CHAPTER ONE

INTRODUCTION

When the first man appeared a few million years ago he had almost learn to everything. He began roaming to learn around the world. He has depended much on animals and plants for his existence. He lived in caves and on trees. He started living, for reasons of safety and started establishing families. He invented fire which provided him safety from wild animals and helped him in the process of cooking food.

The dependence on plants and animals goes on increasing. He started examining the world in order to discover which could be utilized for food, shelter and clothing, which plant could be used for curing the disease and which type could be used for work. Slowly, these activities formed the culture, and such cultures came into existence in different age in various part of the world. Those which developed into the earliest civilizations, in the basins of great rivers – the Nile, the Euphrates with Tigris, and the Indus, are respectively the Egyptian, the Sumerian, and the Aryan, Indus, Sindu, Hindu.

Knowledge developed further with the discovery of means of expression and communication, first in the form of pictorial writings and then in the form of different languages. The term knowledge has been called in different ways in different parts of the world, wherever the pursuit of knowledge became a human activity.
1.1 WHAT IS SCIENCE?

The world Science has its origin from a Latin word ‘Scientia’ meaning ‘to know’. Science in universal but has been defined in the different ways, e.g.

“Science is a systematized body of knowledge.”

“Science is nothing but organized common sense.”

“Science is a heap of truth.”

John Woodburn and E. O. Obourn consider science as that human endeavour that seeks to describe with even increasing accuracy, the events and circumstances which occur or exist within our natural environment.

The definition of Science found in report on Policies for Science Education is ‘Science is a cumulative and endless series of empirical observations which result in the formation of concepts and theories, with both concept and theories being subject to modification in light of further empirical observations. Science in both a body of knowledge and the process of acquiring and refining knowledge.

Thus Science is simultaneously a body of knowledge and continuous, self evaluative process of enquiry.

(a) Science as a Product.

(b) Science as a Process.

Various laws, theories, principles etc. are included in the category of science as a product where as scientific attitude, aptitude, scientific method, accurate and precise description, classification, repetition, consensus, experimentation,
measurement etc. form part of science as a process though both aspects are important in their own way to attain the aims of science education in schools.

Science is not just the information presented but also the way in which that information has been collected. While scientific knowledge should be testable and falsifiable, the way in which such information has been gathered is also important. Science should be unbiased and experiments should be repeatable by different individuals. There are different philosophers who argue on the way science proceeds.

1.2 IMPACT OF SCIENCE ON MODERN LIVING

Science has revolutionized our life style and also brought about tremendous changes in our way of thinking, attitude, outlook etc. The effect of science is visible all round us. Science has brought about a change in such important aspects as health, communication, transportation, power etc. It can now be said without any hesitation that we owe our very existence to science the average span of human life has been doubled.

These effects of science on Agriculture, Health, Industry, Modern Civilization and Democracy can be summarized as follows:

1.2.1 Impact of Science on Agriculture

“Green Revolution” was possible only because of science. Science mechanized agriculture and ‘green revolution’ was possible only because of such a mechanized farming. By mechanized farming and making use of tools invented by science we can now carry out various agricultural works such as ploughing, sowing, reaping, harvesting etc. The different type of bio-fertilizers
makes the lands fertile and it increases the yield of crops. The increase in yields of various agricultural products has been made possible by use of scientific techniques for saving the destruction of crops by harmful insects. For prevention of crops from such insects we make use of pesticides and insecticides discovered by scientists. A spray of these insecticides at a proper time helps to increase the crop yield. Presently nuclear energy is also used for obtaining high yields of some commercial crops.

1.2.2 Impact of science on health

Science has contributed a lot in the maintenance and improvement of our health. It helps us in diagnosis, treatment, prevention of various diseases. It is only due to science that we have prevented the human society of contagious diseases and epidemics for his we make use of various preventive techniques such as vaccination, inoculation, surgical operations etc. We have become health conscious because science has provided us guidance in the fields of hygiene and sanitation, diet, physical exercises etc.

1.2.3 Impact of Science on Industry

Modern Industries depends to a large extent on the discoveries of Science. Such discoveries have brought about drastic changes in the ways and processes of industry. The progress in science has made the difficult tasks easier by use of machines. In Industrially advanced countries the different tasks are performed by machines and human beings are required only to operate machines. Automatic machines carry out various tasks such as yarn production weaving and giving a finish etc. In textile Industry, science by brought about major revolutions in various industries including printing
industry, radio and television industry, pharmaceuticals, agriculture, armament industry etc.

1.2.4 Impact of Science on Modern Civilization

Modern Civilization owes its existence to science and can be easily called scientific civilization. Various advances in fields of agriculture, medicines, cosmetics, transport, communication etc. have affected our way of living and the modern civilization is due to the effect of such changes in our behavior. Science has helped us to overcome the age old taboos of superstitions and we find that a large number of unfounded beliefs have faded away. Science has also contributed a lot in the removal of illiteracy and ignorance. It has also brought about a change in our attitude towards religion, marriage, birth control etc.

