CHAPTER I

GENERAL INTRODUCTION

1.1 Introduction:

Now a day’s science is a common word to all. Almost everything needed for our better life from morning to night is the contribution of science. For example, from morning alarm clock to that of entertainment of television. But the question arises, that what is the root of all these inventions? Obviously the answer is the development of science and the human beings associated with that, known as scientists. They add new knowledge in the existing body of knowledge.

In the 21st century ‘knowledge’ is considered as the biggest resource of development. We should have a strong knowledge base in our country, particularly in science. In this regard, initial attitude and the understanding of the nature of scientific endeavour and the people associated with them have a great role in determining the choice of science as career (Banerjee Payel, 2012). Since today’s students are the future resource of their nation, therefore it is necessary to motivate the students having potentiality to become scientist to select scientist profession in future.

Many philosophers and psychologists opined that every individual has some potentialities, capacities, and the function of education is to draw out the same. In this regard different philosophers and thinkers stated in different ways. T.P. Nunn said, “Education is the complete development of the individuality of the child.”

“Education is the manifestation of divine perfection already existing in man.” (Swami Vivekananda)
“By education I mean an all-round drawing out of the best in man – body, mind and spirit.” (Mahatma Gandhi)

“Education is the process of the individual mind, getting to its full possible development.” (Dr. Zakir Husain)

Biologists also believe that every individual is different from others. Every child is a new and unique product and a new experiment with life. But it is also true that environment has a great role to draw out those potentialities. Behaviorism of Watson and his disciples, who brought a new era in the field of psychology, opined that conditioning through environmental influence are responsible for shaping the behaviour of a child. Watson assert it boldly in 1926 as: “Give me a dozen healthy infants, well informed and my own specified world to bring them up in and I will guarantee to take any one at random and train him to become any type of specialist I might select- doctor, lawyer, artist, merchant chief, and yes, even beggar man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors.” Watson did not deny the fact that certain patterns of behaviour were innate but said they were very limited in number in comparison with the role of experience (Dr. M.S Talawar & T. Pradip Kumar, 2009).

In 1906, Cattell, with a view to collect information about the role of heredity, environment and achievement, made a report of the birth places and residences of a thousand prominent scientists. He observed that the production of scientists in different sections of the country was considerably different. Cattell remarked that there existed a close connection between the environmental quality of the sections and the production of scientists in these places (Dr. S. S. Mathur, 2006). Here researcher’s intention is not to show the contradiction between heredity and environment but to accept both of them as both have their own role and the important thing is that the education system, the
curriculum, the texts, the teachers, the other members of the society should give a fruitful healthy environment to expose children’s innate potentialities that exist in them and should get ample opportunities to explore their inner power. Then there is a possibility that a better portion of them may choose scientist as their profession.

Katepalli. R. Sreenivasan, director of The Abdus Salam International Centre for Theoretical Physics, Trieste stated as “A paradox of our times is that, while our societies have come to depend on technological advances as never before, the interest in basic sciences is diminishing at all levels. Particularly distressing is the lukewarm interest shown towards sciences by the brightest students at the high school level. This state of affairs holds true, to the lowest order, in developed as well as developing nations and deserves our collective attention.”

Again Krishnashawmy Kosturirangan is that personality who played a very special role in the designing and development of India’s first satellite ‘Aryabhatta’ when he was holding the post of “System Specialist”. He gave the unique leadership for building the first two experimental earth observation satellites “Bhaskara I and II” and also directed the team that built the first of the world class series of Indian Remote Sensing Satellites IRS. He stated, “When we often lament the diminishing interest in basic sciences, it is not only the basic research that is in danger, but also dwindling high caliber science and technology leaders. Without science leaders of vision, who can influence the course of science research and technology developments both at policy and implementation levels, the role of science and technology for socio-economic development can be seriously jeopardized. Needless to emphasize, this is of particular concern for the Third World.

But what are the reasons behind this declination of interest towards basic science. Perhaps one of the reasons may be the students’ stereotypic perception towards science
and scientist which is responsible for this declination. One statement given by a scientist of ‘Stanford Linear Accelerator Centre’, USA, named Martin M. Perl, matches with this reason. He expressed it as “the popular image of a scientist and how one does science is very distorted and that is what drives many young people away from career in science.”

