

## Attitude towards Science as a Predictor of Academic Achievement among Secondary School Students in Odisha

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### ABSTRACT

This current research analyzed attitude towards science as a predictor of academic achievement among secondary school students in Odisha based on the vision of the National Education Policy (NEP) 2020 which focuses on scientific temper, engagement of learners and holistic development. The research design embraced was descriptive. A sample comprising of 90 secondary school students were selected through a simple random sampling technique. The attitude towards science was assessed with the help of the Attitude Towards Science Scale developed by Dr. Avinash Grewal (2012) which consisted of 20 items. Academic achievement was assessed based on the percentage of marks secured by students in the previous academic year. The statistical methods to analyze data were mean, standard deviation, t -test, Pearson correlation, and regression. The results showed that there was no significant gender-based difference in attitude towards science and academic performance; however, significant differences were observed w.r.t type of institution and locale. Attitude towards science and academic achievement had a significant positive relationship ( $r = 0.901$ ). The regression analysis proved that attitude towards science is a powerful predictor of academic achievement. The study highlights the importance of fostering positive attitudes towards science to enhance academic performance, in alignment with the NEP 2020 which emphasis on experiential, inclusive and learner-centred education.

**Keywords:** *Attitude towards science, Academic achievement, Secondary school students, NEP 2020*

Science education is essential in the development of learners cognitive skills, problem solving skills and scientific temper, which are crucial in national development in the twenty first century. In the secondary school level, science is not only used as a preparatory subject in higher learning, but also as a channel of inculcating rational thinking, curiosity, and innovation in students. However, academic success in science does not rely on cognitive ability or quality of instruction only but affective factors like attitude of students towards science also play a critical role in learning. Science attitudes refer to the interest, motivation, perception and emotional disposition of the students towards science, which is a combination of the attitudes that determine how they engage and perform in the academic

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settings (Schibeci, 1984). There is a significant research that has been conducted to prove that a positive approach in science has a strong correlation with academic success. Students with interests and confidence in science are more likely to participate in the classroom learning process, may be more persistent in solving the problem, and will excel on tests (Osborne, Simon, and Collins, 2003). Attitude is a predictive variable that mediates learning behaviors of students, including time devoted to the task, desire to learn the concepts, and interest in scientific investigation. Super synthetic information is also available that affective factors such as attitudes and motivation have significant influence on achievement in the subject domains (Hattie, 2009).

The enhancement of science education performance is a national agenda in the Indian context especially given that the region has regional disparities in terms of education access and quality. Majority of the socio-economic and cultural developments in Odisha make it an important context in which to discuss the predictors of academic success in secondary school learners. The information about the impact of the attitude of students towards science on their academic performance could be used to give the empirical data regarding the effect of pedagogical intervention and policy formulation.

The National Education Policy (NEP) 2020 emphasises the need to inculcate scientific temper, critical thinking, and experiential learning in the minds of learners. It focuses on the transformations between memorization-oriented to competency-oriented education, student-focused pedagogy, and the multidisciplinary approaches to teaching science (Government of India, 2020). NEP 2020 explicitly identifies the importance of the interest of students, their engagement, and positive learning experiences in enhancing academic outcomes, which reinforces the applicability of the attitude as one of the main factors in the determination of academic success. The policy, by harmonizing the practices in the classroom with affective requirements of students, envisages the creation of motivated learners, who can innovate and learn throughout their lives. It is against this background that this project aims to investigate attitude to science as a predictor of academic performance amongst secondary school learners in Odisha. Through empirical study of this relationship, the research will help add to the body of literature and assist NEP 2020 vision of holistic, inclusive and quality science education.

### ***Significance of the Study***

The study focuses on the relationship between science-related attitudes and academic performance in secondary school students in the state of Odisha hence giving the study substantial academic, pedagogical, and policy-implication value. Science education has largely been considered as a pillar towards the development of analytical thinking, innovativeness, and scientific temper in learners. However, academic achievement in science is not determined purely by mental abilities but also by affective influences like the student attitude, interests and their motivations (Bloom, 1976; Schibeci, 1984). The study focuses on attitudes toward science as a predictive variable, which makes it a contribution to a more sophisticated insight into the role of the non-cognitive determinants of scholastic success. Academically, the research contributes to the literature by providing empirical data based on the Indian scenario, especially Odisha where the region-specific research on the affective predictors of achievement is limited. Current literature has reported that there is a positive relationship between the attitudes of the student towards science and academic performance (Osborne, Simon, and Collins, 2003; Tuan, Chin, and Shieh, 2005). The present research builds on these results by empirically proving the role of attitude as a

