CHAPTER I

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"The newer turns in modern technological advances, be the studies of natural products and bio-technology, offer a new set of opportunities for us to not only catch up with the developed nations but also to surpass many of them"


Education is a hand post to the success of life. A man without education is a man without backbone. It is the process of learning to ensure a worthy living. Education is a dire necessity of man without which he will face a setback in social relationships. Education is the mainstream of complementation life of an individual. Man should adjust himself to the environment where he lives with other human beings. Education helps him live and love his fellow race.

MEANING OF EDUCATION

The word "education" means becoming developed or progressing from inside to outside. Education is the process of developing the inner abilities and powers of an individual. According to Socrates, "Education means bringing out the ideas of universal validity which are latent in the mind of everyman."
Education is knowledge with which individuals act and react with conscience. Education is the only media, through which everything will be changed to suit the needs of the people. People change their pattern of life, way of thinking and acting on the basis of education they get. It is the essence of life.

PURPOSES OF EDUCATION

Education is an important human activity. It helps us to find out the truth. It was born with the birth of the human race and shall continue to function as long as the human race lives. Education is an essential human virtue. Education is integrated growth. When a child is born, he is a helpless mass. Unless he is properly taken care of, he will cease to grow or perish. If we do not take proper care, his growth may be along abnormal lines. So, education helps the child to grow into a mature and capable human being.

AIMS OF EDUCATION IN DEMOCRATIC INDIA

In democratic India, education aims at instilling love for liberty, equality and fraternity in people. Social justice is based on equality. It provides every citizen with the opportunity to pursue his own development without prejudicing the interests of others. Education is a tool for bringing social change and social reconstruction. In fact aims of education are determined according to the needs of the society and culture. Education is fundamental to all-round development of human
potential - material and spiritual. It refines one's sensitivity and perception that contribute to national cohesion, a scientific temper and independence of mind and spirit, thus furthering the goal of socialism, secularism and democracy enshrined in our constitution. Education is an instrument for developing an economically prosperous society and for ensuring equity and social justice.

SECONDARY EDUCATION

Secondary education is the kind of education which is given after primary education and before university education. It includes all the classes after the primary school and before the university. Before independence, the secondary education in India was classified as, vernacular middle school, matriculation, high school and intermediate etc. After independence this pattern was changed. Now the secondary education has been divided into three groups from sixth to eighth - Junior high school, ninth and tenth - high school and eleventh & twelfth have been regarded as higher secondary or intermediate classes.

OBJECTIVES OF SECONDARY EDUCATION

The general objectives of education at the secondary stage need to provide equality of opportunity to the learners to obtain the knowledge and skills appropriate to their needs and abilities (UNESCO, 1986).
ULTIMATE OBJECTIVES

The ultimate objectives of secondary education are as follows:

* To secure and maintain a condition of personal good health and physical fitness.

* To engage successfully in exploratory, vocational and vocational activities.

* To sustain successfully certain definite social relationships, civic, domestic and community and

* To utilize the leisure time in right way.

IMMEDIATE OBJECTIVES

The immediate objectives of secondary education are as follows:

i. Acquiring fruitful knowledge

   (a) Preparatory to other knowledge, (b) knowledge that functions directly and (c) Knowledge useful in controlling everyday life situations.

ii. Developing interests, motives, ideals, attitudes and appreciations.

iii. Developing mental techniques and

iv. Acquiring right habits and useful skills.
CURRICULUM

Curriculum is a gist of lessons and topics which are expected to be covered in a specified period of time in any class which must be periodically changed with reference to need of the society. It refers to the totality of experiences that a child receives through various classroom activities and also from activities in library, laboratory, workshop assembly hall, play fields etc., Curriculum includes the whole life of the school, which touches the life of students at all levels and helps in promoting a balanced personality. Curriculum should emphasize intellectual, structured and conceptual themes. It should provide sufficient scope for observation, experimentation, independent work, drawing of inferences and criticism of experimental results obtained in the laboratory. It should provide scope for cultivation of scientific skills, interests, attitudes and appreciation. The formation of a good science curriculum should form the basis of certain principles of curriculum planning such as - child & community centeredness, developing creativity, providing variety of learners and conservation of social values.