The review of related literature also reveals that most of the people have stereotypical images about scientists. The stereotypic image may lead potential requisites to believe that a successful scientist must be a genius, enjoy working alone and have a limited kind of social life. And this type of image prevents the students as well as guardians to encourage their children to select a career as scientists for them.

A famous study by Mead and Metraux (1957) conducted on U.S high school students; found that the popular perception of the scientist was that of a white male with facial hair, wearing eyeglasses and a laboratory coat, working alone in a lab and using chemicals and test tubes.

1.2 Stereotypical images of the scientist:

“The scientist is a man who wears a white coat and works in a laboratory. He is elderly or middle aged and wears glasses. He is small, sometimes small and stout, or tall and thin. He may be bald. He may wear a beard, may be unshaven and unkempt. He may be stooped and tired. He is surrounded by equipment: test tubes, Bunsen burners, flasks and bottles, a jungle gym of blown glass tubes and weird machines with dials. The sparkling white laboratory is full of sounds: the bubbling of liquids in test tubes and flasks, the squeaks and squeals of laboratory animals, and the muttering voice of the scientist. He spends his days doing experiments. He pours chemicals from one test tube into another. He peers raptly through microscopes. He scans the heavens through a telescope, or a
microscope. He experiments with plants and animals, cutting them apart, injecting serum into animals. He writes neatly in black notebooks” (Mead & Metraux, 1957, pp. 126-127).

Chamber, (1983) found that children held similar images of scientists when compared to the American high school students studied by Mead and Metraux (1957). He reported that stereotypic items as “lab coats, eyeglasses, growth of facial hair, and laboratory equipment that began to appear in the drawings of the youngest children” (Chamber, 1983, p259). He also found that the various elements of the stereotype appear with greater frequency as students advance through the grades.

1.3 Perception:

Human beings are the most intelligent creatures on Earth. They perceive various things in their own way and attach their own meaning to different things. Each individual is different from other and also they perceive each thing differently. Student made images of scientist from several experiences and there are lots of factors which affect those images. It is noted that the conceptions of students concerning science, the nature of science and the scientists have a positive or negative impact on the future profession selection and the achievement level of the students in that field.(Murat Demirbas,2009). Therefore, to select a scientist profession, realistic perception towards scientists has a great importance. And that is why students’ perception towards scientists is an interest of research by the researcher. Since, in the process of development of perception environment has a significant impact, thus, by providing proper and suitable environmental stimuli to the students towards scientists can create a realistic perception towards scientists.
In philosophy, Psychology and cognitive science, perception is the process of attaining awareness or understanding of sensory information. The word perception comes from the Latin words ‘perceptio’, ‘percipio’ and means “receiving, collecting, and action of taking possession, apprehension with the mind or senses.”

The understanding of the world largely depends upon the perceptive thinking skills of an individual. Different people view world differently and the perception of the people on a particular thing varies depending upon their perceptual skills. People’s actions, emotions, thoughts and feelings are triggered by perception of their surroundings. Perception is the intellectual process by which a person acquires the information from the environment, organize it and obtain the meaning from it.
Thus, perception is the processes through which we select, organize, and interpret input from our sensory receptors. Perception refers to the way the world looks, sounds, feels, tastes/smells. In other words, perception can be defined as whatever is experienced by a person. Perception may be defined as the cognitive process of selecting, organizing and attaching meaning or interpretation to event objects propel in the environment. Perception is the impression made by an object through process of sensory organs and the central nervous system. Perception is the experience we have when brain assembles and combine thousands of individual sensations into a meaningful pattern or image. However our perceptions are rarely exact replica of the original stimuli. Rather our perceptions are usually changed, biased, colored or distorted by our unique set of experiences.

Perception is a process by which we come to know objects in their appropriate identify. Sensation is the most elementary process, which is essential for cognition. Sense organs are described as “Windows of the soul” or the gateways of knowledge. Sensation comes to conscious by way of special sense organs. Sensation is a reaction aroused by a smallest mental process. It can be reduced to any simpler ingredients. A distinction is often made between sensation and perception on the ground that sensation is the primary response of the sense organ, whereas perception is the meaningful apprehension of the stimulus object. The two processes sensation and thought perception is the true beginning of knowledge. Sensations give us only the raw material of knowledge and perception is the first step by which that material is elaborated into definite knowledge of the external world. (Begum, A. J. and Indra, G.; 2012).