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predictor variable, which reinforces theoretical frameworks that combine both affective and cognitive spheres of learning (Ajzen, 1991; Hattie, 2009). This study has found salient pedagogical implications to science teachers and curriculum developers. Positive disposition to science improves student interest, tenacity and clarity of concepts (Fraser, 2015). The knowledge obtained as a result of this study can be integrated into the development of the learner-centred instructional plans, activities based on inquiries, and learning experiences which promote the positive attitudes and, in turn, contribute to the improvement of academic performance. This is more or less in line with the learner-centered and competency-based pedagogical pattern promoted by the National Education Policy (NEP) 2020 (Government of India, 2020). On the policy level, the study supports the vision of NEP 2020 towards fostering scientific temper, critical thinking, and holistic development in the learners. The research outlines the necessity of assessment and intervention plans that can meet the affective needs of students as well as their academic skills by assuming that attitude is a critical predictor of achievement (OECD, 2018). The results can thus inform educational planners and administrators in Odisha to develop specific programmes to help enhance the learning outcomes of science especially in different socio-economic groups. Throughout, the research, practice, and policy gap is filled with the importance of the student attitudes in achieving good-quality and inclusive science education that is highlighted in the study.

### REVIEW OF RELATED LITERATURE

The value of science attitudes as predictors of the academic performance of students has always been emphasized in recent researches. Taghap and Addani (2024) examined the attitude of learners towards science in blended learning settings and concluded that students with positive attitudes to science achieved significantly better academic results, thus pointing to the fact that affective factors continue to have an impact on performance even in the technology-enhanced pedagogies. Sharma and Tripathy (2024) in a review sponsored by NCERT highlighted that systematic evaluation of scientific attitudes is essential in promoting inquiry, critical thinking, and evidence-based reasoning among learners in school level, thus aligning the promotion of attitudes with the reforms in the curriculum. The instrument of science attitude proposed and tested by Kolomuc (2024) in the study of secondary school students thus illustrates the need of reliable measurement instruments to help study the connection between attitude and achievement in a diverse group of learners. According to Limbaga and Borlio (2025), positive science attitude intensified the academic results of Grade 10 students, whereas science anxiety had a negative impact on students, which depicted the complex interaction between affective variables. Lalotra et al. (2023) investigated the connection between scientific attitude and academic performance in secondary school students and discovered that the students with positive scientific attitudes always achieved higher results compared to their colleagues regardless of sex and type of school. The article presented in TIJER (2023) also had a strong positive correlation between student attitude to science and academic performance, which allows attributing motivation and engagement as the key factors of learning outcomes. Mao et al. (2021) validated a statistically significant positive medium correlation between attitude towards science and academic performance through a meta-analysis of 37 empirical studies and hence substantiates, with high statistical strength, the role of attitude as an independent variable predictive. Acar and Ordu (2022) conducted an attitude study of students regarding science by grade levels and found a more positive attitude in high achievers and therefore indicated a reciprocal relationship between attitude and achievement over time. Previous studies by Misra and Srivastava (2016) proved that scientific attitude such as curiosity, rationality, and openness to inquiry, had a major effect on increased academic success in science hence

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providing a substantial background to the future studies in this area. All these findings show a very strong and sustained correlation between attitude towards science and academic achievement thus leading to the suitability of the present study that deals with secondary school students in Odisha.

### Objectives of the Study

1. To study the level of attitude towards science and academic achievement among secondary school students in Odisha.
2. To examine the differences in attitude towards science of secondary school students of Odisha with respect to gender, type of institution, and locale.
3. To examine the differences in academic achievement of secondary school students of Odisha with respect to gender, type of institution, and locale.
4. To study the relationship between attitude towards science and academic achievement among secondary school students of Odisha.
5. To determine the predictive role of attitude towards science on academic achievement among secondary school students of Odisha.

### Hypotheses of the Study

1. H<sub>01</sub>: There is no significant difference in the level of attitude towards science and academic achievement among secondary school students in Odisha w.r.t gender.
2. H<sub>02</sub>: There is no significant difference in the level of attitude towards science and academic achievement among secondary school students in Odisha w.r.t type of institution.
3. H<sub>03</sub>: There is no significant difference in the level of attitude towards science and academic achievement among secondary school students in Odisha w.r.t locale.
4. H<sub>04</sub>: There is no significant relationship between attitude towards science and academic achievement among secondary school students of Odisha.
5. H<sub>05</sub>: Attitude towards science does not significantly predict academic achievement among secondary school students of Odisha.

