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SCIENCE ACHIEVEMENT AMONG SECONDARY SCHOOL STUDENTS IN RELATION TO SCIENTIFIC ATTITUDE

[1]Abhay Gautam, [2]Prof. Harishankar Singh

[1]M.Ed. Student, [2]Professor Department of Education,

[1] Department of Education, Babasaheb Bhimrao Ambedkar University

(A Central University), Lucknow- 226025. U.P.

Correspondence Author: Abhay Gautam

Department of Education, Babasaheb Bhimrao Ambedkar University (A Central University)

Lucknow- 226025 U.P.

ABSTRACT:

The present study investigates science achievement among secondary school students in relation to their scientific attitude, with a focus on institutional differences. A descriptive survey method was employed, and a sample of 195 secondary school students was selected using stratified random sampling from both government and private schools. Self-made tools were used to assess students' scientific attitude and science achievement. The data were analysed using appropriate statistical techniques, including mean, standard deviation, and t-test. The study found a significant positive relationship between scientific attitude and science achievement among secondary school students. A statistically significant difference was observed between students in private and government schools, with students in private schools demonstrating higher levels of science achievement. This difference may be attributed to variations in learning environments, availability of resources, and instructional practices. The study highlights the importance of fostering a scientific attitude as a key factor in enhancing academic performance in science. It also emphasises the need to improve teaching strategies and infrastructural facilities in government schools to bridge the achievement gap. The findings have important implications for educators, policymakers, and curriculum planners.

KEYWORDS: Science achievement; scientific attitude; secondary school students.

INTRODUCTION:

Science education occupies a central place in the modern school curriculum as it plays a vital role in fostering rational thinking, problem-solving ability, and scientific temper among learners (National Council of Educational Research and Training **[NCERT], 2005**; Organisation for Economic Co-operation and Development, 2019). In an era characterized by rapid scientific and technological advancements, the significance of science learning has increased manifold, as it equips individuals with the knowledge and skills necessary to understand and respond effectively to real-life challenges (OECD, 2019). At the secondary school level, science serves as a foundational discipline that shapes students' future academic and career trajectories, making science achievement a critical area of educational research **(NCERT, 2005).**

Science achievement refers to the level of proficiency attained by students in the subject of science, usually measured through academic performance, standardized tests, or classroom assessments **(American Educational Research Association, 2014)**. It is influenced by a wide range of factors, including cognitive abilities, teaching methodologies, learning environment, motivation, and psychological attributes of learners (**Benjamin Bloom, 1956**). Among these factors, scientific attitude has emerged as a key determinant that significantly contributes to students' success in science learning **(Norman Harlen, 1999).**

Scientific attitude can be understood as a tendency to think and act in a rational, objective, and evidence-based manner. It includes qualities such as curiosity, open-mindedness, critical thinking, skepticism, and a willingness to accept new ideas based on empirical evidence (Harlen, 1999; John Dewey, 1938). Students possessing a well-developed scientific attitude are more likely to engage actively in the learning process, ask questions, explore concepts deeply, and apply scientific reasoning in solving problems. Consequently, such students tend to demonstrate higher levels of achievement in science **(Dewey, 1938).**

In recent years, researchers and educators have increasingly emphasized the importance of developing scientific attitude alongside conceptual understanding in science education **(OECD, 2019)**. The National Education Policy 2020 also highlights the promotion of scientific temper and inquiry-based learning as essential goals of the education system. Despite these efforts, disparities in science achievement continue to exist, particularly between students studying in government and private schools **(UNESCO, 2021).** These disparities are often attributed to differences in infrastructural facilities, quality of teaching, availability of resources, classroom environment, and exposure to innovative pedagogical practices **(UNESCO, 2021).**

Private schools generally provide better access to laboratory facilities, technology-integrated instruction, and student-centered teaching approaches, which may contribute to the development of a stronger scientific attitude among students (**OECD, 2019**). On the other hand, government schools, despite their wide reach and inclusivity, often face challenges such as limited resources, large class

sizes, and traditional teaching methods, which may hinder the effective development of scientific attitude and, consequently, science achievement **(UNESCO, 2021**). Therefore, it becomes essential to examine not only the relationship between scientific attitude and science achievement but also the differences that exist across different types of schools.

