Attitude Of Secondary School Students Towards Science In Relation To Academic Achievement, Gender And Type Of School

Monika Bajaj and Surita Devi

The study aims to assess the students' attitude towards science in selected government and private schools at the secondary level in the Jammu district. A sample comprises 200 students from 5 private and government secondary schools of the Jammu district. The Science Attitude Scale (SAS) developed by Grewal (2012) was used to assess the students' attitude towards science. The results show that the students in both government and private schools have a positive attitude towards science. This study revealed that secondary school students' attitudes towards science differ significantly regarding their academic achievement. Female students were found to have a favourable attitude towards science as compared to their male counterparts. Results also showed that students at private schools possess a positive attitude towards science compared to students in government schools. They enjoy science and are ready to pursue their career in science as well.

KEYWORDS: Attitude, Science, Secondary School, Academic Achievement

Introduction

The 21st century is fast-paced and highly competitive. Each day, we make important decisions that will affect our lives today and well into the future. We are provided greater amounts of increasingly complex information than ever before. However, our society's collective sense of literacy is outdated. Many people still think of science literacy as simply being informed about

Monika Bajaj ✉
Associate Professor, MIER College of Education (Autonomous), Jammu, India.
Email: monika.bajaj@miercollege.in

Surita Devi
Research Scholar, MIER College of Education (Autonomous), Jammu, India.
Email: surita.1801042-med@miercollege.in

new advances, for example, in medicine and technology. This definition of scientific literacy will no longer suffice in this new information age. In the 21st century, science literacy is the occupational capacity to apply information in an appropriate context, to analyse information, to synthesize information from various sources or on various topics, and evaluate information to determine the best course of action (Science Blog, 2008).

Science education aims at increasing common knowledge about science and widening social awareness of scientific findings and issues. Learning science requires its language, which often differs from daily language. Learning science goes beyond scientific facts, principles, and theories. One of its aims is to attain a conceptual understanding of science. Today's science intends to produce citizens who can deal with words, concepts, and scientific symbols necessary for the technologically advanced modern age. For many, the term science refers to the organized body of knowledge concerning the physical world, both animate and inanimate, but a proper definition would also have to include the attitudes and methods through which this body of knowledge is formed; thus, science is both a particular activity and also the results of that activity National Research Council (2007).

Science is a subject that has revolutionized all walks of life. Some students take interest and some students feel boredom while studying science. The attitudes of students differ at different levels, especially at the secondary level. The attitude towards science may be operationally taken as the generalized attitude towards science, the content of which is being measured in terms of its favourableness or unfavourableness Lakshmi (2004).

Review Of Related Literature

Zeidan and Jayosi (2015) investigated the relationship between the Palestinian secondary school student's knowledge level of science process skills and their attitudes toward science, and the effect of gender and residence of these students on their knowledge level of science process skills and their attitudes toward science. The study used an 18-question science process skills test and 25-item attitudes toward science questionnaire. The association between knowledge level of science process skills and attitudes toward science was significant, with a correlation coefficient of 0.69. The results of the study showed that there were significant differences in science process skills due to gender favouring females; and because of residence favouring villages' students. However, there were no significant differences in attitudes toward science because of the variables.

Heng and Karpudewan (2015) reported the effects of gender and grade level on secondary students' attitude towards chemistry lessons. For this pur-

pose, the Attitude towards Chemistry Lessons Scale (ATCLS) was administered to 446 secondary school students between 16-19 years old. The ATCLS comprises four different subscales: liking for chemistry theory lessons, liking for chemistry laboratory work, evaluative beliefs about school chemistry, and behavioural tendencies to learn chemistry. The findings show that gender and grade level have a significant effect on attitude towards learning chemistry. Gender and grade level also have a significant interaction effect (Wilks' lambda = 0.933, F (15, 1198) = 2.032, p < 0.05) on secondary school students' attitudes towards chemistry.

Liou and Liu (2015) examined the issues of students' motivational beliefs in science learning and their relations with science achievement. Data of Taiwanese fourth and eighth graders from the Trends in International Mathematics and Science Study 2011 were examined. Students' self-concept and intrinsic interest as motivational beliefs, and science scores in general and in different cognitive domains were used as measures in this study. The results indicate that students' motivational beliefs decrease over grades. The relations between the eighth graders' motivational beliefs and science scores are positively stronger than those of the fourth graders. Meanwhile, students' self-concept has a greater predictive power than intrinsic interest for science scores in both grades

Jebson and Hena (2015) investigated the attitude of students toward science subjects in senior secondary schools in Adamawa state. A sample of 250 science students was selected by using stratified random sampling technique. Science Students' Attitude Questionnaire (SSAQ) was used to collect the data. The results showed that students in Adamawa state have positive attitude towards science subjects and gender has significant effect on their attitude. Boys were having more positive attitude as compared to their female counterparts. Age difference among boys and girls in the secondary schools in Adamawa state does not have influence on their attitude toward the study of science subjects.