## METHODOLOGY

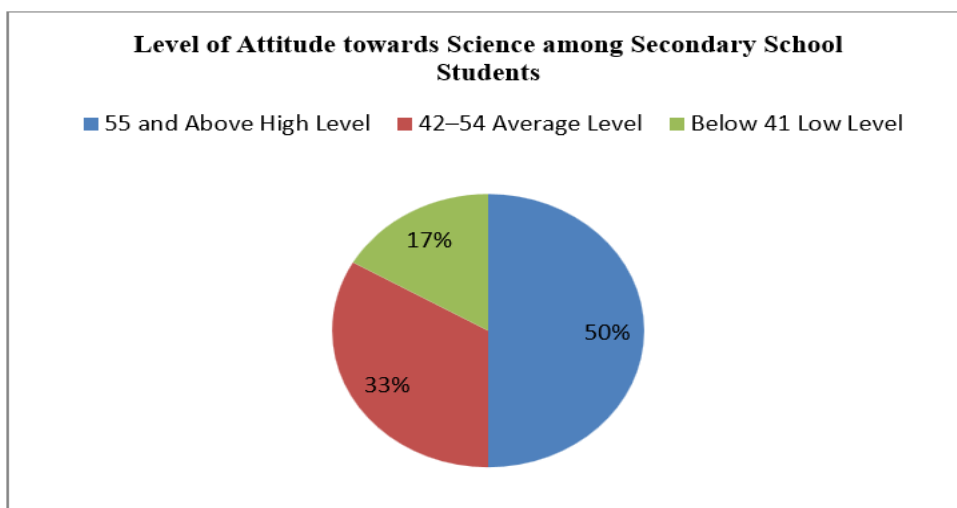
A descriptive research design was employed to test attitude towards science and academic performance of secondary school in Odisha. A sample of 90 secondary school students were selected through simple random sampling. Science attitudes were assessed with the help of Attitude towards Science Scale created by Dr. Avinash Grewal (2012) that includes 20 questions (10 positive and 10 negative statements). The scale exhibited a reliability coefficient of 0.87, computed using the split-half method, indicating acceptable internal consistency. The measure of academic achievement was done using the percentage of marks that students had obtained from the previous year. All data were examined through t -test, Pearson correlation, and regression.

### Analysis and interpretation of the data

*Table 1.0: Level of Attitude towards Science among Secondary School Students*

Score Range	Level of Attitude	Frequency	Percentage (%)
55 and above	High Level	45	50.00
42–54	Average Level	30	33.33
Below 41	Low Level	15	16.67
<b>Total</b>		90	100.00

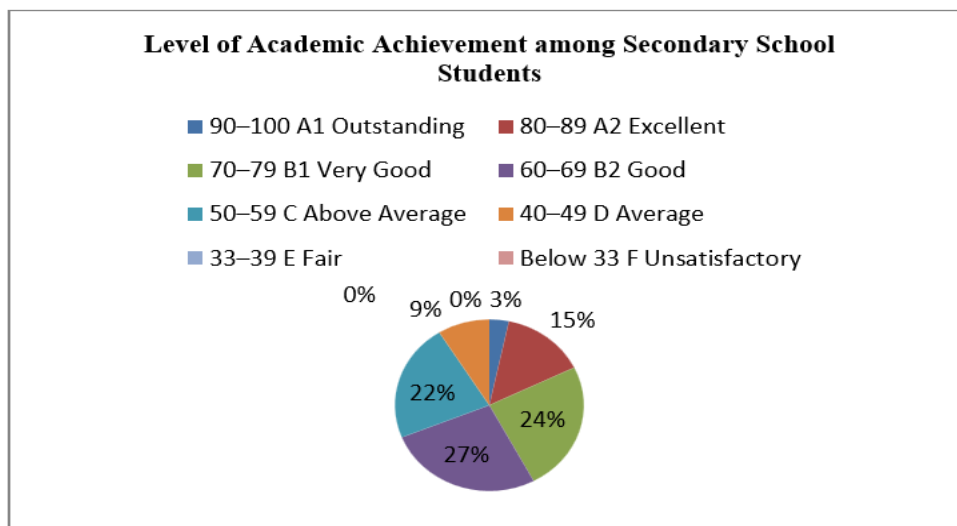
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The table reveals that half of the secondary school students (50%) possess a high level of attitude towards science, indicating strong interest and positive disposition toward the subject. About one-third of the students (33.33%) show an average level, suggesting moderate engagement. Only 16.67% fall under the low level, reflecting unfavourable attitudes. Overall, the findings indicate a generally favourable attitude towards science among the secondary school students.