The present study is undertaken with the objective of exploring science achievement among secondary school students in relation to their scientific attitude and examining the differences between government and private school students. By analyzing these relationships, the study seeks to provide insights into how scientific attitude can be nurtured to enhance academic performance in science. Furthermore, the findings of this study are expected to contribute to the existing body of knowledge and offer practical implications for teachers, curriculum developers, and policymakers in designing effective strategies to improve science education outcomes.

In conclusion, developing scientific attitude is not merely an academic requirement but a necessity for creating responsible and informed citizens capable of making rational decisions in a scientifically driven world (**NCERT, 2005**). Understanding its role in influencing science achievement is therefore crucial for strengthening the quality and effectiveness of science education at the secondary level.

REVIEW OF THE RELATED LITERATURE:

Akram, M., **Fatima, S. A.** and **Ahmad, N. (2024)** in their study titled *"Comparing Students' Science Motivation and their Achievement in Science Subjects at Secondary Level,"* examined how science motivation influences student achievement across Physics, Chemistry, and Biology at the secondary level. The study aimed to: (1) determine gender-based differences in students' motivation and science achievement, (2) assess differences in science motivation and achievement between rural and urban students, and (3) explore how motivational components affect science performance. The research population comprised 10th-grade students from Okara District, Pakistan, and a total sample of 1000 students was selected using cluster random sampling. A causal-comparative research design was employed. The researchers used an Urdu version of the Science Motivation Questionnaire II (SMQ-II), adapted with permission, and collected academic achievement scores from schools. Data were analyzed using independent samples t-tests and descriptive statistics via SPSS. The study found that male students were significantly more motivated than females in Physics and Chemistry, while female students showed higher motivation in Biology. Additionally, urban students were more motivated and achieved better results in science subjects than their rural counterparts. Overall, the findings established a strong link between students' motivation and their academic achievement in science, emphasizing the need for strategies that enhance motivation to improve science education outcomes.

Gupta, A. K. and **Prasad, K. C. (2023)** in their study titled *"Effect of Constructivist Approach on Students' Achievement in Science at Secondary Level,"* examined how a constructivist teaching method impacts science achievement among class 10th students. The study aimed to: (1) assess the effect of the approach on overall science achievement, (2) evaluate its impact on low achievers, and (3) compare

performance between boys and girls. Conducted at D.A.V. School in Bhagalpur, Bihar, the study used a purposive sample of 54 students divided into experimental and control groups. A quasi-experimental design was employed, with the 5E model applied in the experimental group. Data were collected through a teacher-made test and analyzed using t-tests and ANCOVA. The findings showed that the constructivist approach significantly improved students' science achievement, especially among low achievers, while gender had no significant effect. The study highlights the benefits of active, student-centered learning in enhancing science performance.

Olojo, O. J., **Akinwumi, I. O.**, and **Olofin, S. O. (2022)** in the article titled *"Comparative Analysis of Secondary School Students' Performance in Science Subjects in Ekiti State, Nigeria,"* analyzed trends in students' academic performance in Biology, Chemistry, and Physics across public secondary schools over a five-year period. The objectives of the study included: (1) to compare mean performance levels of students in Biology, Chemistry, and Physics, (2) to examine the performance trends in each science subject from 2015 to 2019, and (3) to determine whether significant differences existed among performances in the three science subjects. The population comprised all students who sat for the West African Senior School Certificate Examinations (WASSCE) from 2015 to 2019 in 141 public secondary schools across Ekiti State, Nigeria. A purposive sampling technique was used to select WASSCE student data for the study. Utilizing an ex-post facto research design, the researchers analyzed existing records through descriptive statistics (mean, percentage, standard deviation, graphs) and inferential statistics, including ANOVA at a 0.05 significance level. The findings revealed that students consistently performed best in Chemistry, followed by Physics, and least in Biology. However, the trend of performance across the years did not follow a predictable pattern. A statistically significant difference was found between performances in the three science subjects, emphasizing the need for better resourcing, teacher training, and targeted interventions in subjects like Biology where students underperformed.

