CHAPTER I
INTRODUCTION

1.1 Context of the study
1.2 Need and significance of the study
1.3 Statement of the problem
1.4 Operational definitions of the terms
1.5 Objectives of the study
1.6 Hypotheses
1.7 Methodology in brief
1.8 Scope of the study
1.9 Format of the report
INTRODUCTION

1.1 Context of the Study

Education is widely acknowledged as a vital cultural action that enables individual to transform himself into a complete and integral human being. Education surely is an agency of social change, which transforms the society into a better place to live. The right kind of education is undoubtedly a stimulus to think, question and inquire into the truth of life and thereby refine and purify the human consciousness. It is the function of education to impart the right kind of knowledge, skills, attitudes and values to children so that they become harmonious in themselves and resourceful citizens playing their role effectively in the development of the nation.

In the modern competitive world in which academic achievements are considered important, scholastic backwardness causes tremendous stress for the students. In our pedagogical practices followed in the school, the teachers find it difficult to cater to the needs of the individual differences in the class room situations. The individual differences forming a group of heterogeneous group is a reality. Various factors such as physical, psychological and even socio-economic status of the learner may contribute to the individual differences. This individual differences is a challenge to every teacher however resourceful she may be. It is comparatively easy to interact with the average or above average students.
It is not unusual to find in our classroom many students who do not profit much from the usual classroom teaching mostly designed for the normal or averages. Among such children there may lie a group of children who have relatively a quite lower rate of learning than most of their classmates. They always lag behind in terms of catching the usual pace of the class and consequently suffer in terms of their educational progress and academic achievement. They are often seen to suffer from educational failure by playing truancy, repeating the class or leaving the school education in between as a drop out (Mangal, 2007). Characterised with their lower rate of learning and educational impoverishment, such children are labelled as backward children or slow learners.

Historically, the term slow learners is relatively a new term being used for the type of learners traditionally known as backward children. It was evolved and carried by the American educational psychologists for being used to a group of less able students with IQ between 70 and 85. In our country also we are making use of the term slow learners as an umbrella term covering fairly a large group of students whose rate of learning slowed down by one or more factors of which limited ability may be one. In this way backwardness in terms of rate of learning and academic performance of child in comparison to that of the classmates may be said as the main criterion for labelling a child as slow learner. There are so many causes underlying scholastic backwardness. But if we observe these factors we find that all the factors can be divided into two categories. They are internal factors such as low intelligence, learning
disability, attention deficit disorder and lack of motivation and external or environmental factors such as family adjustment issues, poor discipline, discordant environment in school, sibling rivalry and over expectation of parent etc.

Educationally backward or slow learners do not seem to differ much from the normal or average children in terms of their physical appearance, social and emotional behavior etc. It is difficult to test the general causes of backwardness as it is an individual problem and every individual problem is unique. But it is certain that the root of backwardness of a child must lie within him or outside him within the environment. Moreover it is also found that usually many factors or causes operate together in a particular case of backwardness.

Scholastic backwardness usually provides feelings of anxiety and inadequacy in children. This in turn can have negative impact on the emotional and social functioning of the child. Scholastic backwardness is mainly caused by learning disabilities. Apart from learning disability there are so many factors which provokes learning disability and ultimately leads to Scholastic backwardness. Unrecognized and unmediated Scholastic backwardness has a life long impact on the child affecting school completion or higher education, interpersonal relations etc. Early identification, early intervention and adequate remediation is important and can make a big difference to the child’s future.
Science and Technology of Science

“Science in fact is more than a subject: it is a method of acquiring knowledge” (Griggs, 1990).

The term “Science” (Scientia) is etymologically synonymous with knowledge, which of course does not imply that all knowledge is Science. In the literal sense, science means the pursuit of knowledge, but it has a wider connotation for our purpose and can be said to mean knowledge of nature in the widest possible form.

This is an age where all the modern society is completely drawn in to the Scientific environment and Science has become an integral part of our life. Thus knowledge in Science is necessary to lead a successful life and also to cope up with numerous problems in life. Report of the Education Commission (1964-66) has remarked “There is of course one thing about which we feel no doubt or hesitation: education, Science based and in coherence with Indian culture and values can alone provide the foundation and also the instrument for nation’s progress, security and welfare.”

According to Fitzpatrick (1960) “Science is a cumulative and endless series of empirical observations which result in the formation of concepts and theories with both concepts and theories being subject to modification in the light of further empirical observations. Science is both a body of knowledge and the process of acquiring it.”
According to Schlessinger (2000) “Science is a process of the human intellect. It is a way of thinking, a way of doing, a method of discovering new relationships in the physical and biological universe.”

These definitions emphasize three basic principles of the nature of Science. Science is an accumulated and systematized body of knowledge, the scientific method of enquiry and the Scientific attitude. The first point indicates the product of Science, while the second and third point indicate the process of Science. In other words, Science is both a product and process.