1.2.5 Impact of Science on Democracy

It is the change in our attitude which has been brought about by science that we have developed the qualities of a good citizen for democracy. Science helps us to develop an outlook for receiving new ideas and to have a capacity for clear thinking. Science also develops in us zeal to work for the service of mankind and also to respect the views of others. It also develops our intellectual integrity. These are the very qualities which are expected from an individual. The knowledge of science helps an individual to find useful methods for checking the bias.

The ideas developed in an individual are the very basic foundations of democracy.
1.3 PLACE OF SCIENCE IN SCHOOL CURRICULUM

Science is considered as an important subject in school curriculums because the man’s future depends to a large extent on scientific advances and development productive activity.

The International Congress on Science and Technology Education convened by United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1981 made numerous recommendations for UNESCO’s future role in this broad field of activity.

With the funds provided by UNESCO studies were carried out regarding the place of science in curriculum in various countries. Following generalization was made.

1.3.1 Africa

The data was provided by 21 countries of the region. It was found that in ‘primary’ classes in most of these countries time was allotted for teaching of science. The time allotted per week varied from 1 hour to 4.5 hours. Most of the countries adopted integrated approach for teaching of science. In middle classes also science forms a part of the curriculum and in secondary classes general science is a permitted alternative to integrated science.

General Science includes topics from Physics, Chemistry and Biology and whereas integrated course includes Elements of Astronomy, Geology, Agricultural Science, Home Science and Economics in addition to Physics, Chemistry and Biology.
1.3.2 Arab States

Ten countries of the region were surveyed. All countries put Science firmly on time taste of all grades from 1 to 6. The time allotted per week for science varies, between 1 to 3.5 hours. At ‘intermediate’ and secondary level courses in integrated science are provided and for classes 7, 8, 9 generally 2 hours per week are allotted. In grades 10, 11 and 12 these are taught as separate subjects and 2 hours per week is allotted for each subject.

1.3.3 Asia and the Pacific

Seventeen countries of the region including India participated in survey. In almost every country, a course in integrated science is the one most favoured in the early secondary school years. The three traditional science disciplines Physics, Chemistry and Biology are almost invariably on offer as optional courses during the late secondary school years.

In India through the efforts of National Council of Educational Research and Training (NCERT) science has been made a compulsory subject throughout the school stage. In this connection Kothari Commission and UNESCO’s International Commission on the development of Education.

1.4 VIEWS OF KOTHARI COMMISSION

Kothari Commission was given the task of suggesting necessary improvements in educational system of the country. It worked during the years 1964-1966 and made a detailed study of educational system in India. It suggested various changes for improvement of education in India. The commission suggested that great emphasis be laid on science education and
that science be made a compulsory subject of the school curriculum. Kothari
Commissions report made the point clear.

“We lay great emphasis on making science an important element in the
school curriculum. We therefore, recommend that Science and Mathematics
should be taught on compulsory basis to all pupils as a part of general
education during the first ten years of schooling. In addition, there should be
provision of special course in these subjects at the secondary stage, for pupils
of more than average ability.”¹

1.5 UNESCO’S INTERNATIONAL EDUCATION COMMISSION

The recommendations made by UNESCO’S International Commission
in 1972 are quite similar to those made by Kothari Commission (1964-66) in
India.

The recommendation made by UNESCO’s International Commission
about teaching of Science and Technology are as under:

“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, in order to help the individual
to control social energies as well as natural and productive ones there by
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.”²

(1966), New Delhi. Ministry of Education, Govt.of India.
1.6 VALUES OF SCIENCE IN EVERY DAY LIFE

Present age is known as the age of science and so science is considered an important subject in the school curriculum. In this era of science larger numbers of people are being employed in scientific pursuits and for this they need knowledge of science. The dawn of space age and explosion in knowledge have also necessitated the teaching of science to every pupil.

Science teaching in schools can and should make a difference in the lives of children and the difference will be on the positive side of the educational ladder.

Galileo Galilei once said that in questions of science ‘the authority of a thousand is not worth the humble reasoning of a single individual.’ While learning science, the learner develops certain faculties through reasoning and experimentation which no other subject can provide.

Science education is essential as it is of immense value in the student’s individual life as also his life in society. Science education is important due to the following reasons.

1.6.1 Intellectual Value.

Considering science from the intellectual point of view, it is the most inexhaustible storehouse of knowledge. Science along with being a content of knowledge is a method of acquiring knowledge. Scientific knowledge helps to sharpen our intellect and promotes intellectual honesty. It helps us to report about things and events without any bias. It makes us quite systematic in our
reasoning. It helps us in acquiring the strength of face hardship and failures because the pursuit of science requires diligence and patience. The science education can develop the positive attitudes like open mindedness, reasoning etc. Such a positive attitude is quite helpful to an individual to understand, evaluate and solve many a social problems be in life and helps him to lead a happy, successful and satisfying life.