Kumar, N. L. C. (2021) in the study titled *"A Study on Achievement in Science of Secondary School Students in Relation to Their Attitude Towards Science,"*explored how students' attitudes toward science relate to their academic achievement in the subject. The study had two core objectives: (1) to examine the relationship between science achievement and students' attitudes toward science, and (2) to determine whether science achievement varies among students with different levels of attitude (unfavourable, average, and favourable). The population consisted of secondary school students from government schools in Kolar Taluk, Karnataka, and a sample of 200 students was selected. The study used a descriptive survey methodology, where science achievement scores were obtained from school records, and the Attitude Towards Science Scale (ATSS) by Dr. Anuradha Agnihotri (2009) was administered. Data were analyzed using Pearson's correlation and t-tests. The findings revealed a significant positive relationship between attitude toward science and science achievement. Moreover, students with favourable attitudes toward science demonstrated significantly higher achievement compared to those with average or unfavourable attitudes. The study suggests that fostering a positive

attitude toward science is essential for improving academic outcomes, and recommends early intervention and motivation strategies by educators.

Lalrinmawia, J. and **Fanai, L. (2020)** in the study titled *"A Study of Achievement in Science Among Higher Secondary School Students of Aizawl,"* investigated science achievement levels among class XII students in Aizawl, Mizoram, and how these vary across gender and school types. The objectives were: (1) to assess the level of science achievement among students, (2) to compare achievement between male and female students, and (3) to examine differences in science achievement among students from government, private, and deficit schools. The population included all class XII science students in Aizawl's higher secondary schools, and a sample of 298 students was drawn from eight schools using a balanced representation across gender and school types. The study followed a descriptive research methodology using a standardized Achievement Test in Science (ATS) by Dr. S.C. Gakhar and Dr. Rajnish, focusing on core Physics and Chemistry concepts. Data were analyzed using t-tests and descriptive statistics. Findings revealed that the overall level of science achievement was very low, with the vast majority of students falling below average. No significant gender differences were observed in science achievement. However, students from deficit schools significantly outperformed those from government and private schools. The authors recommended learner-centered teaching methods and collaborative strategies to enhance student interest and performance in science.

Bichi, A. A., Hafiz, H., and **Abdullahi, S. (2017)** in their article titled *"Evaluating Secondary School Students' Science Achievement: Implication for Curriculum Implementation,"* assessed science achievement among senior secondary school students in Kano State, Nigeria, with a focus on curriculum implications. The study had three main objectives: (1) to evaluate students' overall performance in science subjects, (2) to explore the correlation between achievement in Biology, Chemistry, and Physics, and (3) to examine gender differences in science performance. The research population included students from 17 science secondary schools in Kano State, with a stratified random sample of 378 students selected. Using an ex-post facto research design, the study gathered achievement test scores in Biology, Chemistry, and Physics administered by the state's Science and Technical Schools Board. Data were analyzed using descriptive statistics, Pearson correlation, and independent t-tests. The findings revealed that student achievement across the three science subjects was generally above average and strongly interrelated, suggesting consistency in science learning outcomes. However, significant gender differences were observed, with male students outperforming their female counterparts. The study emphasized the need for targeted instructional strategies and curriculum reforms to ensure equitable achievement in science education.

Chan, Y. L. and **Norlizah, C. H. (2017)** in their study titled *"Students' Motivation towards Science Learning and Students' Science Achievement,"* examined how students' motivation affects their achievement in science subjects among Malaysian secondary school students. The study aimed to: (1) assess the relationship between students' motivation toward science learning and their science achievement, (2) investigate gender differences in motivation, and (3) evaluate the influence of parental

education level on students' motivation and performance. The population consisted of Form Four pure science stream students in Pahang, Malaysia, and a random sample of 165 students from ten government secondary schools was selected. Utilizing a quantitative survey design, the researchers employed the Students' Motivation towards Science Learning (SMTSL) questionnaire along with science achievement data drawn from students' midterm examination scores in Biology, Chemistry, and Physics. Findings revealed that students were generally moderately motivated, with most achieving mid-low performance levels. A significant positive relationship was found between motivation and achievement, with female students demonstrating higher motivation than males. However, no significant link was found between parental education level and students' motivation. The study highlights the importance of promoting active learning strategies to enhance motivation and, consequently, science achievement.

