INTRODUCTION

CHAPTER- I

1.1 INTRODUCTION:-

Science is one of the core components of the school curriculum. That is why, science as a separate subject has been incorporated in school curriculum. School curriculum includes following subjects :-

1. Language
2. Mathematics
3. Social science
4. Natural Science

Introduction of science as a compulsory subject in school curriculum was done with the view to develop scientific attitude, scientific temperament, critical thinking active inquiry, independent work and understanding the physical world from different perspectives. 'Good science education is true to the child, true to life and true to science'. This simple observation leads to cognitive, content, process, historical, environmental and ethical validity of a science curriculum. So it is a powerful means of developing attitudes of critical inquiry, respect for truth, adaptability and systematic work which are a pre-requisite for initiating the process of social change and of national development.

At the secondary school stage concepts that are beyond direct experience may come to occupy an important place in the

science curriculum, since not all phenomena are directly observable. Science also relies on influence and interpretation, experimentation often involving quantitative measurement as a tool to discover theoretical principle should be an important part of science teaching.

Nature of Science

Humans have, always, been curious about the world around them. The inquiring and imaginative human mind has responded to the wonder and awe of nature in different ways. One kind of response from the earliest time has been to observe the physical and biological environment carefully, look for any meaningful patterns and relations, make and use new tools to interact with nature and build conceptual models to understand the world. **This Human Endeavour is science.**

Science is a dynamic, expanding body of knowledge covering ever new domains of experience. How is this knowledge generated ? What is the so called Scientific Method? As with many complex things in life, the Scientific Method is perhaps more easily discerned than defined but broadly speaking, it involves several interconnected steps: observation, looking for regularities, making hypothesis, devising qualitative or mathematical models, deducing their consequences; verification or falsification of theories through observation and controlled experiments and thus arriving at the principles, theories and laws governing the physical world.

There is no strict order in these various steps sometimes, a theory may suggest a new theortical model. Speculation and

conjecture also have a place in science, but ultimately a scientific theory, to acceptable must be verified by relevant observation and/ or experiments. Thus law of science are never viewed as fixed eternal truth. Even the most established and universal law of science are always regarded as provisional, subject to modification in the light of new observations, experiments and analysis.

The methodology of science and its demarcation from other fields continue to be a matter of philosophical debate. It professed value neutrality and objectivity which have been subject to critical sociological analysis. Moreover, while science is at its best in understanding simple linear systems of nature, its predictive or explanatory power is limited when it comes to dealing with non-linear complex system of nature. Yet, with all its limitations and failings, science is unquestionably the most reliable and powerful knowledge system about the physical world known to human.

But science is ultimately a social endeavour. Science is knowledge and knowledge is power. With power can come wisdom and liberation or, as sometimes happens unfortunately, power on breed arrogance and tyranny. Science has the potential to be beneficial or harmful, emancipative or oppressive. History, particularly of the twentieth century, is full of examples of this dual role of science.

AIMS OF SCIENCE TEACHING IN SCHOOL.

The general aims of science education follow directly from the six criteria of validity that are cognitive, content, process, historical, environmental and ethical. Science education should enable the learner to:-

- know the facts and principles of science and its application, consistent with the stage of cognitive development.
- acquire the skills and understand the methods and processes that lead to generation and validation of science knowledge.
- relate to the environment (nature environment, artifacts and people), local as well as global, and appreciate the issues at the interface of science , technology and society.
- acquire the requisite theoretical knowledge and practical technological skills to enter the world of work.
- imbibe the values of honesty, integrity, cooperation, concern for life and preservation of environment.
- cultivate 'scientific temper'- objectivity, critical thinking and freedom from fear and prejudice.

ACCORDING TO NCF (2005) SCIENCE TEACHING AT SECONDARY STAGE:-

At the secondary stage student should be engaged in learning science as a composite discipline, in working with hands and tools to design more advanced technological modules than at the 'upper primary stage. Activities and analysis on issues concerning the

environment, health, systematic, experimentation as a tool to discover/ verify theortical principles, and working on locally significant projects involving science and technology are to be important part of the curriculum.

However, realization of aims of teaching science largely depends on the methods of teaching learning of science knowledge in school. But teaching of school science in the present scenario is based on the traditional approach. This approach includes lecture method, lecture cum demonstration along with these methods, activity based discovery, project method etc. are also being occasionally employed is the class rooms. These methods considered to be inadequate methods. It is so because these methods are teacher and text book centered and the students remain passive in the teaching learning process. Further our school science teaching is not research oriented as it does not allow students to develop their faculties like critical thinking, active inquiry and independent work.

