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INTRODUCTION

Today we are living in the age of science and technology; on the highest step of the ladder of civilization on which, the man has been ascending since the stone age. Now a days, life has become not possible for man without the help of science. Science is the most inexhaustible storehouse of knowledge. Modern science has developed as a springboard for the progress of mankind and enabled us to save time, shorten the distance and many more things in all spears of life. It has improved the conditions and quality of life. Therefore, in the present age of rapid scientific advancement, there is no need to justify the role of science in education, because the heart and soul of educational process is science itself.

Science is more related to life than any other subjects. The benefit of learning science is more helpful for the personal growth and development of the entire community. The use of science is to help the people in bettering the quality and standard of life. It is a fact that after independence, India has attained remarkable progress in various fields such as space sciences, telecommunications, information technology, defence and agriculture. To cope up with the new era of global competition, there is no other option but to reorient our education system, to be vibrant and dynamic, competitive, meaningful and relevant.
There is no doubt that development of any nation mostly depends on the role of efficient and enthusiastic Scientists, Engineers, Doctors etc. For this, it is the duty of the nation to create scientific temper and scientific consciousness among younger generation which would in turn help them to lead a better life in future according to the changing scenario of science and technology. To fulfill this goal, our educationists and policy planners included science as a compulsory subject right from the elementary stage itself. In order to establish a stronger theoretical basis for this statement let us have a glance towards the development of science education in India after Independence.

Science Education in India After Independence

In India, Science was not a school subject even in the beginning of 20th century. To improve the pathetic state of science in our country, Indian Science Congress was formed a few decades ago, but it could not make any suitable and appropriate changes in learning of science in schools. The Report of the Secondary Education Commission (1953) recommended the teaching of general science as a compulsory subject in the high schools and higher secondary schools.

In 1956, the All India Seminar on the teaching of science in secondary schools held at Tara Devi, Shimla Hills, analysed critically, almost all aspects regarding the inclusion of general science as a core subject upto higher secondary level. That was the initial step towards the inclusion of science in
school subjects, including selection of curriculum, identification of equipment and apparatus for learning of science, method of examination, teaching learning aids in science and other related learning materials viz., text books, science clubs, exhibition, science museum etc. It had also made a recommendation for a unique and uniform system of science learning for the entire country suited to its needs and local resources available.

It is a fact that the role of policymakers, administrators and parliamentarians in this regard is crucial for any developmental activities especially science and technology. As such their knowledge and information with respect to this area is inevitable. Hence, a committee was setup in August 1961 under the chairmanship of Late Shri Lal Bahadur Shastri to study the problem encountered in science education. The Committee made a solution to the problem of “Science Education in Schools” with a view to find out the relation between the policies and decision of the center and the states, and the courses offered in the schools.

In 1963, the U.S.S.R. experts under UNESCO Planning Mission visited India to study the feasibility of providing technical assistance on science projects. They made certain recommendations based on different issues of science education in secondary schools. These reports gave the total picture of the position of science and mathematics education in India and suggested various modalities for the improvement of science learning in schools.
As a follow up programme of the Report, a central science workshop was established under NCERT to produce prototypes of school equipment and to develop low-cost learning kits for the primary and the middle school stages.

In this connection, a conference of science education was held under the chairmanship of Dr. D.S. Kothari (1996) to plan an effective programme for the development of a total curriculum of science education for different stages. Moreover Indian Education Commission (1964-66) has also pointed out that our science education is in bad shape and it becomes worse if we fail to adapt with the explosion of knowledge. To meet this immediate threat, the commission recommended upgrading school curricula by research in curriculum development, the revision of the textbooks and teaching learning materials. Moreover, it recommended to include science as a compulsory subject as part of general education.

National Policy on Education (1968) examined the steps taken in this area of education in post independence India. It laid stress on the need for a radical reconstruction of the education system to improve its quality at all stages, and gave much attention to learning of science and technology, the cultivation of moral values and a closer relation between education and the life of the people.

As a follow up of the Kothari Commission Report (1964-66) the

The Union Minister of Education and Social Welfare (1977) appointed a Review Committee under the chairmanship of Shri Ishwarabhai, J. Patel to review the stage wise and subject wise objective identified in the NCERT document “The Curriculum for the 10 year school” and also to scrutinize the syllabus of NCERT and textbooks.

In January, 1985, the government of India announced that a New Education Policy would be formulated for the country. A comprehensive appraisal of the existing educational scene was made followed by a countrywide debate. The views and suggestions received from different quarters were carefully examined. As a result, a new National Policy on Education was formulated in 1986. The NPE set up under the chairmanship of Prof. Yashpal, stressed the importance of science education as well as inculcation of scientific temper for the improvement of science education.