**Table 1.1: Level of Academic Achievement among Secondary School Students**

Percentage of Marks	Grade	Grade Description	Frequency	Percentage (%)
90-100	A1	Outstanding	3	3.33
80-89	A2	Excellent	13	14.44
70-79	B1	Very Good	22	24.44
60-69	B2	Good	24	26.67
50-59	C	Above Average	20	22.22
40-49	D	Average	8	8.89
33-39	E	Fair	0	0.00
Below 33	F	Unsatisfactory	0	0.00
<b>Total</b>			90	100.00



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The academic achievement table indicates that 3.33% of the secondary school students achieved an Outstanding level, followed by 14.44% in the Excellent category. About 24.44% of the students secured Very Good performance, while the largest group (26.67%) fell under the good category. Further, 22.22% of the students attained an Above Average level, and 8.89% were at the Average level. No students were found in the Fair or Unsatisfactory categories, reflecting an overall satisfactory academic achievement among the students.

**Table 1.2: Descriptive Statistics of Attitude Towards Science and Academic Achievement (N = 90)**

Variables	N	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
Attitude Towards Science	90	34.00	75.00	55.09	12.05	0.038	-1.270
Academic Achievement	90	42.00	90.00	66.22	12.33	0.151	-0.707

The descriptive statistics show that the attitude of secondary school students towards science is positive with a standard deviation of 12.05 with a mean of 55.09. The average score of academic achievement 66.22 (SD = 12.33) is a satisfactory performance. The skewness and the Kurtosis of the two variables are within acceptable range, which implies that the data is normally distributed and can therefore be further subjected to statistical analysis.

**Table 1.3: Comparison of Attitude towards Science and Academic Achievement with Respect to Gender**

Variable	Gender	N	Mean	Std. Deviation	t-value	Df	Sig. (2-tailed)
Attitude Towards Science	Male	45	55.56	11.81	0.366	88	0.716
	Female	45	54.62	12.40			
Academic Achievement	Male	45	66.93	12.87	0.545	88	0.587
	Female	45	65.51	11.87			

The table 1.3 t-test results of male and female secondary school students show that attitudes towards science do not vary statistically ( $t = 0.366$ ,  $p = 0.716$ ) and academic achievement do not vary statistically ( $t = 0.545$ ,  $p = 0.587$ ). Since the p-values obtained have a value that is greater than the conventional alpha of 0.05, the null hypothesis  $H_{01}$  which states that gender has no influence on neither attitude towards science nor academic achievement stands accepted. This indicates that gender does not have a significant influence on students' attitude towards science or their academic achievement.

**Table 1.4: Comparison of Attitude towards Science and Academic Achievement with Respect to Type of Institution**

Variable	Type of Institution	N	Mean	Std. Deviation	t-value	df	Sig. (2-tailed)
Attitude Towards Science	Private	45	51.13	12.45	3.280	88	0.001
	Government	45	59.04	10.33			
Academic Achievement	Private	45	62.20	12.83	3.257	88	0.002
	Government	45	70.24	10.48			

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The table 1.4 t-test indicates that there is statistically significant difference between the attitude of students in government and private secondary schools towards science as well as in the academic achievement. The attitude towards science ( $t = 3.280, p < 0.01$ ) and academic performance ( $t = 3.257, p < 0.01$ ) of government school students is significantly higher than that of their counterparts at the private schools. As a result,  $H_{02}$ , which assumes that there is no difference depending on the type of institution, is rejected, which proves that institutional affiliation is a significant factor influencing the attitudes of students in science and their academic achievement.