So in present study the researcher selected laboratory approach to see its impact on the development of process skills and achievement. Because the major goal of laboratory approach is not limited to the acquisition of more knowledge and process skill but a balanced alround development of the child. In this approach the focus shifts to the child's education and the teacher moves away from the central position to assure the role of facilitator rather than being its dominant figure.

In laboratory approach, activities develop skills among the learners and also promotes scientific way of learning and learning with reasoning and motivate them to try. So activity engagement involves inquiry, exploration, questioning, debates, application and reflection leading to theory building and the creation of ideas.

According to national curriculum framework (2005) a major area of concern is the gradual decline of practical work and experimentation at secondary and senior secondary level, even while the concept of activity based teaching is get to become a living reality in our elementary school. The aft repealed recommendation of integrating experimental work and theory teaching has not been realized because of perceived lack of facilities and trained teachers in most of schools often practical difficulties are ciled as an excuse for this lack of commitment and awareness that experiment is fundamental to doing and learning science. Even well endowed schools have tended to give only cosmetic importance to laboratory work in the prevailing scheme of things. We have already remarked that cost can not be an excuse for neglecting experiments since it is possible to imaginatively design low cost science experiments using easily available materials.

IMPORTANCE OF BIOLOGY LABORATORY

No course in biology can be considered as complete without including some practical work in it. Biology is a scientific topic, thus it should be learn through experimental method. The laboratory makes teaching of Biology more meaningful and interesting.

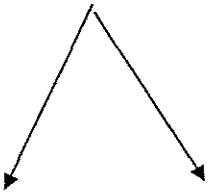
In the laboratories the learners learn about facts and laws of different branch of biology and check their truthfulness and learn to make practical use of them. In this method the learness become very active and learns himself. He himself notes down the figures of his observation and on the basis of calculation, draws conclusion. So science laboratories are the places and means with the help which all these necessary activities can be performed smoothly and effectively. The practical work is to be carried out by individual in a science laboratory. Most of the achievement of modern science is due to the application of experimental method. At school stage, practical work is even more important because of the fact that we "learn by doing". Scientific principles and applications are thus rendered more meaningful. It is well known fact that an object handled impresses itself more firmly on the mind than an object merely seen from a distance or in illustrations. Centuries of purely deductive work did not produce the same utilitarian results as a dew decades of experimental work.

Practical classroom experiments help in broadening pupils' experience and developing initiative resourcefulness and cooperation. Because of the reasons discussed above, practical work frames a prominent features in Biology. The active learning is that which uses the laboratory and traditional, which uses the teaching resources ordinarily available to the teacher. In laboratory students gain more content knowledge and knowledge of process skills compared to traditional instructions. The laboratory approach enhances knowledge and process learning for students.

THE SCIENCE PROCESS SKILLS:

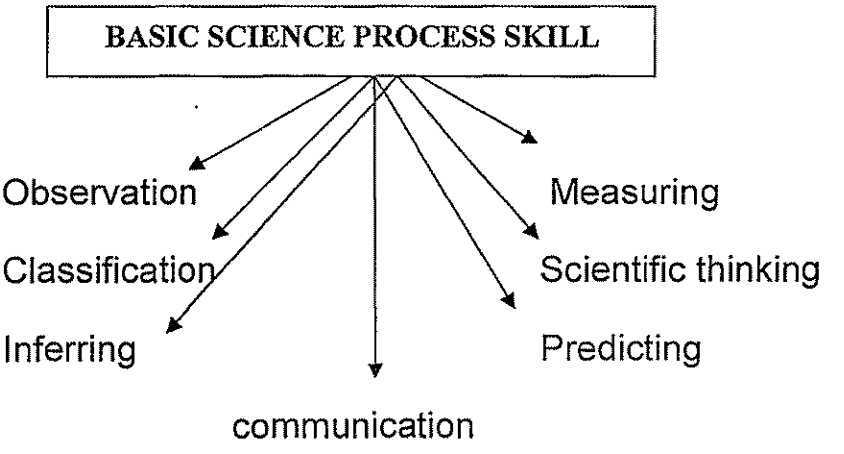
Science process skills in science are very important to develop scientific ideas and to make learners independent thinkers.

SCREEN ((1996) defined the process skills as the sequence of events that are engaged by researchers while taking part in scientific investigations they may be classified in to two types.



Basic Science Process skill Integrated Science Process skill

Brotherton And Preece (1995) classified the basic science process skills like:



- they classified integrated science process skills as graphing hypothesizing, interpreting data, formulating models, experimenting and defining operationally.

Science Series (2008) described that process skills in science are very important in the formal presentation of science to child. Process skill is a preparation to becoming a scientist. The work of science

involves carrying out experiments, recording observations, making measurements and presenting data derived from the experiments. Process skills in science for children emphasises the use of our five sense organs. The concept of doing science is very important for developing process skills among learners .

