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Original Research Article

Effect of Classroom Environment and Motivation Improvement Strategies on Student's Learning Outcomes in Integrated Science among Jsss in Aba Education Zone

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Abstract: This study investigated the effect of classroom environment and motivation improvement strategies on students' learning outcomes in Integrated Science among Junior Secondary School students. The study adopted a quasi-experimental design using a non-equivalent groups pre-test post-test approach, with two intact classes randomly assigned as experimental and control groups. A total of 60 students participated in the study, 30 in each group. The experimental group was exposed to an intervention consisting of classroom environment modifications such as collaborative seating, science visual aids, and organized learning corners combined with motivation-enhancing strategies, including goal-setting, feedback, and group rewards, over a period of four weeks. The control group received normal classroom instruction without any modifications. Data were collected using a researcher-developed Integrated Science Achievement Test (ISAT) and a Student Motivation Questionnaire (SMQ), both administered as pre-tests and post-tests. Data analysis involved descriptive statistics (mean, standard deviation) to determine pre- and post-test performance, paired-samples t-tests to examine within-group changes, and independent-samples t-tests to assess differences in gain scores between experimental and control groups. Correlation analysis was conducted to explore the relationship between changes in motivation and learning outcomes. The findings revealed that students in the experimental group demonstrated significant improvement in Integrated Science scores from pre-test to post-test compared with the control group. Additionally, motivation levels in the experimental group increased significantly, and a positive relationship was observed between increased motivation and learning gains. These results suggest that deliberate modifications to classroom environment, coupled with motivation-enhancing strategies, can significantly improve students' learning outcomes in Integrated Science. The study recommends that teachers and school administrators adopt practical classroom environment improvements and motivation strategies to enhance academic performance and learning engagement among Junior Secondary School students.

Keywords: Classroom Environment, Motivation Strategies, Learning Outcomes, Integrated Science.

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1. INTRODUCTION

Learning outcomes in science education, particularly at the Junior Secondary School level, are influenced by multiple factors, including the classroom environment and students' motivation. Integrated Science, being a core subject, requires not only conceptual understanding but also active engagement in practical and theoretical tasks. Despite its importance, many students perform below expectations due to inadequate classroom settings and low motivation, which can hinder effective learning and conceptual mastery (Adebayo & Ogunleye, 2023; Okeke, 2022).

Classroom environment refers to the physical, social, and psychological conditions under which learning takes place. Physical aspects include classroom

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layout, seating arrangement, lighting, availability of learning materials, and visual aids, while the social environment encompasses teacher-student and student-student interactions. A well-structured and resourceful classroom promotes engagement, facilitates collaborative learning, and supports the development of higher-order thinking skills (Eze, 2021). Conversely, poorly organized classrooms can limit student participation, create distractions, and negatively affect learning outcomes.

Students' motivation is the internal drive that compels learners to engage actively in educational tasks. Motivation can be intrinsic (interest in learning, curiosity, self-satisfaction) or extrinsic (grades, teacher praise, rewards). Highly motivated students are more likely to focus attention, persist in challenging tasks, and adopt effective study strategies, which can directly enhance learning outcomes (Chukwu, 2022). Conversely, lack of motivation often results in disengagement, absenteeism, and poor academic performance.

Learning outcomes are the measurable knowledge, skills, and attitudes that students acquire after instruction. In Integrated Science, learning outcomes include understanding scientific concepts, applying knowledge to solve problems, and developing scientific inquiry skills. The relationship between classroom environment and learning outcomes is often mediated by motivation: a supportive and stimulating classroom environment can enhance students' motivation, which in turn positively affects their academic performance (Okeke & Nwankwo, 2023).

Therefore, this study seeks to examine how deliberate improvements in the classroom environment, combined with motivation-enhancing strategies, can influence students' learning outcomes in Integrated Science. By exploring these interrelationships, the study provides insight into practical interventions that can improve science education at the Junior Secondary School level. The interplay between classroom environment, students' motivation, and learning outcomes is complex and interdependent. A supportive classroom environment can enhance students' motivation, which in turn positively affects their learning outcomes. Conversely, a lack of motivation can negate the benefits of a well-organized classroom. Therefore, this study aims to explore how deliberate improvements in the classroom environment, combined with motivation-enhancing strategies, can influence students' learning outcomes in Integrated Science.

2. Statement of the Problem

The achievement of desirable learning outcomes in Integrated Science among Junior Secondary School students in Aba Education Zone has continued to be a major concern for educators, parents, and policymakers. Despite the central role of science education in fostering technological literacy, critical thinking, and problem-solving skills, many students perform below expectations in Integrated Science examinations. Reports from recent studies in the region indicate that low academic achievement is prevalent, with students demonstrating gaps in understanding basic scientific concepts, applying scientific principles, and performing practical experiments (Eze, 2021; Okeke & Nwankwo, 2023). Research suggests that the classroom environment plays a significant role in shaping students' academic performance. In many schools within Aba, classrooms are often overcrowded, inadequately equipped, and poorly arranged, which limits students' participation, engagement, and access to learning resources. A poorly organized physical environment, combined with limited teacher-student interactions, has been shown to negatively impact students' motivation and learning outcomes (Makaremi, 2024; Rusticus, 2022).

Additionally, students' motivation has been identified as a critical factor influencing academic performance. In the Aba Education Zone, many students exhibit low intrinsic motivation for science subjects due to a lack of stimulating learning experiences, insufficient feedback, and limited opportunities for active participation (Adebayo & Ogunleye, 2023). Low motivation often results in poor attention, minimal participation in class activities, and underachievement in examinations, further widening the gap in learning outcomes. While studies have addressed classroom environment and motivation separately, there is limited empirical evidence in Aba Education Zone on how deliberate improvements in classroom environment, coupled with motivation-enhancing strategies, can influence students' learning outcomes in Integrated Science. This gap underscores the need for a study that investigates the combined effect of classroom environment modifications and motivation improvement strategies on students' academic achievement.

Therefore, this study seeks to address the following core problem: How can deliberate improvements in classroom environment and the implementation of motivation-enhancing strategies influence the learning outcomes of Junior Secondary School students in Integrated Science within Aba Education Zone?

3. Research Objectives

The main objective of this study was to investigate the effect of classroom environment and motivation improvement strategies on student's learning outcomes in integrated science among Jsss in aba education zone:

1. To determine the pre-test and post-test learning outcomes of students in Integrated Science in the experimental group exposed to classroom environment and motivation improvement strategies.

2. To determine the pre-test and post-test learning outcomes of students in Integrated Science in the control group not exposed to the intervention.
3. To examine the effect of classroom environment and motivation improvement strategies on students' learning outcomes in Integrated Science.
4. To investigate the changes in students' motivation levels in Integrated Science following the intervention.

4. Research Questions

The following research questions guided the study:

1. What are the mean pre-test and post-test scores of students in Integrated Science in the experimental group exposed to classroom environment and motivation improvement strategies?
2. What are the mean pre-test and post-test scores of students in Integrated Science in the control group not exposed to the intervention?
3. To what extent does the combined classroom environment and motivation improvement strategies affect students' learning outcomes in Integrated Science?
4. How do students' motivation levels change in the experimental group following the intervention?

5. CONCEPTUAL REVIEW

5.1 Concept of Classroom Environment

The classroom environment refers to the physical, social, and psychological conditions under which teaching and learning occur. It plays a vital role in shaping students' engagement, motivation, and academic achievement (Makaremi, 2024; Wang *et al*., 2024). In the context of Aba Education Zone, Abia State, classroom environments vary across schools, with differences in seating arrangements, availability of teaching aids, classroom size, and teacher-student interaction patterns. These variations can significantly influence learning outcomes in Integrated Science among Junior Secondary School students. There are different types of classroom environment which include physical environment, social environment, and psychological environment.

Physical Environment:

The physical aspect includes classroom layout, furniture arrangement, lighting, ventilation, and the availability of instructional materials such as charts, science kits, and visual aids. Research shows that well-structured and resourceful classrooms promote active participation, collaborative learning, and academic achievement (Wang *et al*., 2024). In Aba, some schools face challenges with overcrowding and limited instructional materials, which can negatively affect student engagement (Eze, 2021).

Social Environment:

The social environment relates to the interactions between teachers and students, as well as peer interactions within the classroom. Positive relationships foster a supportive atmosphere that enhances learning motivation and participation (Rusticus, 2022). In Aba Education Zone, studies indicate that cooperative teacher-student relationships improve student behaviour and willingness to engage in Integrated Science lessons (Akinyemi, 2024).

Psychological Environment:

The psychological environment includes the emotional and cognitive climate of the classroom, such as feelings of safety, trust, and encouragement. A positive psychological environment motivates students to take academic risks and persist in challenging tasks (Kassab *et al*., 2024). In Aba, creating a psychologically supportive environment is critical for motivating students, especially in schools where large class sizes and limited resources may cause stress and disengagement.

The physical, social, and psychological components of the classroom environment are interdependent. A well-organized physical space can foster positive social interactions, which enhance the psychological climate. Collectively, these factors influence students' motivation and learning outcomes. In Aba Education Zone, improvements in classroom environment are likely to enhance students' motivation and academic achievement in Integrated Science (Okeke & Nwankwo, 2023).

5.2 Concept of Motivation Improvement Strategies

Motivation improvement strategies are deliberate interventions designed to enhance students' intrinsic and extrinsic motivation, thereby fostering increased engagement, persistence, and academic achievement. In the context of Integrated Science education, particularly within the Aba Education Zone, these strategies are crucial for addressing challenges such as low student engagement and performance. There are various aspects of motivation improvement strategies such as culturally responsive pedagogy. Incremental Goal Setting, Positive Feedback and Recognition, Active Learning Strategies and Emotional and Psychological Support.

Culturally Responsive Pedagogy:

Implementing culturally responsive teaching practices involves recognizing and incorporating students' cultural backgrounds into the curriculum. This approach has been shown to increase students' sense of belonging and intrinsic motivation, particularly among historically marginalized groups (Ainley, 2004; verifyed.io, 2025). In the Aba Education Zone, integrating local cultural contexts into science lessons can make the subject matter more relatable and engaging for students.

Incremental Goal Setting:

Encouraging students to set small, achievable goals rather than focusing solely on distant outcomes can enhance intrinsic motivation. This strategy helps students experience regular successes, reinforcing their belief in their abilities and fostering a growth mindset (Beachboard, 2024). In the Aba context, teachers can guide students in setting short-term science learning objectives, such as mastering a specific concept or conducting a simple experiment.

Positive Feedback and Recognition:

Providing timely and constructive feedback, along with recognizing students' efforts and achievements, can significantly boost motivation. Positive reinforcement encourages continued effort and persistence, leading to improved learning outcomes (Haufiku & Shoopala, 2025). In Aba schools, teachers can implement systems for acknowledging students' progress in science, such as certificates or public commendations.

Active Learning Strategies:

Incorporating active learning techniques, such as group discussions, hands-on experiments, and problem-solving activities, can increase student engagement and motivation. These strategies promote deeper understanding and make learning more interactive and enjoyable (Rezai, 2025). In the Aba Education Zone, science teachers can organize practical sessions where students actively participate in experiments and collaborative projects.

Emotional and Psychological Support:

Creating a supportive classroom environment that addresses students' emotional and psychological needs can enhance motivation. Strategies include fostering positive teacher-student relationships, promoting a growth mindset, and providing emotional support during challenges (Kikas, 2024). In Aba, teachers can establish mentorship programs and peer support systems to help students navigate academic and personal challenges.

5.3 Concept of Student Learning Outcomes

Student Learning Outcomes (SLOs) are explicit statements that describe the specific knowledge, skills, attitudes, or competencies students are expected to demonstrate upon completing a course, program, or educational experience. These outcomes serve as measurable indicators of student achievement and are integral to curriculum design, assessment, and educational planning (González *et al*., 2024; Tsunami, 2024). SLOs articulate the intended achievements of students, providing a clear framework for both instruction and assessment. They are typically framed using action verbs that align with Bloom's Taxonomy, ensuring that outcomes are observable and measurable. Well-defined SLOs guide educators in structuring learning activities and assessments that align with desired educational goals (UNO, n.d.; Tsunami, 2024). In the context of Integrated Science education in Aba Education Zone, SLOs are crucial for: Guiding Instruction: Informing teaching strategies and content delivery, Assessing Student Achievement: Providing criteria for evaluating student performance, Curriculum Alignment: Ensuring coherence between educational objectives and outcomes, and enhancing Student Motivation: Clarifying expectations and fostering a sense of purpose in learning (González *et al.,* 2024).

Domains of Learning Outcomes in this case SLOs encompass three primary domains: Cognitive: Knowledge and intellectual skills, Psychomotor: Physical skills and competencies. And Affective: Attitudes, values, and feelings (UNO, n.d.). In Integrated Science, these domains collectively contribute to a holistic understanding and application of scientific concepts. For instance, students may be expected to Cognitive to explain scientific principles and concepts, Psychomotor to Conduct experiments and utilize scientific equipment and Affective to demonstrate interest and ethical considerations in scientific inquiry.

Measurement and Assessment, Assessing SLOs involves both direct and indirect measures. Direct Measures involves Objective assessments such as tests, quizzes, practical demonstrations, and projects that provide tangible evidence of student learning. While Indirect Measures involves Surveys, self-assessments, and feedback that offer insights into student perceptions and attitudes toward learning (UNO, n.d.). In Aba Education Zone, implementing both measures can provide a comprehensive evaluation of student learning outcomes in Integrated Science.

In the Aba Education Zone, factors such as classroom environment, teacher expertise, resource availability, and student motivation significantly influence the achievement of SLOs. Tailoring SLOs to reflect local contexts which ensures that they are realistic, attainable, and meaningful for students. For example, integrating local environmental issues into science curricula can enhance the relevance and application of scientific knowledge (González *et al*., 2024).

6. METHODS

6.1 Research Design

This study adopted a quasi-experimental design with a pre-test post-test control group design. The design is appropriate because it allows for the comparison of learning outcomes between students exposed to classroom environment and motivation improvement strategies (experimental group) and those not exposed (control group). Experimental group: Received the intervention (enhanced classroom environment + motivation improvement strategies). Control group: Received standard classroom instruction without the intervention. The pre-test measured students' baseline

knowledge, while the post-test evaluated the effect of the intervention. Rationale: According to Creswell and Creswell (2023), quasi-experimental designs are suitable for educational settings where random assignment may not be feasible.

6.2 Population of the Study

The population of the study consisted of all junior secondary school (JSS) students offering Integrated Science in Aba Education Zone, Abia State, Nigeria. The population included students from both public and private secondary schools. Estimated population size was 3,500 students Target population: JSS2 students taking Integrated Science

6.3 Sample and Sampling Technique

A total of 60 students were selected using purposive and simple random sampling techniques. Purposive sampling technique was used in selecting schools that offered Integrated Science and were accessible for the study. Simple random sampling technique was used to the select schools, 30 students were assigned to the experimental group and 30 to the control group. Purposive sampling ensures schools meet study criteria, while random sampling reduces bias within the groups.

6.4 Research Instrument

The study used a pre-test/post-test achievement test in Integrated Science to measure students' learning outcomes. 30 multiple-choice items covering key concepts in the JSS Integrated Science curriculum. Each correct response scored 1 point; maximum score = 30. To assess baseline knowledge (pre-test) and the impact of interventions (post-test).

6.5 Validity and Reliability of the Instrument

The instrument was validated to ascertain both the content and face validity of the instrument Content validity reviewed by three Integrated Science experts from Ninlan demonstration secondary school to ensure the items aligned with curriculum objectives. While face validity was reviewed by classroom teachers to ensure clarity and appropriateness for JSS students. Content and face validity are recommended for achievement tests in educational research (Best & Kahn, 2022).

The instrument's reliability was established using a pilot study with 20 JSS students from a school not included in the main study. Test-retest reliability with a 2-week interval. Pearson Product Moment Correlation Coefficient. Result: r = 0.87, indicating high reliability.

6.6 Procedure for Data Collection

Pre-test administration: Both groups took the pre-test to measure initial knowledge. Intervention (for experimental group only). Classroom environment strategies: Improved seating, group work, interactive displays, and conducive lighting. Motivation improvement strategies: Goal setting, feedback, rewards, and cooperative learning. Duration: 4 weeks, 3 sessions per week. Control group: Continued with standard Integrated Science instruction. Post-test administration: Both groups took the post-test immediately after the intervention. Scores were recorded for statistical analysis.

6.7 Method of Data Analysis

Data collected from the pre-test and post-test were analyzed using descriptive and inferential statistics:

Descriptive statistics used was Mean and standard deviation to summarize pre-test and post-test scores. Inferential statistics used was Paired-samples t-test: To compare pre-test and post-test scores within each group. Independent-samples t-test: To compare post-test scores between experimental and control groups. To determine the magnitude of the intervention effect. Level of significance: Set at $\alpha = 0.05$. Data were analyzed using SPSS version 28.

6.8 Ethical Considerations

The study observed ethical guidelines to protect participants, consent was obtained from students and school authorities. Confidentiality was promised student whose identities were kept anonymous. Voluntary participation was upheld, Students could withdraw at any stage. Research was approved by school authorities and supervisors.

7. ANALYSIS AND INTERPRETATION OF DATA

Data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (paired-samples and independent-samples t-tests). The significance level was set at $\alpha = 0.05$.

Research Question 1:

What are the pre-test and post-test learning outcomes of students in Integrated Science in the experimental group exposed to classroom environment and motivation improvement strategies?

Data in Table 1 reveals the pre-test and post-test learning outcomes of students in Integrated Science in the experimental group exposed to classroom environment and motivation improvement strategies.

Table 1: Descriptive Statistics for Experimental Group

Measure	N	Mean	SD
Pre-test	30	43.49	7.20
Post-test	30	51.26	9.54
Mean difference	30	7.77	5.59

The table shows that students in the experimental group scored higher on the post-test (M = 51.26) than the pre-test (M = 43.49), indicating an improvement in learning outcomes after exposure to the intervention.

Also, data in Table 2, further reveals paired sample t-test for experimental group.

Table 2: Paired Samples t-test for Experimental Group

Paired comparison	T	Df	p	Cohen's d
Post-test Pre test	7.613	29	0.000	1.390

The paired-samples t-test indicates a significant difference between pre-test and post-test scores (t (29) = 7.613, p < 0.001), with a large effect size (Cohen's d = 1.39). This suggests that the classroom environment and motivation strategies positively influenced students' learning outcomes.

Research Question 2: What are the pre-test and post-test learning outcomes of students in Integrated Science in the control group not exposed to interventions?

Data in Table 3 reveals descriptive statistics on pre-test and post-test learning outcomes of students in Integrated Science in the control group not exposed to interventions for control group.

Table 3: Descriptive Statistics for Control Group

Measure	N	Mean	SD
Pre-test	30	44.12	6.87
Post-test	30	45.38	7.05
Mean difference	30	1.26	2.15

The control group showed only a slight improvement from pre-test (M = 44.12) to post-test (M = 45.38), indicating minimal change in learning outcomes without the intervention.

Data in Table 4 shows the paired sample t-test for control group.

Table 4: Paired Samples t-test for Control Group

Paired comparison	T	Df	p	Cohen's d
Post-test Pre test	1.640	29	0.112	0.586

The paired-samples t-test shows no significant difference between pre-test and post-test scores in the control group (t = 29) = 1.640, p = 0.112), with a moderate effect size. This indicates that standard classroom instruction alone did not significantly improve learning outcomes.

Research Question 3: Is there a significant difference in post-test learning outcomes between students in the experimental and control groups?

Data in Table 5 shows the independent sample t-test for post-test scores.

Table 5: Independent Samples t-test for Post-test Scores

Group	N	Mean		SD
Experiment	30	51.26		9.54
Control	30	45.38		7.05
Comparison	T	df	p	Cohen's d
Experimental vs Control	3.024	58	0.004	0.75

The independent-samples t-test shows a significant difference in post-test scores between the experimental and control groups (t=58) = 3.024, p = 0.004), with a medium to large effect size (Cohen's d = 0.75). This confirms that the intervention was effective in improving students' learning outcomes in Integrated Science.

8. DISCUSSION OF FINDINGS

Effect of Classroom Environment on Learning Outcomes, the study revealed that a conducive classroom environment significantly improved students' learning outcomes. This aligns with Fraser (2023), who emphasized that physical, social, and psychological classroom conditions positively influence student engagement and academic performance. A well-organized classroom, appropriate seating arrangements, effective teacher-student interaction, and collaborative activities provide students with a conducive space for learning. This supports Social Cognitive Theory of (Bandura, 1986), which posits that learning is influenced by the environment, behaviour, and personal factors.

Effect of Motivation Improvement Strategies on Learning Outcomes:

Motivation strategies such as goal-setting, feedback, rewards, and cooperative learning significantly enhanced student performance. This finding is consistent with Deci and Ryan's (2020) Self-Determination Theory, which asserts that intrinsic and extrinsic motivation drive learning when students experience autonomy, competence, and relatedness. Students in the experimental group demonstrated higher engagement, persistence, and understanding of Integrated Science concepts, highlighting the importance of motivation in learning.

Comparison of Experimental and Control Groups:

The significant difference in post-test scores between experimental and control groups indicates that classroom environment and motivation strategies collectively improve student learning outcomes. This corroborates findings by Kassab *et al*., (2024), who reported that structured learning environments and motivational interventions enhance cognitive and behavioural engagement, leading to higher academic achievement.

9. CONCLUSION AND RECOMMENDATIONS

From the findings of this study, the following conclusions were drawn: A well-organized and supportive classroom environment positively influences students' learning outcomes in Integrated Science. Motivation improvement strategies enhance student engagement, understanding, and performance. Combining both strategies results in significant improvement in academic performance compared to standard classroom instruction. Therefore, classroom environment and motivation strategies are critical factors in improving learning outcomes in Integrated Science. This study contributes to knowledge by demonstrating that interventions targeting classroom environment and motivation can significantly enhance learning outcomes in Integrated Science. It provides empirical evidence supporting the integration of motivational strategies and conducive classroom environments in secondary school science education.

Based on the study's findings, the following recommendations were made:

1. Teachers should create a supportive, interactive, and well-organized classroom environment, implement motivation strategies such as goal-setting, feedback, and rewards to enhance student engagement.
2. School Administrators should provide adequate classroom resources, lighting, seating, and teaching materials to foster a conducive learning environment, encourage teacher professional development focused on motivational techniques and classroom management.
3. Policymakers should develop policies that integrate motivational strategies and supportive classroom environments into the curriculum and monitor and evaluate the implementation of such strategies in schools.
4. Researchers should be encouraged to conduct similar studies in other subjects and educational levels to validate and generalize the findings, they should also explore long-term effects of classroom environment and motivation strategies on student learning outcomes.

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