Chapter 1

INTRODUCTION
# CHAPTER I

## INTRODUCTION

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CHAPTER I

INTRODUCTION

"Education is the manifestation of the perfection already in man"

- Swami Vivekananda

Swamiji conceived an education system by which character is formed, strength of the mind is increased, intellect is sharpened and by which one can stand on one's own feet. He felt that education is neither mere book learning nor acquisition of diverse knowledge, but development of skills. This cannot be taught by anybody else; it can only be experienced and internalized by the learner. All knowledge is within him and it requires only an awakening. This is where the task of the teacher begins to help the learner 'discover' or 'unveil' what he already knows. The teacher can motivate, demonstrate and persuade the learners to discover their own potential and intellect to properly understand their body, mind and spirit.

Mahatma Gandhi (1933) also insisted that, "real education has to draw out the best from the boys and girls to be educated. Packing ill-assorted and unwanted information into the heads of the pupils becomes a dead weight crushing all originality in them and turning them into mere automata".

1.1 SCIENCE EDUCATION

The word "science" means "knowledge." It comes from the Latin word, "scire", which means "to know." The baseline definition of "science," then, is human knowledge. Science is more than facts and figures – it's a way of thinking, a way of understanding the world. Being 'scientific' involves being curious, observing, asking how things happen, and learning how to find the answers.
Science is the system of knowing about the universe through data collected by observation and controlled experimentation. This process involves a three-fold step of explaining what has been observed, predicting what has not yet been observed and testing by experimentation the acquisition of new data. This definition implies that science is a human endeavor, a personal way of exploring and knowing. If ‘education’ is ‘exploration and fun’ and ‘science’ is ‘exploration and fun’, ‘science education’ is also supposed to be ‘exploration and fun’.

Science learning has at least two dimensions, namely learning about science and how to do science. ‘Learning about science’ is to learn about the products of scientific inquiry, which includes facts, concepts, principles and theories. The contemporary science programs are on this form of science learning. When newspapers report the proficiency of students in science, they are reporting what students know about this type of science learning. ‘Learning how to do science’ is to pay attention to the process of science and to apply the process skills and inquiry skills that are typical of scientific thinking.

Pickerton (1994) discovered that learning takes place when the students are actively engaged in an intellectual struggle. He also found that knowing how they think helped the learner learn the concept well. Carter and Rua (1999) found that students learned better when teachers used a constructivist approach that involved teaching science in a variety of ways. The researchers provided evidence that this instructional approach may be more useful in enhancing conceptual growth. Debacker and Nelson (2000) identified that the degree to which students and their teachers collaborate on the development of learning and performance goals is directly related to the characteristics of the learning environment.

When teachers emphasize learning strategies and the importance of student effort, students gain a greater sense of control over their own learning. Students feel more in control when they can note their progress and attribute it to their efforts in using effective learning
strategies. When a procedure is repeated frequently, the brain stores the information for easy access. When the teacher take the students to the science lab and allow their episodic memories to work by giving the equipments they used in past procedures and allow them to ‘walk’ through the process and write down each step as they work, the information stored was easy to retrieve.

Anderson and Stewart (1997) identified that science education will be effective when teachers:

- Encourage student autonomy, initiative, and leadership.
- Ask students to elaborate on their responses.
- Allow wait time when asking questions.
- Encourage students to interact with one another and with their teachers.
- Ask thoughtful, open-ended questions.
- Encourage students to reflect on experiences and predict future outcomes.

The studies proved to satisfy one basic idea that if science education is to be effective, the role of the facilitator is to identify and encourage the curiosity which is inherent in every learner and help them understand how to make sense of what they see. The basic procedure is to manifest the innate potentiality of curiosity through guided procedures of learning science. Children learn science best and understand scientific ideas better if they are able to investigate and experiment. This can help children think critically and gain confidence in their own ability to solve problems. What is more important is theoretical understanding than mere truthful knowledge.
1.2 STATUS OF SCIENCE EDUCATION IN INDIA

In India, recommendations that science be made a compulsory subject for all children up to class X was made in mid 50s. However, it was only in 1968 Policy on Education, which accepted the Kothari Commission's recommendations that science was made a compulsory subject in the first ten years of school. This National Policy on Education 1986 and its revision in 1992\(^8\) took note of all past experiences in teaching science in the country and formulated the following statements on science education:

1. In order to develop scientific temper and to attain other goals, it is necessary to define the objectives to be fulfilled through science education.