**Table 1.5: Comparison of Attitude towards Science and Academic Achievement with Respect to Locale**

Variable	Locale	N	Mean	Std. Deviation	t-value	Df	Sig. (2-tailed)
Attitude Towards Science	Rural	49	51.10	11.41	3.662	88	0.000
	Urban	41	59.85	11.15			
Academic Achievement	Rural	49	62.20	9.95	3.599	88	0.001
	Urban	41	71.02	13.27			

The table 1.5 t -test of locale reveals that there is a significant difference in both of the attitude towards science ( $t = 3.662, p < 0.01$ ) and academic achievement ( $t = 3.599, p < 0.01$ ). There are more mean scores in urban students compared to rural students in both variables. Since the p-values that we have seen are less than the 0.01 level of significance, the null hypothesis  $H_{03}$ , which states that there is no difference in attitudes toward science or academic achievement based on locale, is rejected. This finding validates that locale has a significant role to play in the attitude of students towards science and their academic performance.

**Table 1.6: Correlation between Attitude towards Science and Academic Achievement (N = 90)**

Variables	Attitude Towards Science	Academic Achievement
Attitude Towards Science	1	0.901**
Academic Achievement	0.901**	1

**Note:** \*\* Correlation is significant at the 0.01 level (2-tailed).

The correlation table exposes a high positive correlation between the attitude of students to science and their academic performance. The Pearson correlation coefficient ( $r = 0.901$ ) is significant at the level of 0.01 ( $p < 0.01$ ), which is an indication that students with more positive attitudes towards science tend to achieve higher academic performance. Therefore, the null hypothesis  $H_{04}$ , which states that attitude towards science has no significant relationship with academic achievement, is rejected.

**Table 1.7: Regression Analysis Showing Prediction of Academic Achievement by Attitude towards Science (N = 90)**

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.901	0.812	0.810	5.39

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### Coefficients

Predictor Variable	B	Std. Error	Beta	t-value	Sig.
Constant	16.42	3.21		5.11	0.000
Attitude Towards Science	0.91	0.05	0.901	18.52	0.000

The regression analysis also indicates that attitude towards science is a significant and strong predictor of academic achievement among secondary school students. The model explains 81.2 percent of the academic performance ( $R^2 = 0.812$ ). The regression coefficient of attitude toward science is statistically significant (0.901,  $t = 18.52$ ,  $p < 0.001$ ) Which indicates that an increase in attitude score is associated with a corresponding increase in academic achievement. Based on this the null hypothesis  $H_{05}$  is rejected.

### DISCUSSION

The current research examined the relationship between perception of science and academic performance of students in secondary schools in Odisha. The study results are valuable sources of information about the importance of affective variables in science education, and they are mostly correlated with the previous works. The descriptive analysis showed that the students of secondary schools had an intermediate positive attitude toward science and good academic performance. The result is somewhat consistent with the investigations of Lalotra et al. (2023) and Sharma and Tripathy (2024), who indicated that the majority of students in secondary schools have positive attitudes towards science under the conditions of organized curricular and positive learning conditions. The scores have a normal distribution, which also gives further evidence of reliability of the further inferential analyses. Regarding gender, the research did not show any significant difference in the attitude to science or academic performance between male and female students. The results reported are in line with those of Acar and Ordu (2022) and Misra and Srivastava (2016), with both authors indicating that gender-neutral outcomes of science learning are becoming more and more of a reality as a result of equal access and instructional delivery. Nevertheless, there were considerable variations as regards to the type of institution. Students in government schools exhibited much more positive attitude to science and academic performance than did students in the private schools. The given finding supports the previous research conducted by Lalotra et al. (2023) and reviews of NCERT-based studies (Sharma and Tripathy, 2024), which emphasize the importance of qualified teaching staff, balanced programs, and a standardized assessment framework in state schools. Likewise a large difference was identified in terms of locale, the students in urban and rural schools differed in terms of attitude towards science and achievement in the academic results. This finding coincides with the results of Misra and Srivastava (2016) and Mao et al. (2021), who explained these variations with the difference in infrastructure, access to resources, exposure to technology, and learning opportunities. The positive correlation of attitude towards science and academic achievement ( $r = 0.901$ ) is one of the most important results of the study. This is consistent with meta-analytical results of Mao et al. (2021), the review by Osborne, Simon, and Collins (2003) where the meta-analytical findings reported that students who have positive attitudes will engage in the learning process and have better academic outcomes. Moreover, regression analysis proved that the attitude toward science is a predictive variable of high academic performance. This observation conforms with the Theory of Planned Behavior advanced by Ajzen (1991) and empirical research by Hattie (2009) that put forward the predictive power of affective variables in the academic success. All in all, the results confirm the argument that students should be made to have better attitudes to science to achieve better performance in school. The findings are in line with vision of NEP 2020

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which focuses on engagement of learners, scientific temper, and holistic development. The study therefore adds to the available literature giving region specific evidence in Odisha and the need to create a positive attitude towards science in secondary school.

