Perceived Determinants of Academic Achievement in Integrated Science among Senior High School Students in Ghana

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DOI: https://dx.doi.org/10.51244/IJRSI.2025.1210000190

Received: 15 October 2025; Accepted: 26 October 2025; Published: 14 November 2025

ABSTRACT

This study investigated the perceived factors influencing students' academic performance in Integrated Science in public senior high schools within Jomoro Municipality in Ghana. A descriptive survey design with a quantitative approach was employed to gather insights from 294 students and 18 Integrated Science teachers selected through stratified random and purposive sampling respectively. Data were collected using structured questionnaires validated through expert review and pilot testing (Cronbach's $\alpha = 0.80$). Descriptive statistical analyses using frequencies and percentages revealed that home and school environments were largely unconducive for effective science learning. Specifically, 77.2% of students reported unsupportive home conditions, while 55.1% of students indicated limited parental involvement and supervision. Similarly, 100% of teachers and 74.2% of students identified inadequate instructional materials, overcrowded classrooms, and poor school facilities as major impediments to effective science instruction. Teacher-related factors also emerged as critical barriers. About 94.4% of teachers agreed that low teacher qualification and confidence negatively affect student performance. Moreover, the majority of students (70.8%) and teachers (100%) reported minimal use of varied instructional materials and a lack of individualized support for struggling learners, reflecting overreliance on traditional lecture methods. These findings highlight the multifaceted nature of academic performance determinants, emphasizing the interrelationship between environmental, teacher-related, and student-related factors. The study recommends increased collaboration between parents, school management, and the Ghana Education Service to enhance learning environments, improve teacher professional development, and foster student motivation and self-directed learning.

Keywords: Academic performance, Integrated Science, Ghana, teacher quality, student learning habits, parental involvement

INTRODUCTION

Academic performance remains a central theme in educational research due to its far-reaching implications for individual development and national progress. Globally, studies have identified a complex network of interrelated factors influencing learners' academic success across educational levels and disciplines (Azure, 2015; Omolo et al., 2020; Olufemi et al., 2018). Among these, science education, and particularly Integrated Science plays a critical role in fostering inquiry skills, creativity, and problem-solving abilities essential for participation in modern scientific and technological societies (Arokoyu, 2012; UNESCO, 2010). However, in many developing contexts, the teaching and learning of science continue to face persistent challenges that limit student achievement and interest.

In Ghana, Integrated Science is designed to promote scientific literacy and develop foundational capabilities necessary for national development (CRDD, 2010). Despite curriculum reforms and teacher training initiatives, students' performance in science remains suboptimal (Azure, 2015; Safo-Adu et al., 2018). Research indicates that instructional methods in many Ghanaian senior high schools are predominantly lecture-based, with limited integration of practical and inquiry-based learning (Safo- Asano et al., 2021; Coffie, et al., 2019; Taylor et al., 2011). This often stems from inadequate laboratory resources, insufficiently qualified teachers, and constrained institutional support. These systemic challenges have implications for the quality of science learning experiences and, consequently, students' academic outcomes.

While several studies have explored factors influencing academic achievement in science at the general or national level (Alani & Hawas, 2021; Parmin et al, 2020), few have focused specifically on *Integrated Science* within the Ghanaian context (Coffie et al, 2019). Moreover, there is limited understanding of how teachers and students themselves perceive these factors in local educational environments. Understanding such perceptions is critical because they offer context-specific insights that can inform interventions tailored to improve science teaching and learning.

This study therefore sought to identify and analyse the perceived environmental, teacher-related, and student-related factors affecting students' academic performance in Integrated Science in two public senior high schools in a municipality Ghana. The research was guided by the following questions:

1. What environmental factors are perceived by teachers and students to influence academic performance in Integrated Science?
2. What teacher-related factors are perceived to influence students' academic performance in Integrated Science?
3. What student-related factors are perceived to affect academic performance in Integrated Science?

By addressing these questions, the study contributes to the growing body of literature on science education in Sub-Saharan Africa and provides empirically grounded recommendations for improving learning outcomes in Integrated Science.

THEORETICAL FRAMEWORK

This study is grounded in three interrelated theoretical perspectives that collectively explain how environmental, teacher, and student-related factors influence academic performance in Integrated Science: Epstein's Theory of Overlapping Spheres of Influence, Sweller's Cognitive Load Theory, and Bandura's Theory of Self-Efficacy. Together, these frameworks provide a multidimensional lens for understanding the interactions among learners, teachers, families, and the broader learning environment.

Theory of Overlapping Spheres of Influence

Epstein's Theory of Overlapping Spheres of Influence (Epstein, 2001; Epstein et al., 2002) posits that the educational development of students is shaped by the dynamic interaction among three key social environments—family, school, and community. Each of these spheres has distinct roles but overlaps through shared responsibilities and collaborative practices that support student learning and development. The greater the overlap and partnership among these spheres, the more likely students are to succeed academically.

