# CHAPTER – I
## INTRODUCTION

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CHAPTER -I
INTRODUCTION

1.1 Introduction

Education is a human enterprise. It is a process and a kind of activity in relation to human beings. It is a continuous effort to develop all the capacities of a child, to control his environments and fulfill his requirements. It is an attempt on the part of adult members of the society to shape the development of coming generation. This development is to be natural and progressive. It is directed towards desirable goals which are fixed by the society according to individual and social needs. Education is also an integrated growth and this growth leads to enlargement of physical organs and maturity of mental capacities. Every child interacts with his environment. This interaction tends to change towards better capacities.

Education is a dynamic force in the life of every individual, influencing his physical, mental, emotional, social and ethical developments. Education implies experience insight and adjustments on the part of the learner as he is stimulated towards growth and development. Education as a product is the result of interacting forces, including individual insight, intellect, interest and experience, as these are utilized through educational procedures, towards the modification of the individual’s purposes, knowledge, behavior habits, attitudes and ideals.

Education is not transmission of knowledge but transformation of behavior. Thus the concept of education has taken on at present a new meaning and breath. Modern educational theory and practice not only are aliened at preparation for future living, but also are operative in determining the pattern of present day-by-day attitudes and behaviour.
Education is defined as bringing up of drawing out or making manifest the inherent potentialities in pupil Swami Vivekananda Preclaims.

Education is the process of helping the child to adjust to this changing, world, such adjustment. Therefore, the Indian Education Commission (1964-66) says that education ought to be related to life needs and aspirations of the people and thereby made a powerful of instrument of social economic and aspirations of the people and of social economic and cultural transformation.

Tagore viewed education as “The process of evolving unique creative patterns of self-expression towards realization of universal man.” He aimed at education that sought to do justice to the economic, aesthetic, intellectual, social and spiritual aspects of men existence.

According to John Dewey (1976) “Education is the development of all those capacities in the individual, which will enable him to control his environment and fulfill his possibilities”

According to Rousseau, “True education is simply the development of the original nature of the child”

Comenius (1976) over’s all who are born as human beings need education because they are destined to be real men, not wild beasts full animals and clumps of the wood.

1.2 Science

Man has been trying to understand the changes going around him and has been constantly receiving a great number of impressions through his various senses such as hearing, sight, smell, taste and touch. By making an effective use of his senses and using his communicative ability he accumulated information about his surroundings,
organized this information and sought regularities in it and tried to find out why the regularities exist and finally transmitted his findings to the next generation.

This word science has its origin from a Latin word ‘sciatica’ meaning ‘to know’ science is universal but has been defined in different ways, e.g.

‘Science is a systematized body of knowledge’

‘Science is nothing but organized common sense’

‘Science is a heap of truth’

John wood burn and E.O Obourn consider science as the human endeavor that seeks to describe with even increasing accuracy, the events and circumstances which occur or exist within the natural environment.

The definition of science found in Report on Policies for Science Education is ‘science is a cumulative and endless series of empirical observations which result in the formation of concepts and theories, with both concepts and theories being subject to modification in light of further empirical observations. Science in both a body of knowledge and the process of acquiring and refining knowledge.

Thus science is simultaneously a body of knowledge and continuous, self evaluative process of enquiry. Science thus has two important approaches.

(a) Science as a product

(b) Science as a process

Various laws, theories, principle etc., are included in the category of science as a product where as scientific attitude, scientific method etc. form part of science as a process though both aspects are important in their own way but to attain the aims of science education in schools with much more emphasis will be placed on process approach.
1.3 The Nature of Science

The nature of science includes the following.

1. Science is a body of systematized knowledge.

2. Science involves methods of inquiry which help in the growth of knowledge.

3. This knowledge has direct and indirect relationship with man and his environment which includes social, moral and ethical consequences.

The nature of science is represented diagrammatically in Figure 1.1

![Figure 1.1: Nature of Science](image)

1.4 Values of science in everyday life

Science education is essential as it is of immense value in the student’s individual life and his life in society. In the present era of science, people are in pursuit of scientific knowledge necessitated by the space age and explosion and in knowledge and in information technology. Science education has taken an important place because it has influential values in intellectual, vocational, aesthetic, practical, psychological, moral and cultural and adjustment arena of an individual. The following areas testify to the importance and values of science in everyday life.
(a) Intellectual value

Science is a method of acquiring knowledge besides being a content of knowledge. Scientific knowledge helps to sharpen our intellect and promote intellectual honesty. It makes us systematic in reasoning and helps to report an event or a thing without any prejudices. The science education helps one to develop positive attitudes like open mindedness, reasoning, confidence, desire for the acquisition of correct knowledge. Such positive attitude helps an individual to solve many a social problems he faces in life.

(b) Aesthetic value

Knowledge of science develops in man a passion for truth and thus he has a passion for beauty. Science is basically the process of unfolding the store of mysteries and beauties that the nature possesses. Thus, science education is essential for developing an aesthetic sense in an individual. The scientists feel an intrinsic charm and happiness by enjoying the aesthetic aspects of their discoveries and inventions.

(c) Vocational value

There are a large number of vocations for which the study of science is a primary requirement like medicines, engineering, computers, paramedics, agriculture, biotechnology etc. In the present day, we do not find any vocation that does not need the knowledge of science. It thus becomes quite clear that to enter into any such vocational course, an individual must have knowledge of science and so the science education must be included in the school curriculum.

(d) Practical value

Scientific principles and laws find a large number of applications in everyday life. For proper utility of such applications, basic knowledge of science is necessary. The application of science is found in electricity, communication, electronics,
transport, information technology etc. One striking example of the practical utility of science is found in telephone and internet through which one can reach people anywhere in the world in a matter of minutes. The practical value of science is felt in medicines and health. The sources of entertainment like the television, radio, cinema, and internet are all contributions of science which have tremendous utility in modern day life. Science has provided newer dimensions to hobby of an individual, for example, a person whose hobby is gardening will enjoy and benefit from the knowledge of plant breeding, soil science, fertilizer science etc.