The present day need is more on science and technology. Education without the teaching of science is incomplete. So, science education is indispensable today.
SCIENCE EDUCATION

We are living in an age of rapid changes and science is playing a dominant part in bringing about these changes. Science has provided the spring board for all the progress in our world. Science has improved the conditions and quality of living and has saved mankind from excessive toil and boredom. It has helped the man to acquire supremacy over nature. Science has greatly affected the way the people view themselves and the world around them. The wonderful achievements of science have glorified the modern world and illuminated the human creative potential. Science education occupies a very eminent place in curriculum both at school and university stages of education in India. Continuous advances in scientific and technological research have led to the growth and greater application of science in contemporary society. Accordingly science becomes a priority area in education, both at the compulsory education level as well as the level of specialization.

Science education is supposed to reform a two-fold task. The prime objective, in individualistic perspective, is the cultivation of a scientific temper, which includes a spirit of enquiry, a disposition to reason logically and dispassionately, a habit of judging, beliefs and opinions on available evidence, readiness to reject unfounded theories and principles. It is also expected of science education that it would give individuals a firm grasp of the concepts and process of science and impart
to them the ability to use the scientific method of problem solving and the techniques of observation and experimentation in handling problem of comprehension or life. At the societal level, one of the major objectives of science education is to equip individuals to participate in the creation of a society which is free from poverty, hunger, disease and evils such as violence, exploitation, oppression, etc. Research in science education should be urgently addressed to the problem of developing a scientific attitude in the educand. The science education, if properly conceived, should primarily be concerned with the education of the mind rather than acquisition of isolated pieces of scientific knowledge. The vital aspects that should engage the attention of researches in science education, consist in identification of these abilities and the ways and means to develop them among the younger generation.

**IMPORTANCE OF SCIENCE EDUCATION**

The importance of a sound scientific education for the younger generations is recognized by science educators of both technologically advanced societies and developing ones. The recognition of this importance is not, however, consistent with what we know about classroom practices in the natural sciences. These sciences are taught, divorced from the lives of students, the problems of the surrounding community, the global implications they may have etc. Science has specific applications in many of our activities. The contributions of science to the various branches
of human progress are countless. One can marvel at the advances made in medicine, astronomy, agriculture, engineering, oceanography, aeronautics, space travel, microbiology, nuclear biology and innumerable branches and sub branches of scientific study.

In this age of scientific and technological advancement, everybody should have at least some basic knowledge of science for making effective and useful contribution to life. The report of the Education Commission comments that, "There is one thing about which we feel with no doubt of hesitation, that is science based education in coherence with Indian culture and values can provide the foundation as an instrument for the nations progress, security and welfare". (Dr. Kothari 1964).

Science has now become a compulsory subject in the school curriculum because of its multivarious value to the individual as well as to the society. It develops values - social, cultural, moral, aesthetic, intellectual and vocational, among the learners.

The study of science develops scientific attitude among the minds of the students. Science is a way of doing things. As a result, a student is involved in conducting experiments or the laboratory work. This also involves feelings and values. Attitudes reflect feelings of a person. A person having scientific attitude is never superstitious. He forms his conclusions only on the basis of his experiences. He searches
for natural cause or basic reason behind the superstitions passed on to us from our forefathers. He is always curious to know about his environments, his surroundings and existing things and is always ready to know and learn more about them. His mind is like a sea with open mouth ready to gulp down new facts. Further, study of science trains the learners in scientific method of solving the problems.

**SCIENCE EDUCATION IN INDEPENDENT INDIA**

After the independence of our country, Indian government appointed number of education commissions for the welfare of the education, especially science education.

1. **UNIVERSITY EDUCATION COMMISSION (1948-49)**

The University Education Commission 1948-49 (Dr. Radhakrishnan Commission) made recommendations for improving laboratories, and libraries. It was narrow specialization in science and technology. The commission opined that the curriculum of general education should have relevance to the students physical and social environment and have science, language and literature at various levels upto the end of the secondary stage.

2. **SECONDARY EDUCATION COMMISSION (1952-53)**

The Secondary Education Commission 1952-53, (Dr. A.L. Mudaliar Commission) recommended the teaching of general science
as a compulsory subject in the high and higher secondary schools. Science found a place in the diversified course too. The suggestion to retain general science as a core subject is a significant milestone in the history of science education in India.

3. NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING (NCERT)

NCERT (1961) sponsored by the National Government at the centre has re-organized and re-planned the education of science in all areas and fields. This central organization has launched various schemes through its extension services for the improvement of scientific education at all levels and in all fields of human work. Some of its working scheme are as follows.

i) Various schemes have been launched to stimulate the urge for scientific education among school children.

ii) Establishment of science clubs is promoted to popularise scientific education among common people.

iii) Science fairs, seminars and symposiums are organized.

iv) Talented and gifted children in the field of science are selected through examinations and encouraged by the award of scholarships, stipends and appreciations in various ways.

v) On the advice and under the guidance of talented and learned member of UNESCO, the council has established a central science workshop
for imparting effective instruction to science teachers in practical investigations, workshop methods together with techniques of work and instruction and

vi) A part time curriculum for teacher training has been organised at various important places in the country to prepare efficient science teachers for effective teaching and productive guidance.

TEACHING SCIENCE

The National Policy of Education (1986) has laid considerable emphasis on strengthening the science education in the school education. The qualitative improvement in science education depends on many vital components. The teacher is a crucial factor in the teaching-learning process. He develops positive attitude in the learners for better achievement and the formulation and implementation of science education programmes. His teaching must be integrated with environment based on real life situations using local experiences, expertise and resources. The classroom territory must be expanded over the whole environment, so that the activities become supplementary to classroom teaching. If such an approach is systematically implemented with modification of needed resources, there may be improvement in science education at school level. In order to improve the quality of science education, the teaching environment for science is more important. The teaching environment for science includes infrastructure of the science laboratory, quality of
the science text book, curriculum and the co-curricular and the techniques of teaching science. The success of the school science education depends not only upon the teacher, but also on the evaluation of the objectives of science teaching.

INFRASTRUCTURE OF THE LABORATORY

Science cannot be taught effectively with testing, experimentation and demonstration of the scientific facts. Science laboratory is the central place where students get an opportunity to conduct experiments and search principles of science. No course in science can be considered as complete without including some practical work in it. The practical work is to be carried out by individuals in a science laboratory because most of the achievements of modern science are due to the application of the experimental method. At school stage, practical work is even more important because of the fact that learning by doing renders more meaningful education. Experiments help in brooding pupils experience and develop initiative, resourcefulness and co-operation.

The National Science Teachers Association of America (NSTA, 1982), in a position statement has defined the goals of laboratory as the laboratory is the place where students design and perform experiments, manipulate equipment, formulate hypothesis, interpret data and so on. It is here they use higher cognitive skills such as analysis and synthesis. Laboratory outcomes are concerned not only with the cognitive and
affective domains but also the psychomotor domain, Bloom (1964). The psychomotor domain is very relevant to science, since laboratory activities require students to perform certain tasks such as manipulating equipment, and dissecting animal bodies and preparing solutions etc.

**NEED AND IMPORTANCE OF THE LABORATORY FOR TEACHING SCIENCE**

i) The laboratory encourages the students to perform their experiments carefully in a congenial environment.

ii) Laboratories are helpful in creating and promoting scientific attitude in the students.

iii) In the laboratory the students work in groups to develop a sense of co-operation and spirit of healthy competition, the traits very essential for getting desired success in future life and

iv) In science laboratory required apparatus, instruments, chemical and other materials may be kept safe, secure and ready for the use of observation and experimentation.

A well managed and functional laboratory providing optimum learning outcomes within the minimum time is the objective of the laboratory development. Laboratory experiences for the students serve as a powerful tool in making the teaching and learning process more effective. More participation of students in the laboratory activities would
ensure development of confidence in them and the ultimate goal or development of the laboratory would be achieved.

**SCIENCE LIBRARY**

A science library should be an essential part of each school which undertakes science teaching. It is the most attractive and educative place lying in the campus of an institution. It is a calm, quiet and most proper place for the study as well as storing of all types of information. Students of all grades and classes may have sufficient material in it for enriching their knowledge of science. One of the important recommendations made by the Secondary Education Commission (1952-53) was that every school should have subject libraries which are under the charge of subject teachers. It was felt that subject teachers can enrich their teaching by making use of the collections of books.

All India Seminar on the Teaching of Science (1961) made some important recommendations about science library as follows:

i) Each school should have separate science library.

ii) Science books of general interest should be stored in the school library.

iii) Reference books are for use by teacher and also by students but these should not be ordinarily issued for home use.

iv) Books on methods of teaching science should be stored in a separate section in science library.
v) Teachers should encourage love for library books amongst his students and

vi) A few laboratory manual also should be available in school library

The effectiveness of a science library depends upon the books and reading materials it possesses for its readers. It requires a proper planning and wise selection on the part of the organizers. All the prescribed books for each standard, latest developments in science, science magazines and reference books related to the facts are to be kept in the science library.

