

CHAPTER 1
INTRODUCTION

1.1 Science education

Science holds an eminent place in curriculum both at school and university levels of education in not only India, but all over the world. Continuous developments in scientific and technological research have resulted in the growth and increasing application of scientific knowledge in contemporary India. As a result, science takes an eminent place in education, both at the compulsory education level as well as at the levels of specialization.

In the words and vision of Nehru, "Science has brought all these mighty changes and not all of them have been for the good of humanity. But the most vital and hopeful of the changes that it has brought about has been the development of the scientific outlook in man". India is the only country in the entire world that has officially designated the development of science as the responsibility of government. According to Article 51 A (h) of constitution of India, it is now the duty of every citizen of Indian "to develop the scientific temper, humanism and spirit of inquiry".

In India, science education and its aims have been very well highlighted in various educational documents. The Report of the Education Commission (1964-1966), National Policy on Education (1968,1986) POA (1992), National Focus Group position paper on aims of science education (2006) lay down distinct emphasis on the need and importance of science education along with various recommendations about the curriculum to attain them. The documents clearly indorse the aims of science education in schools and the means to achieve them, the responsibilities of a teacher have been highlighted as of extreme importance, as the successful implementation of the science reforms in a classroom relies predominantly on the teachers of the school (Darling-Hammond, 1996).

The recommendations of various Indian educational documents about secondary science educational direct the teaching of science to develop some effective and important qualities among students that facilitate accomplishment of the aims of science education. According to Payne (1977), the aim of science education is not confined to the development of student intellect as cognition only but also the development of affective domain of students. These documents visibly highlight the development and enhancement of effective qualities as a spirit of inquiry, the spirit to question, the removal of superstitions, scepticism, curiosity, scientific temperament, etc. among the students (National Policy on Education, 1992; National focus group position paper, 2006). And all these qualities can be clustered into an extensive category quality called Scientific Attitude (Glaud, 1986).

Thus, the prime objective of science education is the cultivation of Scientific Attitude, which comprises of a spirit of inquiry, an outlook to reason rationally, a practice of judging beliefs and opinions on available evidence, willingness to reject unfounded theories and principles, the valour to admit facts, howsoever, unsettling or displeasing they might be, and lastly, identifying the limits of reasoning power itself.

1.2 Scientific Attitude

National Focus Group position paper (2006) defines scientific attitude as a composite of a number of mental processes or tendencies to react consistently in certain ways to a novel or problematic situation. It is evidence-based reasoning and argumentation, search for clarity and internal consistency, open mindedness and scepticism, and willingness to change when data contradict their own views (Gardner,1975). It can also be defined as ability (i) of critical thinking based on experiments, observations and conclusions and (ii) to critically judge the correctness or inappropriateness of the statement made about different forms of living organisms, object, incidences and methods. Scientific attitude is a composite of the following tendencies:

- Accuracy
- Intellectual honesty
- Open-mindedness
- Respect for evidence
- Scepticism
- Suspended judgement
- Critical thinking
- Perseverance
- Rationality
- Curiosity
- Aversion to superstitions
- Objectivity

The tendencies can be defined as follows:

a) **Accuracy in thought and action and** representation of facts – It is the process of putting exact information in front of others and to act according to one's own thoughts with a proper co-ordination between thoughts and action.

b) **Intellectual honesty** – It is the quality of being honest even if the results are not in favour.