(e) Moral value

Truthfulness and reasoning are good qualities desirable in all human beings. These qualities make one’s life worth living although there is erosion of moral values in present day due to overstressed materialistic greed of humans. However, training in truthfulness will always be a good quality of an individual.

(f) Psychological value

Teaching of science is essential for developing scientific attitudes and scientific temperament. The learning of science is based on the fundamental principles and maxims of learning. Science being an activity oriented subject helps to satisfy basic human desire of knowing about wonders of nature and satisfies human instinct like creativeness, self assertion, curiosity etc.

(g) Cultural value

The knowledge of science develops in us a capacity to critically examine facts and arrive at logical conclusions. A study of the past and the discoveries gives us an insight into the life, sacrifice and adventures of great scientists; and also the cultural heritage of the past.
(h) Adjustment value

Science helps us to develop scientific attitude and scientific method. Such a method prepares an individual to face problems of life and solve such problems systematically and successfully. A person possessing scientific attitude is open-minded and has a desire for accurate knowledge. He believes that the problems can be solved through proper efforts involving scientific observation and experimentation. Science attempts to provide us with systematic and organized information comprising scientific facts, concepts, generalizations, laws and theories which may prove helpful to all of us not only in enhancing the span of the knowledge but also in finding the solution of problems.

1.5 Impact of science on Modern Life

Science has brought about changes in the way of thinking, attitudes, outlook and life style as such the average span of human life has been doubled by bringing about a change in health, medicine and sanitation. There is a revolutionary change in communication, transportation, agriculture, engineering, power etc. The material benefits are immense and universal. The impact of science is evident in agriculture, industry, health, modern civilization, democracy etc. The material benefits are immense and universal.

(i) Science and agriculture

Green revolution was possible because of science. It mechanized agriculture and farming. The tools invented by science are now used for ploughing, sowing, reaping, harvesting etc. The destruction of pests using pesticides and insecticides has increased the crop yield. The present day agriculture is stressing on the use of bio
pesticides and bio fertilizers to retain the natural properties of soil and sustain its productivity.

(ii) Science and health

The third stage of demographic transition propounded by T.R Malthus which is evident in modern day is the contribution of science. The uses of various preventive techniques such as vaccination, inoculation, surgery etc. have prevented the human society of contagious diseases and epidemics. The average life span of human has been doubled due to science as it has helped us in diagnosis, treatment and prevention of various diseases reducing death rate and increasing the longevity of an individual. Science has made us health conscious through the development in fields of hygiene and sanitation, diet, biochemistry of life, physical exercises etc.

(iii) Science and industry

The ways and processes in industries have experienced drastic changes from the discoveries of science. The different tasks in industrial process today are performed by machines and human beings are required only to operate the machines. Industries like textile, printing, radio and television, pharmaceuticals, agriculture etc. are revolutionized by the development in science.

(iv) Science and Modern Civilization

The modern civilization can be called scientific civilization as it owes its existence to science. Various advances in fields of agriculture, medicines, cosmetics, transport, communication etc. have affected the way of living and behaviour. Science has helped us to get rid of the taboos of superstitions and removed illiteracy and ignorance. It has brought about a change in the attitude towards religion, birth control, sanitation, ways of living etc. It has helped an individual to be developed into a good
citizen by changing the outlook to receive new ideas and to have a capacity for clear thinking.

### 1.6 Aims of teaching Science

Science can claim an honourable place in school curriculum if it can produce desirable changes in students.

The broad aims of science teaching should be as follows:

(a) To make students interested in science.

(b) To familiarize the students with the important role played by science in their daily life.

(c) To develop in students, a scientific culture.

(d) To provide a training to students in method of science.

(e) To emphasize upon students, the role of science on social behaviour.

(f) To prepare students for those vocations which require a sound foundation in science with special reference to the concerned subject.

(g) To increase student’s understanding to such a level that he can understand various concepts and theories which unify various branches of science.

(h) To develop scientific attitude and science-related values among students by inculcating scientific temper.

Keeping these things in view, the curriculum may strive for the following aims for the teaching of science in schools.

#### 1. Knowledge aim

Teaching of science should aim for the necessary increase in the span of one’s knowledge regarding science helping him to understand himself and his environment as adequately as possible. The start may be made at primary level with the awareness
of simple facts and principles used and observed in day to day life. The sphere of this awareness may be progressively increased in the higher classes.

2. Practical aim

It is obligatory on the part of a science teacher to teach the practical aspect of all the scientific principles and knowledge, imparted to the students. The students should not only know about the scientific principles and facts, but should also be able to use them practically in understanding their self and environment surrounding them.

3. Towards development of scientific attitudes

Science education should aim for the development of scientific attitude among the learners. It should strive to remove the superstitions, false beliefs, wrong notions spread in the society and cultivate the habits of proper reasoning, observation and experimentation, leading to firm belief in the testing and verification of facts. It should provide proper opportunity for the development of scientific temperament and attitude among the students. It should create a spirit of curiosity for knowing about new things, discovering their environment and penetrating deeply into the nature of the things and solving the problems. In general, the students should begin to develop scientific attitude characterized by-

- open-mindedness
- curiosity
- tolerance
- honest doubt
- respect for another’s point of view
- critical observation and thought
- freedom from superstitions
- judgement made on scientific facts
- faith in cause and effect relationship
- a planned procedure in solving problems

4. Cultural aim

The development of the culture and civilization of a country is essentially linked with the progress and improvement in the study of sciences. The countries ahead in the study of sciences are known to have quite developed civilization and rich cultural aspect. In fact, civilization owes much to the development of science and technology and therefore, if we want to go ahead in the matter of the development of civilization and culture, we have to strive for bringing progressive improvement in the study of sciences. The key for utilizing what science has given us lies in the way and manner, science is being taught in schools. Thus science should be taught to grasp the progress in the field of sciences, apply it for the enhancement of cultural heritage and development of civilization and appreciate the contribution of the study of science in the progress and development of the culture and civilization.

