

A Study On The Scientific Attitude Of The Secondary School Students

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Research Article

Received: 07-Feb-2022, Manuscript No. JES- 51878; **Editor assigned:** 09-Feb-2022, PreQC No. JES-51878(PQ); **Reviewed:** 23-Feb-2022, QC No. JES-51878; **Revised:** 28-Feb-2022, Manuscript No. JES-51878(R); **Published:** 07-Mar-2022, DOI: 10.4172/j.educ.stud.8.2.005

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Keywords: Philosophy; Locality; Gender; Experimentation; Technology

ABSTRACT

The main objective of the present study is to study students' attitudes towards science. The success of science has more to do with an attitude common to scientists than with a particular method. This attitude is one of inquiry, experimentation, and humility before the facts. The main objective of the present study is to examine the effect of type of management of the school, locality, and gender on the scientific attitude of the secondary school students. Scientific Attitude Scale prepared by Avinash Grewal and published by National Psychological Corporation (1977) is a standardized tool which was used for determining a student's scientific attitude. The scale consists of 20 items. A sample of 100 secondary school students of class IX students from government and private schools of Telangana, test was employed for analysis of the data. The findings are, the private students had significantly higher levels of scientific attitude compared to the government students, the rural students had similarly high and low levels of scientific attitude like of urban students and the female students had significantly similar, more or less levels of scientific attitude like that of the male students.

INTRODUCTION

The whole philosophy of science teaching is to develop scientific understanding and in turn, develop a scientific outlook that helps in understanding the unknown phenomena of nature. In the process of developing one's scientific philosophy or outlook, one should be invariably based on scientific principles and should not only apply to Sciences but also contemporary social issues and problems to understand them scientifically and to solve them, scientific understanding leads to objective approach towards a problem and hence based on cause and effect

outlook, that leads to reasoning and right judgment to understand the root causes of every problem, a solution emerges automatically ^[1].

In this modern world which is dominated by science and technology, science teaching must be effective and innovative, and beneficial to pupils. No one can work efficiently in an advanced society unless he is well versed in scientific literacy and certain elementary skills. Science, if studied thoroughly, inculcates the power of logical thinking and reasoning. It develops open-mindedness and scientific temper or scientific attitude. Science is a subject that broadens the horizon of an individual and develops various skills and provides opportunities for the professional growth of an individual. New ideas, often challenging old ones demand, for new science and technology structure which is the treatment for science. Thus, Science has become a great value in the present day. Science has spread its network all over the fields of life. Science has its discipline. It sharpens our intellect and makes us intellectually honest, critical in observation and reasoning. This study is an attempt to know the understanding of the scientific attitude of secondary school students ^[2].

MATERIALS AND METHODS

Scientific attitude

Scientific attitude and scientific temper are complementary to one another and have many overlaps in their meaning. One of the indices for assessing scientific advancement through education is the performance of students. The attitudes students have toward science may affect their performance. Attitude has been viewed as the predisposition to respond positively or negatively toward an object or phenomena. One of the important goals of science teaching is to promote positive attitudes toward science. According to Bloom's Approach, scientific attitudes are the outcomes of science teaching. Characteristics of scientific attitude include: rationality, very curious, open-mindedness in approach, aversion to superstition, objectivity, intellectual honesty, humility and suspended judgment, critical thinking, observation, seek evidence, truthfulness, logical thinking, and skepticism. If these characteristic features are observed in a person we can say that they possess a scientific attitude that can be further measured. To develop a scientific attitude in students, they should be provided with an effective approach ^[3].

Significance of the study

Student's attitudes towards science and scientific attitudes have been a topic of enduring interest in the field of science education for over 40 years, but why? After all, there is no sense in which people are concerned about students' attitudes towards the learning of English or history. So what is it that drives the interest in this topic? The brief explanation is that compulsory science education bears a dual mandate. On the one hand, school science is charged with educating the next generation in and about science an education which essentially requires developing an understanding and appreciation of the explanatory hypotheses that science offers of the material world, how these came to be and why they matter. On the other hand, school science has a responsibility to educate the next generation of scientists. Whilst there are overlaps between the two goals, the former requires a