The two important dimensions of science in addition to the content or scientific knowledge are process of doing science and scientific attitude. The process of doing ‘Science’ are the science process skills that scientists use in the process of doing science. The Science Process Skills forms the foundations for scientific method. There are thirteen process skills, of which eight are basic skills and the rest five are integrated process skills.

There is a growing realisation among our curriculum planners, academics and educational administrators that our Science education at school level fail to fulfill its objectives. One of the most important suggestions in the report submitted to the Government of Kerala by the expert committee, constituted to review the new curriculum is that evaluation should be based on scientific theories. The new curriculum, as part of modernization of education system has made use of modern Psychological theories also. The most important among such theories are constructivism and enquiry learning, theory of multiple intelligences etc.
The contributions of modern educationists like Jean Piaget, Jerome S. Bruner and Vygotsky have a tremendous impact on all the different domains of learning (Joseph, 2004).

The progress, welfare and security of a nation depend on a rapid planned and sustained growth in the quality and extent of education and research in science. Science is universal and so can be its benefits. We are in a crucial stage in the progress of development and transformation. In this context, the role of Science is of utmost importance. Science education being an important component of the education system should contribute to the solution of the problems of the country by developing desirable understanding of skills, attitudes and values.

As part of the study of science, pupils have to develop the capacity to deal with the problems in his day to day life. It can be achieved only through his constant involvement with the process of science. Therefore a process oriented approach to science teaching and learning can serve the causes of science education. Science process skills enable primary students how to think scientifically by applying problem solving techniques to science lessons, while all primary lessons should incorporate process skills in discovering science concepts, teaching science process skills in primary grades will specifically help students retain science lessons longer. Using creative ideas to teach science processes like observing, classifying, predicting and inferring will help the students discover scientific concepts.
Scientific Creativity

Weisberg (1986) claimed that creativity occurs through a series of small steps in which earlier ideas are modified and elaborated. The nature of creativity occurs when the problem solver runs into further obstacles and then refines and elaborates the earlier solutions. Torrence (1978) defined creativity as “the process of sensing gaps or disturbing missing elements and communicating the result possibly modifying and retesting the hypothesis”. Creativity is a thinking and responding process that involves connecting with our previous experience, responding to stimulate and generating at least one unique combination. Researchers agree that creativity is the production of useful new products and ideas, ability to wonder, ability to solve problems, understanding the world around you, seeking solutions and ability to think. The central features of creativity are fluency, flexibility and originality.

- Fluency means the number of original ideas produced.
- Flexibility is the ability to ‘change track’ not to be bound by an established approach after that approach is found no longer to work efficiently.
- Originality can explained statistically: an answer which is rare, which occurs only occasionally in a given population, would be considered original.

Although creativity has been studied by the psychologists and researchers for many years, studies on ‘Scientific creativity’ and ‘Creativity of Scientists’ are rare (Liang, 2002). It is accepted that creativity is an
important aspect of scientific skills; problem solving, hypothesis formulation, experiment planning and technical innovation require a specific type of creativity peculiar to science.

Scientific creativity is defined by Moravesik (1981) as: “Scientific Creativity may be viewed as the attainment of new and novel steps in realizing the objectives of science. Scientific creativity can manifest itself in the conception of new ideas contributing to scientific knowledge itself, in the formulation of new experiments to probe natures’ law, in the development of scientific ideas applied to particular domains of practical interest, in the realization of new organizational features of scientific research and the scientific community, in the novel implementation of plans and blue prints for scientific activities in trail-blazing undertakings to transmit the scientific outlook into the public mind and in many other realms.”

Hu and Adey (2002) have defined the structure of creativity as below:

1. Scientific Creativity is different from artistic or linguistic creativity – Since it is concerned with creative Science experiments creative Scientific problem finding and solving.

2. Scientific Creativity is a kind of ability which includes intellectual factor.

3. Scientific Creativity depends on Scientific Knowledge and Scientific process skills.
4. Creativity and analytical intelligence are two different factors of a singular function originating from mental ability.

Additionally Mansfield and Buse (1981), addressed the five stages of scientific creativity in science fields:

1. The selection of problem sensitively
2. Extended effort to solve the problem.
3. Deciding and using experimental, methodological and cognitive skills.
4. Changing the decisions according to the hypotheses.
5. Verification and elaboration needs repeating the experiment.

In summary, the aspects of Scientific Creativity would be summarized as follows:- being sensitive to any problems, ability to produce new ideas which are technologically accepted, ability to wonder, understanding the world around, ability to problem solving, seeking solutions, designing experiments imagination, identifying difficulties, making predictions etc.