5. Social aim

Study of science should also aim in the development of social virtues among the students for leading a well adjusted social life and contributing significantly towards the welfare and progress of the society. It should help a child to adjust socially and contribute towards the progress of his society, nation and humanity at large. He must also be made to understand that the welfare of his self is completely interlinked with the welfare of the society. The child should be helped to imbibe good social qualities and help him to use the knowledge and skill of science for the progress and improvement of the society. The child with the help of science must understand the evils of the misuse of science and technology which could lead to total annihilation of mankind.
6. Providing basis for vocational career

Science education should strive to guide an individual to earn his livelihood. This can be done by understanding the utilities of science and that the key of almost all the professions and vocations lies in the knowledge and proficiency achieved in the field of science. Science education should plan to prepare the youngster’s to earn his livelihood by learning the essential facts and principles of science, studying relevant courses of study and preparing himself for choosing, entering and achieving success in various vocations for prosperity of the self and the nation.

7. Utilization of leisure time

Science education must also aim in helping the students to learn ways and means of utilizing their leisure hours fruitfully. It should provide ways to derive entertainment from nature and from the technological advancement. It must aim to cultivate useful scientific hobbies for the profitable utilization of one’s leisure time such as photography, gardening, repairs of electrical gadgets and hobbies related to day to day use appliances, initiate creative and exploratory projects.

8. Psychological aim

Children have excessive curiosity for knowing and investigating the things and events around them. They want to do things with their own hand and verify their truth to actual observations and experimentation. Science education is capable of providing proper opportunities for all the students in satisfying their varying psychological needs and diversified interests.

9. Helpful in the study of other subjects

The subjects taught in the schools strive in their own ways to achieve the purposes or aims of education. They have many things in common with regard to the contents, nature and purposes. Therefore, the study in one subject is directly or
indirectly, influenced by the study in other subjects. The study of sciences must be planned in such a way that we may derive necessary help from the study of other subjects for studying science and also may utilize the knowledge of science in studying other subjects of the school curriculum.

10. Development of abilities and skills

Study of science at all levels should essentially aim to develop useful skills and abilities pertaining to scientific observation, experimentation and practical use of scientific facts and principles. Although, we cannot expect a very high degree of manual proficiency and technical skills from the children studying in schools, yet we may safely aim to cultivate the habit of doing things independently, to observe and experiment by; handling suitable appliances and instruments and to infer and draw conclusions in a very systematic and scientific way.

Exposure to scientific concepts both in the classroom and in the laboratory leads to the acquisition of following skills in the pupil:

(a) Experimental skills of handling apparatus and instruments: arranging apparatus for an experiment and preserving chemicals, apparatus etc.

(b) Constructional skills of making improvised aids; making minor repairs when things go wrong in the laboratory.

(c) Drawing skills involving drawing diagrams of experiments done and specimen observed.

(d) Observational skills like taking readings and noting colour changes.

11. Training for better living

The students of science should know the laws of health and hygiene and should be given training in healthful living. From the knowledge of science, they can know the usefulness of ventilation, morning walks, sun-rays and vitamins, sanitation,
vegetables and nutrients etc. They should be taught to take care of the body and to improve their surroundings, thereby improving the standard of living. They should know the ways and means of prevention and eradication of diseases and should be able to adjust themselves with their own domestic, social and physical environment and the economic, social and cultural conditions of the country.

12. Scientific appreciation

The contents in science if developed in evolutionary manner would reveal the fascinating historical and biographical incidents of great scientists, stories of scientific romance, adventures, feelings and emotions. All these provide for emotional satisfaction and develop emotional depth. Appreciation cannot be taught as such, as it develops from understandings and attitudes. History of science, biographies of scientists and impact of modern science on human lives provide ample scope for appreciations. The capacity for appreciation enables the pupils to realize the significance of various discoveries and their impact on human life and society, to value the sacrifices and painstaking efforts made and hardships undertaken by scientists in the course of their discoveries, to get excitement and thrill at every scientific achievement, to show eagerness to convey their job and thrill to others, to show respect and admiration for great scientists and to realize the importance of science in human progress.

13. Towards training in scientific method

Students of science get training in the use of scientific method by performing experiments themselves in laboratory method by performing experiments themselves in laboratory; and by observing experimental demonstrations arranged by the teacher for them. The scientific method involves:

- The appreciation of the existence of a problem and a desire to solve it.
- The accumulation of facts and data which are pertinent to the problem.
- The formation of hypothesis as partial explanations, their testing and their acceptance or rejection.
- Logical interpretation of data supported by adequate valid evidence.

As a result of science education, the student should habitually and skilfully employ sound thinking habits, in meeting problem situations in the daily life. He should be a sphere of his life. The steps involved are:

- Sensing a problem.
- Defining a problem.
- Collecting relevant evidence.
- Formulating the hypothesis.
- Testing its validity and accuracy.
- Drawing rational conclusions.

1.7 Aims of teaching Science at different stages of School Education

There have been many attempts from time to time in our country and abroad by the educationists to think about the aims of science teaching at different stages of school education. One of such attempts in our country was made in 1956 at Tara Devi Hills through a seminar on the topic “Science Teaching in Secondary Schools” The other one relates to the recommendations of Kothari Commission in 1966 followed by the observations on the National policy on Education. Based on these attempts, the following aims can be set at different stages of education.

At primary stages (Class I to V)

1. To make the children interested in the study of nature and to help them in getting acquainted with their natural surroundings.
2. To inculcate good habits of cleanliness and healthful living among children.

3. To develop their faculty of observation.

4. To give them the basic knowledge of numerals and alphabets for the comprehension and understanding of scientific vocabulary and language.

