Research Paper

Volume : 4 | Issue : 7 | July 2015 • ISSN No 2277 - 8179

A Study of Achievement in science in relation to Sex, Habitation and Scientific Attitude of Higher Secondary School Students

Education

KEYWORDS : Achievement, Sex, Habitation, Scientific Attitude

Manpreet Kaur	Research Scholar, Guru Kashi University Talwandi Sabo, Bathinda (Pb) India
Dr. Ram Niwas	Supervisor Dean (Assistant Professor), Guru Kashi University Talwandi Sabo, Bathinda (Pb) India
Dr. V. K. Rai	Co supervisor (Professor), Modern College of Education, Bir Kalan, Sangrur (Pb) India

ABSTRACT

The study examined achievement in science of senior secondary school students in Sangrur District of Punjab State in relation to the gender, habitation and scientific attitude. The descriptive survey research design was used for the study. Random sampling technique was employed to select 200 senior secondary school (standard XII) students from the urban and rural region of the district. Two instruments were used to collect data viz: (1) Scientific Attitude Scale (SAS) and (2) Scientific Achievement Test (SAT). Data were analysed using descriptive statistics and three-way analysis of variance. The findings show that no significant differences were found between male and female and rural and urban students on achievement in science. But significant difference was found among low, average and high scientific attitude students on achievement in science. Two-way interaction effects between sex and habitation, sex and scientific attitude and habitation and scientific attitude on achievement in science were not found significant. Three-way interaction effect among sex, habitation and scientific attitude on achievement in science also was not found significant.

Introduction

Science is a key of individual, social, cultural, industrial, economic, and national development. Science is a basic and essential part of everyday life. Science is helpful in our understanding of the world and this helps us to develop a growing body of idea and information about the ways things work. No nation can develop or grow without science. This is reason that each nation wants to develop their scientific knowledge and power. It is backbone of any nation. Due to great importance of science in national and human life, science is an important school subject.

To develop knowledge and field of science, inculcation of scientific attitude scientific thinking and attitude towards science is essential. But it is shocking that most of youth of our nation are missing to attain scientific knowledge, scientific attitude and science interest and attitude. Scientists participating in the ninth State-level science conference in Bidar on Friday, Agust 3, 2007 expressed serious concern at the declining interest among youth in basic sciences. The scientists said every parent wanted his child to take up a medical or engineering course. But students are not interested in the field of science. At this occasion Gulbarga University Vice-Chancellor B.G. Moolimani said that the candidate was never allowed to take a decision. If this trend continued, all other fields would face lack of talent. He quoted Sir C. V. Rama views that India would not make headway in any direction if pure sciences were ignored. He called upon science teachers to go beyond textbooks and the classroom. A teacher should create an environment which was conducive to students to learn. To do this, the teacher had to be innovative and make the students to think (The Hindu, 4th August). The scientific way of handling any problem and scientific attitude of mind should be inculcated in all individuals in order that they do not accept things on hear say; propaganda or superstitious traditions but upon conclusions arrived at on the basis of evidences.

Many researches have been conducted related to factors affecting students' academic achievement. Various studies also conducted related to achievement in different school subjects and socio-psychological, biological and demographic variables. But studies of achievement in science and scientific attitude have been less in number, particularly in India. Therefore, present study has been conducted to study science achievement of students in relation to gender, habitation and scientific attitude.

Gender and habitation/ location have been a field of researches in most of discipline. In education, a vast literature concerning gender differences and achievement in school subjects have been conducted. With respect to science achievement there has been relatively less attention paid to gender and habitation differences than in other subjects. Researchers over the past several decades in the field of science and mathematics show that males better than female arisen, practitioner and public policy fields.Jovanovic, Solano-Flores, & Shavelson (1994) reported that girls' and boys' performances on standardized tests of science achievement begin to diverge with girls falling behind boys. This fact is well supported by numerous large-scale studies such as the International Association for the Evaluation of Educational Achievement or IEA (1988), the National Assessment of Educational Progress (NAEP) 1970-1986 (Mullis & Jenkins, 1988), and the British Columbia Science Assessments (Bateson & Parsons-Chatman, 1989). In the science classroom, however, girls perform as well, or better than, boys (Maccoby & Jacklin, 1974). Therefore, standardized tests are thought to under-predict girls' science achievement (Linn, 1991). Gender differences have been a popular topic in the examination of science achievement. In general, males often outperform females in science achievement, particularly in physics (e.g., Lee and Burkam 1996; Smith 1992). For example, Kotte (1992), in an international comparative study of 10 nations, found significant gender differences across nations in science achievement, attitude toward science, and science course taking, all in favour of males. Other international comparisons also indicated gender differences in science achievement across countries (e.g., Lapointe, Mead, and Phillips, 1989; Postlethwaite and Wiley, 1992). Young and Fraser (1993) reported significant gender differences in science achievement even after adjusting for individual characteristics, family background, and school context.Demirclioglu and Norman (1999) study indicated that there is a significant gender difference of students'cumulative secondary school grades whereas there is no significant effect of gender on chemistry achievement and chemistry attitudes. Igboke (2004) also found that the differences in performance of male and female students in Physics are not significant. Agbaje and Awodun (2014) findings showed that there was no statistical significant difference in the achievement mean scores of male and female students in the rural school areas and also there was no statistical significant difference in the achievement mean scores of male and female students in the urban school areas.

