CHAPTER I

CONCEPTUAL FRAMEWORK

1.1.0 INTODUCTION

Education is a potent instrument of our learning process in which the knowledge, skills, values, beliefs and habits of the group of people are transferred from generation to generation incessantly for the continuation of human existence. The major role and goal of education is not only enabling a child to acquire knowledge but also to equip him or her with the ability to handle the challenges of life.

Being education the key to empowerment of people, enhancement of its quality and accessibility is of paramount importance for all. We need to prepare our youth to be effective and beneficiaries of the emerging society. This is possible through the spread of good quality education throughout the country including rural domains to access high quality education with the help of low cost technology. Technology vision-2035 reveals that there is a need for the large scale participation of teachers and other experts in this process to raise the quality of our education up to global level. Greater emphasis on value education, pride for one's cultural identity while respecting other cultures and deeper engagement towards achieving higher goals is equally necessary during the formative years of students so as to prevent their undesirable drift as a consequence of the new found liberal environment.

We live in the era of true revolution of knowledge generation, technological innovation and expansion of human mind. Our children will work in many jobs that haven't even been invented yet! Though technology is advancing at a breathtaking pace, there is, and always will be, the human brains behind, alongside and complementing the technology. It is these brains that we want to nurture. It is not the course material, information or data that is important; it is the process of 'learning' matters for each learner. The foundation of education constitutes the very key aspect called *learning process* as a means to reach to any end due to which it occupies a central role in every individual's life.

The American heritage dictionary defines learning as, to gain knowledge, comprehension, or mastery through experience or study. In other words learning is nothing but net change in observable behavior of a learner. Kimble (1961) defined learning as a relatively permanent change in the behavioural potentiality that occurs

as a result of reinforced practice. There is an organic link between learning and survival. It is also the learning process that allows the learner to adjust to a changing environment. Linn (1987) stated that there was widespread agreement with distinguished mathematicians, scientists, and curriculum technology experts, that learner actively construct a coherent worldview based upon their personal observation and experience, and respond to formal instruction in terms of their pre existing intuitive knowledge.

To make the learning process further worse, today's teacher neither perceive that it is a part of his responsibility to develop the child's curiosity, nor does the school provide conditions in which the teacher could fulfill the responsibility. Low salary , lack of zeal to do something to make real learning happen in our classroom, private tuition culture , giving high priority of living aspects by teacher themselves by neglecting life aspect of education was order of those days in the school education system in independent India. All teacher felt educational experiments needs time which is not possible in schools as the priority of teacher is to complete syllabus, taking examinations and ranking students. But it is true that to transform school education needs quite lot of efforts from all stake holders (Badheka,1990**).**

We are living in 21st century world where Science & Technology controls our daily life to a larger extent. In every sphere around us we can feel and see the terrific impact of science and technology. With the tremendous progress of science and technology, it has become necessary for every man to understand and apply science to his day-to-day life. This is only possible through a systematic process of acquiring scientific information called science learning, in a definite schema called schooling process. Thus it is science teaching learning process primarily affects the overall understanding of every learner about science in general in their respective lives. It is a well known fact that science concepts are delivered in our schools mostly in a traditional way, measuring mostly the students ability to recall and comprehend the important information. It is heavily criticized that science education provided in Indian schools is predominantly bookish and theoretical one (Jain *et al.,* 2017). Science disciplines are mainly intended to develop higher order mental abilities but present trend of teaching learning process in science seems little use to realize the ultimate purpose of learning science in our schools. What should we do to bridge the ever widening gap between science learning and science teaching? There is no

shortcut formula to address the issue but to review the entire gamut of teaching learning dimensions prevalent in our schools.

A nation is not built by quantum of mortar, bricks and steel but the men and women of sterling character. Today's education in our country has produced more educated persons without having in-depth idea of education and mechanized humans without having traits of humanity. It appears that our country is passing through a phase of serious apolitical crisis called value crisis. All around us there is a shadow of missing spirit of life as if the true aim of human being is to make wealth effortlessly, swiftly without any hurdle and enjoy a comfortable life without adhering to the very basic philosophy of life. Bharat so called India is losing its cultural supremacy and spiritual diversity in global arena (Biswal, 2014).

Dhall(2017) indicated that the current system of education is seriously flawed in the very concept of learning, teaching and meeting with the real developmental needs of the children. It was developed two hundred year ago to serve a rapidly industrializing society which required stratification into managerial class, skilled and unskilled workers. It encouraged inequality, competition and aggression. This system of education has resulted in global consequences such as division into rich and poor, first world and third world countries. Wars, terrorism, violence, intolerance, anxiety, family tensions, delinquency and suicides as well as indiscriminate exploitation of natural resources, all have their roots in the ways and policies through which children and young people are being educated and raised today.

Further Indian education is at a historic cross road today owing to its unprecedented expansion, less control over quality, changing learning landscape of learners, intrusion of a breed of non performing teachers, ICT revolution, government policy without financial accountability, mushrooming of private players with dubious intentions of social service and nation building etc. As school education is considered as the bedrock of higher education, it is believed that the school's success is directly proportional to the effective management of people to work harmoniously together with an orientation towards the realization of their goals. The major function of school is learner development; enhancement of social access to higher education; nation building through extension programmes for community development; advancement of research. School is the change agent to reach a large body of youngsters in the age

group of 6-18years in the country who are to be shaped in their most impressionable age to develop sensitivity to quality in intellectual attainment; to assume roles as responsible citizens and leaders to determine the destiny of the country; and to acquire a cultural identity and values which bridge tradition and modernity. Good schools pay equal emphasis to curricular aspects, teaching – learning and evaluation, research and extension, infrastructure and learning resources, student support and progression, organization and management, healthy practices, value fostering practices etc. It is in this context ethical issues in school educational management has been conceived so as to give respite to present debacles.(Biswal, 2016).

Sri Sathya Sai baba, famous spiritual master of our time said : Education without character, politics without principles, commerce without morality, Science without humanity, religion without love, culture without unity, administration without justice, knowledge without applications, and patriotism without sacrifice are not only useless but positively dangerous for our society. There is a need to strike a balance between spiritual and scientific attitude. The scientific attitude encourages one to look at the universe without the distorting blinkers of superstitions. Such person can intelligently appreciate the wonders of nature with humility. Famous scientists like Albert Einstein, Richard Dawkins etc recognized that the quest for truth, objectivity and beauty are the fundamentals in science. The scientific attitude encourages truthfulness as science is the quest for unraveling the truth about how nature works, generate humility in us. The attitude fostered by science is an invaluable asset for coping with our ever changing mysterious universe. At this juncture science and spirituality converge at one point working philosophy (called Value education) and emerge as responsible science cultivation that is required to promote science education in young minds wherein they can think scientifically, lead scientifically and reason out the things everyday in a poised manner.

1.2.0 SCIENCE EDUCATION

Science is considered as an attempt to uncover and discover the mysteries of the natural world and the process of developing and understanding about the natural world encompasses the branch called as science education. The need to know and understand what ***is*** and a desire to discover what might be motivates humans to seek answers to the continuous flow of questions which is key to science education.

Science Education draws attention to the need to develop life skills, where abilities gained in science lessons can be building blocks for capabilities in life beyond school (Holbrook, 2010).

1.2.1 Definition of Science

The word 'Science' is derived from the Latin root '*Scire*' which means 'to know'. Thus the original meaning of science is simply 'knowledge', although it generally deals with natural and material phenomenon and is based mainly on observation, experiment and induction. Also the term **"***Science*" refers to a mode of inquiry, reserving the term "scientific knowledge" to the product of the inquiry. Science is considered as a body of knowledge, a way of thinking and leading life. The definition of science varies from person to person as per their own experience, expertise, exposure and personal exposition. According to Bodner **(**1986**)** "Science is not just a collection of laws, a catalog of unrelated facts. Also science is a creation of the human mind, with its freely invented ideas and concepts. The only justification for our mental structures is whether and in what way our theories form a link with the world of sense impression". Foster **(**2006**)** defined science as, a creative human process and education that leaves this out takes the heart out of what the subject could be**.** According to *MASIS* report (2009) science is described as "the way it shapes our views.It also enables innovative products and ways to improve quality of life". Fleck (1935, 1981) defined **"**Science is fundamentally a social activity of ''thought collectives,'' whose maintenance depends on the inculcation of new members in the ''emotional sensibilities'' needed to properly evaluate according to the standards of the collective". Also science is defined as the ways of acquiring and applying knowledge according to the methods of natural science and technology, as well as the structured whole of knowledge and skills resulting from these Methods.

1.2.2 Nature of Science

Curiosity around them has been the essential traits of every human being. The imaginative human mind has responded to the wonder and awe of nature in different ways. Earliest times one kind of response has been to observe the physical and biological environment carefully, look for any meaningful patterns and relations, make and use new tools to associate with nature, and build conceptual models to understand the world. This human endeavour is science (NCERT, 2006).

