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Exploring the Scientific Aptitude among the Secondary School Students: A Study with Reference to Gender and Type of School

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ABSTRACT

The present study was conducted to examine differences in scientific aptitude among the secondary school students. The objectives of the study were to assess the scientific aptitude of male and female secondary school students. The study also aimed to examine the scientific aptitude of government and private secondary school students. As such, the study employed descriptive survey method. 200 ninth - grade students of Prayagraj district of Uttar Pradesh were selected using stratified random sampling technique. The data were collected with the help of a standardized tool prepared by Kusum, Satish and Sumitra devi(2021), which consists of 66 items across four dimensions- Numerical ability, Logical reasoning, scientific knowledge, scientific reasoning. The data were analysed using descriptive statistics and independent-samples t-test. From the study, it was found that there is a significant difference in the scientific aptitude of male and female students and between government and private secondary school students. Male students of secondary school demonstrated a higher scientific aptitude than female students, while private secondary school students demonstrated higher scientific aptitude than government secondary school students. From the findings, it was recommended that there is a need to develop strategies to enhance scientific aptitude, through such educational materials, for secondary school students.

Key words: Scientific Aptitude, Secondary school, Gender, Type of School, Scientific Reasoning, Scientific Knowledge

Introduction

We live in an era of advanced scientific technology. An act done without structured and programmed thinking leads to waste of time, energy and effort. Secondary school students who are mostly adolescents require science-oriented thinking not only to excel in their studies but also to complete their tasks tactfully with minimum of efforts and time. The training of scientific mind can be achieved only with right orientation of scientific aptitude, which could not be gradually upscaled without consistent mindful efforts. Scientific aptitude helps secondary student to train their mind for logical comprehension, reason out thoughts, critical understanding and curious learning. other intended benefit of scientific aptitude could be development of morality, aptitude, character building, cooperative learning, curious decision making and progressive debating. Learning is influenced by individual characteristics and talents (Banerjee,2016) science aptitude develop in students' special talent or aptitude to science courses Lalmuanzuali et al. (2019)

The studies of scientific aptitude development among secondary school students present different pictures. Das, B & Roy, N.R (2022) in their study on secondary school students Jorhat Assam. Found that there was

no scientific difference in scientific aptitude in male and female students. while the distinction in performance in English medium and Assamese medium was noticeable.

Since India is geographically expanse and diverse. Another study of scientific aptitude of higher secondary school students was conducted by Balasundaram, A., & Muthuchamy, I. (2022) in 3 districts of Tamilnadu viz. Tiruchirappalli, Tiruverumbur and Musiri. The results did not produce significant difference among boys and girls. Also, no substantial difference was reported in between urban and rural pupils, but noticeable difference in scientific aptitude was found among pupils in these three districts. so, difference produced in scientific aptitude can be attributed to context than characteristics like gender, location or study class. The complexity of this study is clarified in the study conducted by Moshahid, M (2016) on scientific aptitude among English and Urdu medium schools in Hyderabad. It resulted better performance of English medium school's vs Urdu medium schools. Urdu medium school girls reported better than English medium girls. Also, Urdu medium girls outperformed male students. Such studies display the variations of results and present study provides an opportunity to map scientific aptitude in given circumstances.

Purpose of the study

The study on secondary school students aims to develop in them scientific aptitude and proper training of the mind for it. The range is high as it encompasses from reducing chances of failure to increasing probability of success. It could be measured in terms of academic performance, debating skills and adding a range of activities for better understanding & learning each and every student has large potential to develop in them right orientation for scientific thinking and taking actions following it.

Students both male and female could modify themselves with the help of teachers to get advantage of limited infrastructure in schools. Government and private schools both could provide collective efforts and guidance to shape students' mental development and desired performance so they can be studied keeping in attention of their limitations of resources and approaches.

Objectives of the study

The objectives for the study are as follows-

1.To compare the Scientific Aptitude of male and female secondary school students

2.To compare the Scientific Aptitude of government and private secondary school students

Hypotheses of the study

H_{01}: There is no significant difference between Scientific Aptitude of male and female secondary school students

H_{02}: There is no significant difference between Scientific Aptitude of government and private secondary school students

Research Methodology

Method of the study

The present study adopts a quantitative approach and employs the descriptive survey method. This design was considered appropriate because the study aimed to assess and compare the scientific aptitude of secondary school students.

Population

All secondary school students studying in Prayagraj district were considered as population.

Sample and sampling Technique

A sample of 200 secondary school students was selected for study. The sample included students from both government and private schools. A stratified random sampling technique was used to ensure proper representation of both types of schools. the sample was divided into two strata: Government school students and private school students.

