

An Investigation of Scientific Attitude among Secondary School Students in Kottayam District of Kerala

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Abstract: *Scientific attitude is solving a problem objectively without bias using logical thinking. A person views everything around him based on his scientific knowledge. He accepts everything in a scientific background. Scientific attitude comprises open mindedness, objectivity, aversion to superstition, rationality, curiosity etc. In the present investigation an attempt has been made to study the Scientific Attitude of secondary school students in Kottayam district, Kerala, India. The study also tries to find out whether there exists any significant difference between the various subsamples, Gender, Locality and type of management of school based on their Scientific Attitude. The sample consists of 180 secondary school students of Kottayam District. Investigators used descriptive statistical techniques for the analysis of data.*

I. Introduction

Science is the intellectual heritage of man. Since man became aware of his surroundings, started wondering about the natural phenomena in which he plays an important role. He started searching the secrets of nature. This not only changed his outlook but also changed the way he solved problems of everyday life. Nowadays every people are aware of the impact of science on the society and new age of science. As India is a developing country education is very important in all the fields of society. India needs a number of scientists in agriculture, industries, research, and other related scientific institutions.

Science education develops knowledge to science, science process skills and scientific attitudes among the individuals. However the assessment of scientific attitude is difficult compared to that of scientific knowledge and science process skills, and this scientific attitude is one of the most important aspect of today's science throughout the world (Khan, Shah, Mahmood and Zareen, 2012). Flegg and Hukins argued that the assessment of Scientific Attitude has been generally omitted in the evaluation of student progress in science classrooms. Lack of assessing scientific attitude may be a factor responsible for the poor scientific orientations among science students which are thus made manifest in various facets and aspects of their daily life, some which include declining productivity, haphazardness in development, disorderliness in the society, non-functioning utilities due to inadequate maintenance, distorted values and so on (Oloruntegbe & Omiofo, 2005). Science education can provide patience, honesty, humility, respect for logic, consideration of consequences and understanding of causal relationship; all these attributes can be seen as scientific attitudes. (Ivowi, 1984)

There are different perspectives on Scientific Attitude among different authors. For example Moore and Sutman (1970) defined it as an opinion or position taken with respect to a psychological aspect in the field of science. Singh sees scientific attitude as a condition of mind, showing how one is disposed towards certain things, ideas or persons and the environment around it helps in eliminating intolerance, superstition, gullibility and other patterns of thought like obscurantism. Several authors had classified various components of Scientific Attitude. Emina (1986) classified the components into five, rationality, curiosity, open mindedness, objectivity, aversion to superstition. Persons who possess scientific attitude are open minded, experiment oriented, systematic in approach, possess love for knowledge, intellectually honest, unbiased, truthful, and possess scientific temper and the expectations that the solution of the problem will come through the use of verified knowledge (Jhancirani, Devakrishnan & Devi, 2012). 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, Simson & Collins, 2003). According to Lawson (1982), scientific attitude is necessary to dispel ignorance and backwardness; it will bring a balanced perspective to bear on social evils and conflicts which could lead to a better world. If we act favourably or unfavourably towards some external class of stimuli, according to the ethics of science it is called scientific attitude (Munby, 1983). An individual with scientific attitude consciously or unconsciously thinks and displays traits which are common to scientists. It is the ability to do things based on proven principles. A student having scientific attitude is always free from superstitions, unverified assumptions and popular opinions that have no empirical basis. Every science teacher should undertake the responsibility to develop scientific attitude in their children through planned activities.

Objectives of the study

- To study the scientific attitude of secondary school students.
- To study the scientific attitudes among secondary school students based on gender.
- To study the scientific attitude among secondary school students based on type of school.
- To study the scientific attitude among secondary school students based on locality.

Hypothesis of the study

- The secondary school students of Kottayam district will have a higher level of scientific attitude.
- There is significant difference in the Scientific Attitude of secondary school students based on gender.
- There is significant difference in the scientific attitude of secondary students based on type of school.
- There is significant difference in the scientific attitude of secondary students based on locality.

Method of the study

Normative survey method is used to study the present problem. Sample consists of 180 secondary school students of Kottayam District .Details of the sample took for the studies are given below.

Table 1 Sample selected for the study

| Sl.No | Sample | Number |
|-------|----------------------------|--------|
| 1 | Entire sample | 180 |
| 2 | Male Students | 106 |
| 3 | Female Students | 74 |
| 4 | Government School Students | 100 |
| 5 | Aided School Students | 80 |
| 6 | Rural School Students | 80 |
| 7 | Urban School Students | 100 |

Tool for the study

Tool used for the study was Scientific Attitude Scale developed by Dr.Shailaja Bhagwath (2003)

Statistical Techniques

- Basic statistical techniques such as mean, median and standard deviation
- χ^2 - Test
- Significance of difference between means

Analysis and Interpretation of data

Scientific Attitude of Secondary School Students

The investigators categorised the whole sample in to Very Low, Low, Average, High and Very High Scientific Attitude groups based on the scores of scientific attitude using Percentiles.P20,P40,P60,P80 percentiles were calculated and the students who scores less than P20 scores (100.20)is categorised as Very Low group, the students who scores in between P20(100.20)and P40 (111.40)as Low,P40 (111.40)and P60 (118.00)as Average P60 (118.00)and P80(126.00)as High and greater than P80 (126.00)as Very High scientific attitude groups. The frequency of students with scientific attitude and percentiles was given in Table 2

Table 2 Number and Percentage of different groups of Secondary School Students based on Scientific Attitude

| Group | Frequency | Percentage | χ^2 |
|---------------------|-----------|------------|----------|
| Very low awareness | 36 | 20 | 1.73 |
| Low Awareness | 36 | 20 | |
| Average Awareness | 42 | 29.2 | |
| High Awareness | 31 | 17.1 | |
| Very High Awareness | 35 | 19.3 | |

From Table 2, it is clear that the obtained χ^2 (1.73,p> .05) shows the difference in the number of students in each group is not significant .Hence it can be concluded that there exists no significant difference on the frequency of students in the distribution of students in each group. Thus it can be simply stated that the secondary school students are identically distributed among each group. Table shows that the Average scientific attitude group contains comparatively high number of students (42).