2. For universal enrolment and retention, improvement in the quality of education is necessary. Each student learns in a different way and each student has the right to learn. The teaching and learning of science should be designed in such a way that it serves to that basic right. Science education at the elementary level will be so designed that instead of loading the child with content information it provides him with the joy of learning.

3. Science up to Class X should be treated as one. The laws and principles of science which are operating in the environment should be used for creating desired teaching and learning situations. The performance of activities will be given top priority in the teaching and learning of science.

The policy document also provides specific direction on science education as follows:

"Science education will be strengthened so as to develop in the child well developed abilities and values such as the spirit of inquiry, creativity, the courage to question and our aesthetic sensibility. Science education programmes will be designed to enable the learners to acquire problem-solving and decision making skills and to discover the relationship of science with health, agriculture, industry and other aspects of daily life."
The Sixth All India Educational Survey identified that though the total enrolment in class
I is 27.3 million, only 6.8 million wrote the public examination of standard X conducted by as
many as 34 boards of school education. Of this student population, only 3.9 million went for
senior secondary education. This massive wastage of human effort is a sad reflection of the
quality of education that our schools are able to provide to their pupils. There is also a visible
decline of interest amongst young persons in studying science at higher level. While several
socio-economic factors including emergence of new field of activities, entrepreneurship and
opportunities could be contributing factors of this state, the role of the school and the way
science is taught and learnt cannot be ignored.

1.3 SCIENCE TEACHING IN THE INDIAN CLASSROOMS

In this age of science and technology, aspects of science teaching should get proper
attention in the schools of our country. But the emphasis is still on rote learning of science.
Textbooks are often the prime curriculum resource in schools. In many Indian science
classrooms, the science textbooks are the only instructional tools available. (Kumar, 1986)\(^9\)
Lectures and discussion which also provide fewer opportunities for scientific investigation and
experimentation also plays a major role. The textbooks as the prime source of information
should reflect the methodology of science learning and the policy of the nation. Science
education should be strengthened through developing in the child well defined abilities and
values such as the spirit of inquiry, creativity, objectivity, the courage to question and aesthetic
sensibility. Ravinder Koul (1997)\(^10\) has identified the following views of teachers on the nature
of science text books. Though this study pertains to the text books published by the National
Council of Educational Research and Training of India, the views identified are also applicable
1. There is a dearth of activities, quizzes, puzzles and other hands on activities that can be easily performed and are meaningful for the student.

2. Since development of textbooks requires lot of effort and time, there is dearth of concretization of instructional materials through analogies, situations, problems and illustrations.

3. Present instructional materials do not take into account local materials, resources and environment.

4. The textbooks ensures lots of facts and instills bits of information and students are not given chance to think.

5. The curriculum is compartmentalized into variety of disciplines and become separate subjects. But science by nature is interdisciplinary and integrated. They do not operate as Physics, Chemistry, Botany and Zoology.

6. Teachers normally interpret science according to their own area of specialization and do not view science holistically. Though teachers are graduated from colleges with degrees in Physics, Chemistry, Botany and Zoology, they are not trained to teach science in an integrated, holistic manner.

This brings out the fact that in Indian system of science education, factual understanding is given more importance than conceptual understanding. These practices do not provide opportunities for scientific investigation and experimentation. It therefore becomes much imperative to switch over from the lecture method to the problem solving, activity method, experimentation, demonstration and role play where there in true learning of science.