Habitation/location could also be a factor that affects the performance of students in science subjects. Because students of urban schools avail more learning and other facilities than rural schools students. Young (1998) examined differences in student math and science achievement between rural and urban schools in Western Australia, after controlling for student background variables. Result of multilevel modelling techniques, shows that school location significantly

affected student achievement. Students attending rural schools are not performing as well as those from urban schools. Nebe *et al.* (1979) mention that schooland home locations in terms of rural and urban did not seem to have any effect on physics achievement. Onah and Ugwu (2010) found that school location and interest of students had no significant effects on performance in physics, while performance in physics. Agbaje and Awodun (2014) study revealed that there was statistical significant difference in the achievement mean scores of students in rural and urban school located areas. Mean of rural students was found higher than urban students.

Rao (1996) investigated the relationship among scientific attitude, scientific aptitude, and achievement in biology of secondary students and found that achievement in biology was significantly and positively related to scientific attitude. Bhattacharya (1997) reported that all the three domains of scientific attitude were found highly positively related to students' science achievement. Kar (2004) found significant and positive association between scientific attitude and achievement in general science. Mukhopadhyay (2011) studied achievement in physics of higher secondary students in relation to scientific attitude and found that scientific attitude contribute significantly on achievement in physics. Bang and Baker (2013) studied the effect of high schools' gender organization on Korean tenth-grade students' science achievements. Results indicated that female students from the co-ed school had significantly higher science achievement and positive attitudes towards science from AF and AM. But no significant differences were found between male students in the CE school, and the students from the single-sex schools (AM and AF) on achievement in science and attitudes toward science. Mukhopadhyay (2013) study reveals that achievement in physics was found to be correlated strong and positively with scientific attitude. Shethi (2013) studied scientific attitude in relation achievement in science and found high positive and significant correlation between both variables. Srivastava (2014) attempted to find out whether achievement in science contributes to prediction of scientific attitude in intent as well as action. It was found that knowledge, comprehension and application in science do not contribute to the scientific attitude in intent among male students. Male students with more ability to comprehend in science are not likely to have better scientific attitude in their action. Among female students comprehension in science has been found to be a predictor of scientific attitude in intent and knowledge in science is found to be the best predictor of scientific attitude in their action. Others studies (Moore, 1930; Bileh & Zakhariades, 1975; Rao, 1990; Kaushik, 1998; Sharma, 2007; and Ksheersagar & Kavyakishore, 2013) also reveal a positive relationship between scientific attitude and achievement in science. Findings of Srivastava (2002) and Shinde (1982) studies revealed that students with high achievement in science exhibit higher scientific attitude than their counterparts with low achievement. In contrary to these findings, some studies (Hoff, 1936; Baumel & Berger, 1965 and Dhatrak & Wanjari, 2011) also revealed that there is no relationship between students' scientific attitude and science achievement.

The present study, therefore, sought to investigate how scientific attitude, sex and habitation influence students' achievement in science.

Objectives

Present study has been conducted with following objectives:

1. To study the difference between male and female students of XII standard on achievement in science.
2. To study the difference between rural and urban students of XII standard on achievement in science.
3. To study the difference between students of XII standard with low, average and high scientific attitude on achievement in science.
4. To study two-way interaction effect between sex and habitation, sex and scientific interest and habitation and scientific interest on achievement in science of XII standard students.
5. To study three-way interaction effect among sex, habitation and scientific interest on achievement in science of XII standard students.

Hypothesis

Objective wise null hypotheses were formed in following way:

1. There is no significant difference between male and female students of XII standard on achievement in science.
2. There is no significant difference between rural and urban students of XII standard on achievement in science.
3. There is no significant difference between students of XII standard with low, average and high scientific attitude on achievement in science.
4. There is no significant two-way interaction effect between sex and habitation, sex and scientific interest and habitation and scientific interest on achievement in science of XII standard students.
5. There is no significant three-way interaction effect among sex, habitation and scientific interest on achievement in science of XII standard students.

