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A meta analytic review on scientific attitude of teachers and prospective teachers

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Abstract

Science and Technology has become an inseparable part of the well-being of all humans and other life form that exist. Development of science and technology is only due to the scientific temperament and affective connection of human minds towards science. Science is a discipline that provide the base for critical, logical and rational thinking which help us to search and understand the eternal truth. Scientific attitude of children amplifies when they connect affectively and cognitively both with science and scientific concept. This meta-analytic review intends to critical study of the research work carried out in India in last 10 years on Scientific Attitude of Teachers and Prospective Teachers available on open database sources. The researcher found out that very less number of research work has been carried out in this area. The drift shows that independent variables like gender and stream of prospective teachers and teachers have significant effect on the scientific attitude. However, just a few studies have found that gender has no bearing on scientific attitudes. Teachers and Prospective Teachers of science background have a more scientific attitude than other. It is analyzed that scientific attitude is largely unaffected by variables such as year of study, age group difference, parental occupation, family type and area of residence. It is also examined that scientific attitude has positive effect on the teaching learning methods, teaching profession and personality.

Keywords: Scientific attitude, review, prospective teachers, teachers, meta-analysis

Introduction

21st century is the era of science and technology where it can be realized that rapid growth in every field of the society has been taking place. The ultimate goal of education is to develop humanity in the people of the country and the world. Science education has played very important role in the development of our culture and civilization. The smallest unit of civilization is a person living in the society. The wholesome development of person is only possible with the help of education. Education is the sharing of knowledge and information from one generation to other. The whole responsibility of sharing information, creating new knowledge, manifestation of perfection in child is on the shoulder of the teachers. So, to impart knowledge, share information, facilitating the children and understanding the need of the hour, a teacher must educate their children. Teaching learning process is not a simple process, it is very complex and scientific process. Understanding the child and working as per their requirement's by going to their level is also a scientific process. Inculcating the components of scientific attitude like curiosity, rationality, open-mindedness, aversion to superstition in the children should be the main aim of teachers. This process of inculcation is only possible if and only if teacher have scientific attitude and competent. A teacher should be very much dynamic as the need of society/time is changing very rapidly. A teacher should have high scientific attitude and temperament so that he/she can work progressively and scientifically to nourish the children. "Scientific attitude is scientific mindedness" (Burnet, 1944). "It is the habit of scientific thinking" (Noll, 1933). The scientific attitude is rational way of observing into things that are ruled by facts which are recognized as well as demonstrative. The most important and essential aim of education and specially science and technology education is the development of scientific attitude and scientific temperament among learners. Scientific attitude is the desire to know and understand, questioning to all statements, search for data and their meaning, search for verification, and consideration of consequences (Gardner, 1975; Osborne, Simon & Collins, 2003). In our social and cultural lives, science and technology have played a significant influence.

A wide range of activities are regulated and controlled by science. It has helped man acquire control over nature. The construction of an interconnected sequence of conceptions and conceptual systems has resulted from experimentation and observation. Scientific attitude can be defined as "Open mindedness - a desire for accurate knowledge confidence in procedures for seeking knowledge and all the expectation that the solution of the problem will come through the use of verified knowledge" (Raj R. G. & Malliga T., 2015) [4]. Development of scientific attitude among the learners must be in central focus and should be the main objectives of teaching learning process. Scientific attitudes cannot be established in children by teaching science as a subject, but they can be developed with the support of scientific teaching methods. Open-mindedness, confidence and faith in the techniques for learning information, curiosity, and resistance to superstitions are all aspects of scientific attitude. Scientific understanding is expected to progress in lockstep with scientific attitudes. It may not happen in every situation, but tradition can sometimes hinder the growth of scientific attitudes, and such a skewed development may not be good to scientific knowledge advancement. An important tendency which is found among all human beings and especially in children is curiosity. However, this tendency should be nourished by the teacher encouraging to ask the teacher and should try to provide satisfactory responses to their queries and curiosities, spirit of self-exploration and investigation should be developed among them which ultimately leads to the development of scientific temper in the children.