In the context of this study, the theory provides a framework for examining how parental involvement, school resources, and community support contribute to students' academic outcomes in Integrated Science. In Ghanaian senior high schools, many parents play a limited role in their children's science education, often due to low scientific literacy or socioeconomic constraints. The absence of strong collaboration between schools and families, as suggested by Epstein's model, may therefore hinder students' engagement and achievement. By exploring these dynamics, this study highlights how strengthening the intersections among home, school, and community could enhance Integrated Science learning outcomes.

Cognitive Load Theory

Cognitive Load Theory (Sweller, 2011) explains how the human cognitive system processes, stores, and retrieves information during learning. It emphasizes the importance of balancing the intrinsic, extraneous, and germane cognitive loads to optimize learning efficiency. Overloading students with information or poorly designed instructional materials can hinder learning and problem-solving performance. Effective teaching, therefore, requires structuring learning tasks and resources to align with students' cognitive capacities and prior knowledge (Cook, 2006).

This theory is particularly relevant to Integrated Science, which combines concepts from multiple scientific disciplines. Many students in Ghana struggle to process complex or abstract scientific ideas when instruction relies heavily on rote learning or verbal explanation without concrete, visual, or hands-on experiences. Cognitive Load Theory thus underscores the need for teachers to employ varied pedagogical approaches—such as demonstrations, inquiry-based activities, and visual aids—to reduce unnecessary cognitive burden and improve conceptual understanding. The theory also reinforces the argument that inadequate instructional materials and unqualified teachers can compromise cognitive efficiency and lower academic performance.

Theory of Self-Efficacy

Albert Bandura's Theory of Self-Efficacy (Abele & Spurk, 2009; Gieinik et al., 2020) explains how individuals' beliefs in their capabilities influence their motivation, resilience, and performance. Self-efficacy affects the effort learners invest in tasks, their persistence in the face of challenges, and the degree to which they engage in self-regulated learning. Students with higher self-efficacy are more likely to participate actively in class, use effective study strategies, and persevere through difficulties.

Within the Ghanaian Integrated Science context, self-efficacy is a critical determinant of students' engagement and performance. Many students perceive science as difficult or beyond their ability, often due to repeated academic failure, lack of teacher encouragement, or limited exposure to practical learning. Teachers' pedagogical approaches and attitudes toward learners significantly influence students' self-efficacy; supportive feedback, collaborative learning, and achievable goals can foster positive beliefs about learning science. This theoretical lens therefore connects students' internal motivation and study habits to broader contextual and instructional variables.

The integration of these three theories allows for a holistic understanding of the multiple and interacting determinants of academic performance in Integrated Science. Epstein's framework situates learning within a socio-environmental context that includes family and community engagement; Sweller's Cognitive Load Theory provides insights into instructional design and cognitive processing; and Bandura's Self-Efficacy Theory explains motivational and affective dimensions of learning. Together, they establish a comprehensive foundation for analyzing how environmental conditions, teacher quality, and student attitudes collectively shape science learning outcomes.

This integrative perspective underscores that improving academic performance in Integrated Science requires a systemic approach—one that enhances the home-school-community partnership, optimizes instructional design, and strengthens students' confidence and self-directed learning capabilities.

LITERATURE REVIEW

Overview of Academic Performance Factors

Academic performance has long been recognized as a multidimensional construct shaped by complex interactions among individual, institutional, and socio-environmental variables. Globally, research shows that students' achievement in science subjects is influenced by a range of interrelated factors, including the quality of instruction, availability of resources, socioeconomic background, and student motivation (Alani & Hawas, 2021; Brew, et al., 2021; Vermunt, 2005). Academic success is not only a function of cognitive ability but also of environmental conditions and the pedagogical and emotional climate within which learning occurs (Campbell & Verna, 2008; Omolo et al., 2020).

In the African context, particularly in Ghana, academic performance continues to be a major concern at the secondary education level. Despite policy interventions aimed at improving science education—such as curriculum reforms and teacher training initiatives—student performance in Integrated Science remains below expectations (Azure, 2015; Safo-Adu et al., 2018). This underperformance reflects systemic issues that extend beyond the classroom, encompassing the learning environment, teacher competence, and student dispositions toward science.

The Importance of Integrated Science Education

Integrated Science is conceptualized as an interdisciplinary approach that unifies concepts from physics, chemistry, biology, and earth science to promote a holistic understanding of scientific phenomena (UNESCO-UNICEF, as cited in Arokoyu, 2012). Unlike the traditional single-discipline model, Integrated Science fosters transferable scientific literacy and inquiry skills essential for critical thinking and decision-making in everyday life. It encourages learners to explore connections among scientific disciplines and to apply scientific reasoning to real-world problems.

In Ghana, Integrated Science is a core subject in the senior high school curriculum and serves as a foundation for tertiary studies in science, technology, and health-related fields (CRDD, 2010). Its objectives include developing scientific literacy, promoting curiosity about the natural world, and preparing students for science-related careers (Arokoyu, 2012). However, achieving these objectives has been hindered by a combination of pedagogical, infrastructural, and motivational challenges. Research indicates that many Ghanaian teachers continue to rely heavily on traditional expository teaching methods such as lecturing and note dictation, which limit inquiry and student engagement (Asano et al., 202; Azure, 2015). Consequently, students often perceive science as abstract and disconnected from everyday experiences.