Methodology

Population and Sampling

The target population for the study comprised all the students of Senior Secondary School (standard XII) in Sangrur District of Punjab State, India. Using simple random sampling technique 200 students were selected from 10 schools (5 rural and 5 urban schools). From each school, twenty students were selected randomly.

Tools used

Scientific attitude scale prepared by Shailaja Bhagwat was used to measure the scientific attitude of higher secondary school students. Science Achievement Test (SAT) constructed and standardized by Dr. R.D. Singh was used to measure achievement in science of higher secondary school students.

Statistical analysis

The data was analysed using three-way analysis of variance.

Results

To achieve objectives of the study, three- way analysis of variance was used. Result of descriptive statistics for three-way analysis of variance is given in Table-1. Summary of three-way analysis of variance is given in Table-2.

Table-1 : Descriptive statistics for three-way analysis of variance to find out impact of sex, habitation and scientific attitude on achievement in science.

Gender			Male		Female		Total
Habitation			Rural	Urban	Rural	Urban	
Scientific Attitude	Low	N	17	13	19	17	66
		Sum	612	486	703	617	2418
		Sum of Squares	22762	18584	26471	22827	90644
		Mean	36.000	37.385	37.000	36.294	36.636
		S.D.	6.755	5.881	5.055	5.205	5.583
	Average	N	14	19	15	21	69
		Sum	543	668	577	769	2557
		Sum of Squares	21827	24354	22673	28711	97565
		Mean	38.786	35.158	38.467	36.619	37.058
		S.D.	7.678	6.946	5.842	5.249	6.379
	High	N	19	18	16	12	65
		Sum	785	773	687	482	2727
		Sum of Squares	33235	34611	30725	19744	118315
		Mean	41.316	42.944	42.938	40.167	41.954
		S.D.	6.675	9.123	9.044	5.906	7.753

Volume : 4 | Issue : 7 | July 2015 • ISSN No 2277 - 8179

Total	N	50	50	50	50	200
	1940	1927	1967	1868	7702	
Sum Sum of Squares Mean S.D.	77824	77549	79869	71282	306524	
	38.800	38.540	39.340	37.360	38.510	
	7.144	8.102	7.053	5.465	7.043	

Table-2 shows that F value for gender (difference between male and female) is 0.000. Table value for significance at 0.05 level for 1, 188 df is 3.891. Obtained value is much less than table value. This indicates that male and female students not differ significantly on achievement in science. Therefore, null hypothesis that "There is no significant difference between male and female students of XII standard on achievement in science", is accepted.

Table-2 indicates that F value for habitation (difference between rural and urban) is 1.051, which is less than table value 3.891 for significance at 0.05 level for 1, 188 df. This indicates that rural and urban students not differ significantly on achievement in science. Therefore, null hypothesis that "There is no significant difference between rural and urban students of XII standard on achievement in science", is accepted.

Table-2:Summary of three-way analysis of variance to find out impact of sex, habitation and scientific attitude on achievement in science

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
1-Main Effects:					
Gender (A)	.015	1	.015	.000	.986
Habitation (B)	47.690	1	47.690	1.051	.307
Scientific Attitude (C)	1023.239	2	511.619	11.276	.000**
2-Way Interactions:					
A X B	29.993	1	29.993	.661	.417
A X C	10.766	2	5.383	.119	.888
B X C	82.590	2	41.295	.910	.404
3-Way Interactions :					
A X B X C	79.650	2	39.825	.878	.417
Explained	1390.151	11	126.377	2.785	.002
Residual	8529.829	188	45.371	** p<0.001	
Total	9919.980	199	49.849		

It is clear from Table-2 that F value for scientific attitude (difference among low, average and high scientific attitude) is 11.276. Table value for significance at 0.001 level for 2, 188 df is 7.100. Obtained value is greater than table value. This indicates that significant difference exist among low, average and high scientific attitude students on achievement in science. This result indicates that scientific attitude of students affect their achievement in science. Therefore, null hypothesis that "There is no significant difference between students of XII standard with low, average and high scientific attitude on achievement in science", is rejected at 0.001 level of significance.

Obtained F values for two-way interaction between sex and habitation, sex and scientific attitude, habitation and scientific attitude are 0.661, 0.119 and 0.910, respectively. All values are less than table values 3.891 and 3.043 for 1, 188 and 2, 188 df. This means that these three interaction effect on achievement in science are not significant. Therefore, null hypothesis that "There is no significant two-way interaction effect between sex and habitation, sex and scientific interest and habitation and scientific interest on achievement in science of XII standard students", is accepted.