5. To provide opportunities for the development of their inventive and creative faculties.

6. To cultivate the habit of doing work systematically.

7. To encourage the children to read and listen to the life story of great inventors and scientists.

8. To educate them regarding the application of science in their physical and social environment.

9. To develop the ability to read and understand simple graphs, charts, maps and statistical tables.

At Middle or Higher Primary Stage (Class VI to VIII)

1. To provide knowledge about the basic primary facts, principles and theories related with science.

2. To help the students to get acquainted with the impact of science over the environment surrounding them and to develop their interest in the study of science.

3. To develop scientific attitude among children.

4. To cultivate the habit of systematic and logical thinking.

5. To develop the habit and ability of drawing correct inferences out of the available facts and evidences.

6. To provide essential base for further studies in the higher classes.
7. To acquaint the students with the history of the development of science and help those to understand and appreciate the progress and development made in this sphere.

At the Lower Secondary Stage (IX to X)

1. To provide deeper insight of the facts and principles of science.
2. To develop their ability to perform scientific experiments skillfully.
3. To help them to get better insight into the application of science.
4. To provide appropriate opportunities for the development of inventive and creative faculties of the students.
5. To provide essential base for the higher specialized studies in the areas and fields of science and technology.
6. To equip the students with all the basic scientific knowledge and skills helpful in day to day life.
7. To help the students adopt and learn useful scientific activities as hobbies and leisure time activities.
8. To develop understanding and attitudes for scientific appreciation.

At Higher Secondary Stage (Class XI to XII)

1. To attain desirable proficiency in the specialized areas of science.
2. To acquaint them with the latest concepts and advancement in these specialized branches of science.
3. To prepare them for study of work related specialized vocations like medicine, agriculture, engineering etc.
4. To encourage the students in independent deep study of their specialized branches/areas.
5. To provide opportunities and inspiration through relevant reference material and specialized magazines to the students for the understanding as well as creation of something new in the field of science.

1.8 The difference between the study of Science and other fields

Science and other fields have many affinities. Some people think that every field of science should be based on mathematics, since mathematics should be always used as a tool in scientific research. But there are some differences between science and mathematics as well as other branches of subjects.

For example:

1. There are many real-world problems from Chemistry, Physics, Biology, Geology and engineering, but in Mathematics the real-world problems are very few.

2. One of the main purposes of science is to train people to think logically and critically, whereas the main purpose of the other branches of science is to solve the problem using mathematics as a tool.

3. Learning physics is somewhat like playing games, because science is abstract, whereas the others are deal with concrete material.

4. Different people think about science differently. Some find it fantastic, and some find it boring.

1.9 Traditional Method of Teaching and Learning

Traditional education, also known as back-to-basics, conventional education or customary education, refers to long-established customs found in schools that society has traditionally deemed appropriate. Some forms of educational
reform promote the adoption of progressive education practices, a more holistic approach which focuses on individual students' needs and self-expression. In the eyes of reformers, traditional teacher-centred methods focused on rote learning and memorization must be abandoned in favour of student-centred and task-based approaches to learning. However, many parents and conservative citizens are concerned with the maintenance of objective educational standards based on testing, which favours a more traditional approach.

**Figure 1.2: Traditional Teaching**

The Figure 1.2 examines Philosophies of learning and teaching can be viewed as a continuum with extreme educational interpretations of behaviourism (for example, instruction) and cognitivism (for example, construction) at either end. Any one educator's philosophy resides somewhere on this line. The threshold between the two views marks a critical point of "transformation" for an educator. Traditional education focuses on teaching, not learning. It incorrectly assumes that for every
ounce of teaching there is an ounce of learning by those who are taught. However, most of what we learn before, during, and after attending schools is learned without it being taught to us. A child learns such fundamental things as how to walk, talk, eat, and dress, and so on without being taught these things. Adults learn most of what they use at work or at leisure while at work or leisure. Critics argue that most of what is taught in classroom settings is forgotten, and much of what is remembered is irrelevant.

1.10 Current Technologies of Teaching and Learning

Educational technology is often considered, erroneously, as synonymous with instructional innovation. Technology, by definition, applies current knowledge for some useful purpose. Therefore, technology uses evolving knowledge (whether about a kitchen or a classroom) to adapt and improve the system to which the knowledge applies (such as a kitchen's microwave oven or educational computing). In contrast, innovations represent only change for change sake. Given this distinction, it is easy to argue that educators are correct to resist mere innovation, but they should welcome educational technology. Unfortunately, the history of educational technology does not support this hypothesis (Saettler, 1990).

1.11 Difference between Traditional Teaching Technologies and Current Teaching Technologies

Our Society, these days are divided into two different ways of thinking on education. Some believe that the current teaching method is better than the traditional teaching. For that we take the subject ‘Science’ and discuss about the Traditional Teaching Technology and Current Teaching Technology in the following table.
Table 1.1

Difference between Traditional and Current Teaching Technologies

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<th>Subject</th>
<th>Traditional Teaching Technology</th>
<th>Current Teaching Technology</th>
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<td>Science</td>
<td>Fact-based science: Science class is an opportunity to transmit concrete knowledge and specific vocabulary from the teacher (or textbook) to the students. Students focus on memorizing what they are told. &quot;Experiments&quot; follow cookbook-style procedures to produce the expected results.</td>
<td>With Inquiry-based Science: A student might be asked to devise an experiment to demonstrate that the earth orbits the sun. The emphasis changes from memorizing information that was learned through a scientific method to actually using the scientific method of discovery.</td>
</tr>
</tbody>
</table>

1.12 Advanced Visualization Tools

Advanced visualization defines to show the information about particular subject. It not only expands but also collapses necessary pictures and information of the particular subjects. It seems to easily understandable for the users. The types of visualization tools is diagrammatically represented in Figure 1.3.