Now most of the states have established State Councils of Educational Research and Training (SCERT) on the pattern of NCERT. In these states SCERT incorporates the functions of the State Institutes of Science Education (SISE)

SISEs have been set up in all the states with a view to improve the quality of science education in the schools. The major functions of these
institutes are to provide in-service training to equip the science teachers to update the changes occurred in the field of science education, prepare instructional materials in science, conduct research studies in science education of their respective states, provide guidance service in science to school, take up innovative programmes in science education and participate in the national science programmes.

To get these goals fulfilled, our state of Kerala, has also been conducting many science related programmes for the improvement of science education. These programmes include.

(1) Preparation of instructional materials
(2) Handbook for science teachers
(3) Research studies in science education
(4) Provide guidance service in science to schools and
(5) Provide opportunities to participate national and international science & developmental programmes.

In short, the views and suggestions made by various commissions like Mudaliar Commission (1953), UNESCO’s International Commission (1963), Kothari Commission (1996), etc have put forward pertinent implications in the improvement of science education in our country.

It is worth mentioning that the Education Commission (1964-66) have stressed the need for improving the quality and standard of science education.
“Science has added a new dimension to education and to its role in the life of a nation, but central to all this is the quality of education. If science is poorly taught and badly learnt, it is little more than burdening the mind with dead information and it would degenerate even into new superstition. What we desperately need is improvement in the standard and quality of science education at all levels in country”. Thus for ensuring the quality and standard of science education, we have to do a lot to attain the expected goal.

One of the major roles of learning science is to develop thinking process together with creativity so as to enable them to channalize their ability towards modern development which warrants the setting up of ample facilities and opportunities. But due to various reasons, we have not been able to provide these basic facilities properly so far. Another important goal of learning science in schools is to prepare and equip the students to face scientific as well as societal issues related to their day today life. Further they have to communicate effectively with others about science and scientific problems using their scientific knowledge. But the present system of imparting instructions to the pupils is only a mechanical transmission of contents and processes of science which leads to rote memory. The only solution for this burning problem is to provide ample facilities and conducive learning environment to the students so as to enable them to involve actively in scientific activities such as observation, experimentation, laboratory works etc. As such, our progressive educators like John Dewey, Maria Montessory,
Mahatma Gandhi and Jean Piaget stressed, activity methods, productive methods and experimental pedagogy than traditional method of education.

Thus it warrants that the learning of science must be in a positive approach and quality oriented. But majority of schools in Kerala even now following the traditional methods of teaching which result low achievement in science among our pupils. Moreover majority of our students is not seen capable to apply the knowledge gained through science in new situation or environment. To cope up with the modern developments and changes occurred, the method of learning process, particularly in science subjects, needs thorough investigation to identify the contributing factors related to science achievement among our secondary school pupils.

UNESCO's International Education Commission (1972) recommended that "Science and technology must become essential components in any educational enterprise; they must be incorporated into all educational activity intended for children, young people and adults, inroder to help the individual to control social energies as well as natural and productive ones, thereby achieving mastery over himself, his choices and actions and finally, they must help man to acquire a scientific turn of mind so that he becomes able to promote science without being enslaved by it".

Therefore, with its accelerating importance in our society, science has become an increasingly important part of general knowledge. The principle of
activity is the main basis of the learning of science and satisfies the instincts of curiosity, creativeness self-assertion, self expression etc. of the pupils. The attitude once developed in the student proves useful in later life of the child.

Dilip Thakore (2005) reports that science education in India faces the following three pertinent issues that are to be tackled to create scientific temper and creativity among our children.

(i) Science education is still, far from achieving the goal of equity enshrined in our constitution.

(ii) Science education in India, even at its best, develops competence but does not encourage inventiveness and creativity.

(iii) The examination oriented learning system.

But today the activities included in our teaching learning process has become an isolated one which does not encourage children to link knowledge with their life and environmental situations. So while teaching-learning process of science education, proper emphasis has to be provided to develop scientific interest and dispositions of mind rather than merely the transfer of factual subject matter.

One of the major concerns of science education is to prepare the students to adapt with the changing situations. Therefore, in this era of technology, the recent incorporation of new information technologies into our school curriculum offers science education an unprecedented opportunity to
reconsider traditional approaches to science learning. Unfortunately, it is a fact that the inclusion of technologies like computer, LCD etc. in science education does not create positive attitude and interest among pupils upto the desired level of expectations.

According to Jawaharlal Nehru “Science does not simply sit down and pray for things to happen, but seeks to find out why things happen. It experiments and tries again and again and sometimes fails and sometimes succeeds- and so bit by bit it adds to human knowledge”

Science is considered as an intellectual endeavour which consists of two parts namely, process and product. The ‘product approach’ implies the way of transferring knowledge established by the scientists to the students whereas ‘process approach’ stressed by Robert. M. Gagne (1985) includes the way scientists think and do when they solve any scientific problem. The process approach includes hypothesizing, observing, designing experiments, recording, analyzing data, informing etc. In addition to all this, it consists of an awareness of the values underlying science.