Panneerselvam, M. and **Muthamizhselvan, M. (2015)** in the study titled *"The Secondary School Students in Relation to Scientific Attitude and Achievement in Science,"* explored the relationship between scientific attitude and science achievement among secondary school students. The research focused on three primary objectives: (1) to examine the differences in science achievement between boys and girls of IX standard, (2) to investigate the achievement differences among students attending different types of schools, and (3) to assess science achievement in relation to varying levels of scientific attitude. The population for the study included IX standard students from Vriddhachalam in Cuddalore District, Tamil Nadu, and a stratified random sampling technique was used to select a sample of 600 students from both government and private schools. The researchers adopted a quantitative methodology, employing an achievement test in science developed by themselves and a scientific attitude scale designed by Avinash Grewal. Data analysis was conducted using statistical tools including t-tests, correlation coefficients, and two-way ANOVA. The study found a statistically significant but low positive correlation ($r = 0.298$, $p < 0.01$) between scientific attitude and achievement in science. Students with high levels of scientific attitude performed significantly better than those with moderate or low levels, suggesting that fostering scientific attitudes can positively impact students' academic success in science.

Patel, M. J. (2015) in the study titled *"A Study of Factors Affecting Achievement in Science at Secondary Level,"* investigated how various personal and institutional factors influence science achievement among secondary school students. The study focused on three key objectives: (1) to analyze the effect of personal factors such as gender, socio-economic status, and participation in co-curricular activities on science achievement, (2) to assess the impact of access to technology like computers and the Internet, and (3) to evaluate the role of educational facilities such as laboratories and coaching support. The population included class IX students from Deoria and Gorakhpur districts, and a sample of 500 students (270 boys and 230 girls) was selected from 20 schools representing urban and rural areas. Using a survey research method, the researcher employed a self-developed science achievement test and socio-economic questionnaires. Data analysis revealed no significant gender

difference in science achievement across rural and urban areas. However, students from higher socio-economic backgrounds consistently performed better. Access to computers, the Internet, and participation in co-curricular activities significantly boosted achievement, particularly among urban students. The study concluded that enriched learning environments and access to technology are crucial for enhancing science achievement at the secondary level.

Allen, J. P., Pianta, R. C., Gregory, A., Mikami, A. Y. and **Lun, J. (2011)** in their study titled *"An Interaction-Based Approach to Enhancing Secondary School Instruction and Student Achievement,"* examined whether improving teacher-student interactions could positively impact student achievement in secondary education. The study pursued the following objectives: (1) to assess the effect of the My Teaching Partner–Secondary (MTP-S) intervention on student achievement, (2) to evaluate whether improved teacher-student interaction quality mediates achievement gains, and (3) to determine the sustainability of these improvements over time. The population comprised secondary school teachers and students across 12 schools in the United States, and the sample included 78 teachers and over 2,200 students across two academic years. The researchers used a randomized controlled trial methodology, incorporating video-based coaching, structured feedback, and a year-long teacher development program. Student achievement was measured using standardized test scores, and teacher interaction quality was assessed using the CLASS-S framework. The findings indicated that the MTP-S intervention led to significant improvements in student achievement, observable in the year following the intervention. These gains were mediated by improvements in teacher-student interactions, suggesting that such interactions are crucial to enhancing student learning outcomes, regardless of subject area.

OBJECTIVES OF THE STUDY:

The Objectives for the study are as follows –

1. To examine the relationship between scientific attitude and science achievement, an analysis.
2. To study the science achievement of secondary school students based on the types of school (Government/ Private).

METHODOLOGY OF THE STUDY:

Method of the study: The present study adopts a quantitative approach and employs the descriptive survey method. This design is appropriate as it aims to examine the existing relationship between scientific attitude and science achievement among secondary school students without manipulating any variables.