broad overview of the domain. The latter requires a foundational knowledge of the discipline and its major concepts. And it is the supposed failure of school science to engage sufficient students in studying science for a future career that has pushed students' attitudes to the force as a matter of concern for society and policymakers. Today's student is a citizen of tomorrow. Future society depends on the all-round development of students. Uma Shankar Joshi ^[4] had rightly said, "Man should become human." and for this, every student must have a certain attitude towards everything they face throughout their life G. Shanthi (2014). Panneerselvam M, Dr. Tamizhselvan M. ^[5] carried a study on 'An investigation on the secondary school student about scientific attitude and achievement in science.' Findings of the study revealed that the Government schools the students with a more scientific attitude perform better in Science achievement than that of the students with a low group of scientific attitude. The study was aimed at using a standardized Scientific Attitude Scale to measure the scientific attitudes of students studying in standard IX. The Scientific Attitude scale will be useful not only to know the scientific attitudes of students but also to draw attention to deficiencies in developing scientific attitudes in students. This study will reveal to which extent the variables like type of management, locality of the school, and gender will influence the scientific attitudes of students.

Rationale of the study

Scientific attitude is developed among the students for the benefit of the individual and to the existence of nature. It will help to study in bringing a typical change in the scientific attitude of students. Achievement in Science may depend on the scientific attitude and most of the other factors. The study helps to use a scientific attitude scale to measure the scientific attitude of learners and to draw attention towards deficiencies in developing scientific attitudes in students. The study lets a teacher know the dimensions of attitude and level of attitude present in students. Influence is basically of the classroom environment and activities carried out. The study will assess the scientific attitude, individual, social perspectives level in the learner about locale, type of management of the school, and gender. Learners may have a positive attitude towards science. However, gender, the learner from different backgrounds/areas, different standards, different ways of approach used by teachers, influences the learner's scientific attitude. The purpose of the study is to assess the influence of gender, locale of school, type of management on scientific attitude in secondary school students ^[6].

Statement of the problem

"A Study on Scientific Attitude of Secondary School Students"

Objectives of the study

- To examine the effect of type of the management of the school on the scientific attitude of the secondary school students.
- To examine the impact of the locality of school on the scientific attitude of the secondary school students
- To study the influence of gender background on the scientific attitude of secondary school students.

Research questions

In what way the scientific attitude of secondary school students is affected by the type of management of school?

Is there any relationship between scientific attitude and the locality of school?

What is the influence of gender on the Scientific Attitude of secondary school students?

Variables of study

Independent variables: Type of management of a school (Government, Private), Locality of the school (Rural, Urban) and Gender (Male, Female)

Dependent variables: Scientific attitude of secondary school students [7].

Research design

The study followed the design of a Descriptive survey to find out the scientific attitude of secondary school students.

Population and sample

Population: 100 secondary school students of class IX students from government and private schools of Telangana.

Sampling procedure: Stratified Random Sampling. **Sample:** 100 secondary school students (Table 1).

Table 1. Sampling. Sample: 100 secondary school students.

Locale	Type of the management	Male students	Female students	Total No. of students
Urban	Govt	12	13	25
	Private	12	13	25
Rural	Govt	13	12	25
	Private	13	12	25
Total		50	50	100

Tool: Scientific attitude scale

Scientific Attitude Scale developed by Dr. (Mrs.) Avinash Grewal (1971), Standardized Science Attitude Scale prepared by Dr. Grewal and published by National Psychological Corporation (1977) was used for present study. The scale consists of 20 items. Stated original information related to work carried out while standardizing the tool SAS by Avinash Grewal (appendix 3.1) (Table 2)^[8].

Table 2. Scientific attitude scale -Mrs. Avinash Grewal

Sl. No.	Statement	SA	A	N	D	SD
1	Scientists are persons without human considerations.					
2	Scientific careers are more useful to society than other careers.					
3	Study of science subjects is rather a dull affair.					
4	Other subjects cannot be properly understood without the knowledge of science.					
	*Note. SA= Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree					

The SAS is a self-reporting inventory and the opinion of the individual is recorded on a 5 point scale of Likert Type. The items have to be responded to a five point scale indicated by ‘strongly agree’, ‘Agree’, ‘Undecided’, ‘Disagree’ and ‘Strongly disagree’. The positive items carry marks as 5,4,3,2,1 and negative items carry marks as 1,2,3,4,5. The total marks which can be obtained by a student is 100 (Table 3).