Thus learning of science may be amenable for development of the skills related to process of science along with products i.e., scientific knowledge. This is possible only involving the students in manipulation, observation, exploration, experimentation, interpretation, prediction etc. in science classes. Unless the students are involved in using processes of science
during gathering of knowledge, their leaning of science remains incomplete. Therefore, science instruction in our classrooms should be more activity oriented, instead of a theoretical one which might hamper student's Attitude towards Science and Interest in Science.

Even though the process method of learning science has been implementing in our schools, the scholastic achievement of the learners has not been seen considerable improvement due to various reasons. These may be due to certain gaps existing between theories and practice or lack of interest, aptitude and attitude on the part of the students or may be due to the socio-familial variations of the pupils. Various empirical studies have been seen attempted so far on different psychological factors, but nobody has studied the dominant factors responsible for the scholastic achievement in science, especially Biology. Hence it is proposed to investigate with a view to identify the factors responsible for the scholastic Achievement in Biology. Such a study will be helpful to predict the future performance of students in the learning of science especially Biology.

**NEED AND SIGNIFICANCE**

We are at the threshold of the 21st century. The world is devising innovative ways to usher in the new century. There is a wide knowledge explosion in science and new concepts are being added day by day. The innovations in the fields like communication technology, electronics, atomic
energy, computer science, genetic engineering, etc. made remarkable changes in the student's Aptitude, Attitude, Interest, Intelligence etc. needed for learning science.

To cope with the modern world of science and technology we need persons who have scientific Aptitude, Attitude and Interest to solve problems effectively. Research findings have shown that Science Aptitude is a major factor which determines the Achievement in Science. A student with high Aptitude in Science is expected to get high achievement in all the science subjects. In addition to Science Aptitude there are a number of factors affecting Science Achievement of secondary school pupils like Attitude towards Science, interest in learning science, I.Q. etc. Children are considered as the richest national resources. Therefore, it is necessary to identify their Aptitude in Science, Attitude towards Science, I.Q., their Interest in learning science and also S.E.S. of the students when they are learning in school itself. The identification of these factors will help us to nurture these potentialities responsible for the development of scientific temper, attitude and interest towards science among our school children so as to enable them to acquire more and more sophisticated principles and theories related to science.

Now a days, the trend of science education in India, especially in Kerala is that more emphasis is being given to the student's Achievement in science, while totally neglecting the dimensions like Attitude towards
Science, Interest in Learning Science, Aptitude towards Science, etc. which are the most important factors that determine the achievement in science.

Therefore, it is high time to focus on some progressive steps which would be able to awaken curiosity, interest, Attitude towards Science etc. amongst the learners. But the present teaching learning process is geared towards rote memory without providing practical knowledge. The students are not motivated to learn systematically. Hence it is proposed to study the key factors responsible for the Achievement in Biology and also to suggest some remedial measures to boost these factors responsible for high Achievement in Biology.

Additional reasons that have led to the conduct of the present study are the following:

(1) Being a Biology teacher and teacher educator for the last four years, the investigator has opportunities to observe that majority of the pupils who are talented in science is not seen scoring high marks in science especially in Biology. This may be due to various reasons. Hence the investigator proposed to conduct a study to identify the reasons for not scoring higher marks in science. The investigator earnestly believes that the findings thus emerged will be highly useful and beneficial to educationists, planners and administrators, while framing curriculum in science subjects especially for Biology in future.
It is considered that the factors which differentiate high achievers from low achievers in different school subjects could be different. The investigator felt that she should take up the challenge to conduct a study to identify the different factors responsible for low and high achievers in Biology and hence the investigator made an attempt to conduct an analytical study of some select correlates of Biology Achievement among secondary school pupils.

STATEMENT OF THE PROBLEM

The study is entitled as “AN ANALYTICAL STUDY OF SOME SELECT CORRELATES OF BIOLOGY ACHIEVEMENT AMONG SECONDARY SCHOOL PUPILS”.

DEFINITION OF THE KEY TERMS

The key terms of the title are defined below for their operational meaning in the study and hence for a better perspective of the study.

Analytical Study: According to Carter, V. Good (1968) analytical study is the purposeful mental activity involving breaking down a problem in to its elements or logical parts.

In the present study, the term analytical study denotes to identify the factors responsible for the prediction of Achievement in Biology.

Correlates: The word ‘correlate’ is defined as “a variable which is correlated with a specified variable” (Wolman, 1975).
Biology Achievement: Refers to the performance in school in a standardized test of Biology. In the present study, the achievement of pupils includes the marks obtained by the pupils in scholastic achievement of Biology.