Objective of the Study: To carry out the meta-analysis of the previous researches on Scientific Attitude of Teachers and Prospective Teachers

Meta-analysis of Previous Studies

1. Gokul, R. R. & Malliga, T. (2015) [4]. Conducted research on "A Study on Scientific Attitude among Pre-Service Teachers" and concluded that the level of scientific attitude of female Pre-Service Teachers is higher than male Pre-Service Teachers. The level of scientific attitude also varies with the stream i.e., science & arts stream. The level of scientific attitude of science stream Pre-Service Teachers is higher as compared to arts stream. There is no effect of locality (like urban and rural) and age group (between below 25 year and 25-35 year) on the level of scientific attitude of Pre-Service Teachers.
2. Bala, R. & Punia, V. (2019) [1]. Conducted research on "Scientific Attitude amongst the Science and Non-science Pupil-Teachers: A Comparative Analysis" and concluded that there was a significant difference in the overall status of scientific attitude amongst science and non-science pupil-teachers. The scientific attitude of science pupil-teachers was found higher than the non-science one. There was no difference found in level of scientific attitude of the male Science Pupil Teachers and Arts Pupil Teachers. Significant difference in the scientific attitude of female science and female non-science pupil-teachers was seen. In terms of curiosity dimension of Scientific Attitude, Science pupil-teachers were having high Curiosity than Arts pupil-teachers. There were no difference founds in terms of dimension of Scientific Attitude like rationality, open-mindedness

and aversion to superstitions of science pupil-teachers w.r.t. Arts pupil-teachers. The level of Scientific Attitude in terms of dimensions like Objectivity of intellectual beliefs and suspended judgments of science pupil-teachers was found to be higher than Arts pupil-teachers.

3. Rajendran, P. & Anandarasu, R. (2020) [9]. Conducted research on Study on Scientific Attitude of B.Ed., Trainees in Perambalur District and found that the level of Scientific Attitude of B.Ed. Trainees were average. Female B.Ed. Trainees possess higher level of Scientific Attitude than the male B.Ed. Trainees, which indicates that Scientific Attitude is affected by the gender. Second Year B.Ed. Trainees were having significantly higher level of Scientific Attitude than the First Year B.Ed. Trainees. Urban B.Ed. Trainees were having significantly higher level of Scientific Attitude than the Rural B.Ed., Trainees which shows that geological area have some impact on the scientific attitude. Family background have no effect as the results conclude that nuclear family and joint family of B.Ed. Trainees were having a similar level of Scientific Attitude.
4. Murugan, P.V. (March 25, 2019) [7]. Conducted research on topic "A Study on Scientific Attitude of Elementary Teacher Education Students" and found that there is no effect of year (first year & second year), type of college (government and aided), area of residence (rural and urban), type of family (nuclear and joint family) on the scientific attitude of elementary teacher education students. There was no significant association found between father's education, mother's education, father's occupation, mother's occupation, order of birth, parent's annual income, and scientific attitude of elementary teacher education students.
5. Balaji, G. (2017). Conducted research on topic "Role of science teacher in developing scientific attitude among secondary school students" and establish the conclusion that most of the teachers opined positively for the statement which had a five-point scale (SA, A, U, D, SD). The science teachers agreed and strongly agreed for the statements that a teacher role is very important in building up the student's scientific attitude by possessing the following characteristics:
 1. The science teacher should work towards knowledge achievement of the students and also their scientific attitude development.
 2. The teacher must first possess a scientific attitude.
 3. Scientific attitude of the pupils depends a mainly on science teacher.
 4. The development of scientific attitude is not a difficult task by the teacher.
 5. Relating science to all other areas, of learning is helpful in developing scientific attitude.
 6. Another subject's teacher can also develop scientific attitude
 7. The science teacher can also develop scientific attitude.
 8. Scientist's lives have an impact on child's attitude towards the subjects.
 9. Field trips are successful mean of developing scientific attitude in pupils.
 10. An effective way of communication a congenial atmosphere also inculcates scientific attitude.

11. Teacher should be enthusiastic, lively and should enjoy teaching so that they can modify the classroom and bring life into a class room.
12. Science should be taught more practically.
13. The teacher should not be superstitious, and believe in hearsay; they should seek evidence to verify facts.
14. They should praise the pupils for their answers, give rewards to them and show satisfaction towards them.

An opinion was also agreed upon that use of technology, A.V. aids and in service training programmes is also vital in developing scientific attitude among secondary school students.