Environmental Factors Influencing Academic Performance

The learning environment, both at home and in school, plays a pivotal role in shaping students' academic outcomes. According to Omolo et al. (2020), environmental conditions affect learners' physical, emotional, and psychological readiness for learning. A supportive home environment that provides adequate study space, parental encouragement, and emotional stability enhances students' motivation and achievement (Barnard, 2004; Muema et al., 2020). Conversely, inadequate parental involvement, low educational attainment, and socioeconomic hardship are commonly associated with poor academic outcomes (Azhar et al., 2013).

At the institutional level, school infrastructure and resource availability significantly influence teaching effectiveness and learning engagement. Studies have shown that access to adequate classrooms, laboratories, and instructional materials correlates positively with students' science achievement (Carbonaro, 2005; Owoeye & Yara, 2011). In Ghana, however, many public schools lack functional laboratories and sufficient teaching aids, constraining the use of hands-on experiments and inquiry-based instruction (Safo-Adu et al., 2018). Such deficiencies create inequities in science learning and may partly explain the consistent underperformance in Integrated Science across national assessments.

Teacher Quality and Instructional Practice

Teacher quality has consistently been identified as one of the most powerful predictors of student achievement (Spaull, 2013). Highly qualified teachers possess strong subject matter knowledge, pedagogical competence, and the ability to adapt instruction to learners' needs. In the field of science education, effective teachers integrate practical experiences, inquiry-based learning, and formative assessment to promote conceptual understanding (William et al., 2018).

However, in many developing contexts, including Ghana, the shortage of qualified and experienced Integrated Science teachers remains a pressing challenge (Asano et al., 2021). Studies reveal that some teachers assigned to teach Integrated Science are trained in only one science discipline, which limits their ability to deliver interdisciplinary instruction (Edward, et al., 2017; Winarno et al., 2020). Moreover, teacher confidence and attitude toward science teaching significantly affect classroom dynamics and students' motivation (Ncube, 2013). Teachers who demonstrate enthusiasm, provide encouragement, and create inclusive, interactive classrooms foster higher levels of student engagement and achievement.

The pedagogical approach also plays a crucial role. The overreliance on teacher-centred methods such as lectures and rote memorization constrains students' inquiry skills and higher-order thinking (Parmin, et al., 2020). In contrast, learner-centred pedagogies—such as group investigations, project-based learning, and the use of instructional media—can make science learning more relevant and cognitively stimulating. Thus, enhancing teacher professional development and encouraging reflective pedagogical practices are essential for improving learning outcomes in Integrated Science.

Student-Related Factors

Students' attitudes, interests, and study habits are critical determinants of academic success. Studies consistently show that learners who possess intrinsic motivation and positive attitudes toward science are more likely to achieve higher academic outcomes (Adeyemo, 2005; Sibanda, et al, 2015). Conversely, lack of interest, low self-confidence, and poor time management have been linked to underachievement (Giuliodori et al., 2006). In the Ghanaian context, student absenteeism, irregular study routines, and inadequate preparation for examinations have been identified as persistent barriers to effective science learning (Moloko et al., 2014).

Learning habits such as regular revision, note-taking, and searching for supplementary materials contribute to knowledge retention and understanding. Greetika and Vyas (2017) emphasized that effective study habits are built through consistent practice and self-regulation. Yet many students lack structured study schedules or the metacognitive skills necessary to manage their learning independently. This is often compounded by external factors such as overcrowded classrooms, limited access to textbooks, and inadequate academic support.

The reviewed literature highlights a broad consensus that academic performance in science is determined by interrelated environmental, teacher, and student factors. However, despite extensive research in science education globally, there remains a paucity of empirical studies focusing on the *perceived* factors affecting Integrated Science performance in Ghanaian secondary schools. Most existing studies have either examined science education broadly or focused on cognitive achievement without accounting for the contextual and perceptual dimensions influencing learning. Furthermore, limited research has simultaneously considered the views of both teachers and students—two central stakeholders in the teaching-learning process.

This study therefore addresses these gaps by providing an integrated examination of environmental, teacher-related, and student-related factors as perceived by both teachers and students in the Municipality. In doing so, it contributes nuanced, context-specific insights into the persistent challenges of science education in Sub-Saharan Africa and informs strategies to enhance students' academic outcomes in Integrated Science.

METHODOLOGY

Research Design

This study adopted a descriptive survey research design with a quantitative approach to explore the perceived factors influencing students' academic performance in Integrated Science. The descriptive design was considered appropriate because it allows the systematic collection and analysis of data to describe the nature of existing conditions and relationships among variables without manipulating them (Cohen, et al., 2018). This approach was particularly suited for investigating perceptions among teachers and students, as it facilitated the comparison of views across groups within the same educational context.