Table-2 also shows that obtained F value for three-way interaction among sex, habitation and scientific attitude on achievement in science is 0.878, which is much less than table value 3.043 for 2, 188 df at 0.05 level of significance. This means that three-way interaction effect on achievement in science is not significant. Therefore, null hypothesis that "There is no significant three-way interaction effect among sex and habitation and scientific interest on achievement in science of XII standard students" is accepted.

Discussion

It was found in present study that male and female students not differ significantly on achievement in science. Previous research has produced mixed results related to gender and achievement in science. Most researches show dominance of male over female on achievement in science. But this study shows that no significant difference exist between male and female student on achievement in science. Findings of previous researches by Demirclioglu and Norman (1999), Igboke (2004) and Agbaje and Awodun (2014) also show that no statistical significant difference in the science subjects achievement mean scores of male and female students.

Present study shows that rural and urban students not differ significantly on achievement in science. Previous studies by Nebe *et al.* (1979) and Onah and Ugwu (2010) mention that rural and urban did not seem to have any effect on physics achievement. Therefore, present study supporting findings of Nebe *et al.* (1979) and Onah and Ugwu (2010).

Present study reveals that significant difference exist among low, average and high scientific attitude students on achievement in science. Achievement in science of students with low scientific attitude was found lower than high scientific attitude students. This result indicates that scientific attitude affects achievement in science of higher secondary school students. This study supporting findings of Srivastava (2002) and Shinde (1982) studies that students with high achievement in science exhibit higher scientific attitude than their counterparts with low achievement. Others studies (Moore, 1930; Bileh & Zakhariades, 1975; Rao, 1990; Kaushik, 1998; Sharma, 2007; and Ksheersagar & Kavyakishore, 2013) also reveal a positive relationship between scientific attitude and achievement in science.

Conclusions

Following are conclusions of present investigation:

1. No significant difference was found between male and female students of XII standard on achievement in science.
2. No significant difference was found between rural and urban students of XII standard on achievement in science.
3. Significant difference among students of XII standard having low, average and high scientific attitude was found on achievement in science.
4. No significant two-way interaction effects were found between sex and habitation, sex and scientific interest and habitation and scientific interest on achievement in science of XII standard students.
5. No significant three-way interaction effect was found among sex, habitation and scientific interest on achievement in science of XII standard students.

Since gender and habitation not affects achievement in science and no interaction effect of gender and habitation was found significant, therefore, we can say that impact of scientific attitude on achievement in science is significant and not coloured by gender and habitation.

Educational Implication

It is clear that scientific attitude is one of the factors that affect the achievement in science. Therefore, it is necessary for teach-

ers to enhance the good scientific attitude among the higher secondary school students. It is also necessary of science teacher educators that they develop sound scientific attitude in pre-service teacher and provide good knowledge and understanding to how they can develop scientific attitude in their students.