Table 3. Scoring procedure of tool.

Item No	Item	Strongly Agree (Sa)	Agree(A)	Neutral(N)	Disagree(D)	Strongly Disagree(Sd)
1,3,5,7,9,11,13,15,17,19	Negative	1	2	3	4	5
2,4,6,8,10,12,14,16,18,20	Positive	5	4	3	2	1

Reliability and validity are important aspects of questionnaire design to establish reliability and validity of the tool is a pilot study which will be conducted on a small representative sample. The reliability of the Science Attitude Scale (SAS) was estimated by test-retest 0.7 and has content validity.

Content validity

The Scientific attitude, the standardized tool developed by Dr. Avinash Grewal (1990) was given to a group of fifty teachers who are working in Madurai district. The tool was given to the teachers on the same day. The responses of teachers were scored. Product moment correlation coefficient between the two sets of scores was found. It was 0.82. Thus the content validity of the total was established.

Reliability of the tool

The investigator employed the test-retest method in establishing the reliability of the tool. The tool was distributed to 50 students from ninth standard of a school in Madurai District and the same test was again conducted after one week and the data were analyzed. The correlation coefficient was obtained for the scores and found to be 0.89. Thus the reliability of the tool was established.

Reliability: The reliability of the Science Attitude Scale (SAS) was estimated by the split-half (0.86) and test-retest (0.75) methods which were found to be quite satisfactory. This compares favorably with reliability (0.765) found by Sood (1975) for his scale of attitudes towards science and scientists. Reliability of the scale was further checked by two methods of scoring by administering the scale to a small sample of 50 subjects with the instructions to check the statements in accordance with the usual Thurstone's instruction and the science subjects were then asked to check for each item on one of the five alternatives in accordance with the usual Likert instructions. The coefficient of correlation found between the scores on two scales was 0.94. Ferguson (1941) reported a correlation of 0.82 between the Thurstone and Likert methods of scoring (Table 4).

The reliability coefficient was given in the following table.

Table 4. Reliability of coefficients and their measurement.

SL No	Method	Reliability Obtained	Coefficient Corrected	Reliability	SE of measurement
1	Split-Half(odd numbers)	0.76	0.86	0.87	-2.63
2	Test-Retest(3 months)	0.6	0.75	0.77	-3.55
3	Likert-Thurstone (Technique of Scoring)	0.94	0.96	0.96	4.48

Validity: The SAS appears to have content validity and the method of selecting items supports this supposition. In addition, differences in mean scores were found among the selected groups of known preference for science i.e. Arts (Mean=46.41) and Science (Mean=50.58) students which is highly significant ($t=6.62$) at 1 percent level ^[9].

Norms: For the purpose of interpretation of the raw scores, on the basis of the statistic got, z-score norms for male and female have been prepared separately, norms for interpretation of the z-score When the raw scores have been got after scoring the scale, the same is converted into z-scores (Male/Female Norms) and level of attitude is found (Table 5).

Table 5. Norms for Interpretation of Levels of Scientific Attitude.

Range Of Score	Level
40 and below	Low
41-63	Average
64 and above	High

RESULTS

The data for the study was collected from schools of Ranga Reddy district. On the day of data collection, permission from the head of the institution along with the permission from the respective class teacher was taken.

Statistical techniques

Mean, Standard deviation, and t-test.

Hypothesis 1:

There is a significant difference in the scientific attitude of secondary school students with respect to the type of management of the school (Table 6).

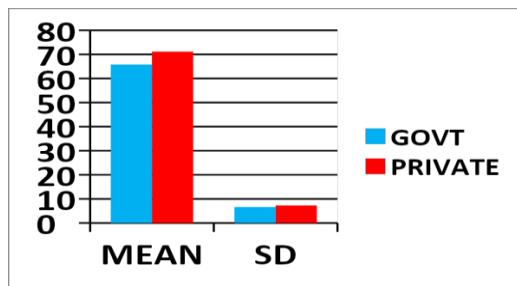
Table 6. The variation in scientific attitudes with respect to the type of management.

Variable	N	Mean	SD	t-value	df	Level of significance
Govt	50	65.82	6.642			
				3.83	98	0.01*
Private	50	71.16	7.263			
*Note. *=significant at 0.05 level of significance; Table value=1.98						

The obtained t-value 3.83 is greater than the table value at df=98 t value=1.98 at 0.05 significance level. Hence Research Hypothesis is accepted. Null Hypothesis is rejected (Graph 1).

