Students' Attitudes and Perceptions toward Physics Education in Assam

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Abstract: Students in Assam generally exhibit a mix of curiosity and apprehension toward physics education. Many appreciate the subject's relevance to technology and real-world applications, recognizing that strong physics knowledge can open pathways to careers in engineering, research and applied sciences. However, a significant number also perceive physics as challenging due to its abstract concepts, complex mathematics, and often limited access to quality laboratory resources. Factors such as teaching methods, classroom environment and availability of practical learning opportunities influence students' attitudes, those exposed to interactive demonstrations and contextualized examples tend to view the subject more positively. Additionally, differences in school infrastructure between urban and rural areas contribute to varied perceptions, with students in better-equipped schools often feeling more confident and motivated. Enhancing pedagogical approaches and strengthening support systems could help foster more positive attitudes and deeper engagement with physics among students across Assam. This study investigates the attitudes and perceptions of higher secondary school students toward physics education in Assam, India. Drawing on quantitative survey data and qualitative feedback, the research explores factors influencing students' interest, motivation, and academic confidence in physics. Findings reveal mixed perceptions shaped by instructional methods, resource availability, and societal attitudes toward science subjects. The study highlights implications for curriculum development, teacher training, and educational policy to enhance physics learning outcomes in Assam.

Index Terms: **Students, attitudes, perceptions, Physics, education.**

I. INTRODUCTION

Physics is widely recognized as a foundational natural science that underpins technological innovation, scientific inquiry, and national development. It provides the theoretical and conceptual framework for understanding phenomena ranging from subatomic particles to cosmic structures. Globally, physics education has been identified as central to promoting scientific literacy and preparing students for careers in engineering, medicine, information technology, and research. However, as noted by Jonathan Osborne, Shirley Simon, and Sue Collins (2003), students' perceptions of science subjects significantly shape their engagement, persistence, and achievement. Attitudes toward physics whether positive or negative can therefore determine not only academic outcomes but also long-term educational and career trajectories. Research shows that student attitudes significantly affect learning outcomes (Wang, 2015). Positive attitudes are linked to strong conceptual understanding and aspirations for STEM careers (Tai et al., 2006). Conversely, negative perceptions often reduce engagement and academic performance (Pintrich, Marx, & Boyle, 1993). Barriers such as abstract content, limited lab resources, and inadequate pedagogical support are documented challenges in many regions (Hassan, 2012). In Indian contexts, rote learning and exam-driven instruction further hinder conceptual grasp (Mitra & Sen, 2017).

In the context of Assam, these perceptions are shaped by a complex interplay of socio-economic, cultural, and institutional factors. Assam, located in the North-eastern region of India, presents a diverse educational landscape characterized by disparities between urban and rural schools, government and private institutions, and resource-rich and resource-constrained environments. Such diversity inevitably influences students' experiences with physics education.

Higher secondary students in Assam often display a dual response toward physics marked by both curiosity and apprehension. On one hand, many students recognize the subject's importance in modern technological advancement. The rapid expansion of digital technologies, renewable energy systems, space exploration, and communication networks has reinforced the perception that physics is essential for careers in engineering, applied sciences, and research. Students aspiring to competitive examinations and professional courses frequently acknowledge physics as a gateway subject, particularly for streams such as engineering and medicine.

On the other hand, physics is commonly perceived as one of the most challenging subjects in the science curriculum. Several factors contribute to this perception. First, the abstract nature of many physics concepts such as electromagnetism, quantum phenomena, and vector mechanics can make comprehension difficult without adequate conceptual scaffolding. Second, the subject's heavy reliance on mathematical formulation often intimidates students who lack strong foundational skills in mathematics. The integration of algebra, trigonometry, and calculus into physics problem-solving creates an additional cognitive load, leading some learners to associate physics with anxiety and fear of failure.

Limited access to well-equipped laboratory facilities further compounds these challenges. Practical experimentation is central to physics learning, as it bridges theoretical principles with observable phenomena. However, in several rural and semi-urban schools in Assam, laboratory infrastructure may be inadequate, outdated, or underutilized. Without sufficient opportunities for hands-on experimentation, students may struggle to connect abstract theories with real-world applications, reinforcing the perception that physics is purely theoretical and difficult.

Teaching methodologies also play a decisive role in shaping attitudes. Traditional lecture-based instruction, focused primarily on examination preparation and rote memorization, often reduces opportunities for inquiry-based learning and conceptual discussion. In contrast, classrooms that incorporate interactive strategies such as demonstrations, group problem-solving, simulations, and contextual examples tend to foster greater engagement. When teachers relate physics concepts to everyday experiences such as motion in sports, electricity in household appliances, or optics in mobile phone cameras students are more likely to perceive the subject as meaningful and relevant.