REFERENCE

Bang, EunJin and Baker, Dale R. (2013). Gender differences in Korean high school students' science achievements and attitudes towards science in three different school settings. Mevlana International Journal of Education, Vol. 3(2), PP. 27-42. Available online at http://mije.mevlana.edu.tr. | Bateson, D. J., & Parsons-Chatman, S. (1989). Sex-related differences in science achievement: A possible testing artifact. International Journal of Science Education, 11, 371-385. | Agbaja, Rashidat Olusola and Awodun , adebisi Omotade (2014) Impact of school location on academic achievement of science students in senior secondary school certificate examination. International Journal of Scientific and Research Publications, Vol. 4 (9) PP. 1-4. | Baumel, H. B. & Berger, J. J. (1965). An attempt to measure scientific attitudes. Science Education,49 (3). 267- 269. | Bhattachraya, G. C. (1997). Scientific attitude and its relationship with academic achievement at higher secondary level. School Science, Vol.3, PP. 32- 40. | Bileh, Y. & Zakhariades, G. (1975). The development and application of a scale for measuring scientific attitudes. Science Education, 59 (2), PP. 155-165. | Demircliogluu, Husniye and Norman, Nilufer (1999). Effects of some variables on chemistry achievement and chemistry related attitudes of high school students. Hacettepe Universitesi Egitim Fakultesi Dergisi, 16-17, PP. 40-44. | Dhatrak, G. and Wanjari, S. (2011). A correlational study of scientific attitude, creativity and scholastic achievement of secondary school students. Indian Stream Research Journal,1(10). www.isrj.net/publish Articles/298.aspx | Hoff, A. G. (1936). A test of scientific attitude. School Science and Mathematics,36, PP.763- 770. | Igboke, G. (2004). Comparative analysis of SSCE and NECO results in Ohaukwu L.G.A of Ebonyi State. Unpublished Thesis ESUT. | Jovanovic, J., Solano-Flores, G., & Shavelson, R. J. (1994). Performance-based assessments: Will gender differences in science achievement be eliminated? Education and Urban Society, 26(4), PP. 352-366. | Kar, P., (2004). Scientific creativity and scientific attitude. Unpublished Ph.D thesis, University of Patna. | Kaushik, N. K. (1998). The long term effect of advance organisers upon achievement in biology in relation to reading ability, intelligence and scientific attitude. Unpublished Doctoral Thesis. Devi Ahilya Vishwavidyalaya. | Kotte, D. 1992. Gender differences in science achievement in 10 countries: 1970/71 to 1983/84. New York: Peter Lang. | Ksheerasagar, S. & Kavyakishore, P. B. (2013). Achievement in science of secondary school students in relation to scientific attitude. International Journal of Education and Psychological Research, 2(2), PP. 61- 65. | Lapointe, A., N. Mead, and G. Phillips (1989). A world of differences: An international assessment of mathematics and science. Princeton, NJ: Educational Testing Service. | Lee,V.E.and Burkam,D.T.(1996).Gender differences in middle grade science achievement: Subject domain, ability level, and course emphasis. Science Education, 80(6), PP. 613-650. | Linn, M. C. (1991). Gender differences in educational achievement [Summary]. In Proceedings of the 1991ETS Invitational Conference: Sex equity in educational opportunity, achievement, and testing (pp. 11-50). Princeton, NJ: Educational Testing Services. | Maccoby, E. E., & Jacklin, C. N. (1974). The psychology of sex differences. Stanford, CA: Stanford University Press. | Moore, E. B. (1930). A study of scientific attitudes as related to factual knowledge. The School Review, 38 (5), PP. 379- 386. | Mukhopadhyay, R.(2011). Scientific Creativity –Its Relationship with Aptitude in Physics, Scientific Attitude, and Approaches to Study, Unpublished Ph.D thesis, University of Calcutta. | Mukhopadhyay, Rajib (2013). Whether aptitude in physics, scientific attitude, and deep approach to study explain achievement in physics significantly – an investigation. International Journal of Humanities and Social Science Invention, Vol 2(1), PP.57-63. | Mullis, I.V. S., & Jenkins, L. B. (1988). The science report card: Elements of risk and recovery. Princeton, NJ: Educational Testing Services. | Nebe, O.I. etal (1979). Study of the relationship between students' interest and scholastic achievement in science subjects with particular reference to NSUKKA L.G.A. Unpublished Thesis of UNN No 15. | Onah, D. U. and Ugwu, E. I. (2010). Factors which predict performance in secondary school physics in Ebonyi north educational zone of Ebonyi State, Nigeria. Advances in Applied Science Research, 1 (3), PP. 255-258. | Postlethwaite, T., and D. Wiley(1992). The IEA study of science II: Science achievement in twenty-three countries. Elmsford, NY: Pergamon. | Rao, D.B. (1990). A comparative study of scientific attitude, scientific aptitude and achievement in Biology at secondary school level. In Fifth Survey of Research in Education, edited by M.B. Buch. N.C.E.R.T. 1997. | Rao, D.B. (1996). Scientific Attitude vis-à-vis Scientific Aptitude, Discovery Publishing House, New Delhi. | Sharma, I. (2007). Problem- solving ability as determinants of academic achievement of higher secondary students. E-journal of All India Association for Educational Research,19(1), P. 7. | Shethi, Tejal J. (2013). A study of scientific attitude among school students. International Journal of Research in Humanities and Social Sciences, Vol. 1(9), PP.41-42. | Shinde, Y. K. (1982). A study of non- formal science activities in secondary schools of Maharashtra states with special reference to their impact on scientific attitude and achievement in science.Unpublished Doctoral Dissertation. Bombay University. | Srivastava, Stuti (2014). Achievement in science as predictors of students' scientific attitude. European Academic Research, Vol. II (2), PP. 2887-2893. | Young, D. J., and B. J. Fraser (1993). Socioeconomic and gender effects on science achievement: An Australian perspective. School Effectiveness and School Improvement, 4, PP.265-89. | Young, Deidra J (1998). Rural and urban differences in student achievement in science and mathematics: A multilevel analysis. School Effectiveness and School Improvement, Vol. 9(4), PP. 386-418. http://eric.ed.gov/?id=EJ581479.