Sethi (2015) studied the attitude of the students towards science in relation to certain non-school factors. The sample consisted of 100 students. Mean, standard deviation and t-test were used to test the significance of difference between means in relation to gender, locality and socio-economic status of students. Significant difference exists between urban and rural students but no significant difference was found on the basis of gender and socio-economic status.

Khitab, Zaman, Ghaffar, and Jan (2015) investigated the impact of low-cost teaching material on students' attitude towards science (Chemistry) at secondary level in Khyber Pakhtunkhwa, Pakistan. This was an experimental study. Each group i.e., experimental and control consisted of 30 students

of Grade 12 science stream. To assess the impact of low-cost teaching material on students' attitude towards science (Chemistry) a modified form of Test of Science-Related Attitudes (TOSRA) comprised of 29 items was used. The test was purely constructed on a Likert scale to measure the students' attitude towards Chemistry on the factors such as behaviour tendency to learn Chemistry, liking for chemistry laboratory work, liking for Chemistry theory lesson, evaluation belief about Chemistry, leisure interest in science and the enjoyment of Chemistry. The main findings of the study indicated that students in the experimental group taught through activity with low-cost materials showed significantly greater attitude towards science (Chemistry) than the control group.

Jamhari and Sipahutar (2018) studied the effects of science-related attitudes on students' problem-solving skills, and the interactions between the visual mapping and science-related attitudes on students' problem-solving skills. This study was conducted at MAN TanjungPura, with the samples of 141 students of the XI-Science Program. The results showed that there were significant effects of visual mapping on students' problem solving skills (F=94.214; P=0.000), where the scores of students' problem solving skills taught by concept mapping (87.74±2.586) were significantly higher than taught by direct instruction (78.84±2.689). Significant effects of science-related attitudes on students' problem solving skills (F=3.397; P=0.031) were seen and the scores of high science-related attitudes on students' problem solving skills taught by visual mapping (85.68±4.312) were significantly higher than the scores of low science-related attitudes on students' problem solving skills taught by visual making (77.26±3.614). They also found that there were the interactions between visual mapping and science-related attitudes on students' problem solving skills (F=2.195; P=0.000) and the scores of students' problem solving skills taught by argument mapping with high science-related attitudes differed significantly from taught by direct instruction with high science-related attitude.

Hu, Leung, and Chen (2018) analysed a sample of 3600 fourth-graders from 132 Hong Kong schools. They found that the family- and student-related factors (book ownership, parent education, student gender, and attitudes to school) had significant correlations with student attitudes toward science, but the school-related factors (school environment and teacher characteristics) did not show significant influence on students' science attitudes.

Toma, Greca, and Gómez (2019) conducted a study to investigate attitudes towards science and views of Nature of Science among Spanish secondary school students. The study stressed the need to address the steady decline in positive attitude toward Science and to improve students' views towards science and to use gender and culturally inclusive science teaching strategies.

Ananda, Suhandi, and Rahman (2019) experimented to improve students' attitude toward science in one of the junior high school at Bandung City after follow science learning used ILD model assisted science magic. Pre-post-test was employed. A sample of 70 students was selected randomly in cluster. The attitude towards sciences scale consisted of 30 items having four dimensions was used. The dimensions were interest in science, importance of science in life, interest in advanced study in science, and interest in future career in science. The results showed that implemented ILD model assisted science magic can improve students' attitude toward science in junior high school.

Binwal (2020) examined the problems in studying science and attitude towards science among adolescent students of 9th grade. This study covered 100 students from the different government schools of Almora and nearby places of Almora city in Uttarakhand. The scientific Attitude Scale (SAS) was administered to collect the data. The study revealed Adolescent students belonging to urban areas were found to have a more positive attitude towards science than rural students. It was also concluded that the attitude towards science is correlated with the achievement in the previous class. Students who scored first division in their previous class showed a favourable attitude towards science as compared to those who scored second or third division.