According to Hergenhahn & Olson (2007**)** Science combines two ancient philosophical positions of knowledge. One of these positions, called rationalism, contends that one gains knowledge by exercising the mind(i.e by thinking, rationalizing, reasoning, and using logic). The other one is called empiricism, contends that sensory experience is the basis of all knowledge. Empiricism states that we know only what we experience, in its extreme form. Thus the rationalist emphasizes mental operations whereas the empiricists equates knowledge with experience. Science combined with both the two positions creates an extremely epistemological powerful tool for us.

To a layman nature of science means the values and assumptions inherent to scientific knowledge and development of scientific knowledge .In other words nature of science(NOS) is referred to as the characteristics of scientific knowledge that necessarily result from the conventional approaches(i.e inquiry) scientists use to develop knowledge (Venville *et al* ,2006). Further scientific knowledge is based on assumption that: knowledge is tentative (subject to change), empirically based (derived from observations of natural world), Subjective (theory laden), necessarily involves human interference, imagination and creativity and is socially and culturally embedded.

1.2.3. Domains of science

The domain of science is ever expanding and having no physical boundary. One of the important aspect of science is that, it seldom evident in school textbooks its "inter-disciplinarity" nature which remains untapped by either teacher or the taught. To understand any science concept in its entirety, we must examine it from the perspective of many streams- physics, chemistry, biology and its philosophy, History, Value dimension and often through combining these disciplines. Hence school science demands a great deal of interdisciplinary approach of science. Probably it is the reason of excitement and wow factor that is being created in science.

1.2.3 Science and Society

Science and technology is a subset of the social system. It affects the social system within which it exists and is also affected by the social systems. The understanding of basic dialectical relationship between science-technology and the society is needed to determine the direction of social as well as scientific development (Fujun, 2013**).** The relationship is essentially a complex function of historical accumulation of all that

scientific and technological knowledge in general and a history of science and technology in a given society in particular. It also depends on the present level of scientific literacy and future trends that are likely to influence and shape social developments. Even after decades of cultivations of science in our county there is still traces of Unscientific, irrational behaviour, superstition, pseudo-science and anti-science is prevalent in the society, and some cases of irrational behaviour propagated by motivated groups endangering our social harmony and stability for instance drinking of Milk by Lord Ganesh and collapse of earth and human civilization rumors etc are to name a few. Therefore, it is not hard to understand the craving for scientific thoughts and spirits in our society in particular and schools in general, as our schools act as a fulcrum of true science propagation in society.

1.2.5 Science and Sustainable Development

Education is the crucible for the economic development, good health programmes, skill developmental programmes, augmentation of livelihood of millions, safe water for life, low-cost housing for poor, women's empowerment, social justice and harmonious society as a whole in our country. Also education is needed for the realization of the desire for India's economic competitiveness in a globalised world in a sustainable way. Therefore we have to conceive a mission called *Mission Manav Vikas* which needs good social cohesion, mutual trust between all stake holders of the society and quality education for overall well being of every citizen of our country where in science can play a catalytic role. Good science ensures good quality of life means happy citizens which implies peaceful world. This has been a part of Sustainable Development Goals (SDG-4) and EFA- 2000 goal of United Nations.

1.2.6 Aims of Science Education

Secondary education aims to develop the intellectual, social, and moral qualities essential for democratic citizenship, and to prepare young people for entry into the world of work or for continuation of academic pursuits (Secondary Education Commission Report, 1952; Report of Education Commission, 1964-66).National policy on education stressed " Science education will be strengthened so as to develop in the child certain fixed abilities and values such as the spirit of inquiry, creativity, objectivity, the courage to question and an aesthetic sensibility" **(**NPE,1986**)**.

NCERT(2006) outlined aims of science education as should enable the learner to, Know the facts and principles of science and its applications, consistent with the stage of cognitive development, to master the skills and understand the methods and processes that lead to generation and validation of scientific knowledge, Relate to the environment (natural environment, artifacts and people), local as well as global, and appreciate the issues at the interface of science, technology and society, Nurture the natural curiosity, aesthetic sense and creativity in science and technology, Imbibe the values of integrity, co-operation, honesty, concern for life and preservation of environment.

1.2.7 Objectives of Teaching Science at Secondary Level

Taradevi Report (1956) demarcated that at the High and Higher Secondary stage, the aims of General Science teaching should be: 1)To familiarize the pupil with the world in which he lives and to inculcate in him the impact of science on society so as to enable him adjust himself to his environment.2)To acquaint him with the 'Scientific Method' and to enable him to develop the Scientific Attitude.

Indian Education Commission (1964-66): In the secondary stage science should be taught as a discipline of the mind and a preparation of higher education. In the lower secondary classes Physics, Chemistry, Biology and Earth sciences should be taught as compulsory subjects. At the higher secondary stage there should be diversification of courses and provision of specialization.

Ishwarbhai Patel Committee (1977): Acquisition of the skills and habits of self-learning; acquisition of a broad-based general education, consisting of Science, Mathematics, participation in and promotion of social activities in the school and the community in such a way as to imbibe democratic values and to work towards the achievement of equality through service to the weak and deprived are the objectives of secondary education.

National Policy on Education (1986) reiterates that Science education should be strengthened so as to develop in the child's well-defined abilities and values such as the spirit of inquiry, creativity, objectivity, the courage to question and an aesthetic sensibility, to acquire problem solving and decision-making skills and discover the

relationship of science with health, agriculture, industry and other aspects of daily life.

National Council of Educational Research and Training (NCERT) 2001**:** The Science & Technology course offered is aimed at developing scientific and technological attitudes and skills among children. The major thrust area for the learner was to : (i)understand the nature of science and technology,(ii)understand the basic concepts, principles and laws of science (iii)Inculcate values that underlie science and technology;(iv)Develop an understanding of the various processes of environment and concern of its conservation and preservation,(v)Acquire process skills which form part of the attitude for developing a scientific temper .

The NCF (2005) stressed upon "Teaching of Science should engage the learners in acquiring methods and processes that will nurture their curiosity and creativity, particularly in relation to the environment. Science teaching should be placed in the broader context of children's environment to equip them with the requisite knowledge and skills to enter the world of work. Overall awareness of environmental concerns must permeate the entire school curriculum".

National Focus group on Teaching of science ,Position paper 11(NCERT, 2006) reveals that students should be engaged in learning science as a composite discipline, in working with hands and analysis on issues surrounding environment and health. Systematic experimentation as a tool to discover/verify theoretical principles involved in science.

1.2.8 Recent Scenario of Teaching of Science at Schools

Science learning is the active process of constructing, or putting together, a conceptual framework by a process of interpretation. Therefore, no one learns science by transmission - at least not meaningfully. In other words, it is important for science educators to understand the fundamental, culturally based beliefs about the world that students bring to class, and how these beliefs are supported by students' cultures; because, science education is successful only to the extent that science can find a niche in the cognitive and socio-cultural milieu of students(Cobern, 1996).

Too often teachers use lecture as their main instructional method in teaching science and classes are very much content oriented. Rote learning and memorizations are over emphasized in development of basic concepts due to which the students reasoning

abilities are not being challenged (Clark, 1996).Further it has been found that in our science class little or no opportunity is provided for the use and development of problem solving skills of the learner. Students do not have the opportunity to arrive at their own conclusions through the inquiry and discovery approaches to teaching. Sometime learning materials are not relevant to students' interest and hands on activities are scantly organized, intellectually challenging questions/ inquiries are less prompted to develop abstract science concepts of learners. Many a time teachers use traditional techniques like drill and memorization due to which opportunities for students to engage in problem solving activities are not provided. Classroom science instruction fails to cut across the various science disciplines to highlight their interconnections and little flexibility exists in pedagogical method.

The report of 3rd International Conference on Creativity and Innovation at Grassroots at Indian Institute of Management, Ahmedabad reflects that "The entire process of teaching Learning (Education) is very structured. The challenges thrown to the pupils are also either 'Known' or 'Similar to known'. Let the thick walls of Examination 'Pattern', assessment 'Schemes', 'framed course curricula' and all such rigid structures be demolished, Instead let the student be taught fundamentals of the course and made to 'explore 'the course of his own. Let the entire education process be made as unstructured as possible and life like" (Mandavgane, 2015).

In the present science classroom milieu the mind-set of teachers have failed to generate a spark of enthusiasm for science in the learners. The classrooms have been reduced into lesson hearing rooms' where the students are told about the subject matter and expected to commit it to memory. Thus, the authoritarian and tradition bound methods have reduced most of the science teaching to mere 'mind filling' in place of mind making (Chaudhary, 2018**).**Therefore the present approach to teaching science needs immediate overhaul.

1.2.9 Approaches and Methods for Teaching Science

The very idea of science teaching is to make a paradigm shift from rigid one way process of communication from teacher to two-way interaction between teachers and students or teacher- scientists or student to scientists. Science Process skills such as observing, inferring, classifying, predicting, measuring, questioning, interpreting and analyzing data are the core skills required to develop scientific knowledge. Hands on activities , learning by doing methods in science are the time tested approach for

developing science process skills among learners. Another learning approach which has not been penetrated into science class rooms is Experiential Learning approach which is considered as the crest jewel method among all methods involved in enhancement of science process skill among learners.

