject. The knowledge is the main essence. The knowledge from various sources are considered as units. This integrated curriculum can be transacted effectively by using the Integrated Approach.

The Integrated approach is a process in which any knowledge or basic concept can be spontaneously incorporated into the various subjects of the curriculum .The Integrated approach leads to integrative learning, which is all about connecting skills and knowledge from multiple sources and experiences; applying skills and practices in various settings; utilizing diverse and even contradictory points of view; and, understanding issues and positions contextually.

The values can be integrated effectively with various subjects by using the integrated approach. Integration of human values along with scholastic and co scholastic activities of students in value -based education, is significant of the al round development of students.

Values can be taught in different ways and can be used with other subjects in a meaningful way. Value education is integrated across all subjects in the curriculum. Here the approach to value education is indirect.

Values could be integrated properly with different subject's areas and educational programme and every subject has got some values embedded in it.

As the very word itself clears that integration in no ways contradicts or alters the existing pattern rather it means supplementing or strengthening the existing pattern with what is pivotal in view of changing needs, situations etc.

Thus integrated approach with respect to value education is a process with which values can be spontaneously incorporated into the various subjects of the curriculum.

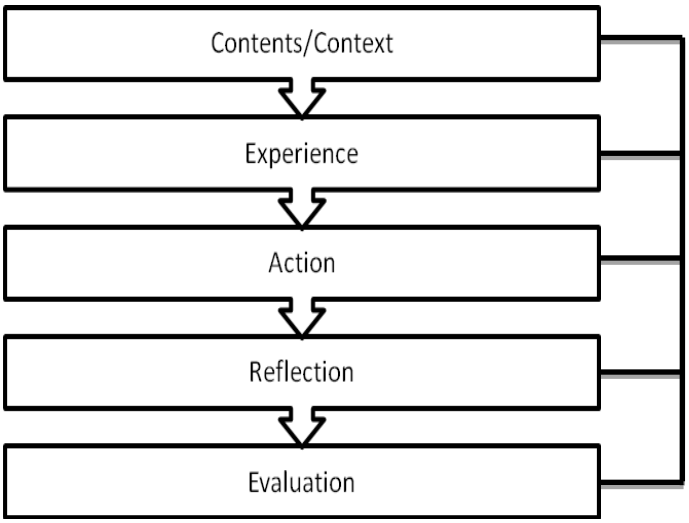
Value education is multi -disciplinary in nature and related to various subject/areas. Integration of value education in different school subjects can be possible in two ways:

i) **Unit Approach:** In this approach new units relating to Value education are developed and added to the existing units in the course/syllabus of the subject area.

ii) **Fusion Approach:** This approach implies inclusion of value education concepts into the normal process of instruction throughout the curriculum without having to develop separate course of new units. Inclusion of this type involves enriching and expanding the existing unit in the syllabi of the accommodating subject areas to include value education related ideas. In this approach examples can be substituted into the already existing materials by Value related examples. Through the substitution of examples, education content remains the same, only the substance of the example changes.

The integrated approach enables the teacher to go deeper rather than remain at the information level (Kumari, 2003). Values no longer need to be isolated as 'moral science' on 'human values', evaluated and assessed like any other body of information (Saraf, 1995). There is a process for integration of values.

FIG: 1.1 PROCESS OF INTEGRATED VALUE BASED LEARNING: (VENUGOPAL AND KUMARI, 2006.)



1. Context/ Content: Subject content/ school/ classroom context for value orientation.

2. Experience: Direct/ indirect experience.

3. Reflection: Thinking, feeling and appreciation leading to internalization of values.

4. Action: External manifestation of internalized values.

5. Evaluation: By the teacher and the students value internalized.

This approach can be dealt by involving various methods of teaching Discussion method is very useful in this approach. The various activities like story- telling, games, presentation, model making, problem solving, project method and field trips can supplements the integrated approach of teaching any subject.

Realizing the call of the time and to sharpen our future generations we can integrate value orientation along with the normal course of teaching-learning process.