1.6.2 Vocational value

In the present age we do not find any vocation that does not need the knowledge of science more ever there are a large number of vocations for which study by science is a primary requirement, e.g. Medicines, Engineering, Agriculture, Para medicines, Computers etc. It thus becomes quite clear that to enter into any such vocational course an individual must have knowledge of science and so the science education must be included in the school curriculum. In this age of science if we wish to prepare an individual for certain vocation it is essential that he be given a good education in science.

1.6.3 Aesthetic Value

Knowledge of science develops in man a passion for truth and thus he has a passion for beauty. The English poet Keats has said, “Truth is Beauty.” Science is basically unfolding of mysteries of nature and nature is a store house of all the beautiful things. Thus we find that teaching of science of essential for developing an aesthetic sense in an individual. By enjoying the aesthetic aspects of his discoveries and inventions the scientist feel an intrinsic charm.
1.6.4 Practical Value

Scientific Principles and laws find a large number of applications in our everyday life. For proper utility of such applications same knowledge of science is necessary. At present we depend on scientific discoveries to a very large extent. Even a cursory and casual look around us shows a lot of applications of science, for example electricity, electronics, communication, transport etc. We find that mobile telephone computer has revolutionized the commercial world and has a profound effect on the market in general and stock market in particular. It has enabled us to talk to our friends or relatives sitting in remote corners of the world or even when they are a passenger on a liner and are in mid sea.

The most important practical value of science is felt in the world of medicine and health. Science has discovered a large number of new medicines which are used to care such diseases which were considered as incurable only a few decades ago. It has also given us new methods for prevention of diseases and we have been able to stop epidemics taking away a large number of human lives some contiguous diseases have been completely eradicated and science has reduced the miseries of humanity and lengthened the average life of ordinary persons.

Science has provided us with a large number of devices such as computer, television, radio, cinema etc. which are a source of entertainment to all of us. These are also a source of knowledge and are used for spread of mass education and making the community aware of dangers of various ills. These devices are also used for eradication of various social evils. The
knowledge of science has also been found to a person whose hobby is gardening. Such a person will enjoy his hobby and will be benefitted more if he knows something about plant breeding, soil physics, chemical, bio-fertilizer etc.

1.6.5 Psychological Value

Teaching of science is essential for developing scientific attitudes and scientific temper. Science helps us to develop positive attitude such as open mindedness, reasoning etc. the learning of science is based on the fundamental principles of psychology i.e. ‘learning by doing’, ‘leaning by observing concrete and living specimen’s. Being an activity oriented subject science helps to satisfy basic human desire of knowing about wonders of nature and so it satisfied common instincts as creativeness, self assertion, curiosity etc.

1.6.6 Cultural Value

Science has made a tremendous impact on the cultural life of the present day society which is a product of science. The thinking, feeling and actions of a modern man are practically guided by the effects of science. There is an involvement of science, direct or indirect, in all works as well as leisure of a modern man. Our habits and attitudes have also been affected by science.

The study of science brings behavioural change in the learner and enriches his character and personality. Science is a subject where ideas can be experimented upon and verified. The learner develops the habits of
searching for the truth. These qualities affect the pattern of behavior of the learner. The significant aspect of science is that whatever the student learns has immediate application in the world around him. This is educationally very sound.

In society, there will always be problems to be solved. One of the very useful outcomes of learning science is the development of science; the pupil can apply this skill to solve problems in his personal or social life. A knowledge of science develops in as a capacity for creative thinking and constructive imagination. The power of imagination is essential for proper solutions of various problems we actually face in our life.

1.6.7 Adjustment in Modern Life.

Science develops in as a scientific attitude. It also develops, in an individual a specific procedure for attacking any problem. Such a specific procedure is called ‘Scientific Method’. Such a method prepares an individual to face the problems of the life boldly and to solve them successfully. A person having scientific attitude has an open mind, a desire for accurate knowledge and a confidence to solve a problem using his sense of reasoning. A person having scientific attitude lives a peaceful and successful life.

1.6.8 Moral Value

Science develops in us truthfulness and reasoning. These are very important qualities which are desirable in all human beings. These qualities make the life worth living though they have lost their value in today’s materialistic world. The study of science brings behavioural change in the
learner and enriches his character and personality. The learner develops the habit of searching for the truth. These qualities affect the pattern of behavior of the learner.

The study of the scientist’s way of discovery is more interesting. It gives the learners an opportunity to grasp the essential steps of scientific method or procedure. For example, the story of the discovery of the Laws of Gravity by Sir Isaac Newton or the story of the discovery of the cause of malaria by Sir Ronald Ross will help to make the meaning of science clear. It is useful to give the pupils, the idea how scientists sacrifice their personal comfort for the good of society. Broad mindedness and selfless service to mankind are characteristics of their lives.

Further, science as a subject has three very important Virtues peculiar to it. The study of science imparts training in scientific method and develops scientific attitude and scientific aptitude in the learners. These qualities, viz. scientific method, scientific attitude and scientific aptitude are major aspects to quality an individual to live as any efficient citizen in the present day scientific society.