1.4 METHODS AND MATERIALS OF TEACHING SCIENCE

We do not want a doctor to remove our gall bladder without the latest technology and the skill to use that technology. It’s the same with teaching. Teachers need tools, techniques and skills.
It's a profession. Teaching is not a theoretical act that has universal application, but a very practical act that takes place in specific classrooms with unique students. Byrne and Johnstone (1988) identified few methodologies of teaching science pertaining to specific situations.

In terms of learning science content, simulations and educational games can be just as effective as traditional methods. To develop positive attitudes, simulations and games can be far more effective than traditional methods. For attitude development role playing, discussion and decision making in the form of brainstorming can be highly effective. Group discussion can simulate thought and interest and develop greater commitment on the part of the student. In terms of promoting an understanding of the process of science, an analysis and evaluation of historical case studies is suggested as effective and to construct new knowledge on the basis of one's previous knowledge analogy could be used.

The shift from book-oriented instruction to instruction that utilizes judiciously the materials and equipment of educational technology is altering the role of the classroom teacher. The three traditional R's of our educational system — reading, writing and arithmetic must be supported by the three T's: Teachers, who are superior; Techniques of instruction that are modern and Tools of instruction which suits the teaching purpose, the character of the group and the quality of the material.

Tools of all sorts used in the teaching learning environment are meant only to help in teaching and not to act as a substitute for teaching nor to replace the teacher. Tools make teaching realistic and effective. The effectiveness of the use of aids depends upon the ingenuity and skill of the teacher who has to examine the necessity and suitability of the aids.

Teachers using audio-visual aids for teaching science should take care that the materials are carefully selected on the basis of need, purpose, accuracy and facility of use. It should be attractive but economic from the cost point of view. The use of aids should be an integral part of teaching and the materials should be integrated with the content discussed. The teaching aids
should enrich the present experiences of the pupils, enlarge their environment, promote intellectual curiosity and foster a favourable attitude.

1.5 AIMS OF TEACHING SCIENCE

The general aim of science education is to help develop well-defined abilities in cognitive and affective domains, besides enhancing psychomotor skills. It should help foster an uninhibited spirit of inquiry, characterized by creative, innovative and objective approaches. Educational programmes should be designed to help unravel the mysteries of the inter-relationship between science and day-to-day life, health, agriculture, industry and indeed, the individual and the universe. Scientific wisdom, knowledge and skills are ammunitions that instill confidence and inspire the individuals to challenge existing beliefs, prejudices and practices. They work as a liberating force and serve as a reliable tool in one’s search for truth in different aspects of life.

The recent trend in science teaching has shown a distinct tendency of general change in emphasis from mere acquisition of assorted facts to the development of functional learning, from unrelated knowledge units to contents logically organized about problems that concern the pupils. The Commission reports which aimed at reform in the education system of India emphasize the objective of science teaching in secondary schools as: “Science in secondary schools is not directed to the production of scientists. Its aim is to give basic understanding and an appreciation of scientific phenomena, biological and physical, which may prepare the ‘non-scientists’ for a fuller and more complete life. The course should also give fundamental principles to those relatively few who will specialize in science. The teacher should aim at awakening in the pupils a lively curiosity about the natural phenomena arousing and developing their capacity for the practical application of their knowledge.”
The student should be enabled to develop the capacity to use science to help solve problems and arrive at the right decisions. Pupils are also expected to develop the skills required to operate ordinary laboratory or science equipment, and to design simple experiments to seek and find explanations for natural phenomena. At this stage, science education should help the pupil develop, understand and appreciate of the inter-relationship of science and technology.

The aim of teaching science at this stage is primarily directed towards the learning of key concepts that span all disciplines of science. At the secondary stage, the pupil should be enabled to develop a more profound understanding of the basic nature, structure, principles, processes and methodology of science with special reference to its relationship with agriculture, industry and contemporary technology. The teaching of science at this stage should help pupils develop insights in health and environment.