![Figure 1.3: Visualization Tool Types](image-url)

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1.12.1 Protege Tool

Protégé is an open-source platform that provides users with a set of tools to create domain models and knowledge-based applications with ontologies. It is developed at Stanford Medical Informatics. Protégé provides users with knowledge of modelling structures and actions to create visualize and manipulate ontologies. This can be done in various formats. Protégé can be extended by defining new plug-ins. The system is domain-independent and has been successfully used in many application areas. The platform is separated into two parts: (i) a model and (ii) a view. The model is based on a flexible metamodel that can represent ontologies. The model is the internal representation mechanism for ontologies and knowledge bases. One of the strengths of Protégé is that the Protégé metamodel itself is a Protégé ontology, facilitating extension and adaption to other representations. The view components provide a user interface that displays the underlying model. With the views of the user interface it is possible to create and maintain ontologies. Protégé is able to automatically generate user interfaces that support the creation of individuals for these ontologies. These interfaces can be further customized by the user with the Protégé form editor.

1.12.2 Types of visualization in Protege

There are different visualization tools in the field of teaching ontology. This study brings out the following visualization tools.

- Onto Graft Visualization
- DL Query Visualization
- OWL Visualization
1.13 Ontology

Ontology is explicit description and representation of knowledge in terms of concepts named as domain. Domain comprises of finite lists of terms and the relationships between them. It defines shared understanding and a common vocabulary. Ontology may include information such as class-subclass relationship and property relationship. Ontology is a useful structuring tool may greatly enrich for the teaching process, providing students an organizing axis to help them mentally mark their visions in the information hyper-space of the domain knowledge.

OWL: Web ontology language is the Computer based ontology language to be used in the Ontology.

OWL

- Derived from DAML+OIL
- Adds capabilities compared to RDF
  - Relations between classes (e.g., disjointness)
  - Cardinality (e.g. exactly one)
  - Equality
  - Rich typing of properties
  - Characteristics of properties
  - Enumerated classes

OWL Sublanguages

- OWL Lite
  - Syntactically simple
  - Best when only simple hierarchy and simple constraints needed

- OWL DL
  - Based on Description Logics
✓ Enables automated reasoning
✓ Checking for inconsistencies

➢ OWL Full
  ✓ Highly expressive
  ✓ But can’t guarantee decidability

Ontology Development

creating example ontology

➢ Defining classes in ontology
➢ Arranging classes in hierarchy
➢ Defining slots and describing allowed values for slots
➢ Filling in values for slots for instances

1.13.1 Ontology-definition

➢ Ontology is a shared conceptualization of a domain.
➢ Ontology is a set of definitions in a formal language for terms describing the world.

1.13.2 Different Types of Ontology

➢ Taxonomies on the Web
  ✓ Yahoo! categories
➢ Catalogs for on-line shopping
  ✓ Amazon.com product catalog
➢ Domain-specific standard terminology
  ✓ SNOMED Clinical Terms – terminology for clinical medicine
  ✓ UNSPSC - terminology for products and services

1.13.3 Visualization of Ontology

1. OWL Visualization (Web Ontology Language)
It shows base and derived classes. Moreover it also hides derived classes. The class is divided into two group’s namely main class and sub-class. Base class belong to main class and derived class belong to sub-class.

2. DLQ Visualization (Data Query Language)

This tool classifies the class information such as, (i) Super class, (ii) Ancestor class, (iii) Equivalent class, (iv) Sub class, (v) Descendant class and (vi) Individuals. The super class is known as Top and root is known as Domain. Ancestor class means hereditary class of the root.

3. OG Visualization (Ontograph Visualization)

This tool shows pictures and information about particular subject. It not only expands but also collapses necessary pictures and information of the particular subjects. The OG visualization tool makes students understand the subjects very easily. It only available in protégé 4.2 version.

1.13.4 Important features of Ontology

- Enable semantics of documents to be used by applications and agents
- Standardize metadata terms within a community
- Enable reuse of domain knowledge
- Make domain assumptions explicit
- Associations between concepts
- Information extraction
- Information integration
- Automatic reasoning

1.13.5 Components to be included in Ontology

- **Individuals**
  - Objects in a domain
✓ Objects with different names *might* be the same

**Properties**

✓ Binary relations on individuals e.g. has Sibling
✓ Can have *inverses* e.g., has Owner and Owned By
✓ Can be *transitive*
✓ Can be *symmetric*

**Classes**

✓ Sets that contain individuals
✓ Described using formal descriptions that state requirements for membership
✓ May be organized into superclass-subclass hierarchy (taxonomy)
✓ Cat is a subclass of animal
✓ Superclass-subclass relationships may be computed by a reasoner

1.13.6 Benefits of Ontology

➢ To share common understanding of the structure of information
  ✓ among people
  ✓ among software agents

➢ To enable reuse of domain knowledge
  ✓ to avoid “re-inventing the wheel”
  ✓ to introduce standards to allow interoperability

➢ To make domain assumptions explicit
  ✓ easier to change domain assumptions (consider a genetics knowledge base)
  ✓ easier to understand and update legacy data

➢ To separate domain knowledge from the operational knowledge
✓ re-use domain and operational knowledge separately
✓ (e.g., configuration based on constraints)

➢ A help in structuring complex definitions and arrive at shared understanding

Here
✓ what elements are needed/allowed in a model definition
✓ what knowledge of an object system is required/essential/relevant to solve a problem using models
✓ what knowledge/expertise on modeling is required for a good modeling Practice

➢ Used for
✓ defining knowledge in general: Internet/WWW
✓ defining protocols in medics and other guidelines
✓ Hierarchical knowledge (ecosystems, car repair, ….)

1.14 Teaching Ontology

There are so many learning tools and languages are available in our Platform. They are not efficient, proper understanding ability and clear idea about the concept etc. Ontology language and protégé tool is more effectively visualized the concept and easily understandable.