Scientific Attitude of Secondary School Students Based on gender

In order to find out whether the scientific attitude of secondary school students vary with gender ,the mean and the standard deviation of the scores on the scientific attitude of secondary school students –boys and girls were calculated. To know whether two groups varied significantly in their scores on scientific attitude, the t-test of non-equivalent groups was administered. The values thus obtained are given below.

Table. 2 Results showing significance of difference between means of scores of scientific attitude of secondary school students based on gender

| Gender | sample size | Mean | Standard deviation | t-value |
|--------|-------------|--------|--------------------|---------|
| Boys | 106 | 109.61 | 13.65 | 1.08 |
| Girls | 74 | 115.31 | 30.21 | |

(not significant at 0.01 level of significance)

The mean and standard deviation of secondary school boys are 109.61 and 13.65 and that of secondary school girls are 115.31 and 30.72 respectively. When the differences in means of boys and girls were tested for significance, got a t-value of 1.08 which is less than the values for .01 and .05 levels of significance. Hence, it is inferred that there is no significant difference in the scientific attitude of secondary school students based on Gender.

Scientific Attitude of Secondary School Students Based on Type of Schools

In order to find out whether the Scientific Attitude of secondary school students vary with type of school, the mean and the standard deviation of the scores of scientific attitude of Government and Aided secondary school students were calculated. To know whether the two groups varied significantly in their scores on scientific attitude, the t-test of non equivalent groups was administered. The values thus obtained are tabulated below.

Table 3 Results showing significance of difference between means of scores of scientific attitude of secondary school students based on type of schools

| Type of school | sample size | Mean | Standard deviation | t-value |
|----------------|-------------|--------|--------------------|---------|
| Government | 100 | 113.21 | 15.53 | 0.03 |
| Aided | 80 | 114.48 | 13.68 | |

(not significant at 0.01 level of significance)

The mean and standard deviation of scientific attitude of Government secondary school students are 113.21 and 15.53 and that of Aided Secondary School students are 114.48 and 13.68 respectively. When their differences in means were tested for significance of difference between means, we get a t-value of 0.03 which is not significant at 0.01 and 0.05 levels. Hence, it is inferred that there is no significant difference in the scientific attitude of secondary school students based on type of school.

Scientific Attitude of Secondary School students based on locality

In order to find out whether the Scientific Attitude of secondary students vary with locale, the mean and the standard deviation of the scores on the scientific attitude of secondary school students of the rural and urban locality were calculated. To know whether the two groups varied significantly in their scores on the scientific attitude, t-test of non equivalent groups was administered. The values thus obtained are calculated below.

Table 3 Results showing significance of difference between means of scores of scientific attitude of secondary school students based on locality.

| Locale | sample size | Mean | Standard deviation | t-value |
|--------|-------------|--------|--------------------|---------|
| Rural | 80 | 113.43 | 13.68 | 0.03 |
| Urban | 100 | 112.42 | 15.51 | |

(not significant at 0.01 level of significance)

The mean and the standard deviation of scientific attitude of rural secondary school students are 113.43 and 13.68 and that of urban school students are 112.42 and 15.51 respectively. When their differences in means

were tested for significance, got a t-value of 0.03, which is less than the values for .01, and 0.05 levels of significance. Hence it is inferred that there is no significant difference in scientific attitude of secondary school students based on their locality.

Major Findings

- The secondary school students are identically distributed among each group based on Scientific Attitude
- There is no significant difference in the scientific attitude of secondary school students based on gender.
- There is no significant difference in the scientific attitude of secondary school students based on type of management.
- There is no significant difference in the scientific attitude of secondary school students based on locale.

II. Conclusion

This study revealed that the level of Scientific Attitude among secondary school students is not significantly influenced by gender, type of school and locality. There is a need for humanising science to develop proper appreciation towards science. In most secondary schools experimentation and laboratory activities are done at the end of the year; which have a negative impact on acquisition of scientific attitude among science students. Thus experimentation and laboratory activities should be combined to show how theory meets practice; which will help to increase the level of scientific attitude among science students. Teachers can inculcate scientific attitude in their students by purposeful preparation of scientific activities, arranging scientific discussions, conducting experiments in a novel manner, assigning projects, giving training to make improvised equipments etc. Institution can organize science exhibitions, science fairs, science quizzes, science debates, etc to develop scientific attitude among secondary school students. There should be an informative science library in schools having modern science magazines, journals etc. Interesting and innovative science teaching methods can increase scientific attitude of secondary school students. Thus the learning of science should focus more on activities that support students culture and experiences in order to relate it to their day today lives. By doing this, students will feel that their ideas are important and valued, thus it will increase their self concept in science. For this to happen, teachers need to consider that learning science needs to have more emphasis on making connection between science and student's life.

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