Underlying this basic principle of teaching science, the objectives of teaching science are framed as follows:

1. To familiarize the pupils the world in which he lives and make him understand the impact of science on society.
2. To acquaint him with the ‘scientific method’ and to enable him to develop the ‘scientific attitude’.
3. To acquire knowledge about the fundamental science principles and apply the knowledge in everyday life.
4. To acquire experimental skills such as:
   a. Handling apparatus and instruments
   b. Arranging apparatus for an experiment.
   c. Preserving apparatus, chemicals, specimens and models.
5. To acquire constructional skills such as:
a. Improving simple instruments and appliances.
b. Repairing certain instruments and appliances of everyday use.

6. To develop drawing skills.
7. To locate reliable and recent information from appropriate sources.
8. To interpret scientific data given in various forms such as tabular, graphical and scientific information.
9. To develop the power of minute observation of their surroundings.
10. To develop the power of oral expression in science to discuss, argue, describe and raise questions using scientific terminology.
11. To develop scientific attitude in making statements, accepting information and forming beliefs.
12. To appreciate the impact of science in life through applying the principles of science in daily life.

Science taught with these objectives will not overwhelm children with loads of information; it would rather open their hearts and minds to the joy of learning. The learning and teaching of science will be prioritized to lay greater emphasis on activity oriented methodologies.

1.6 NEED FOR INNOVATIVE APPROACHES IN TEACHING SCIENCE

A radical change is needed in the way science is taught. Innovation must be introduced into science teaching. Innovation requires a sound base of knowledge and expertise, openness and creativity, a willingness to accept change, determination to break new ground and the zeal to succeed. Understanding how students learn can help us develop innovative teaching methods that lead to improvements in students' learning. If our goal is to help our students develop an understanding of science concepts and the scientific enterprise, we need to facilitate students'
active involvement in their own learning. Evidence is mounting that traditional methods are less effective than we once thought in helping our students to develop an understanding of the science concepts that we are teaching.

The old teaching paradigm is to transfer the faculty’s knowledge to a passive student so that faculty can classify and sort students in a norm-referenced competitive way. The new teaching paradigm is to help students construct their knowledge in an active way while working cooperatively with classmates so that students’ talents and competencies are developed. This paradigm shift is away from individualization of the teacher to a focus on the needs of the student. The new mode of operation expects institutions not to provide instruction but to produce learning.

The “equality” belief that everyone should be capable of learning through the same “modality” and at the “same” rate is a notion of the past. In the chaff-wheat model of the educational selection students who have difficulty keeping up are seen as casualties of lack of ability or effort, rather than the product of ossified instructional techniques. This model is falling by the wayside. There is an increasing need for innovative techniques to meet the needs of this increasingly diverse student population.

Approaches to learning vary substantially. A student’s primary learning style determines how he or she perceives, interacts with, and responds to the learning environment. The teaching methods which are effective for some students may be ineffective for others. Some students prefer to have information presented both verbally and graphically, or presented sequentially or hierarchically. Many students learn best through hands-on personal experience. Some students respond immediately to questions posed in class while others reflect on possible answers before venturing a response.

Learning is enhanced when we create a classroom environment that provides students with opportunities to learn in several ways. We might, for example, use a graphical display
(visual cue) to enhance a lecture (auditory cue). We might have students use materials (tactile cue) to make models. Students might be asked to ride carts around a circular track (kinesthetic cue) to complement concepts.

Whatever the similarities and differences in learning styles and intelligences among our students, we can help all of our students by employing a range of active learning approaches (talking and listening, writing, reading, reflecting) and varied teaching techniques and strategies (such as lectures, videos, demonstrations, discovery labs, collaborative groups, independent projects). Moreover, by using a variety of teaching techniques, we can help students make sense of the world in different ways, increasing the likelihood that they will develop conceptual understanding.