Science has become a part of our life. It has extended immensely the limits of our curiosity and has increased the ways of utilizing our leisure. Science and technology have been playing an important role in our life. So, it becomes essential to promote knowledge of science at different levels of education. It is also important to develop attitudes towards science in our secondary school students so that they may solve their problems and can adjust themselves in society. Review of related literature shows that in India, few research studies have been undertaken in this area. Hence, this investigation was conducted

OBJECTIVES OF THE STUDY

The objectives of the present research study are:

1. To study the overall attitude of secondary school students towards Science

2. To study the attitude of secondary school students towards Science in relation to their academic achievement.

3. To study the attitude of secondary school students towards Science in relation to their gender.

4. To study the attitude of secondary school students towards Science in relation to their type of school.

Hypotheses Of The Study

The hypotheses of the present research study are:

1. There is no significant difference in the attitude of secondary school students towards Science in relation to their academic achievement.

2. There is no significant gender difference in the attitude of secondary school students towards science.

3. There is no significant difference in the attitude of secondary school students towards science with respect to their type of school.

Research Methodology

In this study, the researcher intends to investigate the attitude of secondary school students towards science. Thus, a descriptive survey method was used in this study.

Sample For The Study

The data was collected through a simple random sampling technique. A sample of 200 students studying in class 9th and 10th was selected from 5 government and private secondary schools of Jammu district. The distribution of the sample is given in Table 1.

Table 1

Distribution of Sample.

S.No	Type of School	Male	Female	Total
1	Private	50	50	100
2	Government	50	50	100
	Total	100	100	200

Tool Used

For the accomplishment of the objectives, Science Attitude Scale developed by Grewal (2012) was used. For Academic Achievement, marks obtained by the students in the previous class examination were taken.

RESULTS AND FINDINGS

Objective 1

To Study the Overall Attitude of Secondary School Students Towards Science.

For studying the overall attitude of secondary school students towards science, the percentage was calculated. The result is presented in Table 2.

From Table 2, it can be interpreted that out of 200 students, only 9 students (4.5%) have an extremely high favourable attitude towards science, 37 students (18%) have a highly favourable attitude, 48 students (24%) have above average favourable attitude towards and 56 students (28%) have a moderately favourable attitude towards science. It can also be seen that 50 students (25%) have unfavourable attitude towards science. Thus, it can be concluded that maximum secondary school students have a positive attitude towards science.

Table 2

Level of the Attitude of Secondary School Students Towards Science.

SNo.	Z Score Range	No. of Students	%	Level of Scientific Attitude
1	+2.01 and above	9	4.5	Extremely High Favourable
2	+1.26 to + 2.00	37	18.5	High Favourable
3	+0.51 to +1.25	48	24	Above Average Favourable
4	-0.50 to +0.50	56	28	Average Favourable
5	-0.51 to -1.25	20	10	Unfavourable
6	-1.26 to -2.00	0	0	Very Unfavourable
7	-2.01 and below	0	0	Extremely Unfavourable

Objective 2

To Study the Attitude of Secondary School Students Towards Science in Relation to their Academic Achievement.

For achieving objective 2, Analysis of variance (ANOVA) was carried out to determine the attitude of secondary school students in relation to their academic achievement. The results are shown in Table 3

Table 3

Summary of Analysis of Variance

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	4014.42	2	2007.210	41.85*
Within Groups	9448.45	197	47.962	
Total	13462.87	199		

* Significant at 0.01 Level

Data in Table 3 reveals that the obtained F-value has been found to be significant at 0.01 level of significance. It can be said that the attitude of secondary school students towards science differs significantly in relation to their academic achievement. Thus, the hypothesis 1, "There is no significant difference in the attitude of secondary school students towards science in relation to their academic achievement" is not accepted.

Objective 3

To Study the Attitude of Secondary School Students Towards Science in Relation to their Gender.

To investigate whether gender difference exists in student's attitudes towards science, the mean and standard deviation for each of the male and female groups were computed followed by a t-test. The results are presented in Table 4.

Table 4

Mean, Standard Deviation, and t-Value of Male and Female Students.

Gender	N	Mean	SD	SE_M	t
Male	100	43.79	8.74	0.87	2.64*
Female	100	46.72	6.81	0.68	

* Significant at 0.01 Level

Results in Table 4, show that the mean value of males and females is 43.79 and 46.72. The calculated t-value is 2.64, which is significant at 0.01 level of significance. The mean score of female students is higher than of male students. Thus, it can be inferred that there exists a significant difference in the attitude of secondary school students towards science in relation to their gender. Thus

Hypothesis 3, "There is no significant gender difference in the attitude of secondary school students towards science" is not accepted.

Objective 4

To Study the Attitude of Secondary School Students Towards Science in Relation to their Type of School.