Sample selection: A sample of 195 secondary school students was selected for the 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:

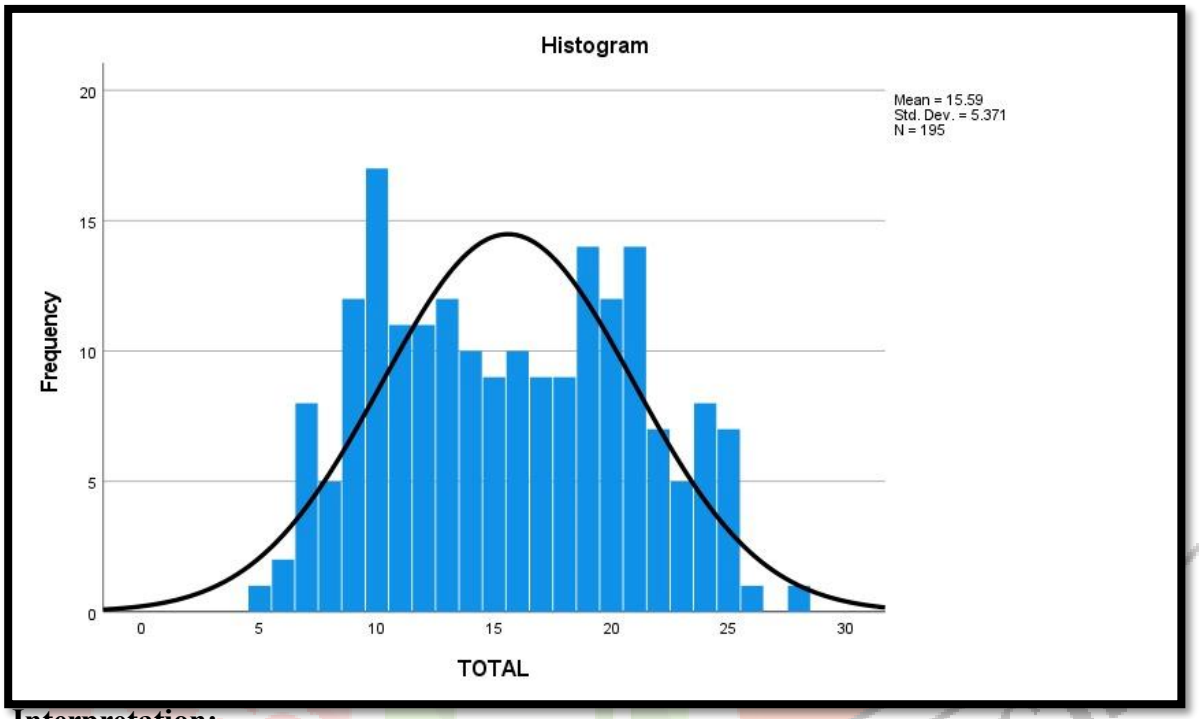
- Government school students
- Private school students

Students were randomly selected from each stratum to maintain objectivity and reduce sampling bias.

Tool of the Study: For the Data collection, the researcher developed a self-made tool with the guidance of the supervisor.

RESULT AND INTERPRETATION:

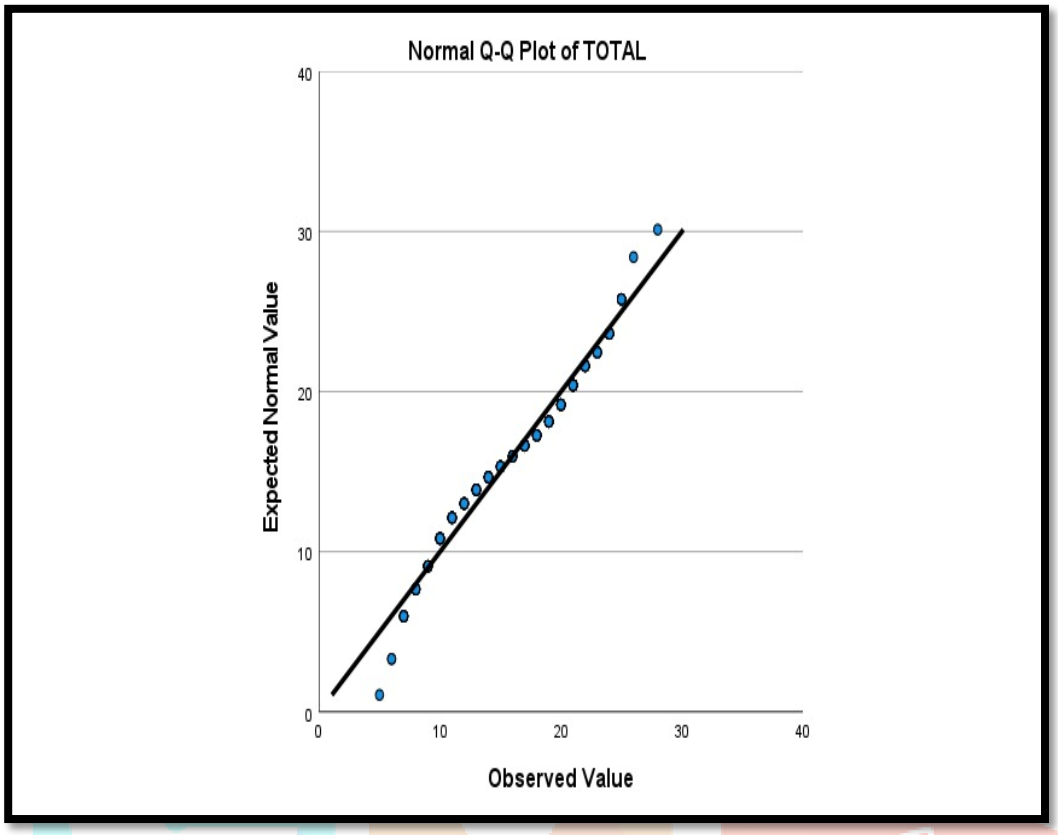
Test of Normality:



Interpretation:

The graph shows that students' scores are spread from around 5 to 28 marks, but most students scored between 10 and 22 marks. The mean score is 15.59, which is nearly the middle of the 30-mark test. This indicates that the overall science achievement level of students is moderate or average. The black normal curve shows that the distribution is approximately normal, although it is not perfectly bell-shaped. Some students scored low, some scored high, but most students are concentrated around the middle score range. The standard deviation is 5.371, which means there is a noticeable variation in students' achievement. In simple words, not all students performed at the same level; some students showed weak achievement, while some showed comparatively better achievement.

Normal Q-Q Plot of Total:



Interpretation:

The Normal Q-Q Plot is used to assess whether the data follows a normal distribution, which is an important assumption for applying parametric statistical tests such as the t-test. In the given Q-Q plot, most of the data points lie close to the diagonal reference line, indicating that the observed values are approximately aligned with the expected normal values. Although there are slight deviations at the lower and upper ends (tails), these deviations are minimal and do not indicate a serious departure from normality. The distribution of the Total scores can be considered **approximately normal**.

Objectives 1.

To examine the relationship between scientific attitude and science achievement, an analysis.

The thematic analysis of students' responses, as reflected through the Total scores representing scientific attitude, reveals several interrelated themes that explain how scientific attitude influences science achievement among secondary school students. Firstly, the theme of curiosity and inquiry-based learning emerges prominently, as students with higher scores exhibit a strong desire to ask questions, explore new ideas, and seek a deeper understanding of scientific concepts, which in turn enhances their academic performance. Closely related to this is the theme of critical thinking and logical reasoning, where students possessing a well-developed scientific attitude demonstrate better analytical abilities and problem-solving skills, enabling them to effectively handle both conceptual and numerical aspects of science. Another important theme is open-mindedness and acceptance of evidence, indicating that high-scoring students are more willing to consider new ideas and rely on empirical evidence rather than preconceived notions, a quality that aligns closely with the nature of scientific inquiry and facilitates meaningful learning. Furthermore, the theme of active engagement in learning highlights that such students are more involved in classroom activities, including experiments, discussions, and

observations, which significantly improves their comprehension and retention of scientific knowledge. In addition, a positive attitude towards science is observed among students with higher scientific attitude scores, reflecting their interest, motivation, and regular study habits, all of which contribute to improved academic achievement. Collectively, these themes suggest that a scientific attitude is not merely an abstract construct but a multidimensional factor that shapes students' learning behaviour, engagement, and cognitive processes, thereby playing a crucial role in enhancing their achievement in science.

Objectives 2.

To study the science achievement of secondary school students based on the types of school (Government/ Private).

H_{01}: There is no significant difference in the science achievement of secondary school students studying in government schools and private schools.

SCHOOL	N	MEAN	SD	σ_D	t- Value	df	CR
GOV. SCHOOL STUDENTS	96	14.18	5.502	0.746	3.73	193	1.97
PRIVATE SCHOOL STUDENTS	99	16.96	4.890				

Table 1. There is no significant difference in the science achievement of secondary school students studying in government schools and private schools.