Ontology is an explicit specification of a conceptualization. The main advantages of ontologies are to share common understanding of the structure of information among people or software agents, to enable reuse of domain knowledge, to make domain assumptions explicit, to separate domain knowledge from the operational knowledge, to analyze domain knowledge.
Figure 1.4: Evaluation of Traditional Teaching Method with Teaching Ontology Education

1.15 Interest

Interest means to make a difference. It describes why the organisms tend to favour some situation and thus comes to react to them in a very selective manner. Interest and attention are very closely related. Interest is one of the subjective factors of attention. It plays an important role in the development of the behaviour and personality and is very important to understand the individuals and to guide his future plans and activities. Interest is a major role in facilitating academic achievement.

1.15.1 Definitions of Interest

James (1890) describes “Interest as a form of selective awareness or affection that produces meaning out of the mass of one’s experiences”.

Strong (1943) speaks of “interest” as “likes” and labels “dislikes” as “aversions”. It is tendency; to become absorbed in an experience and to continue it”.

Downie (1961) defines interests as “motivations of learning”. According to Blair and et al (1966) “Interest are learned dispositions or sets to action”.

The Traditional perspective of educational technology focuses on either the technology itself or a teacher’s instruction and is limited to the first three phases.

The teaching ontology educational technology focuses on a learner’s active construction of knowledge and can reach all the way to the evolution phase.
According to Kulshrestha (1984) interest may be defined “as a tendency to make consistent choices in a certain direction without external pressure and in the face of alternatives”.

1.15.2 Types of Interest

Super (1949) classified interest into four groups depending upon the way in which information about them is obtained namely (i) expressed interest (ii) manifest interest (iii) tested interest and (iv) inventoried interest.

(i) Expressed Interest

A person or an individual expresses that he is interested in this or that service is known as expressed interest.

(ii) Manifest Interest

If an individual involved in literacy programme in addition to his regular work and taking evening classes for the illiterates are considered as manifestation of real interest in those activities.

(iii) Tested Interest

The assumption here is that, if a person knows something about a subject and scores high on an achievement test in that subject shows that he has an interest in that subject.

(iv) Inventoried Interest

An indication of a student interest is obtained here by having him choose among a large number of activities, those he likes and dislikes.

1.15.3 Interest Inventories

Interest Inventories attempt to yield a measure of the types of activities that an individual has a tendency to like and to choose. One kind of instrument has compared the subject’s pattern of interest to the interest patterns of successful practitioners in a
number of vocational fields. A distinctive pattern has been discovered to be characteristic of each field. The assumption is that an individual is happiest and most successful working in a field most like his or her own measured profile of interest.

Another inventory is based on the correlation between a number of activities from the areas of school, recreation, and work. These related activities have been identified by careful analysis with mechanical, computational, scientific, persuasive, artistic, literary, musical, social service and clerical areas of interest. By sorting the subject’s stated likes and dislikes into various interest areas, a percentile score for each area is obtained. It is then assumed that the subject will find his or her area of greatest interest where the percentile scores are relatively high.

Interest inventories are examples of self report instruments in which individuals note their likes and dislikes. These self-report instruments are really standardized interviews in which the subjects, through introspection, indicate feelings that may be interested in terms of what is known about interest patterns.

In this study “Interest in Science” is analysed.

1.16 Attitude

Attitude is a major factor affecting behaviour. It is the result of an individual interaction with social objects and social situations and is subject to alternation with social objects and social situations and are subjects to alternation, maintenance and breakdown through manipulation of the same order of variables as those producing their original acquisition. Attitude influences the perception of objects of people, exposure to and comprehension of information choice of friends, co-workers and so on. The importance of attitudes in understanding psychological phenomenon was given formal recognition early in the history of social psychology. Form the time of
the concepts entry into the language of psychology until now, interests in attitudes has been strong and growing, however, over the years attitudes have been studied with differing emphasis and methods.

1.16.1 Concept of Attitude

It is necessary to be precise in defining attitudes, because the variety of published definitions and descriptions is almost endless. Like any other concept, attitudes may also be defined into two ways-conceptual and operational. Even there is quite a difference in the conceptual definition of the term attitude, and divergent points of view regarding the concept of attitude have developed. The researchers on attitudes tend to define the term on two major aspects: set and readiness, and effect and evaluation.

When the attitude first entered in the field of social phenomenon, it was natural to conceive of attitude as a tendency, set, or readiness to respond to some social object. For the first time, all port noted that all the definitions of attitude which he had observed contained the words ‘readiness’ ‘set’ (tendency to respond) or ‘disposition to act’. Even All port has used these terms in defining attitude. He defines attitude as a ‘mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual’s response to all objects and situations with which it is related. From this point of view, attitude implies a heightened responsiveness to certain stimuli.

Many researchers have defined attitude in terms of effect and evaluation. For example Krech and Crutchfield define attitude as an ‘enduring organization of motivational, emotional, perceptual, and cognitive processes with respect to some aspect of individual’s world.

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Thus attitudes are beliefs imbued with emotional and motivational properties and are expressed in a person’s favourability towards and object. The evaluate nature of attitudes is also emphasized by Katz and Scotland when they define attitude in certain ways. Evaluation consists of attributing goodness-badness or desirable-undesirable qualities to an object.

Apart from the conceptual approach, there is operational approach in defining the term attitude. The concept of attitude is operationalised in a number of ways but in most cases, studies rely on some kind of questionnaire to measure attitudes. Taking attitudes from this point of view, only evaluative aspect of attitudes have been taken into account. For example, Fishbein has noted that most measures of attitudes tap an underlying dimension of favourability-unfavourability and, therefore, attitudes should be regarded as synonymous in a generic sense to any reports of what people think or feel or the ways in which they intend to act.