1.7 INDIGENOUS MATERIALS IN TEACHING SCIENCE

Experience and research show that young children are excited about science when they are given the chance to “do” science. Rich sensory experiences can help children become more observant and curious. Exploring the characteristics of objects and living things can help them learn how to classify or group things based on their characteristics. By playfully interacting with their environment, children understand how they are distinct from the world around them and how they can influence aspects of it. Science begins for children when they discover that they can learn about the world through their own actions. A child best learns to swim by getting into the water; likewise, a child best learns science by doing science. Hands-on experiences, together with conversations about what is occurring, are the best method for children’s science process skills. These hands on experiences are the ones that most children enjoy. Even simplest experiments with indigenous materials and resources could make science more exciting and produce profound learning.
Indigenous resources includes activities such as providing children stimulating environments, arranging field trips, encouraging playful exploration and also engaging children in creative, constructive and thought-provoking activities. These experiences are not only a great way to learn, but it is also a great way to make children excited about science. These carefully planned activities can help children's natural yearning for learning burning.

1.8 NEED FOR THE STUDY

Scientific discoveries and their applications in industry, communications, agriculture, medicine and wars have caused great changes in the lives of mankind. Science is no longer confined to a few seriously devoted persons. Since living in the present world invariably warrants, to variable degrees, knowledge of scientific facts and laws, science has now become everyday science for everybody. This general understanding of science must become part of everyone's life and thought.

Teaching of science need to be further perfected as virtually all aspects of growth and development in the modern era has their basis in scientific knowledge and society needs citizens literate in science and technology at various levels to ensure overall progress. The most important role of science is to sustain the sense of awe and wonder in young people that come from exploring and understanding the natural and technological world. When science is well taught and student engagement is high, science can be the academic subject that keeps a child's natural love of learning alive. Children learn science best and understand scientific ideas better if they are able to investigate and experiment. Hands-on science can also help children think critically and gain confidence in their own ability to solve problems.

Appreciation of science, like the appreciation of music, is likely to increase as one becomes more knowledgeable about how science is done. Normally students who do well in the school tend to be the ones who learn either by listening or by reading. So much of what happens
in the regular classroom is focused only on these modes of learning. The tactile and kinesthetic learners are critically handicapped. To be effective, science education must be enjoyable. 'A bad teacher teaches the truth; a good teacher teaches how to find it'. 'Good' teachers by thorough knowledge of their subject and general background kindle in their students the love for the subject keeping in view all the four types of learners. Once we believe that each child is capable of learning, a common approach used by a teacher shall not be relevant to all children. Learning should be made more child-centric. It should also be made multi-sensory with a variety of teaching methods and materials. This multi-sensory approach of teaching will allow the teacher to engage their students in learning activities that help both student and teacher experience an empowering rapport with scientific knowledge.

In science classrooms, the textbooks function as a source of knowledge whose meaning is mediated by both the developer of the instructional materials and teachers for students, who are expected to reconstruct or restate it. The manner in which authors present science influences the way it is received and interpreted. Textbooks play a major role in presenting content material, determining the nature of acceptable scientific explanations and testing the competency of students. Choices on methods and strategies will also affect the way textbooks engage their readers.

Methods and strategies chosen must make teaching realistic and effective and these are meant to supplement the teaching. The effectiveness of the use these tools depends upon the ingenuity and skill of the teacher who has to examine the necessity and suitability of these tools. Zero cost experiments, educational games and environmental observation are few locally available tools to any teacher to make her science class effective and interesting. Formal experimentation – not demonstration, if commences from middle school level, will enable students tackle the basic concepts of science.
The main impediment of learning science by doing is 'not doing'. If science learning is to be made effective, the difficulties in learning science in the local context should be studied. These can be difficulties in teaching science as, the lack of resources, infrastructure, inadequate experience of the teacher and inadequate resources to teach the concept as provided in the textbook. The tools and techniques of teaching suggested as remedy should be readily available to the teacher and learner to experience science.

This study aimed basically at making science learning more meaningful by identifying the difficulties in learning science and providing instructional materials and methods as remedy and elevate the status of science from being an abstract discourse to lively science.