Secondary School Pupils: Secondary school pupils are those pupils who are studying in standards VIII, IX and X. In this study, IX Std, Malayalam medium schools were considered as the representatives of secondary school pupils.

VARIABLES OF THE STUDY

The study is designed with achievement in Biology as the dependent variable and the below listed psychological variables as independent variables.

The independent variables of the study are the following:

1) Science Aptitude
2) Attitude Towards Science
3) Science Interest
4) Intelligence
5) Socio-Economic Status of the Pupils

OBJECTIVES

1. To examine the significant effect of each of the select correlates on Achievement in Biology among secondary school pupils, for the Total and subsamples viz., Sex, Locale and Type of Management.
2. To find out the relationship of each of the select correlates with Achievement in Biology among secondary school pupils separately for the total and subsamples.

3. To identify the most significant correlates for predicting Achievement in Biology among secondary school pupils.

HYPOTHESES

Based on the objectives, the following hypotheses were formulated for the study:

1) There will be significant effect of each of the select correlates on Achievement in Biology among secondary school pupils.

2) There will be significant difference in the relationship of each of select correlates with Achievement in Biology among secondary school pupils.

3) There will be most significant correlates for predicting Achievement in Biology among secondary school pupils.

METHODOLOGY

(i) Sample:

The study was conducted on a sample of 600 secondary school pupils of Kerala. The sample was selected from 13 secondary schools of five districts of Kerala by using stratified sampling technique.
(ii) Tools:

The tools used for the study are the following:

1. Achievement Test in Biology for Standard IX pupils (constructed and standardized by the investigator)
2. Science Aptitude Test (developed by the investigator, 1998)
3. Scale of Attitude towards Science (prepared and standardized by the investigator)
4. Science Interest Inventory (constructed and standardized by the investigator)
5. Verbal Group Test of Intelligence (Sudheeshkumar, Hameed and Prasanna, 1997)
6. Socio-Economic Status Scale developed by Kuppuswamy and modified by Pillai and Subrahmanyanadas.

STATISTICAL TECHNIQUES USED

Major statistical techniques used for the analysis of data are the following:

1. ANOVA
2. Correlation Analysis
3. Multiple Regression Analysis

SCOPE AND LIMITATIONS OF THE STUDY

The present study is on some select correlates of Biology Achievement
of secondary school pupils. The relationship of Achievement in Biology with each of the select correlates are studied in terms of Pearson’s r and its interpretations disclose the extent to which Achievement in Biology is determined by the select correlates.

The sample for the study is a representative group of secondary school pupils drawn by the stratified sampling technique from 13 secondary schools of 5 districts of Kerala. The investigator hopes that the findings of the present study are valid and are generalizable to a considerable extent.

LIMITATIONS:

The purpose of the study is to identify the factors responsible for the prediction of Achievement in Biology of secondary school pupils of Kerala. But the sample studied for identifying the factors was chosen from only 5 districts out of 14 districts of Kerala. But the psychological and socio-economic conditions of pupils of all the districts are more or less the same, it is considered that the data collected is valid and reliable and hence limited to five districts only.

Though ‘secondary school pupils’ comprise of standards VIII, IX and X, the study was limited to students of standard IX only assuming that it is the representative of three standards.

In the present study, only five psychological variables viz., Science Aptitude, Attitude towards Science, Science Interest, Intelligence and SES
were selected. Other psychological variables may also influence the Achievement in Biology. But the variables included in the present investigation are the major components which influence achievement in Biology. Hence it is considered that the variables included for the study are the contributing factors for scholastic achievement and hence limited the variables.

These limitations are quite natural and are not amenable to bias the findings of the study. Therefore, the investigator earnestly believes that the findings of the present study may be a valuable contribution to the theory and practice of education in the field.

ORGANIZATION OF THE REPORT

The report of the study is organized in five chapters.

Chapter I presents the need and significance of the study, statement of the problem, definition of key terms, variables, objectives, hypotheses, methodology, scope and limitations of the study.

Chapter II consists of two sections. The first section contains a theoretical overview of some select psychological variables of the present study. The second section is a detailed review on the relation of select psychological variables with Academic Achievement.

Chapter III presents the methodology used for the study in detail. This chapter comprises description of variables, tools used for the collection of
data, sample used, data collection procedure and the statistical techniques used for the analysis.

Chapter IV deals with the analysis of the data in detail. Apart from the hypotheses and preliminary analysis of the data, this chapter presents the results of One-Way Analysis of Variance, Correlation Analysis and Multiple Regression Analysis.

Chapter V deals with the major findings, conclusions drawn recommendations and educational implications of the findings and suggestions for further research in the area.