Data collection instrument

Adolescents' scientific aptitude test ASAT-KSDS: For the present study researcher used the Adolescents' scientific aptitude test ASAT-KSDS developed by Kusum, Satish and Sumitra Devi (2021), which comprised of 66 items spread out over four dimensions- Numerical ability, Logical reasoning, scientific knowledge, scientific reasoning. The total mark for this test is 66.

Administration of the tool

At the outset the investigator took the permission from the Principal of the schools to perform test on the students. Then the investigator met the students to inform them about correct way of answering the questions. The researcher also ensured them about the confidentiality of the answers of the questions as it was only for the purpose of the research. The students answered the questions enthusiastically in the booklet submitted them to investigator. The data was compiled and tabulated for analysis.

Statistical Analysis Used

After the data collection was done the data were coded and analysed using relevant statistical methods. The summary of the data obtained was done using descriptive statistics. Mean, SD, and t-test was used to determine whether significant difference existed between male and female students and government and private secondary school students.

Result and Discussion

In order to find out male and female secondary students. t – value along with mean and standard deviation (SD) was calculated and the results of analysis are shown in table - 1

Objective 1- To compare the Scientific Aptitude of male and female secondary school students

H0: 1 There is no significant difference in the scientific aptitude of male and female secondary school students.

Table 1 Mean, SD and t-ratios Showing differences of scientific aptitude between male and female secondary school students.

Gender	N	Mean	SD	Std. Error Mean	df	t-value
Male	102	33.3039	10.69912	1.05937	198	6.081
Female	98	25.4184	7.23668	.73102		

* Significant at the 0.05 level of significance.

It is observed from table 1 that the critical value of t at 0.05 level at df=198 is 1.96, which is less than our calculated t value which is 6.081. Hence our calculated t value is significant at 0.05 levels. It is evident from table-1 that the mean of Scientific aptitude of male secondary school students is 33.30 and S.D is 10.69912. The mean of female secondary school students towards Scientific aptitude is 25.4184 and S.D is 7.236. Therefore, it can be concluded there is a significant difference between the scientific aptitude of male and female of secondary school students. So, it indicated that male students of secondary school demonstrated a higher scientific aptitude than female students. Thus, the null hypothesis at 0.05 level of significance is rejected as: There is no significant difference in Scientific aptitude of government male and female secondary school students and the research hypothesis is accepted indicating that there is a significant difference in scientific aptitude between male and female secondary school students.

The above finding shows that male secondary school students had higher scientific aptitude than their female counterparts. This finding are comparable with that of Magare (2012), who found that there was a significant difference in scientific aptitude between male and female students. However, the result is contradictory of that found by Das and Roy (2022) that found no significant difference in scientific aptitude between male and female students. On the contrary, Lalmuanzuali et al. (2019), Moshahid (2016), and Dar and Majid (2022) found that female students had a higher level of scientific aptitude, unlike the finding discussed above. The discrepancy in results among the studies can be attributed to differences in demographics and other factors.

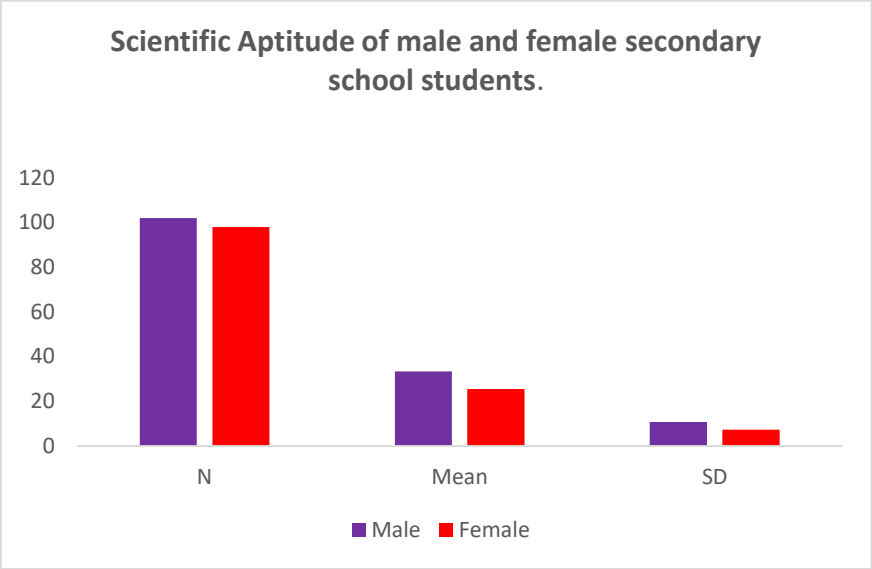


Figure-1 Showing Mean Plot of Scientific Aptitude of male and female secondary school students.