Research Setting

The study was conducted in Jomoro Municipality, in the Western Region of Ghana. The Municipality includes both coastal and rural communities, with public education serving as the primary mode of formal learning. At the time of data collection, the Municipality had two public senior high schools. Both schools follow the Ghana Education Service (GES) curriculum and offer Integrated Science which is a core subject from primary to secondary school in Ghana. The setting was chosen purposively because it reflects typical challenges facing rural science education in Ghana-limited resources, staffing constraints, and varied student engagement levels-making it an appropriate case for studying the multifaceted factors affecting academic performance.

Population and Sampling

The target population comprised all 2,548 second- and third-year students and 40 Integrated Science teachers across the two public senior high schools in the Municipality. The accessible population was 1,245 third-year students (617 females and 628 males) and all 18 Integrated Science teachers who had at least five years of teaching experience. Third-year students were selected because their extended exposure to school activities and science instruction provided them with adequate experience to assess the factors influencing their academic performance.

A total sample of 312 respondents, comprising 294 students and 18 teachers, was drawn for the study through random stratified sampling and purposive sampling techniques. Random stratified sampling involved dividing the student population into two homogeneous groups (male and female), and then randomly sampling within the groups (Cohen, Manion & Morrison, 2018). Random stratified sampling with relevant criteria to sampling size such as confident level, confidence interval, population size and the table of chi-square for one degree of freedom at the desired confident level. A confidence level of 95 per cent and confident interval of ±5 per cent were adopted for this study. This is because, 95 % of the time, the confidence intervals of ±5 per cent will contain the population parameter as the representative sample that would produce a more certainly accurate results that can be extended to the study population which is core in this study.

One widely used and cited method of determining sample size is the Krejcie and Morgan formula (Krejcie & Morgan, 1970 as cited in Cohen, Manion & Morrison, 2018). This was clearly indicated by the actual Krejcie and Morgan formula (Krejcie & Morgan. 1970, p. 607 as cited in Johnson & Shoulders, 2019) as;

$$n = \frac{(\chi 2)(N)(P)(1-P)}{[(d^2)(N-1)+(\chi^2)(P)(1-P)]}$$

where

n = the required sample size

$\chi 2$ = table value of chi square for one degree of freedom at desired confidence level (95%) is 1.96 x 1.96 = 3.841

N = the student’s population size which is 1,245.

P = the population proportion is the proportion of individuals in a population sharing a certain trait, male and female (is 0.50 to maximize sample size)

d = the level of accuracy of the estimate expressed as a proportion. The researcher wants the results to be accurate within five percent points (0.05).

This is because the Krejcie and Morgan formula was intended to calculate the sample size, n, necessary to construct a confidence interval (±5%) around the sample percentage that will, in 95% (confidence level) of all samples equal to n, contain the true population percentage. Thus, the use of Krejcie and Morgan to determine sample size is appropriate as the objective was to estimate population percentages from sample percentages and ensure representativeness of the wider population.

$$n = \frac{(3.841)(1{,}245)(0.50)(1-0.50)}{[(0.05^2)(1{,}245-1)+(3.841)(0.50)(1-0.50)]} = 294$$

A stratified random sampling technique was employed to ensure equitable representation of both male and female students, thereby minimizing sampling bias and enhancing the representativeness of the data. Teachers were selected using purposive sampling, based on their professional experience and direct involvement in Integrated Science instruction. The sampling procedures ensured that both student and teacher perspectives were captured comprehensively.

Research Instruments

Data were collected using two structured questionnaires developed by the researchers: one for students and one for teachers. Each instrument contained both closed-ended and Likert-scale of 20 items designed to capture perceptions across three domains; environmental, teacher-related, and student-related factors influencing academic performance. The questions 1 to 4 were different for students and teachers and captured information specific to their backgrounds and roles. However, questions 5-20 were the same for both groups. This design allowed for comparison of their perceptions on the same issues while recognising their distinct perspectives in the teaching and learning process.

The questionnaires were informed by an extensive literature review and prior empirical instruments (e.g., Azure, 2015; Omolo et al., 2020; Safo-Adu et al., 2018), but were contextualized to reflect local realities of the municipality

To enhance content validity, the instruments were reviewed by two senior lecturers from the Department of Science Education at the University of Education, Winneba, who assessed them for clarity, relevance, and alignment with the study's objectives. Based on their feedback, ambiguous items were revised, and redundant items were removed. The instruments were then piloted with 40 students and six Integrated Science teachers from another senior high school outside the study area. Reliability analysis yielded a Cronbach's alpha coefficient of 0.80, indicating acceptable internal consistency (Pallant, 2010).

Data Collection Procedures

Prior to data collection, formal permission was obtained from the heads of the selected schools and the Municipal Directorate of Education. Ethical considerations including informed consent, confidentiality, and voluntary participation were strictly adhered to. The purpose of the study was explained to all participants, and they were assured that their responses would be used solely for research purposes and reported anonymously.

Questionnaires were administered personally by the researchers during scheduled school hours to ensure high response rates and clarify any queries. Teachers completed their questionnaires separately to avoid influence from colleagues or students. Completed questionnaires were collected immediately to minimize data loss.

Data Analysis

Completed questionnaires were screened for completeness and accuracy before data entry. Quantitative data were coded and analyzed using SPSS, version 21. Descriptive statistics, specifically frequencies and percentages were used to summarize responses and identify patterns within and across groups. Responses for each item on the Likert scale were aggregated into two main categories: *Agreed* (combining "Strongly Agree" and "Agree") and *Disagreed* (combining "Strongly Disagree" and "Disagree") to facilitate interpretation. The analysis focused on identifying convergences and divergences between teacher and student perceptions regarding the key factors influencing academic performance in Integrated Science.

Ethical Considerations

The study complied with ethical standards for educational research as outlined by the University of Education, Winneba, and the Ghana Education Service. Participants were informed of their right to withdraw at any stage without penalty. Data were kept confidential, and no identifying information was recorded. The study prioritized respect, transparency, and the protection of participants' dignity throughout the research process.

RESULTS AND DISCUSSION

This section presents and discusses the findings of the study in line with the three research questions that guided the investigation:

1. environmental factors,
2. teacher-related factors,
3. student-related factors influencing students' academic performance in Integrated Science.

Descriptive statistics, including frequencies and percentages, were used to summarize responses from both teachers and students. The results are interpreted alongside relevant empirical studies and theoretical frameworks to situate them within broader educational discourse.

Environmental Factors Affecting Academic Performance

Home Environment Variables

Results revealed that students perceived the home environment as largely unconducive to effective learning in Integrated Science

Table 1: Home variables as perceived by students

	SD	D	N	A	SA	
Statements	F(%)	F(%)	F(%)	F(%)	F(%)	Total
1. Student's home is conducive to learn Integrated Science.	119(40.5)	108(36.7)	17(05.8)	26(08.8)	24(08.2)	294(100)
2. Students' parents involve and support Integrated Science learning	94(32.0)	68(23.1)	6(02.0)	64(21.8)	62(21.1)	294(100)
3. Students' parents do not supervise what student does	32(10.9)	25(08.5)	10(03.4)	103(35.0)	124(42.2)	294(100)
4. Students' parents are well-educated	114(38.8)	73(24.8)	11(03.7)	51(17.3)	45(15.3)	294(100)

Note. SD=Strongly Disagree; D=Disagree; N=Neutral; A=Agree' SA=Strongly Agree

As shown in Table 1, approximately 77.2% of students indicated that home conditions were not supportive of learning. Furthermore, 55.1% of students agreed that parents were insufficiently involved in their children's science education. Similarly, a majority of respondents reported low levels of parental supervision (77.2%) and parental education (63.6%).

These findings suggest that students' home environments may be limiting their ability to engage with academic work, especially in a cognitively demanding subject such as science. The results align with Epstein's (2001) Theory of Overlapping Spheres of Influence, which posits that optimal student outcomes occur when home, school, and community spheres interact harmoniously. The weak home-school partnership observed here may therefore undermine student motivation, study habits, and overall academic engagement.

The results are also consistent with the findings of Muema et al. (2020) and Barnard (2004), who reported that parental involvement and home support significantly enhance student achievement. The limited parental education and economic constraints common in the municipality may further inhibit parents' capacity to provide academic guidance, consistent with the observations of Azhar et al. (2013) on the link between socioeconomic status and academic achievement.

School Environment Variables

Table 2: school's variables as perceived by teachers and student

		SD	D	N	A	SA	
Statements	Respondents	F(%)	F(%)	F(%)	F(%)	F(%)	Total
5. The school provides students with good meals.	Teachers	4(22.2)	6(33.3)	1(05.6)	3(16.7)	4(22.2)	18(100)
	Students	93(31.6)	84(28.6)	0(00.0)	93(31.6)	24(08.2)	294(100)
6. The school has adequate classrooms for learning.	Teachers	7(38.9)	8(44.4)	0(00.0)	3(16.7)	0(00.0)	18(100)
	Students	78(26.5)	84(28.6)	13(04.4)	55(18.7)	64(21.8)	294(100)
7. The school has inadequate reading and learning materials.	Teachers	0(00.0)	5(27.8)	0(00.0)	6(33.3)	7(38.9)	18(100)
	Students	58(19.7)	69(23.5)	9(03.1)	66(22.4)	92(31.3)	294(100)
8. The school has inadequate teaching and learning materials.	Teachers	0(00.0)	0(00.0)	0(00.0)	7(38.9)	11(61.1)	18(100)
	Students	24(08.2)	32(10.9)	20(06.8)	99(33.7)	119(40.5)	294(100)

As presented in Table 2, a majority of teachers (83.3%) and students (55.1%) perceived that classrooms were inadequate for effective science learning. Similarly, 100% of teachers and 74.2% of students indicated that instructional materials were insufficient, and 72.2% of teachers reported inadequate learning resources. Dissatisfaction with school meals was also notable, with 55.5% of teachers and 60.2% of students expressing concern about their quality.

These findings underscore the role of the school environment in shaping students' learning experiences. Inadequate classrooms and instructional materials can disrupt lesson delivery and limit opportunities for practical engagement—a cornerstone of Integrated Science education. These results echo Owoeye and Yara (2011) and Carbonaro (2005), who demonstrated that the quality of school facilities directly affects academic performance and student motivation. They also align with Sweller's Cognitive Load Theory (2011), which emphasizes the need for well-structured learning environments that reduce cognitive overload and support efficient information processing.

The lack of practical science materials in Ghanaian schools has been widely documented (Asano et al., 202; Safo-Adu et al., 2018). Without hands-on resources, teachers often resort to lecture-based instruction, leading to passive learning and weak conceptual understanding. Consequently, improvements in infrastructure and resources are crucial for enhancing learning outcomes in Integrated Science.

Teacher-Related Factors Affecting Academic Performance

Teacher Qualification and Professional Competence

Table 3: Teachers' qualification variables as perceived by teachers

	SD	D	N	A	SA	
Statements	F(%)	F(%)	F(%)	F(%)	F(%)	Total
1. Teacher's academic qualification affects students.	0(00.0)	1(05.6)	0(00.0)	13(72.2)	4(22.2)	18(100)
2. Teacher's low confidence in teaching negatively affects students.	0(00.0)	0(00.0)	0(00.0)	5(27.8)	13(72.2)	18(100)
3. Adequate professional Integrated Science teachers in school.	14(77.8)	4(22.2)	0(00.0)	0(00.0)	0(00.0)	18(100)
4. Teacher's holistic subject matter positively affects learning.	4(22.2)	4(22.2)	0(00.0)	4(22.2)	6(33.3)	18(100)

Note. SD=strongly Disagree; D=Disagree; N=neutral; A= Agree; SA=Strongly Agree

Table 3 shows that 94.4% of teachers agreed that teachers' academic qualifications significantly affect student performance. Similarly, all teachers (100%) indicated that low teacher confidence negatively influences students' learning. Moreover, all teachers reported a shortage of professionally trained Integrated Science teachers.

These results emphasize the importance of teacher qualification and confidence in fostering positive learning outcomes. They align with Spaull (2013), who asserted that the quality of an education system cannot exceed the quality of its teachers. Teachers who lack content mastery or pedagogical confidence may rely excessively on rote instruction, thereby impeding students' engagement and understanding.

The findings also corroborate Bandura's (1986) Theory of Self-Efficacy, suggesting that teachers with higher self-efficacy exhibit greater instructional creativity and resilience, which in turn enhances student learning. This relationship is further supported by Ncube (2013), who found that students' perceptions of teacher competence strongly influence their motivation and achievement in science.

Teaching Methodology and Pedagogical Practice

Table 4: Teaching methodology variables as perceived by teachers and students

		SD	D	N	A	SA	
Statements	Respondents	F(%)	F(%)	F(%)	F(%)	F(%)	Total
9. Teacher varies	Teachers	0(00.0)	9(50.0)	0(00.0)	5(27.8)	4(22.2)	18(100)

teaching styles and approaches to suit students.	Students	92(31.3)	91(31.0)	32(10.9)	62(21.1)	17(05.8)	294(100)
10. Teacher engages students in the teaching and learning process.	Teachers	0(00.0)	6(33.3)	0(00.0)	4(22.2)	8(44.4)	18(100)
	Students	74(25.2)	56(19.0)	29(09.9)	74(25.2)	61(20.7)	294(100)
11. Teacher uses different instructional materials during lessons.	Teachers	14(77.8)	4(22.2)	0(00.0)	0(00.0)	0(00.0)	18(100)
	Students	111(37.8)	97(33.0)	7(02.4)	53(18.0)	26(08.8)	294(100)
12. Teacher identifies students with problems and assist them individually	Teachers	5(27.8)	6(33.3)	0(00.0)	4(22.2)	3(16.7)	18(100)
	Students	102(34.7)	100(34.0)	3(01.0)	80(27.2)	9(03.1)	294(100)

Note. SD=Strongly Disagree; D=Disagree; N=Neutral; A=Agree; SA=Strongly Agree

As shown in Table 4, approximately 50% of teachers reported that they vary teaching methods to accommodate different learners, whereas 62.3% of students disagreed. Both groups agreed, however, that teachers rarely used diverse instructional materials (teachers: 100%; students: 70.8%) and often failed to identify and assist struggling learners individually (teachers: 61.1%; students: 68.7%).

These findings reveal a significant methodological gap in science instruction. The predominance of traditional lecture methods and limited student-centered engagement are likely constraining conceptual development. This is consistent with Parmin et al. (2020) and William et al. (2018), who emphasized that inquiry-based, interactive pedagogies enhance students' critical thinking and motivation.

The lack of differentiated instruction and remedial support also suggests insufficient formative assessment and individualized feedback—key features of effective science teaching. In line with Sweller's Cognitive Load Theory (2011), diverse instructional strategies and visual or experimental aids help balance cognitive demands and make complex content more accessible. Therefore, teacher professional development in learner-centered approaches remains essential for improving Integrated Science outcomes.

Student-Related Factors Affecting Academic Performance

Student Interest and Engagement

Table 5: Students' interest variables as perceived by teachers and students

		SD	D	N	A	SA	
Statements	Respondents	F(%)	F(%)	F(%)	F(%)	F(%)	Total
13 Attends almost all Integrated	Teachers	7(38.9)	8(44.4)	0(0.0)	2(11.1)	1(05.6)	18(100)

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XII Issue X October 2025

Science lessons on average.	Students	74(25.2)	88(29.9)	14(04.8)	68(23.1)	50(17.0)	294(100)
14 Actively involved in activities of learning science in the school.	Teachers	10(55.6)	6(33.3)	0(00.0)	1(05.6)	1(05.6)	18(100)
	Students	79(26.9)	78(26.5)	14(04.8)	62(21.1)	61(20.7)	294(100)
15. Do almost all exercises and assignment promptly.	Teachers	12(66.7)	1(05.6)	0(00.0)	5(27.8)	0(00.0)	18(100)
	Students	69(23.5)	86(29.3)	9(03.1)	66(22.4)	64(21.8)	294(100)
16. Devote no time for studying Integrated Science.	Teachers	0(00.0)	0(00.0)	0(00.0)	3(16.7)	15 (83.3)	18(100)
	Students	24(08.2)	34(11.6)	15(05.1)	122(41.5)	99(33.7)	294(100)

Note. SD=Strongly Disagree; D=Disagree; N=Neutral; A=Agree; SA=Strongly Agree

Findings in Table 5 reveal that 83.3% of teachers and 55.1% of students reported irregular class attendance in Integrated Science lessons. A substantial proportion also indicated that students were not actively engaged in learning activities (teachers: 88.9%; students: 53.4%) and often failed to complete assignments promptly (teachers: 72.3%; students: 52.8%). Furthermore, 100% of teachers and 75.2% of students acknowledged that students devoted minimal time to studying Integrated Science outside class hours.

These results highlight the critical influence of student motivation and engagement on learning outcomes Consistent literature, the findings indicate that students with limited interest and poor engagement in science tend to underperform with (Adeyemo,2005; Coffie et al., 2025; Giuliodori et al., 2006), Low attendance and weak task commitment also reflect diminished self-regulation and confidence in learning science, which ties directly to Bandura's self-efficacy construct—learners' belief in their ability to succeed determines their persistence and effort.

The limited enthusiasm observed among students may stem from the perception that science is abstract or difficult, a common phenomenon in many developing countries (Moloko et al., 2014). Teachers' ability to make science relevant through contextualized examples and hands-on experiments could therefore play a pivotal role in rekindling student interest.

5.3.2 Learning Habits and Study Practices

Table 6: Students' learning habit variables as perceived by teachers and students

		SD	D	N	A	SA	
Statements	Respondents	F(%)	F(%)	F(%)	F(%)	F(%)	Total
17. Regularly revise the	Teachers	8(44.4)	8(44.4)	0(0.0)	2(11.1)	0(0.0)	18(100)

subject before class.	Students	93(31.6)	84(28.6)	15(05.1)	74(25.2)	28(09.5)	294(100)
18. Have no schedule for Integrated Science.	Teachers	1(05.6)	1(05.6)	0(00.0)	6(33.3)	10(55.6)	18(100)
	Students	55(18.7)	40(13.6)	13(04.4)	79(26.9)	107(36.4)	294(100)
19. Take personal notes from lessons for revision.	Teachers	12(66.7)	1(05.6)	0(00.0)	5(27.8)	0(00.0)	18(100)
	Students	77(26.2)	115(39.1)	22(07.5)	52(17.7)	28(09.5)	294(100)
20. Search for supplementary materials and notes.	Teachers	15 (83.3)	0(00.0)	0(00.0)	3(16.7)	0(00.0)	18(100)
	Students	73(24.8)	142(48.3)	0(00.0)	49(16.7)	30(10.2)	294(100)

Note. SD=Strongly Disagree; D=Disagree; N=Neutral; A=Agree; SA=Strongly Agree

As illustrated in Table 6, most teachers (88.8%) and students (60.2%) agreed that students rarely revise Integrated Science topics before class. Similarly, 88.9% of teachers and 63.3% of students stated that students lacked structured study schedules. Regarding independent learning, 72.3% of teachers and 65.3% of students indicated that students did not take personal notes, while 83.3% of teachers and 73.1% of students reported that students did not consult supplementary reading materials.

These findings suggest that weak study habits are a major contributor to poor academic performance. The results are consistent with Greetika and Vyas (2017), who emphasized that effective study habits—such as organized note-taking and consistent revision—are foundational to academic success. The absence of these habits indicates limited metacognitive skills and self-discipline, which may be exacerbated by insufficient academic guidance and support systems.

From the perspective of Cognitive Load Theory, unstructured study practices may prevent students from effectively consolidating knowledge and transferring learning to new contexts. Moreover, low self-efficacy, as described by Bandura, likely diminishes students' persistence and resilience in the face of academic challenges. Addressing these issues through targeted interventions, such as study skills workshops and peer learning initiatives, could substantially improve science learning outcomes.

The study's findings collectively demonstrate that students' academic performance in Integrated Science is shaped by an intricate interplay of environmental, teacher, and student factors. Weak parental involvement, inadequate facilities, and unqualified teachers create systemic barriers that hinder learning. At the same time, students' limited engagement and poor study habits further exacerbate underachievement.

These findings corroborate the integrated theoretical model underpinning the study. Epstein's framework explains the environmental and parental dimensions; Sweller's Cognitive Load Theory accounts for instructional design and resource-related factors; and Bandura's Self-Efficacy Theory illuminates the motivational and behavioral aspects influencing learning.

Together, the results affirm that improving academic performance in Integrated Science requires a holistic, systemic approach—one that simultaneously enhances learning environments, strengthens teacher capacity, and cultivates student motivation and effective learning behaviors.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study examined teachers' and students' perceptions of the factors influencing academic performance in Integrated Science within two public senior high schools in the Jomoro Municipality of Ghana. The results revealed that students' performance is shaped by a complex interaction among environmental, teacher-related, and student-related variables.

At the environmental level, the findings showed that most students study under home conditions that are not conducive to learning, characterized by low parental education, limited supervision, and weak involvement in science-related activities. At the school level, insufficient instructional resources, overcrowded classrooms, and substandard facilities further constrain the teaching and learning process. These findings reaffirm that the quality of the learning environment is a decisive determinant of academic outcomes, echoing Epstein's (2001) principle that productive overlap among home, school, and community spheres promotes student success.

Regarding teacher-related factors, the study found that a shortage of qualified Integrated Science teachers, low teacher confidence, and limited methodological diversity negatively affect student engagement and understanding. Teachers who rely predominantly on traditional lecture methods and rarely employ inquiry-based or interactive pedagogies tend to foster passive learning and reduce students' enthusiasm for science. These outcomes support Sweller's Cognitive Load Theory, which emphasizes that instructional design and resources must align with learners' cognitive capacities to optimize learning efficiency.

At the student level, weak study habits, irregular attendance, and low self-efficacy emerged as critical impediments to academic achievement. Many students lacked structured study schedules, seldom revised lessons, and rarely engaged in independent reading. These behavioral patterns align with Bandura's (1986) Theory of Self-Efficacy, suggesting that students who doubt their abilities are less likely to persist and succeed in challenging academic tasks.

Overall, the study concludes that the persistent underperformance in Integrated Science among senior high school students in Ghana is not merely a function of cognitive difficulty, but rather the product of interlocking systemic, instructional, and motivational constraints. Addressing these constraints requires a coordinated strategy involving parents, teachers, school management, and policy actors.

Implications for Policy and Practice

The findings carry several practical and theoretical implications:

1. Strengthening Home–School Partnerships:

   Active collaboration between parents and schools is essential for reinforcing learning beyond the classroom. Parent–Teacher Associations (PTAs) should be empowered to organize workshops that educate parents on their roles in supporting their children's academic pursuits, particularly in science subjects.

2. Improving School Infrastructure and Learning Resources:

   The Ghana Education Service (GES) and other educational stakeholders should prioritize the provision of adequate laboratories, instructional materials, and modern science teaching tools. Resource enhancement will not only support hands-on learning but also motivate teachers to adopt more interactive pedagogies.

3. Enhancing Teacher Professional Development:

   School administrators should facilitate continuous professional development through in-service training, mentoring, and collaborative lesson study programs. These initiatives can strengthen teachers' subject matter expertise, pedagogical confidence, and capacity to integrate inquiry-based and student-centered teaching strategies.

4. Fostering Student Motivation and Self-Efficacy:

   Teachers should adopt motivational strategies that build students' confidence in learning science, such as goal setting, feedback, and recognition of effort. Schools could also organize extracurricular science clubs and project-based learning initiatives to cultivate sustained interest and intrinsic motivation.

5. Promoting Effective Study Skills:

   Schools should integrate study-skills training into guidance and counselling programs. Structured workshops on note-taking, time management, and self-regulation can help students develop habits that enhance retention and academic discipline.

Limitations and Future Research

While the descriptive survey design provided valuable insights into perceived factors influencing academic performance, the study's scope was limited to two public schools in one municipality. Future studies could adopt a mixed-methods approach combining surveys with classroom observations and interviews to deepen understanding of contextual and behavioral dynamics. Comparative studies across different regions or school types (urban vs. rural, public vs. private) would also illuminate variations in the determinants of science achievement.

Moreover, longitudinal research could explore the long-term effects of teacher professional development and parental engagement programs on student learning outcomes. Such investigations would contribute to a more nuanced and policy-relevant understanding of how systemic and psychological factors interact to shape science education performance.

Improving students' academic performance in Integrated Science requires more than curriculum revision; it demands a sustained commitment to building supportive environments, empowering teachers, and nurturing students' confidence and curiosity. By integrating environmental support, instructional innovation, and learner motivation, Ghana's education system can cultivate scientifically literate citizens capable of contributing to national and global development.

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