1.7 APTITUDE

The term aptitude is differently defined by different psychologist, as many cases do happen, but these different definitions agree in certain essentials such as ‘present ability.’

Aptitude: According to the Oxford English Dictionary – the aptitude means the quality of being fit for a purpose or position or suited to general
requirements, fitness, suitableness, appropriateness, etc. aptitude is a set of characteristics which is indicative of the capacity to develop. The term aptitude is usually reserved for denoting potential for specific and restricted proficiencies, unlike intelligence which as prognostic of overall general proficiency, Aptitude is only a set of psychological characteristics that is indicative of future accomplishment, possible, only with appropriate training. The present level of attainment in a specific task therefore is not an index of the aptitude. Musical aptitude of a person, of example cannot be judged reliably from his present level of accomplishment in singing. It is better judged by the person’s unlearned memory, timbre, intensity, pitch and rhythm etc. Performance scores of the individual on tests of their dimension in future. Musical aptitude, mechanical aptitude, neuromuscular co-ordination, scientific aptitude, etc. According to dictionary of education by R. P. Taneja,³ aptitude refers to acquired skills or ability that is assumed to underlie, and is conducive to, and individuals capacity to learn and attain a level of achievement in a specific field. In the Dictionary of Education⁴ (Good, 1959), aptitude is defined as a ‘pronounced innate capacity for or ability in a given line of endeavour such as a particular art, school subject or vocation.’ Thus in this definition an aptitude refers to an individuals in born capacities or potentialities which are indicative of some special abilities. According to English and English (1958) it may be regarded as ‘the capacity to acquire proficiency with a given amount of training.’ Aptitude in Great Illustrated Dictionary⁵ (1989) is defined as a natural talent, skill or ability, quickness in learning and understanding. In the

above two definitions it has been emphasized that an aptitude refers to the capacity of an individual to be skilled in some work receiving formal or informal training.

An aptitude is an innate component of a competency (the other being knowledge, understanding, learned or acquired abilities skills and attitudes) to do a certain kind of work at a certain level. Aptitude may be physical or mental. The innate nature of aptitude is in contrast to achievement, which represents knowledge or ability that is gained.\(^6\)

A natural or acquired deposition or capacity for a particular purposed or tendency to a particular action or effect, as oil has an aptitude to burn; Readiness in learning; docility; aptness. A general fitness or suitableness, adaptation.

Aptitude is a person’s ability acquired or innate, to learn or develop knowledge or a skill in some specific area (Singh, 1987)\(^7\). Often we find the people who have some special abilities or potentialities which enable them to do well in certain fields of activity. Such people have special types of aptitude and therefore, they are able to learn and acquire the necessary skill in a specialized field. They are also interested in such activities as are of their liking, further success or achievement in a given field of knowledge or activity depends to a great extent upon attitude and interests.

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\(^6\) U. C. Devis, Standardized tests: Mental ability.

Bingham,\textsuperscript{8} (1987). “Aptitude is a condition symptomatic of a person general fitness of which one aspect is his readiness to acquire proficiency, his general ability and another is his readiness to develop an interest in exercising the ability.”

Traxler,\textsuperscript{9} (1957) – Aptitude is a condition, a quality or a set of qualities in an individual which is indicative of the probable extent to which he will be able to acquire under suitable training, some knowledge, skill or composite of knowledge, understanding and skill, such as ability to contribute to art or music, mechanical ability, mathematical ability or ability to read and speak a foreign language.

Freeman\textsuperscript{10} (1965) has defined an aptitude as a combination of characteristics indicative of an individual capacity to acquire some specific knowledge, skill or set of organized responses such as the ability to speak a language, to become a musician, to do mechanical work. Freeman has also pointed out that the aptitude is different from skill and proficiency. Freeman has further stated that ‘When we speak of an individual’s aptitude for a given type of activity we mean the capacity to acquire proficiency under as revealed by his performance on selected tests that have predictive value.’ In the other words the most important factor is an aptitude i.e. the capacity to acquire proficiency. On the other hand, if an individual has no aptitude for a particular type of task, he will not be skilled or proficient in that task in spite of training given to him. These aptitudes refer to an individual’s inborn capacity to acquire proficiency in a given area of human endeavour. The aptitude is a


\textsuperscript{9} S. K. Mangal (2008), \textit{Educational Psychology}, New Delhi, PHI Learning Pvt.Ltd. p. 382.

\textsuperscript{10} Ibid.
capacity in any given skill or field of knowledge, on the basis of which a prediction may be made regarding the amount of improvement which further training, might effect. According to New Lexicon Webster’s Dictionary of the English language Aptitude – a natural talent, ability to learn easily and quickly a set of factor which can be assessed and which show what occupation a person is probably best suited to.

The American college dictionary defines the Aptitude natural tendency or acquired inclination, both capacity and propensity for certain course. Readiness in learning, intelligence, talent, state or quality of being, special fitness.