Objective-2 To examine the scientific aptitude of government and private secondary school students

H0: 2 There is no significant difference in scientific aptitude between government and private secondary school students.

Table-2 Showing Mean, SD, t-value of Scientific Aptitude of government and private secondary school students.

Type of school	N	Mean	SD	Std. Error Mean	df	t-value
Private	104	33.4712	9.27881	.90986	198	2.365
Government	96	30.3646	9.28510	.94766		

* Significant at the 0.05 level of significance.

Observation of the table -2 shows that the calculated t-value for Scientific Aptitude is 2.365. It is greater than 1.96, the value required for significance at 0.05 level for df= 198. So, the t-value is statistically significant and null hypotheses stating "There is no significant difference in Scientific Aptitude of private and government secondary school students" is rejected. It means that private secondary school students differ from government secondary school students in their overall Scientific Aptitude. The graphical representation of the same is given in the figure 2.

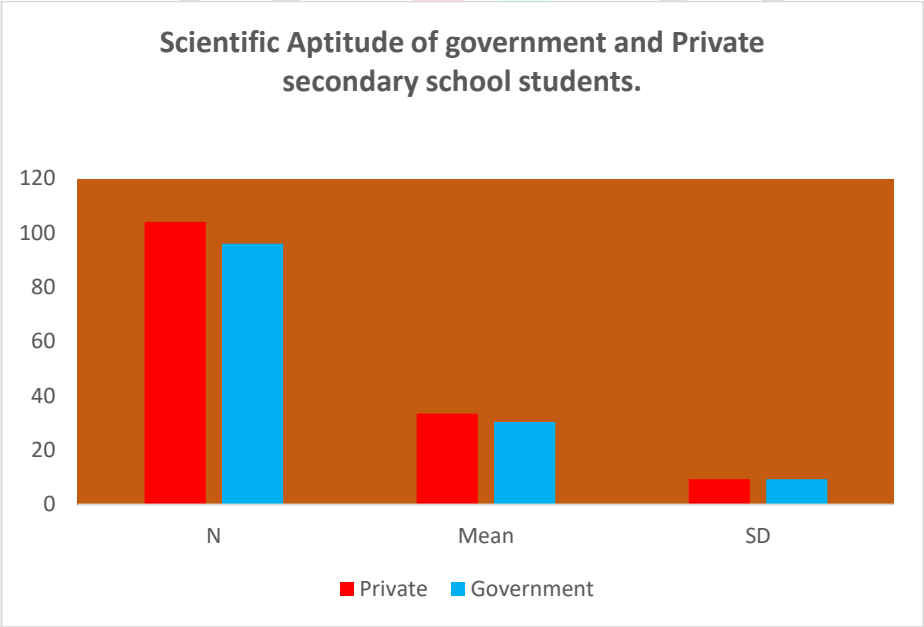


Fig -2 Showing Mean Plot of Scientific Aptitude of government and Private secondary school students.

Implication of the study

1. Scientific aptitude in every student whether male and female can be developed and enhanced.
2. Right training and planned course of actions distributed on daily, weekly and monthly basis can improve scientific thinking.
3. Though learning is majorly individual, group and cooperative learning among students can encourage them to compete, cooperate and propel them to acquire newer skills.
4. Since secondary students are adolescents, they could be trained in a flexible manner in a given academic setting whether government and private, and the available infrastructure, manpower and materials.

5. Private school students reported better scientific aptitude than their government school counterparts. The reasons could be plenty for such observations ranging from individual and social factors to differences in infrastructure etc.

Conclusion

Scientific aptitude development is a continuous process which requires individual as well as collective efforts. Its planning can be started at any level as positive results may be seen over a longer period though each student has this potential and ability to convert it into academic results. It is focussed on students who require greater academic support, including girls where necessary. The first change is actually mental preparation and development of the mind then comes the availability of resources. Updated science-oriented resources could be provided in government schools to bring government school students at par with private school students. Consistency is the key observational learning through proper group activities could be a major boost which could make learning more engaging.

Teachers are important human resources who could be better trained to deal differently with weaker students as against academically sound students. Learning is multidimensional and so is the training of the mind. Generation of interest and accordingly planned learning activities could be done. Teaching aids and curriculum could be made more scientifically robust. Modification should be done through proper guidance and counselling and constructive feedback mechanism approach.

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