Graph 1. Indicating the significant levels of student's scientific attitude based on the type of management.

*Note. ■ Government ■ Private



The private students had significantly higher levels of scientific attitude (Mean=71.16, SD=7.263) compared to the government students (Mean=65.82, SD=6.642).

Hypothesis 2:

There is a significant difference in the scientific attitude of secondary school students with respect to the locality of the school (Table 7).

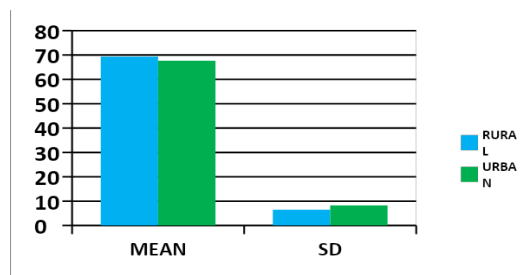
Table 7. The variation in scientific attitudes with respect to locality of school.

Variable	N	Mean	SD	t-value	df	Level of significance
Rural	50	69.32	6.488			
				1.11	98	0.26**
Urban	50	67.66	8.24			
*Note. **=not significant at 0.05 level of significance; Table value=1.98						

The obtained t-value 1.11 is less than the table value at df=98 t value=1.98 at 0.05 significance level. Hence the null hypothesis is accepted and the research hypothesis is rejected (Graph 2).

Graph 2. Indicating the significant levels of a student's scientific attitude about the locality of the school.

***Note.** ■ Urban area ■ Rural area



The rural students had significantly higher levels of scientific attitude (Mean=69.32, SD=6,488) compared to the urban students (Mean=67.66, SD=8.240).

Hypothesis 3:

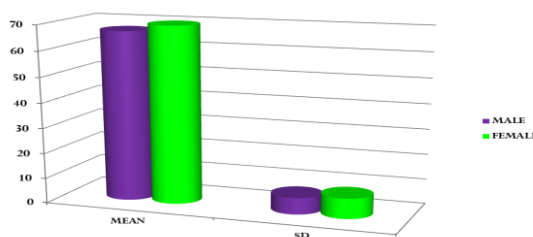
There is a significant difference in the scientific attitude of secondary school students with respect to gender (Table 8).

Table 8. The variation in scientific attitudes with respect to gender.

Variable	N	Mean	SD	t-value	df	Level of significance
Male	50	67.1	6.582			
				1.9	98	0.061**
Female	50	69.88	8.009			
*Note. **= not significant at 0.05 level of significance; Table value=1.98						

The obtained t-value 1.90 is less than the table value at df=98 t value=1.98 at 0.05 significance level. Hence the Null Hypothesis is accepted. Research Hypothesis is rejected (Graph 3).

Graph 3. Indicating the significant levels of scientific attitude with respect to gender. ***Note.** ■ Female ■ Male



The female students had significantly higher levels of scientific attitude (Mean=69.88, SD=8.009) compared to the male students (Mean=67.10, SD=6.582).

DISCUSSION

Hypothesis 1: The private students had significantly higher levels of scientific attitude compared to the government students this may be because of facilities, teacher's interest, and teachers' approach towards the student and socioeconomic background of students. The study was supported by the findings of the study of Surekha Ksheerasagar, Dr.Kavya Kishore P.B ^[10] who had researched 'Achievement in Science of Secondary School students about Scientific Attitude.' The finding of the study revealed that the boys of the private school students had better achievement and then the government school. But in contrast to the study of Vema Narayana Reddy .G, Mr. Shyam Sunder Rao .U 'A Study of Scientific Attitude of IX Class Students with Gender and Management, results show that Government school students have a positive attitude than the Private school students. Pugalenth.N, Kalaivani C. ^[11,12] carried a study on 'Problem Solving Ability And Scientific Attitude of Higher Secondary School Students. The result of the study indicates that there was no significant difference between higher secondary school students towards scientific attitudes concerning their demographic variables. There was no significant difference between the problem-solving ability of higher secondary school students based on Locality.