Majority of the psychologist agree on the point that the aptitudes are innate. In spite of it is also realized that aptitude are influenced by the environment in which the individual lives. In other words, though aptitudes are innate and mostly governed by hereditary factors, yet environmental factors also play an important role. The biological and cultural factors are involved in all psychological activities of an individual.

The aptitude is fairly constant for a period of time. Variations occur within the fame work of environmental factors as it is generally believed that aptitudes like ‘Intelligent Quotient’ are constant. But according to Wrightone, et-al (1956) ‘While the evidence is conflicting the trend seems to be in the direction of assuming that aptitude are some what variable and are affected within limits by educational and environmental influences.’
An educator has first considered aptitude as unitary i.e. a function of a single trait or characteristic. But factor analytic technique indicates that an aptitude need not necessarily be the function of a single general trait.

T. L. Kelly (1928) identified verbal, numerical, spatial, motor, musical, social and mechanical, and verbal influence, number memory, spatial, reasoning, deduction and induction abilities which were indicative of pluralistic aptitude (Jayaswal, 1968).

1.8 APPLICATION OF APTITUDE TEST

Aptitude tests have a wide area of application. Firstly, they are backbone of the guidance services. The results of these tests enable us to locate, with a reasonable degree of certainly, the fields of activity in which an individual is most or least likely to be successful. Therefore, these tests are found to be very useful in guiding the youngsters in the selection of special courses of instruction, fields of activities and vocations.

Secondly, they can be safely used for the purpose of educational and vocational selection. They help us in making scientific selection of the candidates for the various educational and professional courses as well as for the specialized jobs as Munn put it, “The chief value of aptitude testing is, in fact, that it enables us to pick out from those who do not yet have the ability to perform certain skills, these who, with a reasonable amount of training, will be most likely to acquire the skills in question and acquire them to desirable level of proficiency.” 11

Therefore, aptitude tests properly anticipate the future potentialities or capacities of an individual and thereby, help us in making selection of those individuals who are best fitted for particular profession and course of instruction or those who are likely to be more benefitted by professional training or experiences.

Therefore, any reasonable guidance and counseling programme or the entrance examination to specialized, academic and professional courses or the selection procedure for specialized jobs is required to give a proper weightage to Aptitude testing.

Aptitude tests provide information about an individual's knowledge, skill, abilities and other characteristics that are useful for predicting school performance and personnel decisions, such as admission, hiring, placement, promotion, training, career counseling, and succession planning.

In education settings, administrators, teachers, school psychologists, and career counselor use test to make a variety of educational decisions. Career aptitude tests are given to high school pupils as vocational or Career guidance to help them make reasonable career choice according to their personal traits and the needs of society. Colleges and Universities also use aptitude tests to predict the academic achievement of a candidate to facilitate admission decisions. Examples like the Scholastic Aptitude Test (SAT) and the Graduate Record Examination (GRE)

Companies and governments are aptitude tests to determine whether an individual has the skills that are necessary to perform a particular job and whether the job and applicant are well matched. Aptitude test can also be
used to identify employee strengths and performance capabilities, opportunities for development and ultimately to determine their training needs.

Aptitude may be broadly classified as sensory mechanical, artistic and scholastic aptitudes. All these types of aptitude can be measure with help of the suitably designed as well as standardized aptitude tests like we measure intelligence through intelligence tests.

1.9 SCIENTIFIC APTITUDE

Scientific Aptitude is complex of interacting hereditary and environmental determinants producing predisposition or abilities. We can identify to an extent, certain, not all, characteristics possessed by individuals who succeed later in scientific endeavour. Dressel (1963) defines ‘Scientific Aptitude as potentiality for future accomplishment in science without regard to past training and achievement.

‘Scientific Aptitude is presumably largely an intellectual matter and it seems that a battery of test for the selection of promising scientists will stress such factors as reasoning, spatial visualization, number ability, scientific vocabulary and mechanical comprehension are too less pure aptitudes which should also be significant.’

Scientific Aptitude appears to be dependent upon a variety of factors. The presence of certain study skills, persistence in learning, motivation, satisfactions derived from learning a subject; socio-economic factors and cultural background are some of the important determinants, interests, attitudes are also be considered necessary for scientific aptitude.

Brandwein (1995) viewed scientific aptitude not as a single trait but as one of the aspects of general intelligence. In the opinion of Miles (1954), scientific aptitude is another example of a talent present in the gifted group so far greater extent than its probable realization in adult achievement. The important components of scientific aptitude, according to Guilford (1950), are sensitivity to problems, ability to develop novel ideas and the ability to evaluate.

1.10 SCIENTIFIC APTITUDE TEST

Aptitude test is a test designed to measure the potential ability of person for performing a certain type of capacity – Encyclopedic Dictionary and directory of Education (1987).

An aptitude test is a standardized test designed to measure the ability of an individual to develop skills or acquire knowledge – Great Illustrated Dictionary (1984).