- c) **Open Mindedness** - A person with scientific attitude never hesitate to change his/her own strong personal opinion if sufficient convincing proof oppose it. He/she rejects singular approach and believe in revising opinion under the light of sufficient proof.
- d) **Respect for Evidence** – It is the process of keeping faith on evidence, to collect various evidence and verify it till satisfaction.
- e) **Scepticism** - It is the quality of to systematically question all information collected.
- f) **Suspended Judgement** - It is the process of not to take any decision quickly or suspending judgment without thorough consideration of facts.
- g) **Critical Thinking** – Also called Critical Mindedness, it is the process of observing and understanding thing, event or person carefully and to find out true information.
- h) **Perseverance** - It is the process to keep the work going on instead of many difficulties or failures.
- i) **Rationality** - A person with scientific attitude has a respect for logical thinking and reasoning. He/she prefers to accept facts which are rationally explained. He/she tries to find out the cause-and-effect relationship of every phenomenon with critical thinking ability.
- j) **Curiosity** - A person with scientific attitude feels excited to see a new thing and hear a new idea with proof. He/she has a thrust to know the why and how of every phenomenon.
- k) **Aversion to Superstitions** - Scientific attitude of a person never allows him/her to believe any meaningless conclusions based on superstitious believes without convincing proof.
- l) **Objectivity of Intellectual Belief** - A person with scientific attitude is free from any sort of socio- economic and political influences to react in any situation. It is the attitude of being objective in observation and thinking.

India with a tradition of scepticism and a heavy baggage of superstitions and religious dogmatism demand scientific temper (Chowdhury, 2013). Scientific temper has broken many cultural, social and religious dogmas that were otherwise hindering the progress of the human civilization. The scientific temper guides us on how best to use our limited resources, how to assimilate the beneficial gifts of science and technology while avoiding the harmful ones and how to retain our traditional wisdom without succumbing to dogma and

superstitions (Narlikar, 1993). Use of scientific attitude to bring about rational outlook on social issues and problems could be the most important task (Kar, 2011).

The process of developing scientific attitude in Indian citizens should begin with young students all over the country. School is the best time to develop scientific attitude. The inculcation of scientific attitude in our students and eventually in our society would result in our people becoming rational and objective, thereby generating a climate favouring an egalitarian, democratic, secular and universal outlook (Khan, et. al. 2012)

1.3 Need and Significance of the Study

The Indian educational documents highlight the responsibilities of a teacher as of extreme importance, as the successful implementation of the science reforms in a classroom relies predominantly on the teachers of the school. One of those responsibilities is that of developing scientific attitude among students.

The sole responsibility of developing scientific attitude among the students lies on the teacher who can manipulate all situations to instil characteristic features of scientific attitude in them. The teachers should exhibit a spirit of enquiry, problem solving, courage to question and objectivity and be a role model to students so that they can adopt the fundamental qualities of scientific attitude which their teacher has. Scientific attitude in students can also be developed by scientific activities and skills encouraged in schools by teachers. Teachers bear the responsibility of moulding students to individuals with qualities beneficial to the development of our country and development of scientific attitude is one of them.

A pre-requisite to these activities is the presence of scientific attitude among teachers which can prove to guide students to inculcate the same in them. Hence, it is vital to study the scientific attitude among pupil teachers.

Scientific attitude is the generalized disposition of any individual towards science, which can be measured in terms of its favourableness estimated from the scores obtained on a scientific attitude scale. The testing of scientific attitude involves the testing of components like curiosity, open-mindedness, faith in scientific methods, cause and effect relationship, critical mindedness, seeking evidence, objectivity, suspended judgment & aversion to superstition.

The present study titled as, “The study of scientific attitude among Science Pupil Teachers” uses **Scientific Attitude Scale (SAS)** developed by N.N.

Shrivastava to measure the scientific attitude of science pupil teachers belonging to Regional Institute of Education, Bhopal. The scale comprises of a total of 26 statements and can measure scientific attitude for persons of age group 14-55 years. The scale is inclusive of the following components of scientific attitude:

- Rationality
- Curiosity
- Open-mindedness
- Aversion to superstitions
- Objectivity
- Suspended judgments.

1.4 Objectives of the study

The following are the objectives of the study:

1. To measure the scientific attitude of science pupil teachers of the following courses:
 - a) B.Sc.- B.Ed. program
 - b) B.Ed.-M.Ed. program
 - c) B.Ed. program
2. To compare the mean scores of scientific attitude of science pupil teachers of B.Sc.-B.Ed., B.Ed.-M.Ed. and B.Ed. programs.
3. To compare the mean scores of scientific attitude of male and female science pupil teachers.