BRIEF DESCRIPTION OF THE SCIENCE PROCESS SKILLS:

1. **OBSERVATION :-** The skill of observation is seen by Miller and Driver (1987) as an activity in which all the people young and old, engage in throughout their lives. It is said to be theory dependent in that what we see is dependent to some extent on the theories that we hold. They further aver that children's ability to observe involves the learning of a conceptual framework that identifies the elements of a complex situation that is scientifically worth observing .

   Learners are curious by nature. They observe and compared the things. Observational skill developed among learners by designing such activities where learners are required to observe stages like:

   - Use several senses while making observation.
   - Use aids for observation such as microscope, thermometer .
   - Make a number of observations.
   - Identify similarities and differences.

2. **HYPOTHESIZING:-** The learners may provide some plausible explanation for observation. Each student may provide a different explanation, these plausible explanations become hypothesis. Thus hypothesis is a statement put forward or attempt to explain some happening or features.

- Hypothesis suggests an explanation which is consistent with evidences.
- Previous knowledge is used in attempting an explanation .
- Hypothesis is only provisional .
- Hypothesis should be testable.

3. **PREDICTING :** Prediction proceeds investigation. It is an intelligent guess to what would happen type of questions .

- Prediction helps in planning the experiments .
- Prediction suggests what type of investigation is required to test hypothesis.
- Prediction is different from guess in that it makes use of scientific knowledge.

4. CONTROLLING VARIABLES:

Brotherton & Preece (1995) classify controlling variables as a basic science process skill. Controlling variables is the ability to recognize dependent and independent variables. In practical investigations, practical group is usually exposed to some treatment (the independent variable) while the control group is not exposed to the treatment.

5. GRAPHING:

McKenzie and Padilla (1986) defined graphs are an efficient and effective tool for making sense of the pile of information. Graphs are modes of representing quantitatives data and are important means of communicating scientific dataa Graph presents concepts in a concise manner, this displaying a wealth of information in a small space.

6. EXPERIMENTING:

Miller and Driver (1987) describe experimenting as an integrated process skill that include other process skills like observation, interpretation, planning and reporting. Integrated process skills are involved when learners conduct experiments. They formulate hypothesis, design experiments and makes a generalizations after collecting data. A central feature of experimentation is said to be the idea of control in order that possible alternate, interpretations of a situation may be eliminated.

7. INFERRING : Inferring is also a kind of guess based on subjective explanation for observations.

- Inferring is based on a number of observation
- It explains the observations.
- Uses scientific principles.

8. **COMMUNICATING:** Reporting the results of investigation and sharing with peers and others is important communication in science involves graph, chart, table, symbols.

- Discussing ideas among students orally and in written form.
- Recording observations while conducting experiments.
- Using graph, charts diagram, table to make communication meaningful.

LEARNING OF SCIENCE PROCESS SKILL AT SCHOOL:

The learning of Basic Science Process Skills:

Padilla and Pyle (1996) identified three steps that may be followed during the learning of basic science process skills namely brainstorming observation about an object or phenomenon, creating inferences based on observations and testing the inferences through simple experiments Padilla and Pyle (1996) found that for learners to observe more systematically, select some activities that will held their interest and let them perform on their own.

Dixon Adams and Hypes (2001) Identified the following steps that might be followed during the learning of the skill of controlling variables.

- Have the learners brainstorm to determine the factor that are involved in the investigation.

- Ask the learners how they might determine the set up of the investigation that would result in the maximum solution of the problem.
- Before begining the data collection have learners work in groups to identify the factors that they will keep constant and those that they will vary during their investigation.

THE LEARNING OF INTEGRATED SCIENCE PROCESS SKILL:

Integrated process skill are graphing, experimenting etc. The same consideration in the learning of basic science process skills are needed for the learning of the integrated science process skills.

Roth and Roychoudhary (1993) : described as an integrated process skill that involves transforming results in to standard form, graphing data, determining the accuracy of experimental data, defining and discussing limitation and assumption and explaining the relationship.

According to Kamii and Clark (1997). Integrated process skills may be developed and enhanced by using every day activities. They hold that learners should be encouraged to struggle with a problem and to debate it among themselves.

Assessment of Science Process Skills:

Swain (1989) defines a process skill as a series of connected actions, experience or changes; which go on internally with in a learner and can usually be demonstrated externally.

Tamir, Doran and Chye (1992: 265) Identified the assessment of the outcome of practical work as follows:

- Continuous assessment by the science teacher based on systematic observations and records.
- Evaluation of laboratory reports made by the learners on the bases of their laboratory experiences.
- Individual learner projects based on practical skills.
- Paper pencil test items pertaining to laboratory experience and related issues.
- Practical examination.