1.3.0 EXPERIENTIAL LEARNING

Experiential learning is a method of teaching by involving learner's faculties like cognitive, psychomotor and affective domains. It has been long deliberated upon by various educationist form time to time and it is one of the most time tested approach in teaching especially science to secondary students. Buddha says 'Believe nothing, Do not believe what your teacher tells you, merely out of respect for the teacher or merely because you have been told to. But after due examination and analysis you find conducive to the good, and benefit the welfare of all beings' then believe it which talk of learning by experiencing. Experiential learning has a long history way back to (AD 551-179) through a well known Chinese Confucian philosophy i.e *I hear I forget, I see I remember, I do I understand*. This is best understood with the help of an example i.e In many commercial advertisement, the tag line urges the customer to experience first then buy like *: Melody Khao, Khud jan Jao(eat melody chocolate and then know what it is)* for chocolate like melody , to name a few which in other hand promote experience based decision making which talk of experiential learning process.

1.3.1. Historical Underpinnings of Experiential Learning

Learning is that activity whereby a change in behaviour results from some experiences, activities, observations, training. It represents progressive change in learner's behaviour. Everything a child acquires in the form of habits, knowledge, attitude adjustment etc. are the products of learning process. Thus learning can be characterized as an activity which is purposeful, experiential, dynamic, contextual, behavioural, environmental, Individualistic and social. According to Worchel and Shebiske, (1986) learning is a process by which experience or practice results in a relatively permanent change in what one is capable of doing.

1.3.2 Experiential Learning Foundations

The experiential learning theory rests on pillars of followings such as: *Sensory Stimulation Theory*:, Reinforcement theory, Holistic learning theory and Facilitation theory respectively. In *Sensory Stimulation Theory* the premise is that effective

learning occurs when the senses are stimulated. Nearly 75% knowledge held by adults is learned through seeing, 13% through hearing where as touch, smell and taste account for 12%.

Similarly in Reinforcement theory: SKINNER positive reinforcement, negative reinforcement, punishment. Most of the 'competency based training' is based on this theory.

The Carl Roger's Facilitation theory (the humanist approach), Premise rests on the fact that, the learning will occur by the educator acting as a facilitator, by establishing an atmosphere in which learners feel comfortable to consider new ideas irrespective of external factors. It is believed that human beings have a natural eagerness to learn. There is some resistance to, and unpleasant consequences of, giving up what is currently held to be true (Beard, *et al*, 2013).

According to holistic learning theory, elements like intuition, the intellect, emotions, the body impulse (or desire) and imagination etc comprise of students personality and each of the element require activation to make holistic learning more effective.

The Biological Sciences Curriculum Study (BSCS) group in 1989 developed 5E learning cycles i.e Engagement, Exploration, Explanation, Elaboration, Evaluation**.** Australian Academy of science, 1994 recommended 5E model of teaching primary and secondary science. Another version of learning cycle by Eisenkraft (2003) i.e 7E model came into existence i.e Elicit, engage, explore, explain, elaborate, evaluate, extend.

1.3.3 Value Integrated Experiential Learning (ViEL)

We are moving to a scientific era but we are losing our values exponentially. This has created an opportunity for the educators to bridge the gap. The investigator has made an attempt to inculcate twenty selected values through the term one syllabus of Std. IX science .ViEL is an approach of teaching science where in values are integrated along with Science contents that is transacted through the experiential learning mode. According to **(**Pitre,2003) there are six steps in experiential learning which are *Silent Sitting*, Topic initiation, Radiant Thinking, Mind Mapping and web charting, Group activity and final one is presentation. These six steps can be comparable to Enable, Engage, Explore, Elaborate, Explain, Evaluate which is virtually 6E model. The

present value integrated experiential learning could lie in between 5E model & 7E model where in values like Discipline, Co-operation, determination, spirit of inquiry….etc were integrated through activities like: question-answer, project method, book review, group discussion, role playing, brain storming, storytelling, value games etc during teaching of science concept by the teacher. Also it involves indirect teaching, no specific lesson plan like main academic subjects, considers value is as important as academic subject. ViEL offers a sense of achievement and satisfaction to the teacher.

1.3.4 Philosophical Foundation of Value Integrated Experiential Learning

Recent brain research says we produce four kind of Brain waves i.e. $\beta, \propto, \emptyset, \delta$. (Herrmann,1997). The β (Emotional, consuming, highly engaged mind) frequency range is 15-40 Hz, the $\propto$ (Normal, non arousal) frequency range is 9 – 14 Hz,$\emptyset$ (Relaxed, free flow of ideas) frequency range is 5 – 8 Hz and δ (Deep Meditation) frequency range is < 4 Hz. By practicing silent sitting students reduced their exaggeration/excessive body pressure and tension and their brain produced low frequency waves which was very much required for focused attention. Attention span in class was found improved. At this point when the mind was turned inwards towards i.e (our conscience) and established a bond with the truth inside, there was free flow of love from within and purified the mind and created positive feelings called self-awakening. In this context Head, Heart and hands co-operate and function in harmony i.e our thought, feelings and 'work' is perfectly integrated and they are in harmony and this brings integrity in the person and the net reflection is his/her values practices which are called human values. Character is the reflection of the integration of Head, Hand and Heart. Hand should carry out only those ideas emanating from the head which is approved by heart with the experiences entering through senses, the mind will be filled with the

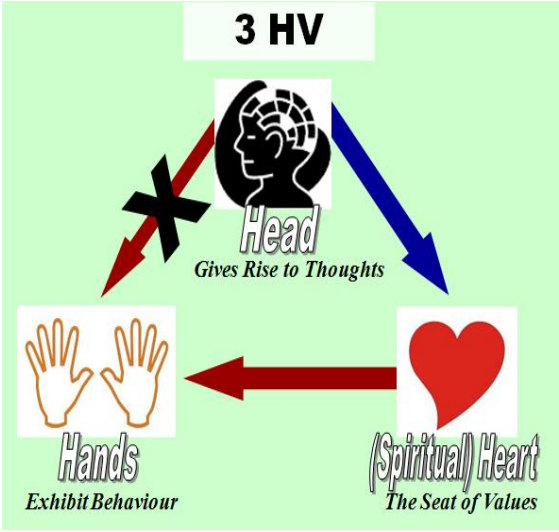


Figure 1.1: Unity of Head, Hear & Hand

Source: Towards Human Excellence: Sri Sathya Sai Education for Schools, 2003.

impression leading to good thoughts and helping inner goodness surface in our behavior as shown in Fig.1.1.

1.3.5 Components of Value Integrated Experiential Learning

In Value Integrated Experiential Learning students worked in small teams, each with students of different levels of ability, used a variety of learning activities to improve their understanding of subject. Every member of team was responsible not only for learning what is taught but also helping teammates learn thus creating an atmosphere of achievement. In this context there existed numerous phenomena which are discussed as under.

1.3.5.1 ***Scaffolding*****:** In ViEL context, when teacher used scaffolding in lessons, he allowed the students to work with what they know, until they come to the point that they need more assistance and still allowing them to discover and learn on their own. The teacher would then teach the next step or the next strategy and allow the students to practice with this new knowledge (Utter, 2007**).**

1.3.5.2 ***Cooperative learning*****:** In ***ViEL*** scheme students undergone cooperative learning process. While working in groups, students began to realize that they are members of team. The students developed a positive interdependence, they helped each other learn, they have both individual and group accountability, they developed interpersonal and small group skills, and they reflected on how well the team functions together which is strongly reflected in Utter, (2007**)**work i.e 'In schools there exists mutual working and learning culture called cooperative learning'.

1.3.5.3 ***Emotion:*** Value Integrated Experiential learning provided ample opportunity for shaping emotional makeup of learner as emotion is an unconscious arousal system that alerts us to potential dangers and opportunities. Learners are much more likely to remember curriculum content in which they have made an emotional investment.

1.3.5.4 ***Problem Solving:*** ViEL throws open intellectual challenges to students through problem solving. The word problem solving means a higher-order cognitive process that requires the modulation and control of more routine or fundamental skills. Problem solving uses sequential skills to solve complex problems and incorporates the ability to see and analyze underlying causes.

1.3.5.5 ***Rehearsal:*** In ***ViEL*** there existed enough space for each learner to recap and review own learning through rehearsal. 'Rehearsal is the reprocessing of information in working memory and it is a cognitive skill (Utter, 2007)**'.**The assignment of sense and meaning to new learning can occur only if students has adequate time to process and reprocess it. This happened precisely in *ViEL* sessions.