As used in the English language the term “perception” does not mean at all a vague and relatively passive form of experience, but it refers to a very active and usually vivid type
of experience. In the broader and more general sense, the term perception refers to the mental experience which arises whenever one recognizes some object that is presented to the senses (Monroe, P, 1990). In this general sense the word perception is to be contrasted with two other psychological terms which define the limits of perception on two opposite sides. Sensation is the first term to be distinguished from perception. Sensation is the relative experiences which are derived from the stimulation of these senses. The second term is recognition. The recognition of any object usually depends upon some earlier experiences with the object. They are therefore interpreting factors drawn from past experience which are added to the present sensory qualities. Perception may therefore be described as a complex of sensations and memory experience.

Shiffman (1996) defines perception as cognitive process of selecting, organizing and attaching meaning or interpretation to event, objects in the environment.

Baron (1998) defined perception as transmission of sensory input to achieve a grasp of our surrounding as well as a cognitive process which yields a unique picture of the world that may be quite different reality.

James (1990) called a booming buzzing confusion experiencing meaningful patterns in the jumble of sensory information is what we mean by perception.

Perception develops through three stages which can be explained by the following diagrams:
Sensation: A sensation is our first awareness of some outside stimulus. An outside stimulus activates sensory receptors, which in turn produce electrical signals that are transformed by the brain into meaningful bits of information.

Attention: attention is a compel adjustment of organism preparatory to receive to react to stimuli of a certain class. Paying attention is not only getting ready to hear, see, smell or feel something, it also involves the getting ready to react to these stimuli as rapidly and as efficiently as possible. It is a process of getting ready to carry out a given line of action. It helps us to avoid the doing of many nonessential things.

Perception: Perception is the experience we have when brain assembles and combine thousands of individual sensations into a meaningful pattern or image. However our perceptions are rarely exact replica of the original stimuli. Rather our perceptions are usually changed, biased, coloured or distorted by our unique set of experiences. Thus perceptions are our interpretation of the real world.

1.4 Factors of perception:

There are some factors which influence the perception. Some of the important factors are explained as under-

Need and Desire: Perception is greatly influenced by the individual’s needs and desires. When an individual is in need of something he will perceive the same. His perceptual processes are influenced by needs and motives.

Motivation: The perception is influenced by set of motivation. It may be a goal seeking activity. According to Murphy (2005), since perceiving is influenced by the goals which one seeks, the set is within the individual and motivation is an important kind of set.
Learning: Learning and past experience play an important role in the way an individual perceives his world. Whatever learned is partly a learning of new perception. An object acquires different meanings for different persons depending upon the persons past experiences.

Maturation and Heredity: Maturation and Heredity also influence perception. The maturation of sense organs is a very important factor in perception. Gestalt psychologists like Wertheimer and Kohler have tried to explain the principles involved in the organization of perception. Similarity is used when objects of similar shape, size or colour tend to be grouped together.

Culture and society: The society in which one is born and brought up makes him to adopt the way of that culture and the individual’s perceptions are very much influenced by that culture. An individual cannot act anything away from his culture. Our perceptual processes are always guided by our cultural norms.

In order to create a real perception of the students towards scientists’ sensation can be considered as the first stage because if a student gets a scientist closer to him/her and gets actual information regarding scientist then it would be stimulus for the student. In some earlier studies it is stated that some scientists were invited to deliver some lecture to the students and have some interaction with the students. And it is obvious that if this is practiced with the students their attention will automatically increased. Thus the second stage of perception comes to be effective. And it will automatically eliminate the stereotypic image of scientist and create a real perception of the students towards scientists.
In this study, here scientists refers the person, who may be an expert in one or more areas of science that is the person who performs research toward a more comprehensive understanding of nature including physical, chemical, biological and mathematical.

Many prospective scientists think that love of science and high intelligence are the two primary characteristics needed to permit them to be successful scientists. This idealized picture of science can lead to disillusionment or worse. Love of science and high intelligence are neither necessary nor sufficient, though they are the springboard of most scientific careers.