**SCIENCE TEXTBOOK**

Text books occupy a central and prominent place in teaching-learning process related to the study of any subject. They help the teachers and taught to get acquainted with the limits and boundaries of the subject matter being taught or learning experiences to be gained with respect to a particular grade or class. The subject matter related to a particular subject written by experienced teachers and eminent authors is readily available to the students and teachers in the form of text books. The text books are considered quite indispensable at all stages of science education. The science text-book should aim at guiding the pupil in the development of personality and developing open mindedness, critical attitude in order to enable him to discover new knowledge to appreciate and understand nature and to mould it to one's own ends and not merely
stuffing of facts. The text books are very much useful in saving the time and energy of students as well as of the teachers. They are also helpful in maintaining the uniformity of the standard not only within the different sections of a school, but also within the different schools belonging to a region, state or country.

Text-books commonly include in the body of each section many suggestions for supplementary activities, experiments, demonstrations, reading etc., The science text-books help to form correct understanding of basic concepts and principles of science. It helps to inculcate scientific attitude in the pupils and develop understanding about the scientific method. The science text books should acquaint the child with the wide variety of the application of the scientific knowledge through proper exercises. The text book should supplement meagre experimentation that can be done in the class room. It should give information about the past discoveries and some of the thrilling experience made by the scientists. It should give directions and problem solving. It should help the pupils for systematic and speedy revision of the lesson.

**SCIENCE TEACHER**

The quality competence and character of teachers are undoubtedly the most significant in the different factors which influence the quality of education and its contribution to national development.
The success or failure of science course results mainly with the science teacher. He may be provided with all the possible facilities in terms of laboratory apparatus and equipment, an ideal syllabus and sufficient time for teaching of science. Unless he is enthusiastic about his work, though he knows the subject and the teaching method, he is not likely to achieve success. On the other hand, a keen and well informed teacher who loves his subject and believes in its value will succeed inspite of difficulties and handicaps.

Radha Krishnan S.(1949) explains the role of teacher in the following words "The teacher's place in society is of vital importance. He acts as the pivot for transmission of intellectual tradition and technical skill from generation to generation, and helps to keep the lamp of civilization burning. He not only guides the individual, but also determines the destiny of nation. Teachers have therefore to realize their special responsibility to the society". The quality of education would depend upon the quality of the teacher.

The science teacher must be trained in the latest techniques, strategies and methodology of teaching science, including the use of all types of aid material. A good deal of attention has been directed in recent years to the techniques of revitalizing classroom teaching in Indian schools.
TECHNIQUES OF TEACHING SCIENCE

Techniques of teaching are the classroom activities which the teacher may design for a particular lesson. They may include group discussions, projects, use of a textbook and field tripping. The term 'Technique of Teaching' means 'Art of teaching'. The art of teaching is the art by which a teacher uses certain principles, procedures and means to teach his students in class or individually, in such a way that the student gets an opportunity to make his all round development.

A teaching technique can be thought of as an activity which affects the learner's encoding process, that is, how the learner will learn the desired information, concept, generalization and skills. A great variety of teaching techniques are being used in modern Indian schools. There is no rigidity concerning this because the educator chooses his technique to suit the occasion, the subject, the class and the availability of facilities. The teaching techniques should be flexible, and the methods employed should flow from one to the other. The science teacher need not insist to a particular method during the whole period. The teacher should change from one method to another to create desirable climate for learning. Some instructional methods are effective in developing particular kind of values and others may help to cultivate different values. There are many methods in teaching science. They are as follows:
DEMONSTRATION METHOD

Demonstration is an act to display working of some experiments. It is one of the most versatile and useful methods of teaching science. Students actually see the experiments. They learn handling of apparatus and verbal ideas are replaced by concrete objects. If the teacher is well prepared with demonstration, it has the desired effect upon the students. In this method of teaching, the teacher performs experiment before the class and simultaneously explains what he is doing. Demonstration method is used by good science teachers for imparting science education. This method combines the instructional strategy of information imparting' and 'showing how'. It is less expensive. In this method all the students see the same operation and techniques. In case of dangerous experiments student's mishandling is saved. Verbal instructions are concretised for the students. This method can prove to be the best method if the teacher initiates active participation of students.

BIOGRAPHICAL METHOD

Young people are usually fascinated by interesting stories. In this method, the lives of the important scientist are described in an interesting manner and simultaneously their achievements are discussed in the class. The events of struggle and achievements of the great scientists arrest their attention and make the study of science interesting. This attitude provides great incentive to the study of science. The protagonists
of this method of teaching science suggest that the pupil should try "to project himself into the life of the original discover, to experience his successes and frustration, to appreciate his hopes and disappointments".