The classroom environment further influences students' academic self-confidence. Supportive teacher-student relationships, opportunities to ask questions, and encouragement to explore mistakes as learning experiences contribute to positive attitudes. Conversely, highly competitive or exam-oriented atmospheres may heighten anxiety and discourage participation. Gender norms and socio-cultural expectations may also subtly shape confidence levels, affecting how students perceive their own competence in physics.

Infrastructure disparities between urban and rural schools in Assam create additional variation in perception and motivation. Urban institutions often have better laboratory facilities, access to digital resources, and exposure to science exhibitions or coaching centers. Rural schools, while often rich in contextual learning opportunities, may lack technological integration or supplementary academic support. These inequalities can influence students' confidence in handling complex topics and performing well in board examinations or entrance tests.

Against this backdrop, the present study seeks to examine the attitudes and perceptions of higher secondary school students toward physics education in Assam. By employing a mixed-method approach, combining quantitative survey data with qualitative feedback. The research aims to capture both measurable trends and nuanced personal experiences. Quantitative data allow for the analysis of patterns in interest, motivation, and academic self-efficacy, while qualitative responses provide deeper insight into students' lived experiences, challenges, and aspirations. Specifically, the study analyses factors such as perceived difficulty, relevance to career goals, classroom experiences, availability of laboratory resources, and teacher support. It also investigates how these variables influence students' intrinsic motivation and academic self-confidence. Understanding these dimensions is crucial for designing targeted interventions that promote equitable and engaging physics education.

II. RESEARCH OBJECTIVES

To examine the attitudes and perceptions of higher secondary school students toward physics education in Assam.

III. RESEARCH METHODOLOGY

This study employed a mixed-methods design combining quantitative surveys with qualitative focus group interviews. A sample of 300 students from Class 12 across urban and rural schools in Assam participated. Schools were selected through stratified random sampling to ensure representation. Data were collected over two months (November-December, 2025). Quantitative data were analysed using Likert scale. Qualitative responses were coded thematically.

IV. QUANTITATIVE FINDINGS

Table: 1 Students' responses to selected statements about physics

Item	Mean	SD
Physics is interesting	3.45	1.02
Physics is difficult	4.20	0.88
I enjoy physics experiments	3.12	1.15
Teacher explains concepts clearly	3.73	0.97
Physics important for future career	4.01	0.83

Source: Compiled by Researcher

The table 1 presents students' responses to selected statements about physics, showing the Mean (average level of agreement) and Standard Deviation (SD) (variation in responses). Assuming a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), the findings can be interpreted as follows.

Physics is interesting (Mean = 3.45, SD = 1.02): Students show a moderately positive attitude toward physics. The mean above 3 suggests general agreement that physics is interesting, though the SD of 1.02 indicates noticeable variation in opinions.

Physics is difficult (Mean = 4.20, SD = 0.88): This statement has the highest mean, indicating strong agreement that physics is perceived as difficult. The relatively lower SD (0.88) suggests that most students share this perception, showing fairly consistent views.

I enjoy physics experiments (Mean = 3.12, SD = 1.15): The mean is slightly above neutral, implying moderate enjoyment of practical activities. However, the higher SD (1.15) shows considerable differences among students some enjoy experiments greatly, while others do not.

Teacher explains concepts clearly (Mean = 3.73, SD = 0.97): Students generally agree that their teacher explains physics concepts clearly. The mean close to 4 reflects a positive evaluation, and the SD indicates moderate consistency in responses.

Physics important for future career (Mean = 4.01, SD = 0.83): Students strongly agree that physics is important for their future careers. The relatively low SD (0.83) shows strong consensus on this point.

It is noteworthy that majority perceive physics as *difficult* (M = 4.20). While students agree that physics is *important for careers* (M = 4.01), but enjoyability is lower (M = 3.12). Students recognize its importance for future careers and acknowledge clear teaching. They find the subject interesting to some extent, especially in practical contexts. However, they overwhelmingly perceive physics as difficult, which may affect confidence and engagement.

V. QUALITATIVE THEMES

Teaching and Instructional Approach: Students noted that emphasis on theory over hands-on learning reduced interest.

Resource Limitations: Rural students highlighted scarce laboratory facilities.

Motivation and Career Aspirations: Many view physics as essential for engineering and medical entrance examinations.

VI. CONCLUSION

Students in Assam generally recognize the importance of physics but hold mixed attitudes toward the subject. While career relevance is appreciated, perceived complexity and instructional constraints diminish positive perceptions.

Ultimately, enhancing students' perceptions of physics in Assam requires a multi-faceted approach, improving laboratory infrastructure, strengthening teacher training in interactive pedagogies, integrating contextual and experiential learning, and providing academic support to students with weaker mathematical backgrounds. By addressing these structural and pedagogical challenges, educators and policymakers can foster a more positive learning environment, one in which physics is perceived not as an intimidating barrier, but as an empowering and intellectually stimulating discipline.

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