1.4.0 VALUE EDUCATION

Value education is such a scheme of education where in moral values and social values can be inculcated in students so that they can lead their life fully and purposefully. Through value education the very foundation of human existence could be strengthened in such a way that everyone can make their life more meaningful. Without good value education today's generation may lead to a uncertain crossroad and self degradation. Therefore, emphasis on value education seems felt need by many a educationists and intellectuals.

1.4.1 Meaning and Definition of Values

According to the Oxford dictionary, 'value' is defined as "to consider to be of great worth or importance," or "standards or principles considered valuable or important in life." While the first meaning denotes value in terms of material worth, the second meaning pertains to our behavioural patterns. Therefore what we value in life depends on our likes and dislikes, our attitude, our mentality and our behaviour.. In academic circle *Value education* is interpreted as *Moral education* interchangeably though there is thin line difference between these two. Moral education refers to ethical practices or code of conduct as enshrined in our religious practices but value education is the "rational outlook" which is secular in nature. Therefore education brings such divine qualities from us through a process and practice called value education. Value education is thus needed for taking us from where we are, to that ideal being in us. Thus value education seeks to cultivate the element of human capital.

Value education is considered as the education for 'becoming '. In that sense value education is concerned with the development of the total personality of the individual—intellectual, social, emotional, aesthetic, moral and spiritual. It involves developing sensitivity to the good, the right and the beautiful, ability to choose the right values in accordance with the highest ideals of life and internalizing and realizing them in thought and action (Seshadri, 2005). Thus value education was an integral part of our education since our gurukul (means Seminary) system where in all

disciple were trained to meet the challenges of life (Life skills) along with knowledge of language, mathematics and science. In ancient gurukul system *guru* used to be the torch bearer for the disciple and the disciple received all values and virtues from the guru.

The Indian Constitution Part III has explicitly laid down Fundamental Rights where in certain values are guaranted.ie Right to Equality (Article 14-16) - *equality* before the law (Article 14),**.** Discrimination against any citizen (Art.15). Fundamental duties which talks about our moral commitment to nation as a whole, are nothing but our moral obligation which itself is considered as a value.

1.4.2 Committees and Commissions on Value Education in India

In order to understand the value education in its totality we need to explore the policies, Recommendations of committees and commissions constituted by our government from time to time.

Religious Education Committee (1946) appointed by CABE recommended that the fundamental importance of Spiritual and moral values of life must be recognized in any scheme of education.

Radhakrishnan Commission of (1949) held the view that in addition to the search for truth through scientific and scholarly pursuits, an important task of education is a concern with values. Also the committee stressed upon fact that 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.

Sri Prakasa Committee (1959) Otherwise known as committee on religious and moral instructions report mentions the disruptive forces at work in our society outside the school such as loosening of social relationship and more and more materialistic orientation of life. At this juncture ethical and unifying factor is clearly needed in the society. If values inherent in different religions could be taught in an objective and tolerant way, this type of instruction might very well turn out to be the solutions to all existing problems.

The Constitution of India, through 42nd Amendment in 1976, inserted Article 51-A as Part IV-A and incorporated Fundamental Duties for 'Secular' character i.e care, is on values, attitudes and behaviour patterns like noble ideals, unity and integrity of India, harmony, spirit of common brotherhood, preservation of the rich heritage of our composite culture, compassion for living creatures, scientific temper, humanism,

abjuring violence, pursuit of excellence, higher levels of endeavor and achievement. Fundamental duties are equally as important as fundamental rights. These have to become part of our curriculum and content of courses (Saraf , 1986**).**

The National Education Commission (1964-66) or 'Kothari Commission' laid greater emphasis on education's role in national development includes among the functions of higher education cultivation of right interest, Attitudes, moral and intellectual values.

Planning Commission in its Sixth Plan, 1980-85, laid special emphasis to transform the system of education qualitatively in terms of its value content, standards and relevance to life. The role of education to promote humanistic outlook, sense of brotherhood and a commitment to ethical and cultural values needs to be re-emphasized (Saraf, 1986**).**

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

Programme of Action (1992): It covered a vast gamut of the crucial Value Educational parameters .It surveyed the Value Educational scene on the country, points, out the implications of the statements contained in the N.P.E. and suggested strategies of implementation. It contained twenty four well intentioned excellent essays on various aspects of Value Education such as Management of Value education, Secondary value education and Navodaya Vidyalayas etc.

NCFSE (2000) lamented the "erosion of the essential social, moral and spiritual values and an increase in cynicism at all levels." Also the framework advanced a plea to integrate value education into the curriculum with a view that "Schools must strive to resolve and sustain the universal and eternal values oriented towards the unity and integration of the people enabling them to realize the treasure within. Further NCF stated that the entire educational process has to be such that the boys and girls of this country are able to do good, see good and love good, and grow into mutually tolerant citizens.

NCF (2005)**:** The National Curriculum Framework NCF (2005) voices the concern that the vision of education where values are inherent in every aspect of schooling. The framework also urged to strengthen our commitment to the concept of mutual interdependence of humans to promote values that foster peace, equality amidst diversity, , humaneness and tolerance in a multi-cultural society.

1.4.3 Value Classification

Values are classified in a number of ways .There is no watertight compartmental classification of values as they overlap with each other. For instance Aesthetic values, cultural values, citizenship values, emotional values, ethical values, moral values, national values, religious values, economic values, citizenship values. Also values may be intrinsic values and mundane values. It could be global values and national values. Some time one may say essential values, personal values, social values, institutional values, and cultural values. Human values are called as core values like Truth, Righteous conduct, Peace, Non violence and love.

Further Values are classified as social Values, Moral Values, and Scientific Values etc.

NCERT (1979) has listed 83 values under 3 categories like, (1) Social values (2) Ethical values (3) Spiritual values. They are: 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.

Various committees and commissions emphasized values that are core to human existence such as : The Universal Declaration of Human Rights, Article 26 (2) reiterates 'full development of the human personality(honesty) and fundamental freedoms', UN Conference on Environment and Development "Earth Summit" Rio de Janeiro(1992), Johannesburg Summit (2002) advocates for 'Environmental Ethics'**,** Delor's report advocated four pillars of learning which are: *Learning to be, Learning to know, learning to live together etc.* Similarly the preamble of the constitution of India strongly advocates *equality*, Indian constitution *Article 51A (g)***,** to have *compassion* for all living creatures, the spirit of inquiry (Article 51 A (h)), unity and integrity of India (Loyal to duty, common goal towards country) of part IV of Fundamental duties' .These values are embedded in science content of the standard IX CBSE book and twenty such selected values were considered for the present study.

1.4.4 Value Deterioration in School Education

A country is less known by its geographical boundaries, economic development , quality of industry, world class infrastructure, advancement in technological edge, scientific innovations, extraordinary sky scrapers and giant structural marvels , instead, the people who inhabit her distinguish the features of the country. Researches reveal that "The school is a place, which transmits value and forms attitudes in an interactive and learning environment of the school, where a child spends a maximum of eight hours of the day, human values can be inculcated by making the child experience and live with values"(Dhankar, 2010).

In recent years attempts are being made to fulfill the goals of education through "Values Education" programmes. Although this is a laudable venture, it has some serious drawbacks. In the first place, the term much "values" is used in the narrow sense of "virtue" so much that values education is the same as moral education. Values should not only include moral values but also intellectual, aesthetic and spiritual values, and "values education" should include not only good conduct but also pursuit of science, pursuit of art, social service, spiritual practices, etc (Bhajanananda, 2016**).**

During recent decades our younger generation is facing insecurities ,existence based on glooming fear about future career, high expectations from parents, negative impact of social media, excessive cut-throat competition commercialization of education , consumerism, child abuse, fanatic religious dogmas, easily accessible drugs, etc. are putting immense pressure on families especially on Children and younger generation leading to degeneration of moral values in the society. The ancient *Guru-Shishya Parampara* (teacher-taught relationship) is replaced by the modern teaching methodology which cannot be considered as flawless and the goal of present day education is only chasing material world and Comforts gained from it and also it is apparent that the cultural awareness, humility, empathy, universal brotherhood, integrity, spirit of nationalism, pride of Heritage etc. are totally absent (Sharma *et al* ,2018**).**

1.4.5 Status of Value Education in India

In the present day scenario the curriculum of schools and colleges is mainly centered superficial and material benefits rather than inner and psychological developments. The fantasy and the purity of the mind of a child is distorted badly by our so called classroom education where the teachers are always under pressure to complete the syllabus but a very little thought is given to the mental growth of the child (Joshi, 2012).Classrooms are more or less a battle field, where every parent and their ward are busy in winning the race by simply acquiring and vomiting the information. Unfortunately in this rat race, students lag behind, develop complexes which unfortunately pushes them to a corner characterized by negativity and poor personality development.

Today educational institutions are the place for bookish knowledge. Throughout the year everyone are busy preparing for exams by forgetting values. The rush for short cuts to achieve for economic prosperity has pushed moral values into the background .There is a decline in character, moral values and general behaviour of students coming out of school. There has been a lapse in our educational system which educational institutes should inculcate in students. No serious plans have been taken for a concrete plan of inculcating values in our education (Umesh, 2013).