**HISTORICAL METHOD**

Historical method believes that children's ideas and thinking follow the same historic route of original discovery of a scientific phenomenon. In this method to start from the discovery of the scientific phenomenon and pass through the actual course of its development from the earliest beginning. This way of developing the topic is fascinating to the pupils and it appeals to them. This method is started with an interesting incident or story of the lives of scientists leading to a particular scientific discovery such as Archimedes and his bath or Newton's curious thought over the falling of an apple, which led to the discovery of two most important theories in science. This method can be conveniently used for the exposition of important theoretical concept in science.

**TOPIC METHOD**

This method is a sort of approach to a subject rather than a method of teaching and that its final aim is to establish the principles from facts rather than the reverse. In this method, the teacher selects a topic of general interest and one that is easily experienced by the pupils. He develops around the topic a series of lessons or units. For example, in the topic of the study of 'air', which is of immediate interest to the
pupils, around air, the teacher can develop a series of lessons such as properties of air, its constituent gases -O₂, N₂ and CO₂, etc. Various appliances using air-barometers, pumps, syringes, uses of air-respiration, ventilation, air-conditioning etc. It is more real to them when they understand the points of the lesson.

**HEURISTIC METHOD**

It aims to put the pupil in the attitude of a discover, or better, of a researcher and he should be helped to make his discoveries. In this method each student has to solve scientific problems experimentally, think for himself how to proceed, observe carefully and note down the essential data, analyse the data and draw conclusions. In a way, he is placed in the position of the original investigator. Heuristic method is indisputably an excellent approach for training students in scientific method.

**LABORATORY METHOD**

The Laboratory method of science instruction is characterised by the students (either alone or in small group) actually producing and manipulating the different variables that are under exploration. It is 'child centered' in its approach rather than being "subjects centered". The common expression is that laboratory work involves "hands on" exploration. In this method, the students are encouraged to derive the laws and principles of science themselves by actually performing the
experiments. The students are given all necessary materials and equipments in the laboratory along with proper instructions for carrying out their experiments with their own initiative and effort, then they carry on the experiments and record the observation and infer their own results. They learn by their own experience, observation, testing and verification. The teacher supervises their work and also guides them wherever needed. This method keeps the student always alert and active. Knowledge gained through this method is more lasting and permanent.

Laboratory method can rightly be called a psychological method as it suits the nature and interests of the learners. It helps in satisfying their urges of self-doing, exploration, creativity and inventiveness and proves a helping hand in realizing the psychological needs of the children. It paves the ways for the exploration, experimentation and verification of the scientific facts and principles. The experimental work trains them in the development of virtues like truthfulness, honesty and sincerity as they conduct their experiments honestly and records the observations and draws the inferences truthfully and,

PROJECT METHOD

Based on the principle of 'learning by doing', and 'learning by living', this method is a type of problem solving method. The students workout problems selected by themselves, investigate them and solve them in groups or individually. Spontaneity is the essential quality of
the project as project grows out of children's own purpose. A project is a whole hearted purposeful activity proceeding in social environment. It is a unit of activity in which pupils are made responsible for planning and purposing. Project is the core and heart of this method. For carrying out the solution of a day-to-day felt need or problem, the students pick up a suitable project to be completed in a co-operative way as naturally as possible. The definite planned steps necessary for doing the project method is providing a situation, choosing the project, planning, execution, evaluation and writing report or recording of the project.

ASSIGNMENT METHOD

In assignment method, the whole syllabus is divided into well planned portions called assignments to be coursed in a particular month or week. A topic is taken and the teacher issues instructions with references from the books with page and paragraphs. Students study those pages, write the answers and draw diagrams etc. The teacher checks these note books and points out their mistakes for correcting their errors. The students correct their mistakes themselves and so do not repeat them again. This part of assignment is called home assignment. The second part of assignment is laboratory assignment. After successful completion of the first part, the teacher may enter the names of successful candidates in assignment card and issue instructions for laboratory work. The success of an assignment depends upon its proper planning. Apparatus
can be improvised. The students learn working independently. They themselves find books, collect matter and organize it. Students learn the habit of extra study.