- 6 Nooguri, A. (2017) ^[8]. Conducted research on “A study on scientific attitude of science teachers in secondary schools of Mancherial district, Telangana, India” and concluded that Science teachers have high level of scientific attitude and there is no any difference were seen between the Government and Private Science teachers’ Scientific attitude.
- 7 Gundalli, N. C. & Lakkanavar, B.L. (2017). Conducted research on “Study of Scientific Attitude and Job Involvement of Primary School Teachers in Related to Teaching Effectiveness’ and found that levels of scientific attitude is not affected by the gender. The levels of scientific attitude of male and female pre service teachers were same. Significant difference was found between the subjects’ group of the science and arts group pre service teachers in their levels of scientific attitude. There were no effect of locality and age group difference (the age group of below 25 and between 25- 35) on the levels of scientific attitude.
- 8 Roy, D. (2018) ^[10]. Conducted Research on “A study of scientific teaching attitude as the process of learning in secondary school teachers” and found that the Teacher’s scientific attitudes are the positive way of teaching strategies at the teaching profession and teachers can play vital role in the developing & improving the scientific attitude among the student’s personality. Positive correlation was found between scientific attitude & process of learning in secondary school teachers. Scientific Attitude & Teaching Strategies are positively correlated each other’s & create a good impact on students’ personality and process of learning.
- 9 Sharma, U. (2016) ^[11]. Conducted research on topic “A comparative study of scientific attitude of science and non-science B.T.C. pupil teachers” and concluded that the science B.T.C. pupil teachers were more scientific than non-science B.T.C. pupil teachers. It indicates that the science students have greater tendency to test traditional belief and adopt critical attitude in comparison to non-science students. It was also found that male and female science B.T.C. pupil teachers have same scientific attitude.

Critical Analysis of the Previous Studies

After reviewing the previous researches, it has been concluded that a very a smaller number of researches have been carried out in India on the Scientific Attitude of Teachers/ Prospective Teachers. The researcher has found only nine researches which are available online through open access. The researcher has also noted that most of the researches have been carried out on the finding Scientific

Attitude of secondary and higher secondary school students. Teachers are the pillars of nations which shapes the children’s which are the future of the society. So, it is very much required that a teacher having scientific attitude can develop scientific attitude of in their children. As it has been observed from the previous studies trend shows that the study carried out by keeping Scientific Attitude as a dependent variable and the independent variable are mainly Gender (male & female), stream (science & non-science pupil), area of residence (urban & rural). Few researchers also taken particular age group difference, parental occupation, year/semester of the course (1st/2nd year/semester), types of family (joint family & nuclear family). The trend shows that female teachers/prospective teachers possess significantly higher scientific attitude than male. But few researches show that gender does not play any role in the level of scientific attitude. In context with the stream of the study, trends shows that prospective teachers those who are from science background are having higher scientific attitude than non-science prospective teachers. By critically analyzing the studies it can be concluded that scientific attitude of prospective teachers/teachers are generally not depends upon the variables like year of study, age group difference, parental occupation, year/semester of the course (1st/2nd year/semester), types of family (joint family & nuclear family), type of college (government/private/ grant in aid). There is a contradiction in the results of previous researches on the variable like area of residence/locality (urban & rural). Some researches shows that there is no effect of area/locality on scientific attitude and vice-versa. Some researches carried out on school teachers shows that scientific attitude of teachers positively affect the teaching profession, teaching strategy and helps in developing Scientific temperament in the children.



Fig 1: Main components of scientific attitude based on the previous studies

Conclusion

Scientific Attitude plays very crucial role in the teaching learning process. A teacher having scientific attitude can easily connects the children affectively to the nature which can helps them to think differently and creatively. Scientific Attitude means the way of rational answering the question or favoring or disfavoring any entity which is scientifically

true or false respectively. To end the evils prevailing in the society and to make the life of the human being easier, inculcating scientific attitude in the children is the need of the hour.

Researches carried out on the Scientific Attitude of Prospective teachers in the last ten year are having many contradictions when we compare their results with each other. It was also found that the generally tools used were self-made and were administered on low sample. In some researches the components were taken only 4 or 5. The number of statements in the previous tools were low, which can't find out the exact scientific attitude of the Teachers/ Prospective Teachers. So, it can be finally concluded that a more studies should be carried out the Scientific Attitude of the Prospective teachers/Teachers at large sample scale and the well-developed standardized tool with proper components having ability to measure the exact Scientific Attitude should be prepared in English as well as regional languages also.

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