1.7.1.1 *The Characteristics of Integrated approach according to Veer (2004)*

1. The knowledge of subjects is given in the integrated form.
2. The students learn the various subjects simultaneously.
3. This type of curriculum is activity oriented and experience- centered.
4. This type of curriculum provides knowledge of the subject which is useful in the real life.
5. The students' interests are taken into considerations.
6. It employs group controlled instruction therefore duties and responsibility are assigned to the students.

1.7.1.2. *Advantages of the Integrated Approach:*

The advantages of the integrated approach include 1)There is no need for a separate period in school's time table.2) There is no requirement of separate classroom or a separate teacher to be appointed for this subject3). It reduces burden on the part of teachers and students. 4) No extra books are required except the subject books. The students need not take examination on the topics studied using integrated approach.

1.7.1.3. *Disadvantages of the Integrated Approach:*

This approach is very time consuming.1) It is not possible to integrate all the topics on an activity. 2) It is very costly from time, money and energy point of view.

These approaches cannot be successful if they do not use a method of teaching values; method enables to supplement the values approaches in the value inculcation. There are various methods that can be used during the various approaches used while inculcating value education. These methods can be categorized in the form of **(i) Direct Method; (ii) Indirect method and (iii) Incidental Method.**

(i) **Direct method** is the immediate accomplishment of definite ends or goals. The direct method of value education refers to deliberate, systematic attempt by the teacher to teach values as a subject or an area of thought.

This is a traditional method and has existed since years. A specific subject is included in the curriculum called 'value education'. Many catholic institutions have 'moral science' in their curriculum. Test can also be held based on the text.

This method aims at acquainting the pupils, consciously and overtly with the skills, techniques and qualities required to get the right answers to moral questions and giving them practice involving moral problems. Such a method might include regular classroom instruction, talks and discussion to develop knowledge and understanding of values, discussion of situations involving value conflicts, presenting students with value dilemmas and developing the ability to make sound value judgments.

(ii) **Indirect method**, value education is given indirectly as a by-product of teaching a particular subject. It is assumed that educational effort is aimed at value development along with achieving the aims of the subject being taught.. Thus, instruction in any subject has value development also as one of its aims. This method is categorized further as curricular or co-curricular.

(a) Indirect co-curricular method : A large number of co -curricular activities are normally conducted in or most of the schools and colleges. But the focus is merely in conducting activities and on winning prizes, instead of value inculcation. These activities can inculcate values like discipline, team work, self-actualization, honesty, determination, etc,

(b) Indirect curricular method: Teachers go through the curriculum and text books of their respective subjects and while teaching when they come across any example of values they try to identify and state it in their teaching process.

(iii) **Incidental method**. Many incidents which can be labeled as right or wrong do ordinarily occur in every school. Their frequency may be high or low depending upon several factors. The advocates of this method see in such incidents opportunities for value education and want them to be exploited for the purpose. Whenever an incident which has a value implication is noticed by a teacher, he/she has an opportunity to use it for giving the right value perception.

These methods can be used effectively during the teaching of students through various approaches. The integrated approach is one of the useful approaches for imparting value education and inculcating values in students. This integrated approach has been used by the researcher in the present study.

1.8 VALUES INTEGRATED WITH MATHEMATICS:

For the present study ten values namely equality, co- operation, determination, simplicity, team work, discipline, loyalty, dignity of labour, regularity and honesty were identified by the researcher to be inculcated through teaching of Mathematics. These ten values were identified on the basis of a through content analysis of the class VIII Mathematics text book. These were the frequently occurring values in the various chapters which had a scope of integration with different topics of Mathematic .A brief account of these values and their integration with Mathematics has been given below.

- **Equality:** 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 beliefs. As per Oxford Dictionary(2010) it is defined as **"**The state of being equal, especially, in status, rights, and opportunities". A person is said to be having the value of equality if he or she treats everybody equally. He/she believes in all God rather than their own god and will visit any holy places any moment of time, select friends

on the basis of compatibility and not by any bifurcations, shares and receives eatables with all and not being choosy about from whom to take and from whom not to.