Hypothesis 2: The rural students had similar high and low levels of scientific attitudes like urban students. This may be because of the type of administration and societal involvement and teacher's approach towards the student based on teaching practices and experience. This finding was supported by the following studies of Bindia Rani, (2018) carried out a study on 'Scientific Attitude analysis among Secondary School Students of Yamunanagar region in relation to their achievement in General Science. The main findings of present work are as under: The rural area students have just a favorable attitude towards science. Most of the students achieved average scores in their previous classes as their achievement in general science. Jampannanavar G. C. and Dr. Yadawad S. B ^[13] carried out a study on 'A Study of the relationship between Scientific Attitude and Academic Achievement in Science among Secondary School Students' It was shown that the relationship between Scientific Attitude and Academic Achievement in Science of IX standard Rural school students was found to be significant and Positive. It was shown that the relationship between Scientific Attitude and Academic Achievement in Science of IX standard Urban school students is found to be not significant and Positive.

Hypothesis 3: The female students had significantly similar, more or less levels of scientific attitude like that of the male students. This might be because of the Student's socio-economic background, the interest of the student towards science, scientific approaches, attitudes towards science learning and doing, psychological, intellectual, and behavioral aspects of students. The finding was substantiated by the studies of Revati.N, Dr. Meera K.P. (2017) carried out a study on 'An investigation of scientific attitude among secondary school students in Kottayam district of Kerala.' The study revealed that the level of scientific attitude among secondary school students is not significantly influenced by gender, type of school and locality. Amit Ahuja, (2017) has carried out a study entitled 'A study carried on Study of Scientific Attitude about Science Achievement Scores among Secondary School Students'.

The findings of the study revealed that there was no significant difference in scientific attitude and Science achievement scores of secondary school students based on gender. Shashi Agrawal, Priya Trivedi,(2016) carried out a study on 'Attitude towards Science of Secondary School Students In Wardha Region.' The sample consists of 100 Government students from Wardha (M.S.) region. The findings reveal that there was no vital distinction between male and feminine secondary school students in their science angle. Sakariyau, A. O.* Taiwo, Michael O. Ajagbe, Olalere W (2016), a study carried on 'An Investigation on Secondary School Students' Attitude Towards Science in Ogun State, Nigeria' The findings of the study was that Secondary School student has a positive attitude towards science lesson also both male and female students have almost the same attitude towards science finally there is no disparity in the attitudes of students towards science based on gender ^[14].

- The purpose of the study is to support the administrators and policymakers in becoming aware of the importance of involving scientific attitude in the current curriculum to raise the value system of scientific temper in students to heights.
- The government should conduct seminars, workshops sessions to carter the importance of scientific attitude such that to develop scientific interest. The schools should include present value education, problem-based educational activities, science fair, laboratories and field trips that improve scientific attitude and programs for both teachers and students which would add a fine teaching benefit to nation-building.
- Developing a scientific attitude in teacher educator and student teachers inculcates the qualities like truthfulness, honesty, purity of thought, cleanliness, justice, and self-control in the students too. This is supported by Balaji .G, ^[3] carried a study on 'Role of Science Teacher in Developing Scientific Attitude among Secondary School Students.' A sample of 50 science teachers was selected from 20 schools of Khammam District (10 private and 10 Govt. English medium High schools only). The science teachers agreed and strongly agreed on the statements that a teacher's role is very important in building up the student's scientific attitude.

At the secondary level, more emphasis should be given to hands-on experiences, project work and activity-based teaching should be focused. The knowledge of agriculture and farming technology in urban areas should be added to the curriculum. For identification of positive and negative attitudes and finding its relation with other components and factors such as problem-solving ability, open-mindedness, creativity, skepticism, and socioeconomic status, father's occupation, science achievements, activity-based approach, etc ^[15].

When the level of scientific attitude is known, the teacher will be able to arrange educational activities to develop scientific attitudes in students.

The study further can be carried on a larger sample, on students studying at different levels of education (primary, secondary and higher), on more number of schools and in various boards of schools such as SSC, CBSE ^[16].

CONCLUSION

One of the important goals of science teaching is to promote positive attitudes toward science for this not only student and teacher but also administration and society must take an active part in providing resources and arranging workshops, seminars, activities, science fairs, and field trips which leads to quality education. The scientific attitude once developed in the student proves useful life long in the child.

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