1.9 SCOPE OF THE STUDY

Designing of instructional material needs careful analysis and planning. The diversified views of teachers on the nature of difficulty in making students comprehend the science concepts will help in the consideration of the views of teachers in the drafting of tutoring materials of science. The influence of background variables on the opinion of teachers will enrich awareness on the eligibility requirements of teachers to teach science.

Teachers are reflective practitioners. They accept that they can always find new and more inspiring ways of teaching a subject. This study will further expand their awareness on the creative use of indigenous tools and techniques to perfect science learning in students. This procedure of investigating the learning process and being a reflective practitioner will actually add stimulation and interest to one's work and make teaching more fulfilling.

The view has been emerging today in teaching and learning situation is that it is not what is learnt but how it is learnt is important. The tools and techniques suggested will provide rich sources of information on making students learn science by doing science.
The tools and materials provided in this study will enable instructional material designers to use them as follow up, activity, home work, assignment and project materials to make learners become skilled at science.

The impact of varied instructional tools and techniques in teaching science will lead to more researches on analyzing the impact of exclusive tools in teaching specific science concepts.

1.10 STATEMENT OF THE PROBLEM

"The aim of education should be to teach us rather how to think, than what to think—rather to improve our minds, so as to enable us to think for ourselves, than to load the memory with the thoughts of other men" said John Dewey. A scientific literate person is the one who is able to use scientific knowledge and ways of thinking for personal and social purposes. But the nature of difficulty a learner faces in comprehending the science concepts is diversified. It could be because of the nature of textbook, teacher, learner and the infrastructure to learn science. Any extraneous factor from these variables will impede the learner’s progress towards scientific literacy.

Learning science could be made more fun, current, local and relevant when teachers make use of local resources to teach science. The basic thought of making students learn science by doing science had led to the basic design of this study.

So, in the present study, the investigator intends to identify the extent and nature of difficulties in learning the science concepts, both from teacher and learner perspective. The concepts identified are made specific to IX standard science textbook of the Tamilnadu State Board Syllabus. Further the investigator intends to develop remedial teaching learning material to help the learner overcome the difficulties in learning science and study the impact of the material in improving the student’s achievement in science.
Hence the problem for the present study is stated as follows:

"IDENTIFICATION OF THE DIFFICULTIES IN LEARNING SCIENCE BY IX STANDARD STUDENTS AND PROVIDING REMEDIAL MEASURES" with the following objectives:

1.11 OBJECTIVES OF THE STUDY

1.11.1 GENERAL OBJECTIVE

The primary objective of the present study is to identify the difficulties in learning science by IX standard students and to provide remedial teaching learning materials.

1.11.2 SPECIFIC OBJECTIVES

The following are the specific objectives of the present study:

1. To identify the nature of difficulties in learning science by IX standard students.
2. To identify the extent and the nature of difficulty in teaching and learning the science concepts as perceived by teachers.
3. To develop remedial teaching learning materials to help teachers and students overcome the nature of difficulty identified.
4. To develop and validate an achievement test to analyze the effect of remedial teaching learning material on the achievement of students in learning the science concepts.
5. To find out the effectiveness of remedial teaching material by comparing the performance of students who used the intervention programme with those who have not used the intervention programme.
1.12 RESEARCH HYPOTHESES

The following research hypotheses were framed for this study:

1. The opinions of teachers on the extent and nature of difficulty in understanding the science concepts is varying significantly according to the background characteristics such as type of school, locality of school, qualification, experience, subject specialization and sex of teachers.

2. The ability of students in understanding the science concepts is varying significantly according to the background characteristics such as type of school, locality of school, medium of instruction, sex, achievement and community of students.

3. There is a significant variation between the entry and exit behaviour of teachers before and after attending the orientation program respectively.

4. There is a significant difference between the achievement test mean scores of experimental and control group students.

1.13 DEFINITION OF KEY TERMS

The key terms of the title are defined for their functional meaning as:

Identification

The process of designating, recognizing or identifying something.

Difficulties

A factor causing trouble in achieving a positive result or tending to produce a negative result.