1.2. Need and significance of the study

Science education is an integral part of our school curriculum. The effectiveness of Science education to a very large extent depends upon the method of teaching and learning of Science. Science as a discipline has distinct nature and characteristics. Scientific theories, principles etc are the out come of the method of Science. More precisely, observation, classification, making hypothesis, verification, concept formation etc are
the important processes involved in the formulation of Scientific theories and principles.

An effective instructional strategy cannot overlook the distinct nature and characteristics of a discipline despite the pedagogical principles. The paramount importance of process in science learning cannot be over emphasized. Therefore any instructional design that fail to give due importance to this process component may not produce the desired results.

The National Curriculum Framework (NCERT, 2000) shares their concern in the poor quality of Science education in India. They also envisage a process oriented approach in the teaching of Science, Science teaching as process ensures the active involvement and participation of the learner through appropriate learning activity. This makes way for sense learning and consequently enhanced perceptual clarity and conceptual clarity. In this context it is relevant to appreciate the cognitive psychologist Bruner’s ideas on the conceptualization process and discovery learning. When a learner is involved in the process of Science, he is really constructing knowledge of his own (Dandapani, 2001).

Gagne’s ideas about the ‘process’ in Science help us develop a clear understanding of the same (Bhatt, 2003). Gagne’s explanation centres upon the idea that what is taught to children should resemble ‘What Scientists do’-the process that they carry out in their own Scientific activities. Generally all scientific activities involves observation, classification, measurement, making inferences, experimenting etc.

fact they are the process skills. So if a learner has acquired these process skills, he is independently able to initiate process in Science and understand scientific concepts by way of process approach. So an emphasis on process approach in the teaching and learning of Science may help significantly to minimize the prevalence of Scholastic Backwardness.

The investigator feels that the existing Scholastic Backwardness in science learning can be changed for the better by enabling the learner to practice process skills in Science learning. Literature review does not give studies on the science process skills of scholastically backward children. Whether this backwardness is because of their poor process skills is to be investigated. Moreover the relationship between Scholastic backwardness and various process skills is to be probed.

In the modern educational field creativity research has been given its due importance. Some researchers proved that highly intelligent person is highly creative (Rosamma, 2007). Some others opposed to this view and their findings proved that intelligence always do not promote creativity (Bindu, 1997). Usually researchers are interested in the study of creativity of normal children. But it is equally important and relevant to investigate in to the creativity aspects of children at risk. So it is necessary to find out whether slow learners in Science are creative or not. Scientific creativity plays a major role in science education. The research study findings may help to draw guidelines for the teachers to
stimulate the scientific creativity of the pupils. Hence the investigator finds it relevant to study the implications of creativity on slow learners.

1.3. Statement of the problem

Scientific discoveries and inventions are the end product of a long process such as observation, experimentations, inference etc. Therefore the most effective way of learning science is to help the learner to go through this process and involve in the construction of knowledge. But lack of process skills and creative ability stand in the way of construction of knowledge leading to Scholastic Backwardness in science. This investigation looks into the science process skills and scientific creativity of scholastically backward children. Hence the problem is stated as SCHOLASTIC BACKWARDNESS, SCIENCE PROCESS SKILLS AND SCIENTIFIC CREATIVITY OF UPPER PRIMARY STUDENTS.

1.4. Operational definitions of key terms

The keywords used in this study are Scholastic Backwardness, Science Process Skills, Scientific Creativity and Upper primary students. The researcher gives the following definitions for these words.

1.4.1 Scholastic Backwardness

Scholastic Backwardness refers to case where their educational attainment falls below the level of their natural abilities and grade level. In this study children with marks below 40% were considered as scholastically backward.
1.4.2 Science Process Skills

Science Process Skills are defined as those competencies involved in the process that are required to find out concepts and evidences in science and analyse them so as to reach meaningful conclusions.

Among the different process skill only five skills were selected for the present study. They are

1. Predicting
2. Classifying
3. Using number relations
4. Communicating
5. Inferring.

1.4.3 Scientific Creativity

The terms stands for various aspects of divergent thinking ability in science estimated through its accepted characteristics viz, measures of fluency, flexibility and originality and obtained using standardized test of Scientific Creativity.

1.4.4 Upper primary students

Students studying in Vth, VIth and VIIth standard of government and aided schools of Kerala

1.5. Objectives of the study

1. To identify the prevalence of Scholastic Backwardness in science among upper primary students.
2. To analyse the Scholastic Backwardness with respect to the extent of Science Process Skills.
3. To analyse the Scholastic Backwardness with respect to the level of Scientific Creativity.

4. To analyse the Scholastic Backwardness of upper primary students with respect to selected socio-demographic variables.