One of the major objectives of the ISCA (Indian Science Congress Association) is to inculcate scientific temper among people and to encourage young scientists to develop steadily by involving them in the programmes relevant to fundamental, experimental and operational activities. The scientific community has a place for everyone. If one is really serious about science, he/she might want to pursue a scientific career. Typically (though not always!), scientists who want to run their own research continue their studies to complete a Masters degree, a Ph.D., and possibly a postdoctoral research appointment (commonly called a postdoc), which provides recent Ph.D. recipients with advanced training under the direction of a mentor. A Ph.D. and postdoc allow one to learn how to do science under the supervision of a senior scientist who can guide him/her through the whole process, making all the twists, turns, and dead ends of science easier to navigate until one gets the hang of doing it on his/her own. Many scientists see a Ph.D. as a credential that certifies its holder's ability to conduct scientific research. The Ph.D. process can be grueling, but the rewards of scientific inquiry can make it worthwhile.

Though many scientists today have advanced training, it is possible to work ones’ way up to a research-focused position even without a Ph.D. For example, physicist and
chemist Michael Faraday had very little formal schooling. He was apprenticed to a bookbinder at fourteen and learned science by reading books he bound. Fascinated by an article he read on electricity, he began performing experiments using an electrostatic generator and a weak battery he built himself. He started attending lectures on physics and chemistry, and was particularly enthralled by a series of lectures given by the then-prominent chemist, Sir Humphry Davy. Faraday took notes at these lectures and after the series finished, sent a copy to Davy along with a letter asking for a job in his lab. Davy was impressed with Faraday and as soon as he had an opening, hired Faraday. Faraday became one of the most influential scientists of the 19th century, laying the groundwork for James Clerk Maxwell's theory of electromagnetic radiation- and all without any college degree.

A more modern example of an unusual path into science is the route taken by aquatic biologist Alexandra Morton. Following a childhood dream to study animals, she received her bachelor's degree and went straight to studying sound production and communication in dolphins and orca. In 1981, she co-founded a non-profit organization to support her orca research off the coast of British Columbia. After the introduction of salmon farms to the area in 1987, signs of ecological distress appeared and the orca vanished. Morton unsuccessfully attempted to get the government involved and then added studying the effects of salmon farming to her research activities. Her research has revealed dietary differences between transient and resident orca populations and has documented a rise in sea lice associated with salmon farming. A graduate degree is not a requirement to conduct important scientific research!

Though some scientists get into science in unexpected ways, but most of the scientists enter through the traditional route. Even Jane Goodall, who began studying chimps in the
wild without a Ph.D., ultimately decided that the degree would help her to continue her studies of chimps and be taken more seriously by the scientific community. The majority of the scientists are like Goodall; they see the benefits of a formal education. Still, this isn't the only way to get into science. Formal training is important, but it's not absolutely essential (www.undsci.berkeley.edu/..professional). Therefore, for students’ realistic perception towards scientists-curriculum planner, text book planner, teachers, and parents should make them clear about the two ways discussed above to get into science. As students come into classroom with their own knowledge and they reformulate their existing knowledge, either valid or invalid or incomplete, only if new information is connected to knowledge in their mind. Otherwise memorized information that has not been connected with the students’ prior knowledge will be quickly forgotten. Besides, science is no longer presented as a mystery tour or a magic show. Now science is all around us. The contemporary teaching of science at school tends to be active and hands-on, and teaches children a great deal about their world. In fact, the more opportunities to ask questions, make observations, and learn through hands-on experiences, the more easily they learn and connect to the real world (Bransford, et.al 2000; Driver, Asoko, Leach, Mortimer, & Scott, 1994).

All students have more positive attitudes toward a subject when the subject they are learning seems directly relevant to their lives (Zacharia, 2004). Attitudes about a particular subject influence the choice of school courses. Data in Oakes’s study show that students must choose the science “pipeline” early in their educational careers in order to achieve the training necessary for science careers (Oakes, 1990). More importantly, it appears that one of the deterrents of students from entering science careers is the stereotypical image they hold of a scientist (Finson, 2003). If a student cannot picture herself as a scientist, she will most likely not view this as a possible career
option (Monhardt, 2003; Finson, 2002). Since scientific and technological developments are important for all countries and continuing human support is a reality, examining children’s images of scientists and helping them to develop more realistic images is extremely crucial in attracting their interest in science (Gulshen, 2011). Therefore the researcher is interested to determine the high school and junior college students’ perception towards scientists as after these levels they have to choose their career. It will reveal some aspects of their attitude towards scientists, their idea regarding the nature of scientific activities and the profession as a scientist. The high school and junior college level period are often seen as a critical time for students to enter the science pipeline. Therefore the comparison of the perception towards scientists between these two levels is an interest of research.