- **Equality and Mathematics:** As per Oxford dictionary (2010) meaning in Mathematics it is**:** A symbolic expression of the fact that two quantities are equal; an equation. "Mathematics is the language with which God has written the universe."- Galileo Galilei. In Mathematics equality is a relationship between two quantities or, more generally two mathematical expressions, asserting that the quantities have the same value or that the expressions represent the same mathematical object. The equality between A and B is written A = B, and pronounced A equals B. The symbol "=" is called an "equals sign".

  The etymology of the word is from the Latin aequalis, meaning uniform or identical, from aequus, meaning "level, even, or just." In some cases, one may consider as equal two mathematical objects that are only equivalent for the properties that are considered. This is, in particular the case in geometry, where two geometric shapes are said equal when one may be moved to coincide with the other. The word congruence is also used for this kind of equality. Equivalence is also a word used in Mathematics for showing strong equality. If for any functions, if a function is reflexive, symmetry and transitive it is said to be equivalence function. Logical equality describes two logical values being the same in Boolean algebra.

- **Honesty:** 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. Honesty is valued in many ethnic and religious cultures. "Honesty is the best policy" is a well-known proverb of Benjamin Franklin;. In general this attribute has to be dealt in an ideal manner. A student is being considered honest when they do their own homework, tell a friend the truth, explain the real reason about not doing the homework, Keeping eyes on their own paper while writing test, Clean

up their room after making a promise, gives the cashier the extra money she gave them by mistake writes a report in their own words instead of copying, admit that he/she made the mistake, keep a friend's secret intact. Being honest with oneself is to accept responsibility of one's own actions; and not blaming others. It is also about being honest about ones own feelings. If a student considering lying, they try to think of the consequences. When these students are confronted by any situation, they think of others.

- **Honesty and Mathematics :** In Mathematics honesty is related with the integrity of formulas, how works of mathematicians with honesty and integrity lead to great outcomes. It is indeed the honest nature of various formulas that gave the required solutions. The correct formula gave the right and desired result. Honesty is observed in axioms, theorems and postulates. All the formulas used in Mathematics are correct formulas and is so derived to provide the accurate results, for instance the formula to find Interest, Compound Interest, gave us the right amount of money and truthfulness of the formula provided the right values. Even the value of (π= pie) which is not accurately known but calculated to n decimal values gives the accurate values, which supplements the formula or area and circumference of circle. It is this honest nature that lead to various solutions of problems in Mathematics.

- **Co-operation:** Co-operation means living in accord with others. It is the process of working or acting together to achieve common goal. It's all about mutual understanding among the individuals. Co-operation develops a sense of mutual inter- dependence among individuals. A person believing in cooperation believes in equality, they have a service motive; they have the value of empathy more than sympathy. There is a sense of duty in those individuals and they are self- motivated individuals. Co -operation is something which makes both the party feel good if it's done for a good cause. Co -operation is an act done not with discrimination or voting out the task. There is no loss of self- respect or personal attributes; instead it enhances the character of an individual. A child sharing his things like providing his ruler to his friend for drawings, helping in doing sums not by

just lending their books to copy, giving his hand in any deed and also listening to their monitor friends for a disciplined class all are considered to be a good co -operation attributes in a student.

- **Co -operation and Mathematics:** One idea is used by other mathematicians to sum it up to a new concept. The co-operation is all based on basic principles of life. Co -operative study of Mathematics can enrich the true essence of Mathematics. It can be made more healthy and productive if there is a co -operative attitude among students to study the subjects. All Sciences has experiments where there can be group work and so is the case of Mathematics, Group work of students with co -operative nature can ignite the ignorant minds and also give spark to students to find new ways and means to get outcomes or results.
- **Simplicity:** Simplicity deals with simple living which encompasses a number of different voluntary practices to simplify one's lifestyle. These may include increasing self-sufficiency, for example. Simple living may be characterized by individuals being satisfied with what they need rather than want. Simple living is distinct from those living in forced poverty, as it is a voluntary lifestyle choice.

  Simple living can also be a reaction to materialism and conspicuous consumption. Some cite socio-political goals aligned with the anti-consumerist or anti-war movements, including conservation, de-growth, social justice, ethnic diversity, tax resistance and sustainable development.