Interpretation:

The above table presents a comparison of science achievement scores between government and private school students. It is observed that the mean score of government school students (M = 14.18, SD = 5.502) is lower than that of private school students (M = 16.96, SD = 4.890), indicating comparatively better performance of private school students. The calculated standard error of difference (σD = 0.746) reflects the variability between the two group means. The obtained t-value (t = 3.73) is greater than the critical value (CR = 1.97) at 193 degrees of freedom and 0.05 level of significance. This indicates that the difference between the mean scores of the two groups is statistically significant. Therefore, the null hypothesis stating that there is no significant difference in science achievement between government and private school students is rejected. It can be concluded that private school students have significantly higher science achievement compared to government school students, possibly due to better academic environment, resources, and teaching practices.

DISCUSSION:

The present study examined science achievement among secondary school students in relation to scientific attitude, with special reference to the difference between government and private school students. The study used a descriptive survey method with a sample of 195 secondary school students*, selected through stratified random sampling from government and private schools. The paper also states that self-made tools were used for measuring scientific attitude and science achievement. The descriptive results show that the overall science achievement of students was at a moderate level. The mean score was 15.59, and most students scored between 10 and 22 marks, while the minimum and maximum scores ranged from 5 to 28. This indicates that although some students performed well, a considerable number of students remained at an average or below-average level. The standard deviation also shows variation in students' achievement, suggesting that science learning is not uniform among all learners. The histogram and Q-Q plot further indicate that the data were approximately normally distributed, making the use of the t-test suitable for further analysis. The findings related to scientific attitude suggest that students who possess curiosity, logical thinking, open-mindedness, interest in evidence, and active engagement in classroom learning tend to perform better in science. This shows that science achievement is not only dependent on memorization or textbook learning, but also on students' ability to think scientifically, ask questions, observe carefully, and apply reasoning. Therefore, scientific attitude plays an important role in improving students' achievement in science. This finding is in line with earlier studies discussed in the paper, which reported that students' motivation, attitude toward science, and scientific thinking are positively related to science achievement. The comparison between government and private school students showed a clear difference in science achievement. Government school students obtained a mean score of 14.18, while private school students obtained a higher mean score of 16.96. The calculated t-value was 3.73, which was greater than the critical value of 1.97 at 0.05 level of significance. Therefore, the null hypothesis stating that there is no significant difference between government and private school students was rejected. This means that private school students performed significantly better than government school students in science achievement. This difference may be due to variations in school environment, classroom facilities, availability of science laboratories, teaching methods, teacher-student interaction, parental support, and academic exposure. Private schools may provide better learning resources, more structured academic monitoring, and greater opportunities for students to participate in science-related activities. On the other hand, government schools may face challenges such as limited resources, overcrowded classrooms, insufficient laboratory facilities, and less exposure to activity-based learning. However, this finding should not be understood as a weakness of government school students; rather, it points toward the need to strengthen the academic and infrastructural support available to them.

The findings of the study have important educational implications. Teachers should encourage inquiry-based learning, experimentation, questioning, discussion, and problem-solving activities in science classrooms. Schools should focus not only on completing the syllabus but also on developing scientific

temper among students. Special attention should be given to government schools so that the achievement gap between government and private school students can be reduced. Improving science laboratories, using low-cost teaching aids, organizing science exhibitions, and providing teacher training may help improve students' interest and performance in science.

CONCLUSION:

The study concludes that the overall science achievement of secondary school students was moderate, with noticeable variation among students. The results indicate that scientific attitude is an important factor associated with better science achievement. Students who show curiosity, logical reasoning, open-mindedness, and active participation in science learning are more likely to achieve better academic results in science. The study also found a significant difference in science achievement between government and private school students. Private school students scored significantly higher than government school students. Therefore, the null hypothesis related to school type was rejected. This finding suggests that school type and learning environment play an important role in shaping students' science achievement. Overall, the study highlights the need to develop scientific attitude among students and to improve the quality of science teaching, especially in government schools. Strengthening laboratory facilities, adopting activity-based teaching methods, encouraging questioning, and creating a supportive classroom environment can help improve science achievement among secondary school students. Thus, the study is useful for teachers, school administrators, curriculum planners, and policymakers who aim to improve science education at the secondary level.

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