Aptitude tests attempt to predict the degree of achievement that may be expected from individuals in a particular activity to the extent that they measure past learning (Best, 1982).

According to dictionary of education by R. P. Taneja. Aptitude Test concerned with spatial and mechanical skills necessary for particular task.

Aptitude test for measuring to psychological characteristics that is predictive of success in same specific activity. Mechanical spatial, musical, artistic, numerical, clerical etc. are the aptitude for which tests are available. High scores in the test predicts are higher degree of proficiency, if the persons
is given proper training, High score on a test of mechanical aptitude is predictive of success in mechanical, engineering and allied courses of studies.

1.11 NEED OF THE STUDY

Science is playing a major role in the present age to satisfy the needs and desires of the people and it has also become one of the major human activities.

Science, in curriculum, provides certain values which are not provided by any other subject. The entire school subject are taught because they provide liberal education, they are part of the equipment and preparation for life which we expect the school to give to its pupils so that they may play their parts in the community as intellectual citizens. Science takes its place side by side with other school subjects as an essential element of one’s education. It affords knowledge of certain facts and laws and an insight into methods and data peculiar to the domain of science. However, the inclusion of any subject in the curriculum should satisfy the intellectual, utilitarian, vocational, cultural, moral and aesthetic values. Besides these, teaching of science imparts training in the scientific method and develops scientific aptitude, which is very valuable and at the same time is transferable to other situations of life. The scientific aptitude plays a major role in science education, and in the lives of pupils pursuing science education, the science Policy Resolution (1958) of the government of India stated that the dominating feature of the contemporary world is the intense cultivation of science on a large scale and its application to meet the country’s requirements. And science has now become a
compulsory subject in school curriculum, and is trying to inculcate scientific aptitude besides preparing the pupils for leading quality life.

Objective proposed for science education always include the development of interests, values, attitudes, aptitudes, and appreciation scientific aptitude is concerned with ability of future accomplishment in science. It an individual is endowed with better scientific aptitude, he will be in a position to pursue science education with which he can climb the ladder of success with ease and effect. It is as necessary as scientific attitude to develop scientific aptitude, and to develop interest in science education.

In India, systematic and sustained research work is lacking in the field of aptitude testing in general and measurement of scientific aptitude in particular (Sharma 1980). In spite of after the recommendations of Secondary Education Commission (1952) were adopted. Interest in aptitude testing grew and some independent attempts were made by the Indian researches to standardize scientific aptitude tests and to study the scientific aptitude of school children.

Scientific aptitude is necessary for pupils to pursue science education. By knowing basic science man can adjust in daily life. So every pupil of school education must possess good scientific aptitude.

The science education needed for the school going pupils. Because science education our children may be able to win our race in education in the 21st Century. To achieve this end, we have then to walk confidently as the continuum some what as follows:
The field of Science education is, thus, conterminous with life. This view promotes as well inherent value system of science on a very large scale. It is precisely for this reason that research in science is needed.

Many researches indicate that intelligence and aptitude in specified areas are two important determinants of school attainment and therefore, are potential predictors of success in all forms of performance in school subject (Pillai, 1986). The major distinction between aptitude and achievement is temporal achievement refers to present or past accomplishments, aptitude relates to the possibility of future accomplishment. Achievements depend, in part, on prior aptitudes, and aptitude as a predictor of future achievement involves present and past accomplishment.

Considering the importance of scientific aptitude in all stages of human life, it is tried to identify the level of scientific aptitude possessed by the secondary school pupils, aged between 14 plus and 15 plus, the age in which the scientific aptitude begins to take concrete shape. This is also the age

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which decides the future educational and vocational aspirations in the science and allied areas.

Now a days the importance of aptitude testing increases in every field, after 10+2 level the pupils wants to face the several common entrance test like Medical, Engineering entrance examination, Kishore Vaigyanic Protsahan Yojana (KVPU) Olympaid, National Defence Academy (NDA), All India Engineering Entrance Examination (AIEEE) etc. are giving importance to the aptitude testing. Such type of aptitude testing is essential in all fields.

By knowing the basic concept of science the pupils can adjust in his daily life. By knowing the scientific aptitude pupils can choose the faculty after tenth class. Therefore it is need of time to measure the scientific aptitude of pupils.

In the present study, it was decided to study the scientific aptitude of tenth class pupils of Nashik District.

1.12 STATEMENT OF THE PROBLEM

“A study of scientific aptitude of tenth class pupils of Nashik District.”

1.12.1 Functional Definitions of Important terms.

The functional definitions of the important terms used in the present study on the ‘Scientific Aptitude’ at Secondary School level are defined as
1.12.2 Scientific Aptitude

Scientific aptitude is an ability of pupils to solve the questions in simple Number series, Science information, Formulation, Spatial ability and Scientific interpretation.

1.12.3 School pupils

Learning at the end of Secondary level (Std. X).

1.12.4 Nashik District

Is clarified into three areas tribal, rural and urban areas.

1.12.5 Pupils

Includes male pupils as well as female pupils of tenth class.