- **Simplicity and Mathematics:** Simplicity in Mathematics is Art of doing Mathematics in a simple way, Simplicity is the best policy, and doing Mathematics with simple concepts and high thinking can enable to decrease the complexity of the subjects. Simplicity and Mathematics is a bit hard to explain as simplicity is attached to Art, whereas Mathematics has is roots in Art, Music, nature and in every aspect of life, so goes the simplicity can go on nicely with Mathematics, the concept of symmetry in art is also existing in Mathematics, the simplicity in drawing curves, lines and deriving formulas. Simplicity is to something which is easy to understand, in contrast to something complicated. The use of simple

concepts like area of square, rectangle, and circle to understand the shapes of both 2 D and 3D can enable a simplistic approach with more depth knowledge of higher order concepts. Going to n degree equations from linear form is the best strategy in Mathematics. Simple thinking and high derivation leads to a better logical thinking in students. That's why it's said simplicity is the best policy in tackling the complex situation, whether it's is deriving complex mathematical formulas or complexities of life. In past while deriving many complex formulas about quadratic and bi-quadratic expression with just the knowledge of integers leads to complexities and with the discovery of complex numbers C, combination of both real numbers and imaginary numbers the complexity was simplified. In Mathematics the root cause of big expression are due to simple expression, that's why students were evaluated most often with the term simplify a particular expression. This can be taken as case where students can simplify any complex expression through an appropriate method if it can be simplified.

- **Dignity of Labour:** Dignity of labour means that one respects all jobs/positions equally and does not consider one superior to another. Dignity of labour is all about giving to persons work and put in all efforts to do it fulfill the job. It is all about doing work honestly and sincerely. Dignity of labour is not about looking down upon others, especially to those who do manual work like domestic help, laborers, sweepers, masons etc. Students having this value, if given a task, do not label it as below his level and instead fulfill it by giving their cent percent. Similarly in case of students we can say that they enjoy cleaning their rooms, helping their mothers in household chores, without any feeling shame and disgust.
- **Dignity of Labour and Mathematics: "**A man is like a fraction whose numerator is what he is and whose denominator is what he thinks of himself. The larger the denominator, the smaller the fraction." Leo Tolstoy

  "Practice makes a man perfect" is the chant the students are taught right from the beginning of their study in Mathematics. At primary stage, the students are asked to practice the tables, words, numbers, addition and subtraction and then sharpen their mathematical thinking by learning it

whole heatedly. All the concepts are to be practiced with utmost care in a proper way. In Mathematics dignity of labour can be understood by giving mathematical angle to it, this can enable the students to develop more interest in the subject as well as value can be inculcated in them. The concepts like area, volume, i.e., mensuration in whole can be used effectively for doing some work and understanding the importance of work.

- **Determination:** 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 letting go. Determination is falling on your face and getting back up. Determination is losing feeling on your legs, and wanting to keep on going. Determination in an individual is also termed as self-determination,

  Self-determination is "a combination of skills, knowledge, and beliefs that enable a person to engage in goal-directed, self-regulated, autonomous behavior.

  Individual who show immense determination towards their work are focused in life, they are hard working. They are found to be good decision makers and can take responsibilities. They are able to prioritise their needs, desires, interests, strengths, and limitations and use this information to make choices. These individuals show self-confidence and healthy self-esteem. They can be creative will have a clear vision of the future. They can identify and choose from several options and anticipate consequences for each. They can manage their behavior and take appropriate actions. They can make future plans based on outcomes of previous actions.

- **Mathematics and Determination:** "A fixing or finding of the position, magnitude, value, or character of something: as the act, process, or result of an accurate measurement."

  Mathematics related to determination relates to the attitude to do Mathematics. Determination in Mathematics is developing an attitude to find solution irrespective of its difficulty level. Determination towards the

subject makes it more understanding and enables to do Mathematics with ease .To determine something most often enhances the beauty of subject. Students with determination techniques, develops good qualities like patience, hard work, trying again and again for results. There are topics in Mathematics where students need to determine some objectives, even a chapter is named called Determinants which deals with finding solution of n types of variables, with the concept of Determinants, the solution becomes simplified and object oriented, it again expresses with respect to determination.