5. To find out the extent of Science Process Skills of children with Scholastic Backwardness.

6. To compare the various Science Process Skills of scholastically backward children.

7. To analyse the Science Process Skills with respect to the level of Scholastic Backwardness.

8. To analyse the Science Process Skills with respect to the level of Scientific Creativity.

9. To analyse the Science Process Skills of upper primary students with respect to selected Socio-demographic variables.

10. To find out the extent of Scientific Creativity of children with Scholastic Backwardness.

11. To study the Scientific Creativity of upper primary students with respect to the level of Scholastic Backwardness.

12. To analyse the Scientific Creativity of scholastically backward students with respect to the level of Science Process Skills.

13. To analyse the Scientific Creativity of scholastically backward upper primary students with respect to selected socio-demographic variables.

1.6. Hypotheses

1. Scholastic Backwardness of upper primary students do not differ significantly with respect to the difference in their science process skills.

2. Scholastic Backwardness of upper primary students do not differ significantly with respect to their level of scientific creativity.

3. Scholastic Backwardness of upper primary students do not differ significantly with respect to the difference in the socio-demographic variables.

4. There is no significant difference among the various Science Process Skills of scholastically backward students.

5. Science Process Skills of upper primary students do not differ significantly with respect to their level of Scholastic Backwardness.

6. There is no significant difference in the Science Process Skills of scholastically backward students with respect to their level of Scientific Creativity.

7. Science Process Skills of scholastically backward students do not differ significantly with respect to the difference in the socio-demographic variables.

8. Scientific Creativity of upper primary students do not differ significantly with respect to their Scholastic Backwardness in Science.
9. There is no significant difference in the Scientific Creativity of scholastically backward students with respect to their level of Science Process Skills.

10. Scientific Creativity of scholastically backward students do not differ significantly with respect to the difference in socio-demographic variables.

11. There is no significant relationship among Scholastic Backwardness, Science Process Skills and Scientific Creativity.

1.7. Methodology in brief

A descriptive study describes and interprets what is. It is concerned with conditions or relationships that exist, opinions that are held, process that are going on, effects that are evident or trends that are developing. It is primarily concerned with the present, although it often considers past events and influences as they relate to current conditions.

The survey method gathers data from a relatively large number of cases at a particular time. It is not concerned with characteristics of individuals as individuals. It is concerned with generalized statistics that result when data are abstracted from a number of individual cases. It is essentially cross-sectional.

In the present study descriptive method is used for the investigation in which normative survey technique is employed for the collection of relevant data.
This study is conducted on a random sample of 1243 students studying in V\textsuperscript{th}, VI\textsuperscript{th} and VII\textsuperscript{th} standards in the southern districts of Kerala namely Thiruvananthapuram, Kollam, Alappuzha and Pathanamthitta.

The tools used for the collection of data are:

1. General Data sheet
2. Science Process Skills Tests for V\textsuperscript{th}, VI\textsuperscript{th} and VII\textsuperscript{th} standards
3. Scientific Creativity Test for upper primary students
4. Ravens’ Coloured Progressive Matrices

The data collected were analysed using t-test, analysis of variance, and Least Significant Difference Test and Karl Pearson’s Product Moment Coefficient of Correlation.

1.8. Scope and limitations

The study is expected to make an assessment of prevalence of scholastic backwardness in upper primary students. It is expected to throw light on how lack of process skills hinders scholastic achievement in science. Based on the findings, strategies and different methodologies can be suggested to enhance the process skills of scholastically backward students giving attention to their specific needs. Although creative abilities are natural endowments, yet they are capable of being nourished and nurtured by training or education. This is possible in the case of scholastically backward students also to a certain extent. The findings of the study can be used for broadening and identifying different techniques for nurturing the creativity of scholastically backward students along with science education.
The study is expected to measure the level of Scientific Creativity of scholastically backward students. If the level of Scientific Creativity is not found up to the mark, ways and means can be suggested to enhance them. The result of the study may be applied for the improvement in science learning in the case of scholastically backward students with a corresponding enhancement in their level of Scientific Creativity and Science Process Skill development.

In spite of careful preparation and planning to make the present study as scientific as possible, certain limitations could not be avoided. The following limitations constraints the generalisations evolved from the present study.

1. The sample studied was limited to 1243 students from upper primary classes from four southern districts of Kerala.
2. In the present study the investigator has selected only five basic process skills since the sample is selected from upper primary level. From the psychological point of view, it is expected to develop the higher order integrated process skills only in the secondary level.
3. Classification of scholastically backward students in to different levels was done only on the basis of marks in the school records provided by the authorities.

1.9. Format of the report

The report consists of five chapters.

Chapter 1 contains the rationale for selecting the present problem, statement of objectives and hypotheses, brief outline of the
methodology and discussion on scope and limitation of the study.

Chapter II consists of the relevant background literature and abstracts of related research findings.

Chapter III provides a description of the design of the study which gives an account of the methodology in detail.

Chapter IV deals with the analysis of data and the interpretations of the results.

Chapter V provides the summary of the study, major findings, implications of the results and suggestions.