In the atmosphere of consumerism, materialistic values seem to have superseded the moral values of life. Values of hedonism have got an upper hand over ethical values of life. India which was once looked upon as a spiritual land in now mired in

materialism of the basest sort. We have to extricate ourselves from the trap of mindless materialism and reset our value education system in educational institutions (Dubhashi, 2014).

1.4.6 Need of Value Education

With increasing cynicism and the time when the world is under risks of violence and terrorism, teachers can no longer afford to claim education to be 'value-free'. Educators can no longer shun the moral responsibility for teaching universally shared human values conducive to a culture of peace and all-round human development of each individual. Gandhi (2005) made pressing observation that, in addition to the prescribed academic syllabus, there is a need to include value based spiritual education, emphasizing the unity of god, unity of religion, unity of mankind, universal brotherhood and international peace. No religion teaches hatred. Basic principles of all world religions are the same. Some examples are: In Gita, chapter 12, shloka-4 (i.e 12.4) it is given that .....सर्व भूत हिते रता : ,means by co controlling all senses one who engages himself for the welfare of all beings attains god.Similarly in Ramcharitmanas (Hindu scriptue) Tulsidas wrote, सिया राम मय सब जग जानी; it means lord Rama pervades all space and he is present everywhere in this material world.

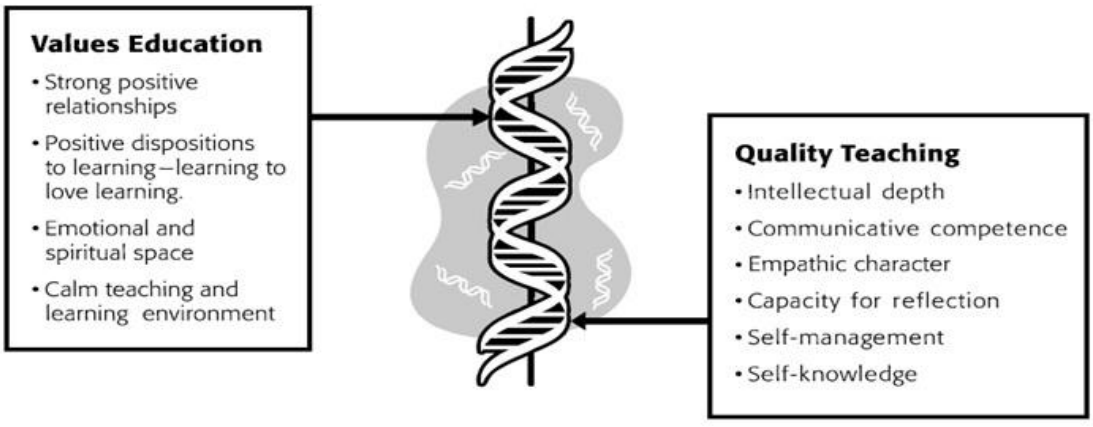
The Bible (Romans,13.9) reiterates " Love thy neighbor" meaning we cannot harm our neighbor and respecting other/their need as like ours. , Guru Granthsahib (the holy scripture of Sikh) in one of his Guru vani says '……एक नूर तो सब जग उपज्या कौन भले कौन मन्दे' ,which means the divine light was created by the lord with his supreme power from which the entire universe then manifested .So who is good and who is bad ? because we all are from the same divinity. Also, great Buddhist scholar – Dhammapada says that, the kind of seed sown will produce that kind of fruit. Those who do good will reap good results. Those who do evil will reap evil results i.e as you sow, so shall you reap.

In taking all religions, it could be said that all religions talk of similar values .It is quite clear from above that all creations are the manifestation of divinity, everyone is part of same divinity and no one is bad and no one is good. We have to respect all and love all. This is precisely our ancient culture taught us and it our moral responsibility

to pass it on to our next generation. Therefore, these universal values need to be part of our social life which can be inculcated primarily by schools, colleges and of course family, as they are the basic source of imparting education to all.

1.4.7 Methods of Teaching Values.

Many commissions and committees felt that teaching of values should be done both by direct and indirect (suggestion, personal example, direct experience of values) manner. It may be stressed that we should not depend on one particular method but all should be used in an integrated way. At secondary stage, there may be frequent discussion between the teachers and pupils on value sought to be inculcated. Also, values can be taught in i) Autocratic styles (e.g. Lecture, Lesson Demonstration, Tutorials and Programmed Instructions or ii) Permissive Styles (such as question-answer, project strategy, review, group discussion, role playing, discovery, brain storming). As methods are closely related to aims and objectives of teaching a particular subject the major specific aims of teaching Value Education must be remembered. Integrated method of teaching values has been very much effective. It involves indirect teaching, no specific lesson plan like main academic subjects, considers value is as important as academic subject, sense of achievement and satisfaction by the teacher. An Integrated Values Education model by Lovat & Toomey (2009) is illustrated in figure 1.2.



Source: Lovat & Toomey (Eds.). (2009).Values Education and Quality Teaching.

Figure 1.2: The Double Helix structure of Values Education and quality teaching

The first stand talk of values inculcation process (such as panel discussion, participation in prayer sessions, dramatization, celebration of festivals etc) where as

the second strand talk of improving quality of teaching in classroom (through brainstorming sessions, team learning, project work, debates etc).

1.4.8 Value Development Process

Human behavior is determined by the consolidated values. It is the consolidated values that is the very foundation of one's personality. It's an important concern for the schools to check the way students learn values i.e incidentally or in a planned way. Thus it is necessary for the teachers to define more accurately and precisely about the value and how can accepted value might be seen in actual bahaviour.

According to Marmar Mukhopadhyay(2001), value development takes place in four steps namely *Value collection(through imitation), Value assessment(inner evaluation) , value clarification(value conflicts) and value consolidation.* Further Rohidekar (2007) explained strategies for the value development and value assessment. Value development strategy includes: direct value education, incidental approach, co-curricular approach, indirect curricular approach ,indirect co-curricular approach, personal example approach etc. Indirect curricular approach offers a wide range of opportunity for the teachers to explore hidden values in each and every chapter in the respective subjects. The researcher used this approach for the value development. However to evaluate the values in learner, it was pertinent to refer Rohidekar's values evaluation pyramid which include five steps namely: *Knowledge, Appreciation, Discrimination, action with effort and spontaneous manifestation.* Accordingly researcher made three layered pyramid for the value manifestation i.e Value Knowledge, value Perception and Value actualization which is illustrated in fig.1.3.

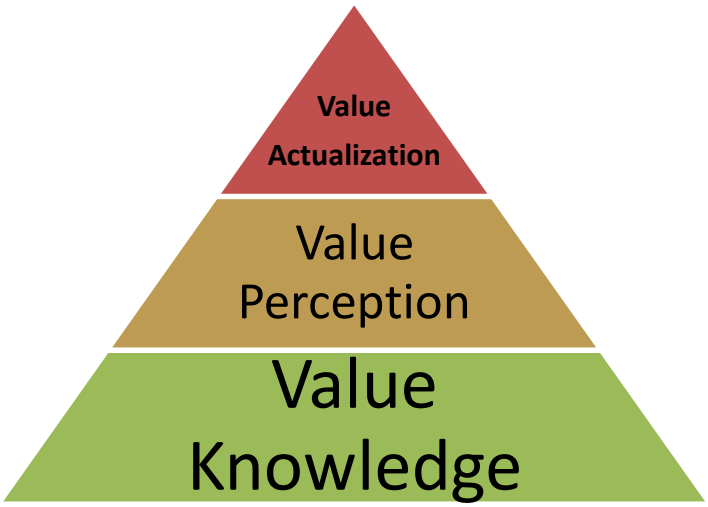


Figure 1.3 Value developmental process.

An ounce of practice is more important than tons of theory says Swami Vivekananda. Every human being carries infinite potentials and considered great resources for the

country. By acquiring value conceptual knowledge one could develop arrogance, with value practices and reflection, there is greater and greater humility. Life is what we make it. By accumulating value conceptual knowledge, value perception, one could translate it into action called value actualization.

In that sense the process of value education call into play three domains i.e Knowing, feeling, and doing. The dimension of knowing i.e information comes to us from various sources namely Family, friends, experts, reading books, discussions, viewing videos (Mittal, 2018) and performing value activities. Similarly value perception comes from deep conviction about values and love for values. Gradually it becomes the part of our personality and forms strong foundation for character formation. Once it becomes inevitable part of our life, then it is reflected through our daily practices i.e behavior which is termed as value actualization. Education should not only aim at making human life materially prosperous but also through spiritual, social and moral strengthening so that he can realize the higher truth (i.e *Tamaso Ma Jyotirgamaya*) form darkness to light. It is well said that: As you sow so shall you reap, when we sow good habit, action, and thought, we reap better individuals.