- **Discipline :** In its original sense, discipline 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. Discipline is a course of actions leading to certain goal or ideal. A disciplined person is one that has established a goal and is willing to achieve that goal at the expense of his or her individuality. Discipline is the assertion of willpower over more base desires, and is usually understood to be synonymous with self -control. Self-discipline is to some extent a substitute for motivation, when one uses reason to determine the best course of action that opposes one's desires. Virtuous behavior is when one's motivations are aligned with one's reasoned aims: to do what one knows is best and to do it gladly. Continent behavior, on the other hand, is when one does what one knows is best, but must do it by opposing one's motivations. Moving from continent to virtuous behavior requires training and some self-discipline.

- **Discipline and Mathematics:** Mathematics deals with calculations, reaching to results through appropriate steps of pure mathematical logics. There is no short cut for getting the exact results without any logical thinking. Through discipline efforts true mathematical concepts are developed and with right concept and right efforts always logical results can be derived. Discipline in Mathematics is all about the order in which the problems are solved in general. The systematic approach of learning concepts is a disciplined approach. Firstly for any disciplined approach

there has to be a goal. In Mathematics students based on their potentials sets different goals, some set goals of cent -percent, some set a goal for passing out the subjects based in their interest towards the subjects. For accomplishing this goal, they need to get results for every problems or sums they have to undergo step wise efforts. Based on their efforts and disciplined work they reach to the goals and mathematical problems help them to be disciplined.

- **Loyalty:** It is something Intra-personal related to person to person or country or group of person or ideas or causes. There are many aspects to loyalty. It is faithfulness or a devotion to a person, country, group, or cause.

  Royce (1908) said, loyalty is a virtue, indeed a primary virtue. He further stated that Loyalties differ in basis according to the foundation upon which they are constructed. Loyalties differ in strength. They can range from supreme loyalties, to merely presumptive loyalties. Loyalties differ in scope. They range from loyalties with limited scope, that require few actions of the subject, to loyalties with broad or even unlimited scopes, which require many actions, or indeed to do whatever may be necessary in support of the loyalty. Loyalties differ in legitimacy. This is about people with one loyalty can hold that another. Finally, loyalties differ in the attitude that the subjects of the loyalties have towards other people.

- **Loyalty and Mathematics:** It is said that Mathematics is customer loyalty. In real life the practical uses of Mathematics determines the loyalty of accounts, without mathematical reasoning the loyalty is doubted of any product. Mathematics explains the truth of any product, whether it is daily basis expenses or monthly bill, Mathematics determines the loyalty of accounts in terms of money, the salary statement of an individual is an example of loyalty of organization, based on these statements loyalty of organization can be determined, the M.R.P on certain commodities can estimate the loyalty of the item, its purchase values, sale value and profit share all determines the quality and loyalty.

- **Team work:** It is an art of people coming together and working together for achieving goals, objectives or for 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 groups. 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. Henry Ford quoted "Coming together is beginning, keeping together is progress and working together is Success". Team is also said as when people come together than every other person will achieve more than what they could have done alone.

Mother Teresa who is considered to be one of the prominent lady of the yester years People still remembers her as the Mother of love and Care, who contributed her entire life in the service of mankind once stated " You can do what I cannot do, I can do what you cannot do. Together we can do great things".

- **Team work and Mathematics:** Team work in Mathematics deals with the collaborative studies exerted by students for understanding a concept and helping each other and self to learn and understand Mathematics as a whole. It can be also used to make a project work in Mathematics for some exhibits with proper co- ordination and communication for showing their respective abilities working in groups.

  Team work in true sense is used in playground while playing any sport; Mathematics plays a great role in the success of a team. There are lots of calculations and derivation of possible strategies to be implemented. These strategies are based on the probabilistic nature of Mathematics.

  Certain concepts, models, properties in Mathematics highlights the significance of Team work, for example properties of numbers like Commutative says something about Team work, where a + b = b+ a, it can be correlated to team work as in a game of doubles if A scores 7 points or B scores 8 points, or vice versa, end of the match, it's the final score that matters, irrespective of the number of points made by the players. So, we can hence correlate team work with Mathematics.