**EVALUATION**

Evaluation is an integral part of the teaching learning process. It is a process used to determine what has happened during a given activity or in an institution. The purpose of evaluation is to see if a given program is working, if an institution is successful according to the goals set for it, or if the original intent is being successfully carried out. Evaluation adds the ingredient of value judgment of the social utility, desirability or effectiveness of a process, product or program etc. Evaluation is an interviewing process that allows us to plan and move forward. It provides evidence whether the instruction is going in the right direction. From evaluation, a student may obtain individual data, using the well-known self-evaluation techniques, which will guide future decisions about learning. Such an approach will inform him intelligently how far he is achieving the objectives in the class. Evaluation can ensure not only better learning but also development of various abilities in the pupils.

**TECHNIQUES OF EVALUATION**

The techniques of evaluation represent the ways and means to measure and assess the teaching-learning outcomes, that is, to know
the extent to which desired behavioural changes have taken place in the learner. The science teacher may make use of many techniques for the measure and assessment of the teaching learning outcomes. The few important evaluation techniques are; (i) oral tests, (ii) practical tests and (iii) written tests.

A) ORAL TESTS

The oral tests are based on oral communication between the examiner and the examinees. In general oral questions are put to the students.

B) PRACTICAL TESTS

In practical tests, the students are required to demonstrate their learning performance by engaging themselves in experimental and work activities.

C) WRITTEN TESTS

Written tests are the most frequently and popularly used evaluation techniques. The students receive test questions and are required to give their responses on the supplied answer sheet or on the question paper itself in the written form. The questions framed in the written tests are usually in three types. They are; (a) essay type, (ii) short answer type and (iii) objective type.
(i) **Essay type questions**

In essay type questions, the students are to respond by providing quite lengthy, descriptive, detail and elaborate answers. The students are at liberty to respond to the presented questions in a way they like.

(ii) **Short answer type questions**

In short answer type questions which need a short and pinpointed reply are either limited to fixed number of words, say 100 and 200.

(iii) **Objective type questions**

In objective type of questions which can be responded by writing one or two words or numerals, filling up the blank or choosing one out of the multiple given responses etc. The answer to such questions are one and the same and therefore do not vary from examinee to examinee.

**SIGNIFICANCE OF EVALUATION**

i) Evaluation helps the teacher to classify students according to their capacities and abilities. A student's performance can be assessed and compared to other students. This helps the teacher to plan for individual differences.

ii) Evaluation can be laid to continuous curriculum change which is essential in our times. It can identify strength and weakness of the entire curriculum.
iii) A good evaluation system will provide accurate and reliable reports for parents and administrators concerning the progress of individual students and

iv) Evaluations programme can be very useful in determining the effectiveness of a teacher. Teachers as well as students need to have feedback on their work in regular basis.

CONCLUSION

Teaching zoology and conducting experiments in laboratory in the schools in Tamil Nadu need more trained manpower and laboratory resources. The view of professors, college teachers, school teachers and other specialists of zoology pointed out that present teaching of zoology in higher secondary schools have the following limitations. Quality of the zoology text book is not satisfactory. There is inclusion of dead topics in the syllabus of eleventh and twelfth standard. Less emphasis is made on individual practical work. The relationship between zoology and other branches of science especially physical science is not adequately recognized. There is more emphasis on morphological work and no integrated approach. In public examination, only subjective type test items dominate in the question paper. The questions set for the examination are not really comprehensive. The whole syllabus is not covered in public examination. According to B.F Skinner (1904), in teaching of science, theory and practice must go hand in hand with emphasis on learning by doing. The scientific principles can be taught more effectively with the help of the laboratory.
The science teachers prefer to assess laboratory skills through laboratory performance tests or practicals. These science laboratory practical tests can also be used not only to assess practical psychomotor skills but for other cognitive outcomes such as the ability to design experiments, make quantitative and qualitative observations, analyse, and interpret, predict, formulate hypothesis, and apply techniques to new situations. The teaching of zoology aims at developing proper abilities, right appreciations, desired habits and attitudes. The objectives of teaching zoology could be realized through i) updated syllabus, ii) well prepared text books, iii) equipped laboratory and classrooms, iv) modern techniques of teaching and v) current evaluative practices. In teaching of zoology, the science teachers should know the students needs, interest and plan his learning activities while considering students accessibility and relevance in a given situation. In order to make learning process more effective, the science teacher should take more responsibility to evolve new pattern of teaching and encouraging the students for learning.

The higher secondary stage is the feeder stage for higher education. In order to gear up the national development, the theoretical and laboratory instructions are to be improved. The students should acquire the skills and understanding of zoology subjects so that they become creative and innovative zoologists of the future.

The ensuing chapter deals with the review of related literature.