The researcher provided all information about selected twenty values and conducted activities to give enough scope for the leaner to get acquainted with the value. In order to see the desired change the researcher conducted pre test and post test in value knowledge. Similarly the value perception for selected values were tested through pre test and post test value perception scale. The actual manifestation of values happened during various Value integrated experiential learning activities.

In the present study the researcher used integrated method of value inculcation along with teaching science.

1.5.0 SCIENCE AND VALUES

According to The Association for Science Education (ASE), the values inherent with science education are: contribution to learner's development as whole people-morally, intellectually, aesthetically, culturally, and emotionally. Also it develops enthusiastic interest in and constructively critical attitude towards scientific values, ways of working and ways of seeing the world, Curiosity in and a responsible attitude towards the natural and the physical world. Further Kalra (2008) stated that science as

an important tool to solve human and social problems, and as an important component of the cultural, social and spiritual heritage of the majority of third world countries. According to him inculcation of values through science education at the school level can be described as:

I. Observation	Quest for knowledge, curiosity, Inquisitiveness about things and events
II. Designing of experiments	Search for truth, team spirit, ask 'what', 'how', and 'why' to find answers.
III. To be free from dogma and superstitions	Scientific temper, modernization, courage to question dogma and beliefs
IV. Balanced Science for all---a holistic	Human values and Science View of science.

National Curriculum Framework (2005) strongly refers to six different validities pertaining to the science curriculum i. e cognitive, content, process, historical, *environmental and ethical* aspects. *Process validity* refers to the right pedagogic processes that are used by the teacher so as to enable interactive and activity-based learning climate in our classroom through engagement of the learners in acquiring the methods and processes of learning science like observation, classification, measurement, making hypothesis, experimenting, reasoning, arriving at conclusions, so that they can validate the scientific knowledge. Ethical validity means science education should promote values of honesty, objectivity, cooperation, freedom from fear and prejudices, and concerns for life and the environment. Further Rajan (2012) described the values attached with science were Intellectual value, Vocational Value, Disciplinary value, Psychological Value, social and moral value, utilitarian value, moral and aesthetic value etc. A skilful teacher can able to elicit values hidden in Science curriculum.

1.6.0 VALUE INTEGRATION IN SCIENCE TEACHING LEARNING

Science without values degenerates in to arrogance and is of little benefit to the society. It is important to appreciate that science support disruptive Innovation and discipline of dissent ability to change existing practices. Science also requires reviewing existing theories in the light of new evidences with open mind, that is

probably why finding proper balance between science and values is a tremendous challenge to human intellect and scholarship **(**Gupta *et al.,* 2017).

Science is the discovery of the truth. Such a discovery is led by a scientific quest starting with a hypothesis, pursued with logic and validated by experimentation. Discovery shows the power of intuitive and imaginative mind which is synonymous to an inquiry led by mind driven by curiosity (Mishra *et al.,* 2012) .Hence, cultivation of science should engage both mind and curiosity of the learner so that the greater learning can be achieved. In that sense Science needs to come closer to heart (affective domain) and the mind (cognitive domain) of the learner.

The pertinent question for all of us is: how to elicit hidden values (activating affective domain) from science curriculum for the amalgamation of values for the better understanding of science? Thus value integration with science teaching is of paramount importance in present secondary education system. Science teaches us some of the finest core values of life: honesty, truthfulness, integrity, objectivity, open mindedness, knowledge of inner self, harmonious coexistence with all other forms of life etc. For instance from *Covalent bonding concept* (where there is sharing of electron(s) takes place between two bonded atoms), we can elicit values like sharing, co-operation, giving. Similarly *Friction* (the opposing force of motion) concept taught us learning to live together, harmony etc and ***cell*** (building block of living organism) concept taught us values like: team work, coordination, interdependence etc. It means that science and values are complementary and mutually supportive to each other. Since values and science are inseparable, teacher must be extremely careful to mix it together. In this context the role of teacher and teaching approach finds immense importance. So, an attempt has been made by the researcher to venture into exploring the possibilities of applying value integrated approach in teaching Science to standard IX CBSE students.

1.7.0 SCIENCE OF EXPERIENTIAL LEARNING AND VALUE EDUCATION (3H APPROACH)

Effective Science teaching and learning largely depends on the strategy adopted by the teacher other than regular lecture method. Making science learning more effective needs provision of experiences to learners. It is the teacher's job to provide such useful experiences to students for their learning. Further researches in teaching – learning of science point out that Science curriculum would arouse curiosity of

students for the creation of new knowledge, develop in them skills of observation and experimentation and improve their power for accurate thinking. It is believed that the Sciences have great utilitarian values. In recent years scientific thinking has developed to such an extent that it seems that no country could survive, let alone prosper, without taking a full advantage of the immense benefits of science. For both the moral development and material progress of the nation, inculcation of values must have as significant place as culture in Science curriculum (Ganihar *et al.*, 2013**).**

Further over last three decade, learning theorists argue the stronger correlation of cognition and learning which is being influenced by the personal involvement, self initiation by the student, and interactions in the learning process. While performing experiential learning in science concepts, the faith in science process gives self confidence, self satisfaction then self sacrifice and finally self realization. Main organs of faith are search for the Truth, Right conduct, Love, Equanimity and Non injury. Out of these five values, the first two i.e. Truth and right conduct contains distillate all morality. When one performs experiential learning in science with unselfish love, there is perfect peace and equanimity in success or failure, pleasure or pain and joy and grief. Hence convinced learners engaged in Experiential Learning in Science do not look for a shortcut which strengthens his integrity. Since, he seeks no unfair advantage over others, Honesty comes naturally. Where else the learner is not a self seeker, his loyalty is very steady and strong. Under these conditions, he says what he thinks, and does what he says. Thus there is perfect co-ordination between thought, word, and deed i.e integration of Heart- Head –Hand (3H). This helps in formation of sterling character of the learner. It is a well known fact that character is the hall mark of a learner. Hence, strong moral character could be cultivated by the teacher with the help of experiential learning through science education for the inculcation of values. Therefore, experiential learning itself is value education where the learner is learning values with the help of his/her own experiences.

1.8.0 TRIANGULATION OF EXPERIENTIAL LEARNING, VALUE EDUCATION AND TEACHING SCIENCE

One of many functions of schools is to provide conducive atmosphere for the young learners to imbibe virtues, values for self in addition with learning academic subjects. Science is considered as one of the important academic subject in schools. It is expected that in Science classes young learners would acquire all necessary inputs

from three directions such as: Science Education, Value Education and Experiential Learning. Education is the vehicle, values are the drivers and science education is the tool and experiential learning is the fuel to drive the vehicle for every learner to epitomize his /her hidden abilities. Education without scientific pursuits, science without principles and without the objectivity of larger aspect of education are virtually dangerous for human existence. Thus there could be a symbiotic link between science education, experiential learning and value education in our present teaching learning system.

In the past, education was sub-divided into cognitive, affective and psychomotor domains (Holbrook, 2005). Out of three domains, although the affective domain was clearly important, the role of the psychomotor domain was not well understood and education tended to stress the cognitive domain only. In true sense this aspect has been incorporated in ViEL i.e it covers those three important domains which is depicted in fig.1.4.

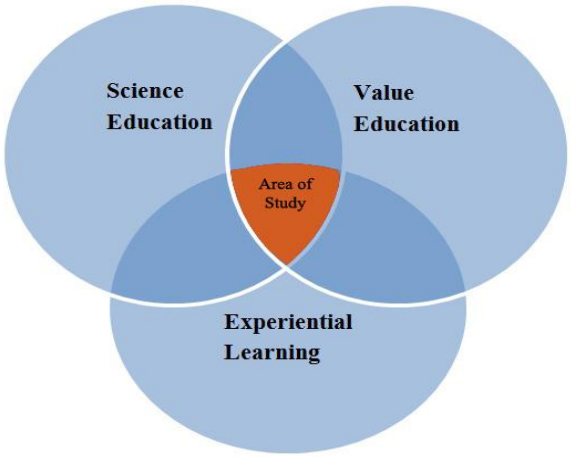


Figure 1.4: *Triangulation of Science Education, Value education & Experiential Learning*

For instance study of literature says, an experiential learning class involves teaching methods that engages the students in doing activities in science and reflecting on what they did. This includes such techniques as case studies, simulations, role play, quiz, riddle making, data mining etc as per the need of the concepts. In other words the core of value integrated experiential learning is action which is endorsed by research work (Boud, Cohen & Walker, 1993) i.e 'Learning-by-doing involves a direct encounter with the phenomenon being studied. It utilizes actual experience with the phenomenon to validate a theory or concepts which connect to the learner's lives in order for learning to occur. The value integrated experiential learning method to teach science in std. IX is promising a paradigm shift from learning secondary science as a body of knowledge to promote educational skills to be acquired through the subject of Science by using the approach called experiencing through learning by doing. Experience is the bridge between our thought and actions, knowing to doing, body to mind, nature to personalization, theory to practice, and education to Industry.