- **Regularity :** Regularity is all about being regular in doing some work. It is about doing similar action or behavior most often. Regularity is often referred to word regular. It is also related to punctuality, consistent, determined towards doing a particular task most often with sincerity and devotion. In spite of any circumstances and situation a person has the tendency of doing it the desired way and simultaneously in the similar fashion, than that person is said to having the value of being regular or regularity.

  It is a quality or state of being symmetrical in appearance or form; evenness. Further it can be said as it is an act in doing the same thing or action at the same time each day or on a regular basis.

  Individuals are considered to be regular, if they are systematic and punctual in their approach. Regularity develops good quality thinking, management of time and good Co-ordination with others. These individuals are perfectionist in their work and will not compromise with the work they are supposed to do. They will be regular in their attendance and task oriented.

- **Regularity and Mathematics:** "The mathematician's patterns, like the painter's or the poet's, must be beautiful; the ideas, like the colors or the words, must fit together in a harmonious way. Beauty is the first test; there is no permanent place in the world for ugly Mathematics." G.H. Hardy (1941)

  One might argue that such beauty is strongly emergent because of the 'harmonious way' the parts fit together: the regularity (or fitting together) of the whole is not reducible to the regularity of the parts. Regular triangles, squares, and hexagons fit together, but regular pentagons do not. This concept is called tessellations of which deals with mathematical shapes based on regularity.

  In Mathematics had found it roots in many concepts like regular polygons, all the derivations is the outcome of regular outputs. Regularity in results dealt with various formulas, Mathematics conclusion, i.e., formulas, postulates, theorems are based on regularity, formula of $A = \pi r^2, C = 2\pi r$

are all by the regular and rigorous works of mathematicians where π is considered as an irrational number, with never ending values of π.

1.9 RATIONALE OF THE STUDY:

Since last few years our country has seen the downfall in the basic values which are required for any society to form a strong and healthy foundation of the society and the nation. Hence there are serious efforts made all across India to integrate these values through the education system.

The Educational Boards and institutes are seeking various measures to develop a proper way for value education in the teaching learning process. The Central Board of Secondary Education (CBSE) has introduced the concept of value based question in question papers. Questions of three to five marks in almost all the major subjects in Class 9, Class 10, Class 11 and Class 12 in CBSE Board Exams were made effective since academic session 2012 – 2013. The Central Board of Secondary Education towards the introduction of CCE (Continuous Comprehensive Evaluation), in the co-scholastic assessment the students are graded on the basis of attitude and values. However values are not being taught systematically and methodically in most of the schools.

The degradation of value system and deterioration of values and culture in the run of materialistic and economic development is evident everywhere the school is considered to be the place a student can be given the proper guidance on values and holistic education. In the present times the emphasis on consumerism and competition for achievement, has sidelined its central concern for the overall development of the persons being educated. The important dimension of education, i.e., the development of moral and spiritual side of human personality needs more focus.

Value education which needs to be looked upon as an essential aspect for the overall qualitative improvement of education is being neglected to a great extent. There is a need to strengthen the value education at schools today and many approaches and methods need to be adopted for imparting value education. The curriculum would get overcrowded if new subjects

are added according to the needs of the changing times. Therefore the integrated approach goes a long way in the inculcation of values.

Mathematics and its nature helps students to develop the ability to analyze, synthesize, to differentiate, to integrate, etc. and to check any probability of any situation using mathematical concepts. These qualities of Mathematics have an ability to use any approach or strategy in order to develop various skills in a student. If values are interwoven in the teaching process of Mathematics then, there is a much better scope of inculcation of values in student through various situations and examples used while teaching of Mathematics.