The final objective of the study was to study the attitude of secondary school students towards science in government and private secondary schools of Jammu. To achieve this objective, the t- ratio was computed. The results are presented in Table 5. The data shows that the mean value of government and private school is 43.48 and 47.03. The calculated t-value is 3.22, which is significant at 0.01 level of significance. The mean score of private schools' student is higher than government school students. Thus, it can be inferred that private school students have a favourable attitude towards science as compared to government school students. Thus hypothesis 3, "There is no significant difference in the attitude of secondary school students towards science with respect to their type of school" is not accepted.

Table 5

Mean, Standard Deviation and t-Value of Government and Private School Students.

Type of School	N	Mean	SD	SE_M	t
Government	100	43.48	7.07	0.70	3.22*
Private	100	47.03	8.42	0.84	

* Significant at 0.01 Level

CONCLUSIONS

It was found that out of the total of 200 secondary school students, 150 (75%) students have a favourable positive attitude towards science and only 50 (25%) students have an unfavourable attitude towards science. There exists a significant difference in the attitude of secondary school students towards science in relation to their academic achievement. Female students have a favourable attitude towards science as compare to their male counterparts. Private school students have a favourable attitude towards science as compared to government school students.

Science plays an important role in every field and students should generally have a positive attitude towards science. They think that the process of inquiry

can be developed through the study of science and are also ready to adopt a scientific attitude. Thus, steps should be taken accordingly, to improve and developed such conditions in the school so as to develop a scientific attitude in the students. Schools and teachers should launch programmes such as science exhibitions, educational tours, projects, workshops, etc. which help in developing scientific attitudes among students.

REFERENCES

Ananda, S. R., Suhandi, A., & Rahman, T. (2019). Students' attitude toward science in junior high school after follow science learning used ILD model assisted science magic. *Journal of Physics: Conference Series*, *1157*(2), 1-6. Retrieved from https://iopscience.iop.org/article/10.1088/1742-6596/1157/2/022060

Binwal, H. K. (2020). Attitude towards science: A study of 9th grade adolescent students. *The International Journal of Indian Psychology*, *8*(1), 609-615.

Heng, C. K., & Karpudewan, M. (2015). The Interaction Effects of Genderand Grade Level on SecondarySchool Students' Attitude towardsLearning Chemistry. *EURASIA Journal of Mathematics, Science and Technology Education*, *11*(4), 889-898. https://doi.org/10.12973/eurasia.2015.1446a

Hu, X., Leung, F. K., & Chen, G. (2018). School, family, and student factors behind student attitudes towards science: The case of Hong Kong fourth-graders. *International Journal of Educational Research*, *92*, 135-144. https://doi.org/10.1016/j.ijer.2018.09.014

Jamhari, M., & Sipahutar, H. (2018). The effects of visual mapping and science-related attitudes on students' problem solving skills. In *3rd Annual International Seminar on Transformative Education and Educational Leadership* (p. 40-47). Atlantis Press.

Jebson, S. R., & Hena, A. Z. (2015). Students' attitude towards science subjects in senior secondary schools in Adamawa state. *International Journal of Research in Applied, Natural and Social Sciences*, *3*(3), 117-124.

Khitab, U., Zaman, A., Ghaffar, A., & Jan, Q. (2015). Impact of low cost teaching material on students' attitude towards science at secondary level in Khyber Pakhtunkhwa Pakistan. *International Journal of Innovation in Teaching and Learning*, *1*(2), 1-14.

Lakshmi, G. B. (2004). *Attitude towards science*. Discovery Publishing House. Retrieved from https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=attitude+towards+science++Lakshmi&btnG

Liou, P. Y., & Liu, E. Z. F. (2015). An analysis of the relationships between Taiwanese eighth and fourth graders' motivational beliefs

and science achievement in TIMSS 2011. *Asia Pacific Education Review*, *16*(3), 433-445.

National Research Council. (2007). *Taking science to school: Learning and teaching science in grades k-8*. Washington, DC: The National Academies Press. Retrieved from https://doi.org/10.17226/11625

Sethi, U. (2015). Study of attitude of the students towards science in relation to certain non-school factors. *International Journal of Education and Information Studies*, *5*(1), 75-80.

Toma, R. B., Greca, I. M., & Gómez, M. L. O. (2019). Attitudes towards science and views of nature of science among elementary school students in terms of gender, cultural background and grade level variables. *Research in Science & Technological Education*, *37*(4), 492-515. https://doi.org/10.1080/02635143.2018.1561433

Zeidan, A. H., & Jayosi, M. R. (2015). Science Process Skills and Attitudes toward Science among Palestinian Secondary School Students. *World Journal of Education*, *5*(1), 13-24. https://doi.org/10.5430/wje.v5n1p13