1.16.2 Definition of Attitude

The term attitude is defined by Freeman as a dispositional readiness to respond to certain situations, persons, objects or ideas in a consistent manner, which has been learned and has become ones typical mode of response. It is a tendency to react in a certain way toward a designated class of stimuli. These are the ways in which an individual thinks feels and acts. Attitudes are not observable they can only be inferred from overt behaviour. We may, therefore, look upon attitudes as hypothetical constructs rather than objective entities. Opinion is expressions of one’s attitudes. How far can rely on expressed opinion of a person? Would he conceal his ‘real’ opinion and convey something that is more socially acceptable? If ones opinion and action do not match we term it as ‘hypocrisy’ one might wax eloquence on the immorality of corruption: but one might surreptitiously indulge in it overt behaviour
may not always provide a reliable index of attitude. An individual may both profess strong religious beliefs and regularly attend church/mosque/temple, not because of his religious convictions, but as a means of gaining social acceptance in his community there could be a dichotomy between ‘public’ attitudes.

1.16.3 Components of Attitude

Broadly viewed attitudes are reflected in behaviour. Behaviour has three components. The cognitive component or element consist of knowledge and believes. Ones attitude depends upon knowledge. Knowledge is logical and rational. For example, inflation leads to depression, suppression of views is antidemocratic are universally accepted. No one would dispute this. On the other hand, statements such as “moral education has no place in schools” or “compulsory education deprives the freedom of individuals” are loaded statements. These can be disputed.

It takes us to second component of attitude, namely feeling element. Attitude always arouses ones feelings and emotions. We like some persons and we hate some others. These are based on the feelings that unite and integrate people are termed positive while those that divide and disintegrate people are termed negative.

Both “Knowledge” and “feeling” urge an individual to “act” this action tendency in an attitude enables others to infer the feelings and understanding it is rather difficult for an individual to act in a manner contrary to his feelings and understanding some believe that the action – component of an attitude affects the feeling- components it is difficult to say which is the cause and which is the effect.

1.16.4 Measuring Attitude

Love is gradually getting desiccated in this space age we seem to be facting vacuum of values that has led to unfavourable attitude and unsavoury interest elaboration on these issues would be beyond the scope of this chapter these fall within
the province of philosophy and sociology these are normative issues aimed at regulating and purifying life psychology would analyse these aberrations dispassionately and objectively however psychologists always attempt the impossible to probe and penetrate into the dynamics of human thought and action and x-ray the invisible attitudes lurking behind actions can we measure attitude as we do height and weight? Have psychologist devised instruments to measure attitude is not the measurement specialists. We need someone else to do that they need not necessarily by psychologists. We hand over that responsibility to educators. Their business is not over by mere teaching of science and mathematics attitude; need to be changed wherever these impede progress.

1.17 Achievement

Achievement is nothing but educational attainment which refers to the gains got by the pupils as a result of education in educational institution. The achievement level of the students is judged by the marks that the students have scored in different tests and examinations.

Achievement in an educational institution may be taken to mean any desirable learning that is observed in the student. Since the world desirable implies a value judgement it is obvious that a particular learning may be referred to as achievement or otherwise depending on whether it is considered desirable or not. Understood in this way, any behaviour that is learned may come within the scope of achievement.

According to Smith (1969), achievement is the task oriented behaviour that allows the individual’s performance to be evaluated according to some internally or externally imposed criterion that involves the individual in competing with others, or that otherwise involves some standard of excellence.
The concept of over-achievement and under-achievement logically speaking are meaningful in relation to some expected level of performance. Theoretically, if one’s performance is superior to the expected standard of performance then one may be regarded as over-achiever: whereas when one’s performance is inferior then one may be regarded as under-achiever.

1.17.1 Achievement Tests

The term achievement is often mainly understood in terms of pupil’s scores on a certain school subject. If for instance, a pupil is tested in two school subjects say Mathematics and Biological Science and informer he get 80% while in the latter 60% marks, it is understood that his achievement in Mathematics is better than his achievement in Biological Science. In other words, achievement means one’s learning attainments, accomplishments, proficiencies etc. According to Denis Baron and Harold W. Benard, the concept of achievement involves the interaction of the factors namely, aptitude for learning, readiness for learning and opportunity for learning. Achievement in education precisely speaking implies one’s knowledge, understanding of skills in a specified subject or a group of subjects.

Achievement tests constitute an important tool of evaluations. It is necessary for the teacher to know how for the pupils have attained in a particular subjects area. In the school evaluation programme, various forms of achievement tests are used to measure the accomplishment of the pupils. “Any test that measures the attainment or accomplishments of an individual after a period of training or learning is called an achievement test” (N.M. Doconic)

Super observers “An achievement or proficiency test is used to ascertain what and how much has been learnt or how will a task be performed, the focus is on evaluation of the past without reference to the future, except for the implicit as
assumption that required skills and knowledge will be useful in their own right in the future” In the words of Walirs “Achievement tests are useful aids for diagnosing pupils’ specific learning needs, for identifying his relative strengths and weaknesses, for studying his progress and predicting his success in a particular curriculum” Of all the different types of tests, achievement tests are used most frequently.

1.18 Need for the study

The present study has its importance because today we are in Gray revolution. The advancement in science and technology has changed the face of education. The role of a teacher has also changed. Yesterday a teacher was only one source of information. But today teacher has become one of the sources of information. The invention of internet and World Wide Web has opened the source of information for all. The paradigm shift in the field of education triggered by Gray Revolution is matched by real life teaching learning situations. The whole game of education becomes learner-centric and learning centric. To be tuned with the paradigm shift that the world of education witnessed, any teacher at any level of education must “adapt their relationship with learners, switching from ‘soloist’ to ‘accompanist’ and shifting the emphasis from dispensing information to helping learners seek, organize and manage knowledge, guiding them rather than molding them” (Delor’s Commission Report).

The use of such technology in the institutions will motivate the teaching community and create better learning conditions. Hence, keeping all these in view the researcher attempted an experiment to apply Advanced Visualization Tools in Science at high school level.
1.19 Scope of the study

The scope of this study is restricted to Science at high school level prescribed by Board of Secondary Education, Government of Tamil Nadu. This study is primarily concerned to what extent the children have the interest in Science and also about how much that the Advanced Visualization Tools influences the achievement in Science. This study also composes the type of attitude towards Advanced Visualization Tools at high school level.