1.12.6 Private Schools

The school managed by private organization or persons either partially or totally were included in private schools.

1.12.7 Aided Schools

The school recognized by Government and managed by organization or persons the salaries get to teachers from government.

1.12.8 Residential Schools

The pupils should stay on the school premises with their teachers, instead of coming from their houses daily, so they spend all their time either on the school campus or in the hostels and pursue studies under the constant supervision of teachers. Such schools were considered residential schools.
1.12.9 Non-Residential Schools

The pupils of these schools will only be in the school campus during instructional hours and spend their remaining time at home or other places such schools were considered non-residential schools.

1.12.10 Variables

Often changing or likely to change able to take on different numerical values. For the present study the variables are choose Boys versus Girls, Government Unaided School versus Government Aided Schools, Residential versus Non-residential schools, Rural versus Urban schools, Rural versus Tribal schools and Urban versus Tribal schools.

1.13 OBJECTIVES OF THE STUDY

Objectives are the heart of any worthwhile research. The following objectives were framed for the present research study.

1. To find out the present level of scientific aptitude possessed by the pupils studying in tenth class pupils of Nashik District.

2. To compare the scientific aptitude of boys and girls studying in tenth class of Nashik District.

3. To compare the scientific aptitude of pupils studying in unaided and aided schools of Nashik District.

4. To compare the scientific aptitude of pupils studying in residential and non-residential secondary schools of Nashik District.
5. To compare the scientific aptitude of pupils studying in rural and urban and tribal secondary schools.

6. To study the view of teachers towards science teaching.

7. To study the effect of the teaching aids, experiments on scientific aptitude of pupils.

8. To give suggestions for improvement of level of scientific aptitude in pupils if it is low and if it is high then suggestion for better improvement to the level of scientific aptitude.

1.14 HYPOTHESES OF THE STUDY

The following Hypotheses were framed for present research study.

1. There is no significant difference between the level of scientific aptitude possessed boys and girls pupils of the Nashik District.

2. There is no significant difference between the level of scientific aptitude possessed by the pupils of Aided and Unaided secondary schools.

3. There is no significant difference in the level of scientific aptitude possessed by the pupils of Residential and Non-residential secondary schools.

4. Secondary school pupils will possess low scientific aptitude.

5. There is no significant difference in the level of scientific aptitude possessed by pupils of Rural and Tribal areas schools of Nashik District.
6. There is no significant difference in the level of scientific aptitude possessed by pupils of Urban and Rural areas schools of Nashik District.

7. There is no significant difference in the level of scientific aptitude possessed by pupils of Urban and Tribal areas schools of Nashik District.

1.15 SCOPE OF THE STUDY

Before the second world war there were small scale attempts to find out the important dimensions of scientific aptitude and the development of techniques for the prediction of success in science. But later, on increased effort was made to develop technique to identify and locate pupils with science aptitude for professional and specialized courses, programmes etc.

In History of the Scientific Aptitude was used to find out the best personnel for services right from the fighter pilots to cooks stimulated the psychologist to derive measures of inherent human potentialities for success in specific jobs. Like Armed Services Vocational Aptitude Battery (ASVAB) thus the aptitude was distinguished from intelligence and was considered as the capacity to acquire proficiency with the given amount of training, formal or informal, like wise scientific aptitude is concerned, with proficiency in science.

These who studied scientific aptitude a complex of interacting hereditary and environmental determinant producing predisposition to science learning focused on aspects such as its predictive efficiency group’s differences, aptitude treatment, interaction on instruction and the like.
1. Due to this test the pupils must know about his accomplishment in science. If he was interested and he has some sort of knowledge related to science then he must be perform good in science in his career.

2. This test was helpful to find out the level of pupils in science and their interest in the science subject.

3. This test was helpful to choose the science faculty after tenth class.

1.16 LIMITATIONS OF THE STUDY

The present study is limited to only tenth class pupils of Nashik District. It is known that scientific aptitude begins to germinate by about 12+ to 13+ and tends to be developed in full form by about 15+ to 18+ with these aspects in mind; the present study is limited to the study of the Scientific Aptitude of secondary pupils who will be in the age group of 14+ and 15+.

1. The present study is related to tenth class of Nashik District.

2. The present study is limited to Marathi, English Medium and unaided schools of Nashik District.

3. Only those schools with std. tenth are taken for study.

4. The data was collected in the year 2008-2010.
1.17 A HISTORICAL PERSPECTIVE OF NASHIK DISTRICT.

Nashik has a personality of its own, due to its mythological, historical, social and cultural importance. The city is situated on the bank of the Godavari River, making it one of the holiest places for Hindus all over the world. Nashik has a rich historical past, as the mythological past, as the mythology has it that Lord Rama, the king of Ayodhya, made Nashik his abode during his 14 years in exile. At the same place Lord Laxman, by with of Lord Rama, cut the nose of “Shurpanakha” and thus this city named as “NASHIK”.