Practical test are administered individually or in groups, Individually administered tests involve a learner who performs the required tasks and an examiner who observes and assigns marks. Group practical tests involve learners. written responses to questions which are based on observations, measurement inferences, Hypothesis, classification and reasoning by the learners during the performance.

1.2 NEED AND IMPORTANCE OF THE STUDY

Science teaching does not mean passing on information only but is concerned with developing analytical, critical observation and problem solving abilities as well as the creativity of an individual. These abilities are less developed through traditional approach because in traditional approach practical and productive work does not find a prominent place.

Many research studies have been done concerning pupils achievement and performance. But very few researches have been made regarding process skill and achievement in the field of biology and this prompted the researcher to take up the present study of impact of laboratory approach on process skills and achievement.

1.3 STATEMENT OF THE PROBLEM:

The present study is entitled as: - " A study of the Impact of Laboratory Approach on Achievement and Process Skills in Science Among ix Standard Students".

1.4 OPERATIONAL DEFINITION OF THE TERMS:

Before proceeding further in any research the researcher should have a clear understanding of the problem. The problem selected for the study is impact of laboratory approach on process skills and achievement.

The terms such as achievement, process skill, laboratory approach, traditional approach needs special description, as these terms convey different meanings to different people. This may result in ambiguous understanding of the terms. Therefore, to overcome this problem, the researcher made an attempt to define the terms operationally so as to avoid confusion. In this study researcher has given the understanding of the terms.

Achievement:

Achievement is a general term for the successful attainment of some goal requiring -

1. a certain effect.
2. The degree of success attained in a test.
3. The result of a certain intellectual or physical activity defined according to individual and objective prerequisites.
4. Achievement is nothing but something accomplished successfully by means of exertion, skill, practice or perseverance.

PROCESS SKILLS: Process skills are the sequence or events that are engaged by researcher while taking part in scientific investigations. Process skill as a series of connected actions, experiences or changes which go on internally with in a learner and can usually be demonstrated externally. Process skills are important to formal presentation of science.

LABORATORY APPROACH: By this approach students make systematic use of science processes, develop concepts via questioning and require exercise of discretion.

TRADITIONAL APPROACH: Traditional approach is built on the assumption that there is a particular body of information that should be covered and mastered by the students. This approach in education is teacher and text book directed and designed for

generic students. Traditional approach contained different method like lecture, lecture cum demonstration etc.

1.5 OBJECTIVES OF THE STUDY:

For the purpose of direction to the study the present researcher has formulated following objectives:

1. To study the effect of laboratory approach on developing process skills among IX std. students.
2. To study the effect of laboratory approach on the achievement of IX std. students.
3. To study the effect of traditional approach on developing process skills among IX std. students.
4. To study the effect of traditional approach on the achievement of IX std. students.
5. To study the differences in process skills achieved through traditional and laboratory approach.

1.6 HYPOTHESIS OF THE STUDY:

1. There will be variation in process skills among IX std. students studied through laboratory and traditional approach.
2. The development of process skills through laboratory approach will be better than the development of process skill through traditional approach.
3. There will be variations in achievement between IX std. students studied through laboratory and traditional approach.

4. The achievement of IX std. students studied through laboratory approach will be better than the achievement of students studied through traditional approach.

1.7 DELIMITATION OF THE STUDY:

A. Spatiotemporal Limitation:

- The study has Spatial limitation because it confined Jaipur city only.
- The study has temporal limitation because it completed in a duration of 10 days.

B. Procedural Limitation:

- The study has a procedural limitation because the activities carried out through a selected laboratory and traditional approach.

C. Disciplinary Limitation:

- The study has disciplinary limitation because it conducted only in the field of Biological science.

D. Sampling Limitation:

- The study has a sampling limitation that it carried out only on 40 students of a single school.

1.8 STRUCTURE OF THE STUDY:

Present study is proposed to organize in to five chapter. This description is given below:

CHAPTER-1 : Chapter one is introductory in nature. It introduces problem. In this chapter objectives and hypothesis are presented. It mentions delimitation of the study also.

CHAPTER-2 : This chapter is meant for the review of related literature. This chapter provides foundation for the research problem.

CHAPTER-3 : Chapter third deals with the methodology of this study. Hence, the chapter delineates the tools administered for the study. It deals with research design, sample, tools used, data collection procedure and statistics used.

CHAPTER-4 : Chapter four intends for the analysis and interpretation of the obtained data.

CHAPTER-5 : Last chapter is of summary and conclusion. This chapter deals with major findings, conclusion and education implication of the study and also includes suggestion for further research.