1.20 Statement of the problem

The problem under the present investigation is “A Study of the Effectiveness of Advanced Visualization Tools on pupils’ Achievement and Interest in Science at High School Level”.

1.21 Operational Definition of the key terms

Advanced Visualization

Advanced visualization defines to show the information about particular subject. It not only expands but also collapses necessary pictures and information of the particular subjects. It Seems to easily understandable for the users.

Achievement

The term achievement is often mainly understood in terms of pupils’ scores on a certain school subject. In other words, achievement means one’s learning attainments, accomplishments, proficiencies etc.

Interest

The term Interest is the feeling of a person whose attention, concern or curiosity is particularly engaged by something. In other words, Interest means
something that concerns, involves, draws the attention of, or arouses the curiosity of a person.

Science

Science is a cumulative and endless series of empirical observations which result in the formation of concepts and theories, with both concepts and theories being subject to modification in light of further empirical observations. Science in both a body of knowledge and the process of acquiring and refining knowledge.

High School Level

The Secondary stage of school education in the hierarchy of educational level.

1.22 Objectives of the study

1) To develop instructional design for selected topics in Science at high school level.

2) To develop suitable Advanced Visualization Package for the selected topics in Science at high school level.

3) To develop suitable Criterion Reference Test for the selected topics in Science at high school level.

4) To validate the Advanced Visualization Package for the selected topics in Science at high school level.

5) To validate the Criterion Reference Test for the selected topics in Science at high school level.

6) To study the effectiveness of Advanced Visualization Tools on pupil’s achievement and interest in Science at high school level.
7) To find-out the significance of difference between the Pre-test and Post-test mean scores of the achievement in Science of the experimental group and the control group.

8) To find-out the significance of difference between the Pre-test and Post-test mean scores of the interest in Science of the experimental group and the control group.

9) To find-out the significance of difference between the Pre-test and Post-test mean scores in attitude towards Advanced Visualization Tools of the experimental group and the control group.

10) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to sex.

11) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to parents’ educational qualification.

12) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to parents’ occupation.

13) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to parents’ income.

14) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to locality.

15) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to study habit.
16) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to chances for using internet.

17) To find-out the significance of difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to experience in using internet.

18) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to sex.

19) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to parents’ educational qualification.

20) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to parents’ occupation.

21) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to parents’ income.

22) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to locality.

23) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to study habit.

24) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to chances for using internet.
25) To find-out the significance of difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to experience in using internet.

26) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to sex.

27) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to parents’ educational qualification.

28) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to parents’ occupation.

29) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to parents’ income.

30) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to locality.

31) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to study habit.

32) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to chances for using internet.
33) To find-out the significance of difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to experience in using internet.

34) To find-out the relationship between the achievement in Science and interest in Science of the experimental group in the Post-test.

35) To find-out the relationship between the achievement in Science and attitude towards Advanced Visualization Tools of the experimental group in the Post-test.

36) To find-out the relationship between the interest in Science and attitude towards Advanced Visualization Tools of the experimental group in the Post-test.

1.23 Hypothesis of the study

The followings are the hypotheses framed for this study.

1) There is no significant difference between the Pre-test and Post-test mean scores of the achievement in Science of the control group and the experimental group.

2) There is no significant difference between the Pre-test and Post-test mean scores of the interest in Science of the control group and the experimental group.

3) There is no significant difference between the Pre-test and Post-test mean scores in attitude towards Advanced Visualization Tools of the control group and the experimental group.

4) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to sex.
5) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to parents’ educational qualification.

6) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to parents’ occupation.

7) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to parents’ income.

8) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to locality.

9) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to study habit.

10) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to chances for using internet.

11) There is no significant difference between the Post-test mean scores of the achievement in Science of the experimental group with respect to experience in using internet.

12) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to sex.

13) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to parents’ educational qualification.
14) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to parents’ occupation.

15) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to parents’ income.

16) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to locality.

17) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to study habit.

18) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to chances for using internet.

19) There is no significant difference between the Post-test mean scores of the Interest in Science of the experimental group with respect to experience in using internet.

20) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to sex.

21) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to parents’ educational qualification.

22) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to parents’ occupation.
23) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to parents’ income.

24) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to locality.

25) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to study habit.

26) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to chances for using internet.

27) There is no significant difference between the Post-test mean scores of the attitude towards Advanced Visualization Tools of the experimental group with respect to experience in using internet.

28) There is no relationship between the achievement in Science and interest in Science of the experimental group in the Post-test.

29) There is no relationship between the achievement in Science and attitude towards Advanced Visualization Tools of the experimental group in the Post-test.

30) There is no relationship between the interest in Science and attitude towards Advanced Visualization Tools of the experimental group in the Post-test.
1.24 Limitations of the study

Owing to the constraint of time and money,

1) Only the high school level is taken for the study.

2) Only English medium is taken for the study.

3) In Science, at high school level though there are many units, only ‘Motion and Liquids’ and ‘Addiction and Healthy Lifestyles’ units were considered for the present study.

4) Only some limited variables were assumed for the study.

5) Only Thanjavur Educational District is included for the study.

1.25 Organisation of the study

The study is concerned with the “A Study of the Effectiveness of Advanced Visualization Tools on pupils’ Achievement and Interest in Science at High School Level” The various aspects of the study are presented in five chapters. The chapter-I deals with the introductory part of the thesis. Chapter-II enumerates the review of related literature. This deals materials related to Multimedia, Information technology, Achievement, Interest, Attitude, Computer and Science found in India and abroad. The various techniques and methods involved in the conduct of the study are presented in Chapter-III. Chapter-IV deals with the analysis of the results and discussion. The summary and conclusion, suggestions and recommendations for further study are given in Chapter-V. The bibliography provides a list of books, journals, and reports which helped the researcher in conducting the research.