Learning

The cognitive process of acquiring skill or knowledge.
Science

A particular branch of scientific knowledge conducted on objective principles involving the systematized observation of and experiment with phenomena, especially concerned with the material and functions of the physical universe.

Remedial

Tending or intended to rectify or improve.

Measures

Any maneuver made as part of progress toward a goal.

1.13.1 OPERATIONAL DEFINITION OF KEY TERMS

Identification

The term identification refers to the process of making out or knowing the difficult concepts in Science. The concepts were identified as difficult from both – the teacher and learner perspective. Identification is also done in terms of knowing the nature of difficulty sensed by the teacher and the learner.

Difficulties

‘Difficulties’ refers to not easily doing, accomplishing, comprehending, or solving the given concept. The extent and nature of difficulties in learning the concepts refers to:

- The extent of difficulty the teacher senses in teaching the science concept and thereby making students comprehend the same.
• The nature of difficulty in its various dimensions — ranging from lack of adequate resources to provide sufficient exercises in learning the concept to the complexity of the concept by itself.

Learning Science

"Learning Science" refers to the knowledge, information, comprehension and skill gained through the study of the concepts given in the prescribed Science curriculum pertained to the level of the learner. Learning also refers to the way in which the learner comprehends the concepts.

IX standard students

Students in standard IX of the State Board Schools in Tamilnadu.

Remedial Measures

"Remedial Measures" refers to the action taken as a mean to correct or improve the difficulties faced by the students in learning the science concepts. The remedial measures refer to remedial teaching learning methodologies and remedial supplementary material in the form of audio visual aids.

1.14 SIGNIFICANCE OF THE STUDY

In this study attempt has been made to identify the difficulties in learning science from its various perspectives such as availability of resources to learn, inadequate exercises, unclear picture in the textbook, necessity of real time examples to understand the problems, inadequate exercises to comprehend the problem, lack of simple activities to prove the phenomenon of study, necessity of group activities, lack of illustrations and inadequate problem solving and brain storming situations to comprehend the concept.
The study highlights the difficulties as perceived by the teacher and the student. The study will throw light on the extent of difficulty of the concept and also on the nature of difficulty as apparent by the teacher and the learner.

This study will enable researchers to study the background variables which could affect the way a learner comprehends the science concepts.

The study will also facilitate in identifying the variables that makes the teacher sense a particular concept as difficult to be taught in the science classroom.

It also attempts to make learning of science effective by designing and developing instructional tools and techniques to help the teacher and the learner overcome the nature of difficulty.

This study will also highlight the suitability of the material designed to the situational demand of teaching and learning.

It ensures that science learning could be made fun with the use of indigenous teaching learning material.

The method of designing instructional tools and materials in line with the nature of difficulty perceived by the teacher and the learner is also shown through this study.

This study will attempt to highlight the creative use of various instructional tools ranging from lecture methods accompanied by suitable audio visual material to activities where students are given chances to explore the concept by themselves.

It will help teachers the use of combination of teaching methodologies to bring in desired learning outcome in the students and draw attention on the rarely used teaching methodologies in science such as brain storming sessions and role play to make science learning more meaningful.

The remedial teaching learning material of this study will be a valuable resource material for any teacher to add to their existing knowledge on the concept. This study will help teachers
utilize the material as a valuable resource to improve the comprehending of the concepts by the student. The same material will also be a rich source of reference for any learner to have a methodical perception of the concept.

This study will endure evidence to the impact of the remedial teaching learning material on the nature of learning science. This study will also substantiate the impact of background variables on the effect of learning using the remedial teaching learning material.

1.15 LIMITATIONS OF THE STUDY

1. This study was confined to the science concepts which the student learns at the standard IX in Tamilnadu State Board Schools.

2. This study did not make an analysis of whether the teaching competency of the teacher improved while teaching with the remedial teaching learning material.

3. Since the aim of the study was to prepare and introduce indigenous teaching learning material which could be utilized by rural and urban schools, modern teaching methodologies such as CAI and multimedia projectors are not utilized.
REFERENCES