The other aspect of our ***ViEL*** is convergence into the theme of Continuous and Comprehensive evaluation (CCE) in a way that assessment of learners in the beginning of instruction, during the instructional processes and assessment of performance done at the end of unit or term. In this process multiple techniques of assessment (i.e., curricular areas, Co-curricular areas, personal qualities like attitudes and values etc) are assessed as proposed by CBSE in its entire 14000+ odd school world over. ***ViEL*** creates self awareness of the learners towards self guided learning and increases the exposure of different learning situations, strengthens the interest and motivation of learner thereby creating inner urge for self participation and greater involvement in activities. It also facilitates the learner to internalize the concept and adopt it for future learning ladder which is supported by Robertson (1999) i.e brains need stimulations and it is crucial for shaping and re-moulding of the electrode muscles of the mind. It is important to note that *ViEL* involves a linking of body and mind. Also *ViEL* offers a platform of integration of Head, Heart and Hand, i.e cognitive – affective –psychomotor balance.

1.9.0 RATIONALE

Since child come to school in his formative years, he undergoes several experiences that influences his moral development. Therefore, moral development of the learner is the indirect responsibility of schools.

From moment of conception, human being undergoes process of development. In adolescence (11-20years) period physical development includes rapid physical growth, cognitive development include abstract thinking, development of scientific reasoning and attitudes-behaviours. This is the time when they decide to imbibe what is important to them, re-evaluate the values they inherited from their parents and society. Thus the adolescent years form an important part of growing up and learning to cope with the demands society puts on the child as they approache adulthood. Therefore the strong foundation of values education perhaps needed at this stage in order to invigorate their personal qualities and core life principles. As secondary education starts with classes IX-X, leading to the Higher Secondary classes of XI-XII, it serves as a bridge between elementary and higher education and prepares young person's between the age group of 14-18 years for entry into the world of work or for entry into higher education (Dutta, et al**,**----),the quality of each learner matters .

As far as learning is concerned, the primary mode of learning is to gain experience of the physical world around us by 'acting on it in various ways and noting what happens'. This is instinctively the young child's mode of learning. It is quite true to say that the natural sciences are observational. Experimental studies demands thought and imagination (Varghese, 2013). Science today at secondary level is taught in an autocratic fashion. Teachers find difficulty to respond to basic aspect of teaching science in schools viz.

- How do I know what I know? (Process aspect- cognitive ability)
- How well do I Know it? (Understanding of science-affective domain)
- Can I or others repeat this procedure? (Transferring skills-psychomotor domain)

The Content led teaching learning approach virtually has failed to accommodate both *cognitive –affective-psychomotor domain triangulation* and it has made our learners' mind as mere storage house rather than makers of new science. Thus, experience based science learning seems vital for our secondary students.

Moreover Times of India report 'Decline in Science Education' (Narlikar, 1999) highlighted the plight of Indian Science Education scenario. According to him there was a sharp decline in number of students and standard in science education in India. The major factor behind decline was sub-standard quality of teaching and text-books in science subjects, ill-equipped laboratories, and craze for scoring high marks in examinations. A rather similar concern has been expressed in Indian education policies. According to NCF (2005**)** our age old traditional teacher dominated read and remember till asked" and "chalk-n- talk" practice ought to be replaced by pupil centered constructivist teaching learning process. The level of language, pedagogical gap in content lay out, inclination towards more problems etc. seems to impediments in understanding intricate science concepts which requires a high quality science teaching in schools.

The science education system India needs now *Scientific Humanism* i.e. a concept which involves a progress in technology in relation to our cultural, economic, social spiritual, ethical and human values. This should be the aim of our school and higher Science education **(**Kalra, 2008) which is again reflected in Education for Values in School Frame work (2012), Education must imbue children with a proactive social conscience. This implies strong value oriented education for our students.

True education equips individuals to live creatively, responsibly and peacefully in society, and becomes agents of change for a better society. However due to higher emphasis on cognitive domain for academic success and the total neglect of the affective domain(i.e. creating total alienation between Head –Heart-Hand) has converted children into machines which defeats the very purpose of education. In a same way Singh (2005) opines that "Education, besides cultivating student's intelligence, should help them to develop a personality where there is self reverence, self knowledge, self control. *Vignan* (science) and *Pragyan* (spirituality) are cultivated as part of an integral process". Hence, there is an urgent need to bring seamless synergy among science education-Value education and Experiential learning which has a great potential to cater to the pressing need of the day. Therefore, in this context Value integrated Experiential Learning (ViEL) is proposed with a view to equip students to understand and situate scientific and technological developments in their cultural, environmental, economic and social contexts.

From the review of related literature the investigator has found that most of the research pertains to establish value inculcation, attitude formation, and achievement in science by employing hands on activity. Moreover most of the studies were based on survey method but no one has opted to go for experimental method except a few. Further the review also reveals that there were studies on value integration in science, value education and less study on experiential learning but a very few study was dedicated to the value integration in science with the help of experiential learning and very negligible study in teaching science for inculcating values for standard IX students through experiential learning method in particular.

It is also very obvious from the studies cited above that the ViEL is more relevant and time appropriate with regard to global pattern of learning. Thus the investigator finds that research problem more appropriate for the experimental study. The present study is an endeavour to cater to the pressing demand of stimulating value inculcation and Science education through experiential learning method among students of standard IX in CBSE schools. Hence, the researcher made an attempt to undertake a study including, Science Education, Value Education and Experiential Learning.

1.10.0 RESEARCH QUESTION

The following research questions were in the mind of the researcher that lead the researcher to undertake the proposed study.

1. Whether values can be inculcated through value integrated experiential learning approach while teaching science?
2. Whether integrated approach of experiential learning for teaching science will affect the achievement of students in science?

1.11.0 STATEMENT OF THE PROBLEM

Teaching Science to Standard IX CBSE Students through Value Integrated Experiential Learning.

1.12.0 OBJECTIVES OF THE PRESENT STUDY

1. To develop an intervention programme through value integrated experiential learning approach for teaching of science to standard IX students for the inculcation of values like: Learning to live together, Team work , Loyalty to duty , Tolerance, Flexibility, Curiosity, Environmental ethics, Compassion, Gratitude, Quest for knowledge, Discrimination, , Honesty, Spirit of inquiry, Co-operation, Equality, Simplicity, Determination, Common goal, Dignity of labour, and Discipline.

2. To implement the developed intervention programme for teaching of science through Integrated experiential learning approach for the inculcation of the taken values.

3. To study the effectiveness of the intervention programme on integrated experiential learning approach for value inculcation in teaching science in terms of value conceptual knowledge, value perception and value practice of the taken values along with the achievement in science.

4. To study the reaction of students towards the intervention programme on Integrated Experiential Learning approach for value inculcation in teaching science.

1.13.0 HYPOTHESIS

The Present study is an experimental study. As per the objectives of the study following null hypotheses has been formulated for the testing in the present study. There were 43 hypotheses to be tested for the present study at **0.05** level of significance.

$H_0$1: There will be no significant difference between mean post- test value conceptual knowledge of learners taught through the Value integrated Experiential learning approach and learners taught through the Traditional Teaching Approach in the value of learning to live together.

$H_0$2: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Team work.

$H_0$3: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Loyalty to duty.

$H_0$4: There will be no significant difference between mean post -test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Tolerance.

$H_0$5: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Flexibility.

$H_0$6: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Curiosity.

$H_0$7: There will be no significant difference between mean post -test value conceptual knowledge of learners taught through Value Integrated Experiential Learning

approach and learners taught through the traditional teaching approach in the value of Environmental ethics.

$H_0$8: There will be no significant difference between mean post test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Compassion.

$H_0$9 There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Gratitude.

$H_0$10: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Quest for knowledge.

$H_0$11: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Discrimination.

$H_0$12: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Honesty.

$H_0$13: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential

Learning approach and learners taught through the traditional teaching approach in the value of Spirit of inquiry.

$H_0$14: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Co-operation.

$H_0$15: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Equality.

$H_0$16: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Simplicity.

$H_0$17: There will be no significant difference between mean post -test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Determination.

$H_0$18: There will be no significant difference between mean post -test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Common goal.

$H_0$19: There will be no significant difference between mean post -test value conceptual knowledge of learners taught through Value Integrated Experiential

Learning approach and learners taught through the traditional teaching approach in the value of Dignity of labour.

$H_0$20: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Discipline.

$H_0$21: There will be no significant difference between mean post-test value conceptual knowledge of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in twenty selected values.

$H_0$22: There will be no significant difference between mean post- test value perception of learners taught through the Value integrated Experiential learning approach and learners taught through the Traditional Teaching Approach in the value of learning to live together.

$H_0$23: There will be no significant difference between mean post test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of
Team work.

$H_0$24: There will be no significant difference between mean post -test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Loyalty to duty.

$H_0$25: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Tolerance.

$H_0$26: There will be no significant difference between mean post- value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Flexibility.

$H_0$27: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Curiosity.

$H_0$28: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Environmental ethics.