### *Major Findings of the Study*

1. The average score of the attitude of the students towards science was 55.09 (SD = 12.05), which signifies a moderately positive attitude of secondary school level students in Odisha.
2. The average academic performance of students was 66.22 (SD= 12.33), which means that students performed reasonably in general academic performance.
3. There was no significant difference in the attitude towards science ( $t = 0.366$ ,  $p = 0.716$ ) and academic achievement ( $t = 0.545$ ,  $p = 0.587$ ) between male and female students, as revealed in gender-wise analysis.
4. The attitude towards science was significantly different among the type of institution students in government schools scored higher ( $M = 59.04$ ) than students in the private school ( $M = 51.13$ ) ( $t = 3.280$ ,  $p < 0.01$ ).
5. There also was a big difference in the academic achievement according to the type of school, with students in government schools scoring higher mean ( $M = 70.24$ ) than students in private schools ( $M = 62.20$ ) ( $t = 3.257$ ,  $p < 0.01$ ).
6. Locale - wise analysis indicated that the attitudes towards science among the students in urban areas ( $M = 59.85$ ) were significantly higher than among the students in rural areas ( $M = 51.10$ ) ( $t = 3.662$ ,  $p < 0.01$ ).
7. The levels of academic performance were significantly high among urban students ( $M = 71.02$ ) than rural students ( $M = 62.20$ ).
8. The attitudes toward science and academic achievement were positively correlated ( $r = 0.901$ ,  $p < 0.01$ ), which means that the two variables are closely related.
9. Regression analysis showed that attitude towards science was a significant predictor of academic achievement and that it forms a very strong determinant of the success of students in studying.

### *Educational Implications of the Study*

The results of the current study have great implications to education in the fast-moving world of technology and digital revolution of education. Since it was established that positive attitude towards science has a strong and statistically significant impact on academic performance, teachers need to consider developing positive attitudes towards science besides developing a positive learning outcome. Within the context of the current technological age, digital tools (i.e., virtual laboratories, simulations, etc., and interactive applications in science teaching) may be used strategically to increase the interest, curiosity and engagement of students in the teaching of science. As the strong predictive nature of attitudes towards science would imply, technology-facilitated, learner-based pedagogies should be successfully implemented as a continuation of science curricula, i.e., the inquiry-based learning, the flipped classroom, and the project-based learning. All these teaching methods encourage active learning, problem solving and application of scientific concepts in real life, which is appropriate to foster positive attitudes and improve performance. Learning management systems (LMS), online testing and adaptive learning platforms also make it possible to personalize teaching based on the learning patterns and interests of students. The large differences identified in terms of institution type and setting highlight the importance of equal access to digital infrastructure, especially in an under-resourced and rural school. The urban-rural and institutional disparities in the provision of science education can be

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overcome by the provision of smart classrooms, effective internet connection and training of teachers on the use and application of educational technology. Teacher development programmes need to focus on the technological competencies as well as the ways of developing the affective aspects of students. In line with the vision presented in the National Education Policy (NEP) 2020, the study shows that scientific temper, critical thinking, and experiential learning development under the integration of technology are essential. By constantly measuring the attitudes of the students with the help of digital feedback mechanisms, the teachers can discover at-risk learners and develop the necessary interventions in time. In general, the research highlights that the proper implementation of technology, along with the positive attitude-forming initiatives, can significantly enhance the results of science education in the modern educational environment.

### CONCLUSION

The study concluded that attitude towards science is an important predictor of academic achievement among secondary school students in Odisha. Despite the moderately positive attitude of the students and their satisfactory levels of achievement, the impact of the contextual variables is still apparent. The non-significant gender differences show that there are uniformities between male and female students, but there is significant variation in outcomes across type of institution and locale. Such a positive correlation and a high predictive validity prove that the change in the attitude of students can positively influence academic achievement. Nevertheless, the results also indicate that the functioning of attitude is subject to larger structural factors, such as the availability of the resources and the quality of the instructions. Thus, promoting science education would need a converged emphasis on both affective and equitable academic support frameworks to guarantee a coherent enhancement in student achievement.

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### **Conflict of Interest**

The author(s) declared no conflict of interest.

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