In Kritatyuga, Nashik was ‘Trikantak’, ‘Janasthana’ in Dwaparyuga and later in Kaliyuga it became ‘Navashikha’ or Nashik Renowned poets like Valmiki, Kalidas and Bhavabhooti have paid rich tribute here. Nashik in 150 B. C. was believed to be the country’s largest market place from 1487 have of emperor Akbar and he was written at length about ;Nashik in ‘Ein-c-Akari.’ It was also known as ‘The land of brave’ during the regime of Chhatrapati Shivaji Maharaj.

Nashik District was also remembered in the history – Jackson Murder case, Abhinav Bharat, Vinayak Damodar Savarkar, Anant Kanhere, Krishnaji Karve, Vinayak Deshpande, Tatya Tope (1814-1859), V. V. Shirwadkar and Vasant Kanetkar and many other freedom fighter.

1.17.1 Geography of Nashik District

Nashik District has an area of 15,530 square Kilometer. It is bounded by Dhule, Jalgaon, Aurangabad, Ahmednagar, Thane Districts and also Navsari and Dang Districts. Nashik district is located between 18.33 degree
and 20.53 degree North latitude and between 73.16 degree and 75.16 degree East longitude at Northwest part of Maharashtra State, at 565 meters above mean sea level.

Two, new Talukas are created in District making the total Talukas to 15. Out of 15 Talukas in District, as many as 8 Talukas viz. Surgana, Peth, Igatpuri, Kalwan, Baglan, Dindori, Trimbakeshwar and Nashik are tribal Talukas. The district also identified as tribal by the State Government. Many important rivers of Maharashtra originate in the district. Godavari which popularly known as Ganga of South India originates at holy place Trimbakeshwar. Another major river is Girna. Other rivers are Darna, Mosam, Aram, Vaitarana, Manyad and Kadwa.

1.17.2 Climate

The average rainfall of the district is between 2600 mm and 3000 mm, there is wide variation in the rainfall received at various Talukas. The maximum temperature in summer is 42.5 degree centigrade and minimum temperature in winter is less than 5 degree centigrade. In last two years’ the minimum temperature recorded below 5 degree centigrade, i.e. up to 2 degree centigrade. Relative humidity ranges from 43% to 62%. Climate of Nashik is generally compares with that of Bangalore and Pune because of its pleasant nature.
Map No. 1  Map of India showing place of Maharashtra State

(www.google.co.in/indiamap.com)

Map No. 2 Map of Maharashtra showing place of Nashik District

(www.google.co.in/indiamap/maharashtramap)
1.17.3 Muhammedan System

The schools were known as domestic maktabs, and teachers were called ‘Maulvi sahib’ or ‘Munshi sahib’.

1.17.4 Mediaeval Times

No definite information is available about the centres of learning in Nashik District during ancient times. However, from the old relies it is to be presumed that yojanas were performed during mediaeval time at Nashik.

1.17.5 British Times

The first secondary school in Nashik District Superior Anglo Vernacular School in the year 1961, which is transformed into Nashik High school in
The church Mission, started St. George High School in 1913-14 with the great efforts of Reverend Annasaheb Shinde of Nashik District.

Nashik Shikshan Prasarak Mandal, which was founded under the presidency of Raosaheb Datar, retired Civil Judge, started the New English School in 1918. This was the biggest school in 1923-24 and renamed as J. S. Rungta High School in 1943. In 1937 one military school started by Dr. B. S. Moonje named as Bhonsala Military School which was one the most famous military school in India.

1.17.6 Crops

Bajra is important crop of the District. However, other crop like wheat, paddy and other cereals are also grown in various parts of the District. Onion, Grapes are also taking place dominance on the agricultural economy of District. The District has been also identified for the purpose of establishment of Wine Park and Food Park.

1.17.7 Place of Interest

Nashik was also known as Tourist place in Maharashtra. So many place are here to see like Shree Kalaram Mandir, Kapaleshwar Mandir, Ramkund, Ganga Godavari Temple, Bhaktidham, Planetarium, Shri Kalika Devi Temple, Tirupati Balaji Temple, Pandav Caves, Someshwar Temple, Navashya Ganapati Temple, Kushavarta Tirth, Muktidham, Tapovan, Seeta Gumpa, Kumbhamela, Artillery Centre, Nandur Madhameshwar, Trimbakeshwar temple, Saptashrungi God, Vani, Muktidham, Kalsubai, Someshwar, Mangi-tungi etc. A religious festival which occurs every 12 year
is held at Trimbakeshwar. Kumbhmela is considered one of the most sacred festivals.

1.17.8 Education

Education system in early times existing among both Hindus and Mohammedans.

**Hindu System** To give and receive instruction is enjoined by sacred books of Brahmans, and their ancient sages produces a literature which is deep and subtle and often of great beauty. Pandits gave instruction in Sanskrit, Grammar, Logic, Philosophy and law. The pupils were also called Chelas or Children of their Gurus or teachers, lived with them in a semi-filial relationship, and owed them obedience and respect.