$H_0$29: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Compassion.

$H_0$30: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Gratitude.

$H_0$31: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Quest for knowledge.

$H_0$32: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Discrimination.

$H_0$33: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Honesty.

$H_0$34: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Spirit of inquiry.

$H_0$35: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Co-operation.

$H_0$36: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Equality.

$H_0$37: There will be no significant difference between median post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Simplicity.

$H_0$38: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Determination.

$H_0$39: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Common goal.

$H_0$40: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Dignity of labour.

$H_0$41: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the value of Discipline.

$H_0$42: There will be no significant difference between mean post-test value perception of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach in the twenty selected values.

$H_0$43: There will be no significant difference between mean post-test achievement scores of learners taught through Value Integrated Experiential Learning approach and learners taught through the traditional teaching approach.

1.14.0 OPERATIONAL DEFINITIONS

(1) **Value Conceptual Knowledge**: The value conceptual knowledge in the values is the total score secured in the value test prepared by the investigator.

(2) **Value Perception**: The value perception in the values is the total score secured in the value perception scale prepared by the investigator.

(3) **Achievement in Science**: The achievement in science is the total marks secured in the achievement test prepared by the investigator.

1.15.0 EXPLANATION OF TERMS

Value Practice: The value practice in the present study means the incidental behaviour of students.

Experiential Learning: Experiential learning in the present study means the process in which student construct their own knowledge in learning Science through six steps such as : Silent sitting , Topic initiation , Radiant thinking ,Mind Mapping and web charting, Group Activity, Presentation.

Value Education: The value Education in the present study means the development of personality traits though teaching science for values like : Learning to live together, Team work , Loyalty to duty , Tolerance, Flexibility, Curiosity, Environmental ethics, Compassion, Gratitude, Quest for knowledge, Discrimination, , Honesty, Spirit of inquiry, Co-operation, Equality, Simplicity, Determination, Common goal, Dignity of labour, and Discipline.

Learning to live together: It is a feeling of an individual to become oneness with the members of own family and other members of the society. Major traits of a person having quality of Learning to Live Together are: assisting others to uphold living spirit, living in a joint family, live and let live ,much knowledge in a socially acceptable norms.

Team Work: Working together for the realization of common objective. Major traits of a person having spirit of team work are: to bring synergy to work for the goal, unity in achieving targets. Work to win, coordinated efforts.

Loyalty to duty: It is a trait of a person by which he remains committed towards any assignments. Major traits of a person having quality of Loyal to duty are: sincere to one's duty and job, passionate about the work, faithful adherence to a cause, and allegiance to one's duty.

Tolerance: Tolerance is an inner strength which enables the individual to understand others. Major traits of a person having spirit of tolerance are: ability to develop deep understanding about any problem or situation, to give a thought to some bodies work, recognizing other religion, the ability to endure.

Flexibility: One's ability to cope with the changing needs or situations. Major traits of a person having spirit of flexibility are: working happily within all situations, adaptability to adaptive to any circumstances, easily persuaded etc.

Curiosity: A desire to find answers to questions or problems that comes on the way of day to day living. Salient features of a person having curiosity are: self- interest to know, of inquisitive in nature, spirit of asking question to self and others, to know something new, native to explore new things.

Environmental Ethics: One's self awareness about non harming attitude towards the nature. Essential characteristics of a person having environmental ethics are: respect for the environment, understanding natures principle/laws, like to save environment, love for nature, and a person works to solve environmental problems.

Compassion: It is a state of feeling of oneness about somebody's problem. Major traits of a person having spirit of compassion are: feeling sympathetic for others, to help somebody, showing kindness to others, sympathizing deeply etc.

Gratitude: Individual's ability to express feelings honestly for the innumerable helps accepted from others. Salient features of a person having gratitude are: appreciating good work done to us by somebody, being grateful or thankful to others, deeply thankful to others for their help.

Quest for knowledge: A feeling of acquiring new idea or knowledge which leads a person to resolve some issues or problems. Salient features of a person having quest for knowledge are: exploring new knowledge or ideas, thorough investigation about anything, to establish the truth, passionate to understand the cause of anything, active partner in learning process, a noble goal.

Discrimination: It is the ability of an individual's will to keep oneself away from wrong practices. Major traits of a person having discrimination are: recognize difference, experimenting with self to arrive at logical conclusion, pattern of behaviour.

Honesty: It is an individual's ability of owning responsibility for wrong actions of oneself. Honesty comes through the core principle of truthfulness. Salient features of a person having honesty are: devoid of corrupt behaviour, act truthfully, think positively, thankful to self, refraining from lying etc.

Spirit of Inquiry: It is an individual's intention to search for cause (truth) of any problem when he is tempted by an external stimulus. Major traits of a person having spirit of Inquiry are: inquisitiveness, arguing with the self or the system in work. How things work ?

Co-operation: It is a quality of an individual to work happily with people and helping others as and when they require. Essential characteristics of a person having co-

operation are: to be helpful to others, to accommodate every one's view in a given situation, add value to any collective views and task accomplishment, working together without personal ego, help without any hope, to help or share burden to relax others, help during difficult times.

Equality: Equality means treating all persons equally without any discrimination on the basis of caste, sex and physical abilities. Major traits of a person having equality are : treating others by looking towards their due, gender neutral attitude, caste – creed – colour neutral feelings in heart, no partiality towards anybody, no discrimination among group members working in a team, constitutional value, no superior feelings among group members.

Simplicity: A good feeling for others and respecting every one. Major traits of a person having spirit of simplicity are: live in natural way , no show up to others ,following principle of natural call of life, not adhering to fashion, simple thinking and living, attitude to accept the self, not living for others.

Determination: The innate nature of an individual to exercise his will freely so as to form a desirable habit. Essential characteristics of a person having determination are: strong will to achieve something, firmness of purpose, boldness in decision, serious intention.

Common goal: Working together and helping each other to attain larger purpose. Major traits of a person having spirit of common goal are: achieving public goal, working together without self-interest, be a part of social goal, working with winning spirit, shared goals by all, promoting national integration.

Dignity of labour: Respect for the work irrespective of gender. In other words it is an individual's outlook to treat every work or assignment respectfully. Essential characteristics of a person having dignity of labour are: respecting all people irrespective of their duties or jobs, respect for all occupations/professions, positive attitude towards physical work and mental work, no job is thankless.

Discipline: A way life where in the individual exhibit regularity and obeys codes of conduct. Salient features of a person having discipline are: strict follower of rule, self-awareness about the work or decision, net behaviour ,to train/control self.

1.16.0 VARIABLES INVOLVED IN THE STUDY

The following variables will be considered for the above study.

Independent Variables: Type of teaching i.e Value Integrated Experiential learning, Conventional method of teaching

Dependent Variables: Value Conceptual Knowledge, Value Perception, and Achievement in Science.

1.17.0 DELIMITATIONS OF THE STUDY

The present study is made keeping in mind with the following delimitations.

1) The present study is delimited to the lessons of std. IX NCERT Science Text book from chapters like (*Ch.1: Matter in our surroundings, Ch.2:Is matter around us Pure ?, Ch.5: the fundamental Unit of life, Ch.6: Tissues, Ch.8: Motion, Ch.9: Force and Laws of Motion, Ch.10: Gravitation (Half Chapter only),Ch.15: Improvement in Food resources*) during term I of the academic year 2016-17.

2)In the present study value is delimited to: Learning to live together, Team work , Loyalty to duty , Tolerance, Flexibility, Curiosity, Environmental ethics, Compassion, Gratitude, Quest for knowledge, Discrimination, , Honesty, Spirit of inquiry, Co-operation, Equality, Simplicity, Determination, Common goal, Dignity of labour, and Discipline.

1.18.0 STRUCTURE OF THESIS

The present thesis comprises of five chapters each covering various aspects of Value integrated experiential learning in science.

Chapter one presents introduction of the study, definition of science, need of Science education, status of science education in India, value education status , its need, experiential learning definition, steps involved in experiential learning, Objectives, Rationale, Statement of the problem, Operational definitions, meaning of the terms, delimitations of the study.

Chapter two provides the theoretical framework through review of related studies on value education, teaching science in Std.IX, experiential learning approach in India and abroad. It also out lines and analyses the objective and abstract of studies relevant to the present study. A discussion follows based on the horizontal and vertical analysis of the review of related literature and its implication to the present study.

Chapter three reflects the research design and suitable methodology applied for the present study. Value integrated experiential learning steps, its pedagogy is being discussed in details along with lesson plans. Also it highlights researcher made tools, its validation, piloting, execution of four tools and detailed procedure for the collection of data.

Chapter four discusses the data analysis based on various tools namely Value knowledge test, Value perception scale, Reaction Scale and Achievement tests. It also highlights Major findings of the present study, value actualization evidences and its elaborate discussion.

Chapter five reviews the earlier chapters, and briefly summarizes the methodology and findings of the study. It also focuses the implications of the present study followed by suitable recommendations and suggestions for future research.

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