The researcher came across survey and experimental types of research in the literature reviewed. The survey type studies focused on the relationship between values and different variables There were other studies which focused on various models, methods, approaches, designs, programmes on value development in students. There were few studies which focused on CAI, technology enabled programme, and co- related approach with an aim to improve achievement in Mathematics. However the literature reviewed did not include any study related to Integrated Approach in teaching of Mathematics for inculcation of values in students at secondary level. Therefore the researcher took up a study and developed strategies to integrate the identified ten values namely equality, co-operation, and simplicity, dignity of labour, team work, honesty, regularity, discipline, loyalty and determination through the teaching of Mathematics.

1.10 RESEARCH QUESTIONS:

The researcher formulated the following research questions for the present study.

1) Can values be inculcated through teaching of Mathematics using the integrated approach?
2) Can the developed strategies be effective for value inculcation?

1.11 STATEMENT OF THE PROBLEM:

Teaching of Mathematics through integrated approach at secondary level for value inculcation.

1.12 OBJECTIVES OF THE STUDY:

1. To develop strategies for teaching of Mathematics through integrated approach for the inculcation of values like equality, co-operation, simplicity, dignity of labour, determination, honesty, regularity, discipline, loyalty and team work

2. To implement the strategies for teaching of Mathematics through Integrated approach for the inculcation of the values.

3. To study the effectiveness of the integrated approach of teaching Mathematics in terms of conceptual knowledge of values, value perception and value practice along with the achievement in Mathematics

4. To study the reaction of students towards the value integrated approach.

1.13 HYPOTHESES:

The proposed study will have Null Hypotheses. Out of the literature reviewed, no clear direction emerged that the interventions or experiments conducted would lead to value inculcation in the experimental group. Therefore Null hypotheses were formulated by the researcher.

1. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value equality.

2. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value Co-operation.

3. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value dignity of labour.

4. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value simplicity.

5. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value determination.

6. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value honesty.

7. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value regularity.

8. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value discipline.

9. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value loyalty.

10. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of the value team work.

11. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the conceptual knowledge of all the values as a whole.

12. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value equality.

13. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value Co-operation.

14. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value dignity of labour.

15. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value simplicity.

16. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value determination.

17. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value honesty.

18. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value regularity.

19. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value discipline.

20. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value loyalty.

21. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the value perception of the value team work.

22. There will be no significant difference between the mean gain scores of the students of control and experimental group of class VIII in the Value Perception of all the values as a whole.

23. There will be no significant difference between the mean gain scores of the students of control and experimental group in the Achievement Test in Mathematics of Class VIII students.

The null hypotheses will be tested at 0.05 level of significance in the present study

1.14 OPERATIONAL DEFINITIONS:

(1) Value Conceptual Knowledge: Value conceptual knowledge of a specific value is the score secured by a person in that value present in the value knowledge test prepared by the researcher. The conceptual knowledge of the ten values taken as a whole is the total score secured by a person in the value knowledge test prepared by the researcher.

(2) Value Perception: Value perception of a specific value is the score secured by a person in that value present in the five point value perception scale prepared by the researcher. Value perception of ten values as a whole is the total score secured by a person in the five point value perception scale prepared by the researcher.

(3) Value practice: The value practice are the different values exhibited by the students in their behaviour..

(4) Achievement in Mathematics: The achievement in Mathematics in the present study will be considered as the total marks secured in the achievement test prepared by the investigator.

1.15 EXPLANATION OF THE TERMS:

Integrated Approach in Mathematics: An approach of teaching values indirectly through the teaching of Mathematics.

Strategy: A strategy is a plan of action which includes all activities designed for the inculcation of the values.

Secondary level: In CBSE schools secondary level consisted of classes VI to X in the year 2008 .In the year 2008 class VIII was also included at the secondary level in the schools affiliated to Gujarat Secondary and Higher Secondary Board. The students studying in Class 6 to 10 were considered to be of secondary level in the CBSE school of Bharatiya Vidya Bhavan's V.M.Public School, Vadodara in the year 2011- 12.

1.16 DELIMITATIONS OF THE STUDY:

(A) The present study was delimited to the Class VIII English medium students of secondary level following Central Board of Secondary Education curriculum.

(B) Values in the present study were delimited to the values of equality, co-operation, simplicity, dignity of labour, determination, honesty, regularity, discipline, loyalty and team work.

1.17 CHAPTERISATION: