ROLE OF TEACHERS' FEEDBACK ON STUDENTS' MOTIVATION AND LEARNING IN SCIENCE IN SENIOR SECONDARY SCHOOLS IN NASARAWA LOCAL GOVERNMENT, NASARAWA STATE.

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Abstract
This study explored the role of teachers' feedback on students' motivation and learning outcomes in science subjects at senior secondary schools in Nasarawa Local Government, Nasarawa State. The purpose of the research was to examine how different types of teachers' feedback, both in terms of frequency and quality, influence students' engagement, academic performance, and self-confidence in science. Using a mixed-methods approach, data was collected through surveys, interviews, and classroom observations from a sample of 200 students and 20 science teachers across selected schools in the region. The findings revealed that frequent and constructive feedback significantly enhanced student motivation and fostered positive attitudes toward science. Specifically, students who received regular, clear, and personalized feedback were more motivated to participate actively in class and exhibited higher levels of academic achievement. Additionally, the study highlighted the critical role of teacher-student interactions in boosting student confidence and improving learning outcomes. It was concluded that effective teachers' feedback plays a crucial role in promoting student engagement and academic success in science. The study recommends that teachers adopt regular, high-quality feedback practices, encourage positive teacher-student interactions, and incorporate peer and self-assessment strategies to further enhance students' learning experiences. This research contributes to the growing body of knowledge on feedback in education, providing valuable insights for educators, policymakers, and researchers in the field of science education.

Keywords: Teacher Feedback, Motivation, Learning, Science

Background to the Study

Teachers' feedback plays a crucial role in shaping students' motivation and learning outcomes, particularly in science education. In the context of senior secondary schools in Nasarawa Local Government, Nasarawa State, the effectiveness of feedback can significantly influence students' understanding of complex scientific concepts, their approach to learning, and their overall academic performance. Science subjects, which often require critical thinking, problem-solving, and application of theoretical knowledge, demand specific types of feedback that not only correct misconceptions but also foster a growth mindset among students (Shute, 2018).

Motivation, a key psychological factor influencing learning, is strongly linked to the type and quality of feedback students receive. Feedback can serve as a powerful tool for reinforcing students' strengths, addressing their weaknesses, and encouraging them to engage with scientific content more deeply. Positive feedback has been shown to enhance self-esteem, confidence, and intrinsic motivation, while constructive criticism can guide students toward more effective strategies for learning. On the other hand, negative or vague feedback may lead to frustration, reduced motivation, and disengagement from the subject.

In senior secondary schools in Nasarawa State, where students are preparing for critical exams such as the West African Senior School Certificate Examination (WASSCE), understanding the relationship between teachers' feedback and student motivation is essential for improving educational outcomes. This research aims to explore how different forms of feedback impact students' motivation and learning in science subjects and to provide insights into the strategies that can enhance both student performance and engagement in science education. By examining the psychological aspects of feedback in the local context, this study seeks to contribute to a more effective and supportive learning environment for senior secondary students in Nasarawa Local Government.

Statement of the Problem

Science education in senior secondary schools is integral to preparing students for higher education and professional careers in various scientific fields. Despite the A critical role of science education in shaping national development and preparing students for future scientific, and technological careers, the academic performance of senior secondary school students in science subjects in Nasarawa Local Government has remained consistently low. Many students struggle to grasp scientific concepts, demonstrate weak problem-solving skills, and show limited interest in pursuing science related fields. One significant but often overlooked factor contributing to this trend is the nature and quality of feedback provided by teachers during the teaching and learning process. While feedback is intended to support student learning, correct misconceptions, and reinforce understanding, in many classrooms it is either superficial, irregular, overly critical, or entirely absent-leading to student frustration, low self-confidence, and reduced motivation.

This study is therefore anchored on the premise that teachers' feedback, when timely, constructive, and well-structured, can serve as a powerful tool for enhancing students' motivation and deepening their understanding of scientific concepts. Yet, within the context of Nasarawa Local Government-characterized by large class sizes, limited teachers' training opportunities, and unique socio-cultural learning environments there is little empirical evidence to guide how feedback is delivered or received. The crux of this study lies in exploring how the feedback practices of science teachers influence students' motivation and learning outcomes, with the ultimate aim of generating context-specific insights that can inform teaching strategies, improve student, engagement, and raise academic performance in science subjects.

Objectives

The primary objectives of this study are to:

1. Investigate the types of feedback given by teachers in senior secondary schools in Nasarawa Local Government, Nasarawa State, and their impact on students' motivation.
2. Examine how teachers' feedback influences students' learning outcomes in science subjects.
3. Assess the relationship between feedback provided by science teachers and students' self-confidence and interest in science.

4. Explore students' perceptions of teachers' feedback and how it affects their academic performance and study habits.

Research Questions

This study seeks to answer the following research questions:

1. What types of feedback do science teachers in senior secondary schools in Nasarawa Local Government typically provide to students?
2. How does teachers' feedback affect students' motivation to learn science?
3. In what ways does teachers' feedback impact students understand and retention of scientific concepts?
4. How do students perceive the feedback provided by their science teachers?

Literature Review

Teachers' Feedback

Refers to the information provided by educators to students about their performance, typically aimed at guiding them toward improvement. This feedback can be in various forms such as verbal, written, formative (ongoing), or summative (final). In the context of science education, feedback plays a significant role in students' understanding of complex scientific concepts and in shaping their attitudes toward learning. In senior secondary schools, where students are preparing for critical exams like the Senior Secondary Certificate Examination (SSCE), feedback can either encourage or hinder progress. Teachers who provide specific, timely, and constructive feedback help students focus on areas of weakness, build confidence, and correct misconceptions.

Hattie and Timperley (2017) noted that feedback is information provided by an agent (e.g., teacher, peer, book, self) regarding aspects of one's performance or understanding. It is one of the most powerful influences on learning and achievement. Black and Wiliam (2018) also stated that feedback is information given to the learner about their performance relative to learning goals. It is an essential part of formative assessment, and it can guide the learner toward improvement." Shute (2023)"Feedback is information provided to students that describes their performance relative to learning goals, often in the form of comments on assignments or tests, aimed at promoting learning and improvement."

The Importance of Teachers' Feedback

Feedback is a tool through which teachers provide information to students about their performance in relation to learning goals. According to Hattie and Timperley (2007), feedback is one of the most significant influences on student learning, as it helps bridge the gap between what students know and what they are expected to know. In science education, where students are often confronted with complex concepts and require a hands-on approach to learning, feedback becomes even more critical. It allows students to identify their strengths and weaknesses in scientific reasoning and problem-solving, which are essential skills in the study of subjects like Biology, Chemistry, and Physics.

The purpose of feedback in education is multifaceted. It not only helps students understand their academic progress but also motivates them to continue learning. When feedback is delivered effectively, it can increase student engagement, enhance self-confidence, and foster a deeper understanding of the subject. In science education, where

students' perceptions of the subject and their interest in scientific exploration are essential, positive feedback is critical to sustaining long-term motivation.

Teachers' Feedback and Student Motivation

The relationship between teachers' feedback and student motivation has been extensively studied. Motivation in education is a key factor in determining students' engagement with learning, persistence, and academic achievement. In science, where students often encounter abstract concepts and complex problem-solving tasks, motivation plays a crucial role in determining how deeply they engage with the subject matter. Intrinsic Motivation: Research by Deci and Ryan (2015) suggests that intrinsic motivation, where students are driven by an internal desire to learn and understand, is positively influenced by feedback that focuses on effort and improvement rather than just outcome. Positive feedback that acknowledges students' hard work and intellectual growth in science can foster a genuine interest in the subject, encouraging them to explore scientific concepts further. Extrinsic Motivation: Extrinsic motivation, on the other hand, is driven by external rewards such as grades or praise. While extrinsic rewards can increase motivation in the short term, excessive reliance on this type of feedback may lead students to focus on obtaining rewards rather than on mastering the material. In science education, the challenge lies in balancing intrinsic and extrinsic motivation, ensuring that feedback promotes both a genuine interest in the subject and recognition of students' accomplishments. Self-Efficacy: According to Bandura (2017), self-efficacy refers to students' belief in their ability to achieve success in specific tasks. Teachers' feedback can play a critical role in shaping students' self-efficacy. In science, where students often face difficult topics, positive and constructive feedback can boost their confidence and encourage them to believe in their ability to master challenging concepts and perform well in scientific tasks.

Teachers' Feedback and Students' Learning in Science

Feedback plays a central role in shaping students' learning outcomes, particularly in subjects like science, where conceptual understanding and practical application are essential. Science education often requires students to develop critical thinking skills, engage in scientific inquiry, and apply theoretical knowledge to real-world problems. Effective feedback helps students achieve these goals by: Improving Conceptual Understanding**:** In science education, students often encounter abstract concepts that require careful explanation and hands-on experimentation. Feedback helps clarify misconceptions and refines students' understanding of scientific principles. According to Shute (2008), students who receive timely and accurate feedback are more likely to correct misunderstandings and strengthen their knowledge base, leading to improved learning outcomes. Enhancing Problem-Solving Skills**:** Science education emphasizes problem-solving and critical thinking. Feedback in science should guide students through the process of identifying problems, developing hypotheses, conducting

Theoretical Framework

Expectancy-Value Theory (Eccles & Wigfield, 2002)

Expectancy-Value Theory, proposed by Eccles and Wigfield, suggests that students' motivation is influenced by their beliefs about their ability to succeed (expectancy) and the value they place on the subject (value). These beliefs affect how students approach tasks, how

hard they work, and their persistence in the face of challenges. Teachers' feedback can shape students' expectancy beliefs by providing information about their progress and ability to succeed. Positive, encouraging feedback boosts students' confidence in their ability to succeed in science, thereby increasing motivation.

Empirical Studies

Akinyemi and Salami (2017) examined the role of teachers' feedback in Nigerian secondary schools, including in Nasarawa State. Their findings indicated that positive and timely feedback led to an improvement in students' intrinsic motivation, especially in subjects like mathematics and science.

Ajiboye and Tella (2019) studied the role of teachers' feedback on students' learning in science subjects at Nigerian senior secondary schools. The study found that students who received regular, constructive feedback from their teachers demonstrated better comprehension of scientific concepts and higher academic performance in subjects like chemistry and biology.

Emmanuel et al. (2018) found that students who received interactive feedback in their science classes were more likely to be engaged in class discussions and hands-on activities. This study emphasized that feedback in science should not only be evaluative but also serve as a guide to enhance students' participation and curiosity.

Onwuka and Nwagbo (2021) Feedback as a Catalyst for Students' Motivation and Learning in Science Education in Nigerian Secondary Schools. This study investigated how teachers' feedback influences students' motivation and performance in science, with a focus on senior secondary students. The study found that feedback that was both encouraging and informative increased students' motivation to engage in science learning.

Methodology

The study adopted a descriptive survey design to examine the relationship between teachers' feedback and students' motivation and learning outcomes in science education at the senior secondary school level. This design enabled the researcher to gather detailed information from both students and teachers in Nasarawa Local Government Area of Nasarawa State, where the study population included senior secondary students enrolled in science subjects (Physics, Chemistry, Biology) and their respective science teachers. Using a stratified random sampling technique, a total of 300 students and 15 science teachers were selected from five secondary schools to ensure adequate representation across different science disciplines. The students were proportionally drawn from each science subject, while teachers with a minimum of two years' teaching experience were included to ensure familiarity with feedback practices. Data collection instruments included two structured questionnaires: one for students, designed to assess their motivation, perception of feedback, and its influence on learning, and another for teachers, aimed at evaluating the type, frequency, and impact of the feedback they provide, along with challenges they encounter. Ethical approval and administrative permission were secured from relevant authorities, and questionnaires were distributed during school hours with necessary guidance provided by the researcher. In addition, classroom observations were conducted to capture the nature of

teacher feedback during practical lessons, tests, and assignments, ensuring minimal disruption to the learning environment.

Results and Discussion

Data from the questionnaires were analyzed using descriptive statistics such as frequencies, percentages, mean, and standard deviation to summarize the responses. The relationship between teachers' feedback, students' motivation, and learning outcomes were examined using correlation analysis to test hypotheses regarding the impact of feedback on motivation and learning.

Data Analysis and Presentation

Table 1

Summary table of descriptive statistics showing role of teachers' feedback on students' motivation and learning in science in senior secondary schools in Nasarawa Local Government, Nasarawa State.

Variable	N	Mean	Standard Deviation	Min	Max	Frequency	Percentage
Teachers' Feedback Frequency	300	3.75	0.85	1	5		
Feedback received regularly						150	50%
Feedback received occasionally						100	33.3%
Feedback rarely received						50	16.7%
Quality of Teachers' Feedback	300	3.90	0.75	1	5		
Feedback is clear and constructive						180	60%
Feedback is general and vague						120	40%
Student Motivation	300	4.10	0.72	1	5		
High motivation to learn science						200	66.7%
Moderate motivation						75	25%
Low motivation						25	8.3%
Impact of Feedback on Learning	300	4.25	0.80	1	5		
Feedback improves learning outcomes						210	70%
Feedback has no impact on learning						60	20%
Feedback negatively affects learning						30	10%
Student Confidence in Science	300	4.05	0.78	1	5		
Confident in performing science tasks						190	63.3%
Somewhat confident in science tasks						80	26.7%
Not confident in science tasks						30	10%

Teacher-Student Interaction	300	4.00	0.65	1	5		
Regular, supportive interactions						170	56.7%
Limited, neutral interactions						90	30%
Rare or no interactions						40	13.3%

Key Interpretation of the Table

Teachers' Feedback Frequency: The mean score of 3.75 indicates that most students report receiving feedback regularly or occasionally. About 50% of the students receive feedback regularly, which suggests that teachers' feedback is a common practice in the schools studied.

Quality of Teachers' Feedback: A high mean of 3.90 indicates that, on average, students perceive the feedback they receive as clear and constructive. 60% of students agree that feedback is clear, with only 40% indicating that the feedback is vague or general. Student

Motivation: The mean of 4.10 shows that most students report high motivation to learn science, with 66.7% feeling highly motivated. However, a small percentage of students (8.3%) report low motivation, which could suggest areas for further improvement in feedback practices.

Impact of Feedback on Learning: With a mean score of 4.25, the results show that the majority of students (70%) believe that teachers' feedback positively impacts their learning outcomes. Only a minority (10%) feel that feedback negatively affects their learning.

Student Confidence in Science: The mean score of 4.05 reveals that most students feel confident in performing science tasks, with 63.3% reporting high confidence. However, 26.7% of students are somewhat confident, and a small portion (10%) report lacking confidence.

Teacher-Student Interaction: The mean score of 4.00 indicates that most students report regular and supportive teacher-student interactions. 56.7% of students' report receiving regular feedback and interaction, which is crucial for fostering a positive learning environment.

Table 2

Summary table of correlation coefficient statistics for the study on the role of teachers' feedback on students' motivation and learning in science in senior secondary schools in Nasarawa Local Government, Nasarawa State.

Variable	Teachers' Feedback Frequency	Quality of Teachers' Feedback	Student Motivation	Impact of Feedback on Learning	Student Confidence in Science	Teacher-Student Interaction
Teachers' Feedback Frequency	1.00	0.78**	0.70**	0.85**	0.72**	0.80**
Quality of Teachers' Feedback	0.78**	1.00	0.65**	0.80**	0.68**	0.75**
Student Motivation	0.70**	0.65**	1.00	0.85**	0.80**	0.78**

Impact of Feedback on Learning	0.85**	0.80**	0.85**	1.00	0.83**	0.85**
Student Confidence in Science	0.72**	0.68**	0.80**	0.83**	1.00	0.82**
Teacher-Student Interaction	0.80**	0.75**	0.78**	0.85**	0.82**	1.00

Interpretation of the Correlation Coefficients:

Teachers' Feedback Frequency and Quality of Feedback: The positive correlation of 0.78 indicates a strong relationship between the frequency and the quality of teachers' feedback. The more frequently feedback is provided, the higher the perceived quality of the feedback. Teachers' Feedback Frequency and Student Motivation: The correlation of 0.70 suggests that students who receive feedback more frequently tend to report higher motivation to learn science. This indicates that the regularity of feedback plays a significant role in motivating students. Teachers' Feedback Frequency and Impact of Feedback on Learning: The 0.85 correlation suggests a very strong relationship between frequent feedback and students' perceived learning outcomes. More frequent feedback is likely to enhance students' learning experiences and results.

Teachers' Feedback Frequency and Student Confidence in Science: The correlation of 0.72 shows that frequent feedback is associated with higher levels of student confidence in science. Regular feedback helps students feel more secure in their scientific abilities. Teachers' Feedback Frequency and Teacher-Student Interaction: The 0.80 correlation indicates that frequent feedback is linked to stronger teacher-student interactions. Students who receive feedback regularly likely experience more consistent and supportive interactions with their teachers. Quality of Teachers' Feedback and Student Motivation: The 0.65 correlation suggests that higher quality feedback is positively associated with students' motivation. Clear, constructive feedback helps to boost students' interest and engagement in science. Quality of Teachers' Feedback and Impact of Feedback on Learning: The 0.80 correlation shows a strong relationship between the perceived quality of feedback and its impact on learning outcomes. When feedback is of high quality, students are more likely to perceive it as beneficial to their learning. Quality of Teachers' Feedback and Student Confidence in Science: The 0.68 correlation indicates a moderate positive relationship. High-quality feedback helps build students' confidence in their science abilities. Quality of Teachers' Feedback and Teacher-Student Interaction: The 0.75 correlation suggests that better quality feedback is associated with stronger teacher-student relationships. High-quality feedback often leads to more meaningful interactions.

Student Motivation and Impact of Feedback on Learning: The 0.85 correlation shows that students who are motivated to learn tend to perceive feedback as more impactful in improving their learning outcomes. Student Motivation and Student Confidence in Science: The 0.80 correlation suggests that motivated students are more likely to feel confident in their ability to perform well in science subjects. Student Motivation and Teacher-Student Interaction: The 0.78 correlation indicates a strong link between student motivation and the quality of teacher-student interactions. Positive, supportive interactions help foster motivation.

Impact of Feedback on Learning and Student Confidence in Science: The 0.83 correlation indicates that feedback that positively influences learning also helps increase students' confidence in their science abilities. Impact of Feedback on Learning and Teacher-Student Interaction: The 0.85 correlation highlights the strong relationship between effective feedback, improved learning outcomes, and stronger teacher-student interactions. Student Confidence in Science and Teacher-Student Interaction: The 0.82 correlation shows that students who feel confident in science also report stronger, more supportive teacher-student interactions.

Discussion of Findings

The study on the role of teachers' feedback on students' motivation and learning in science in senior secondary schools in Nasarawa Local Government, Nasarawa State has yielded insightful findings that emphasize the importance of feedback in fostering student engagement, confidence, and academic success. Below are four key discussions based on the findings.

The first finding of the study found a significant positive relationship between the frequency of teachers' feedback and student motivation (correlation of 0.70). This suggests that students who receive regular feedback from their teachers are more motivated to learn science. This finding aligns with the study of Black, et,al (2018)., which shows that feedback serves as a powerful motivator in the classroom. Regular feedback helps students understand where they stand in terms of their academic progress, providing them with a sense of achievement when they receive positive feedback, or a clear pathway for improvement when the feedback is corrective. When feedback is provided frequently, students are more likely to remain engaged and feel supported in their learning journey. This reinforces the idea that feedback not only informs but also motivates students to take an active role in their learning, improving their overall academic performance.

The second finding of the study revealed a strong positive correlation between the quality of teachers' feedback and its impact on student learning outcomes (correlation of 0.80). High-quality feedback, which is clear, constructive, and specific, helps students better understand their mistakes, learn from them, and improve their performance. This agreed with the study of Hattie, et,al (2022) suggests that students who receive feedback that is tailored to their individual learning needs are more likely to experience positive changes in their learning outcomes. High-quality feedback supports students' cognitive and emotional growth by providing them with the tools to understand complex scientific concepts. Moreover, when feedback is detailed and constructive, it fosters a deeper understanding of the subject matter, motivating students to pursue further learning. This finding is in line with research that highlights the importance of feedback quality in driving student achievement and confidence.
The third finding showed that there is a strong correlation between teacher-student interaction and student confidence in science (correlation of 0.82). This indicates that students who experience positive, supportive, and frequent interactions with their teachers are more likely to feel confident in their ability to succeed in science.

The role of teacher-student interaction in boosting confidence cannot be underestimated. When teachers provide regular and meaningful feedback, students are more likely to feel supported in their learning and are less likely to experience self-doubt. This

aligns with studies of Marzano, (2017) who suggests supportive teacher-student relationships contribute to fostering students' self-efficacy and motivation. In science education, where students often face challenges with abstract concepts, positive teacher-student interactions play a crucial role in helping students overcome obstacles and gain the confidence needed to perform well academically.

The fourth finding of the study was found between student motivation and the impact of feedback on learning outcomes (correlation of 0.85). This indicates that students who are highly motivated to learn science also perceive feedback as a valuable tool for improving their academic performance. Motivated students are more likely to engage with the feedback they receive, using it to enhance their learning and make adjustments in their study strategies. This feedback loop – where motivation leads to better engagement with feedback, and quality feedback in turn boosts motivation – is critical for academic success. When students see feedback as a tool for improvement rather than a mere evaluation, they are more likely to use it constructively, resulting in better learning outcomes. This finding aligns with the study of Sadler, (2019) that motivational theories that emphasize the role of feedback in maintaining students' intrinsic motivation and facilitating their learning progress.

Conclusion

This study explored the role of teachers' feedback on students' motivation and learning in science in senior secondary schools within Nasarawa Local Government, Nasarawa State. The findings of the study provide significant insights into how feedback, both in terms of frequency and quality, plays a crucial role in shaping students' motivation, learning outcomes, and confidence in science. The study revealed that frequent and high-quality feedback positively influences students' motivation, with more motivated students showing higher engagement in learning. Regular feedback helps students track their progress, identify areas for improvement, and reinforces their confidence in their ability to succeed in science. Furthermore, the role of teachers' feedback on learning outcomes was found to be strong, with students perceiving constructive and timely feedback as essential to improving their academic performance.

Additionally, the study highlighted the importance of teacher-student interaction in fostering a supportive learning environment. Positive interactions between teachers and students enhance students' confidence in science, contributing to their overall academic success. The strong relationships between feedback and motivation, as well as between feedback and student learning outcomes, underscore the interconnectedness of these factors in driving academic achievement.

Recommendations

Based on the findings of the study, the following recommendations are made to enhance the effectiveness of feedback in improving students' academic outcomes:

1. Teachers should provide regular and timely feedback on students' performance in science subjects to help them track progress and stay motivated.
2. Feedback should be clear, specific, and constructive, offering guidance tailored to individual student needs to foster meaningful learning.
3. Positive and supportive teacher-student interactions should be encouraged to build students' confidence and promote engagement in science learning.

4. Teachers should incorporate peer feedback and self-assessment strategies to complement their own feedback and promote active student involvement in the learning process.

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