



## ENHANCING STUDENTS' ACADEMIC ACHIEVEMENT IN BASIC SCIENCE: THE ROLE OF ASSESSMENT FOR LEARNING, CLASSROOM MANAGEMENT, AND TEACHER-STUDENT RELATIONSHIPS

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### Abstract:

This study explored how assessment for learning, classroom management strategies, and teacher-student relationships predict students' academic achievement in Basic Science among students in Enugu State. The correlational survey design was employed in the study. The population of the study comprised 21,989 JSS III Basic Science students for the 2022/2023 academic session in public secondary schools. A sample of 400 students determined using Taro Yamen's (1967) formula and drawn through a multi-stage sampling procedure was used for the study. Data was collected using the Assessment Quality Enhancement Scale (AQES) and the Basic Science Academic Achievement Proforma (BSAAP). The internal consistency of the AQES was determined using Cronbach's Alpha reliability method, yielding a reliability estimate of 0.84. The BSAAP, on the other hand, collected existing academic achievement scores of sampled students in Basic Science from their 1st and 2nd term results for the 2022/2023 academic session. Data was analyzed using regression analysis. Results revealed significant predictive relationships between teachers' use of assessment for learning, classroom management approaches, teacher-student relationships, and students' academic performance in Basic Science. Specifically, the correlation coefficients (R) of assessment for learning, classroom management, and teacher-student relationships were 0.53, 0.51, and 0.41, with predictive powers of 28%, 26%, and 16%, respectively. These findings highlight the importance of ongoing teacher professional development, curriculum reform initiatives, and supportive school environments in fostering academic success in Basic Science. The

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implications of these results underscore the critical role of effective teaching practices and positive teacher-student interactions in enhancing students' academic achievement.

**Keywords:** academic achievement, assessment for learning, classroom management, teacher-student relationships

## 1. Introduction

The progress and growth of nations rely heavily on science. Science is widely recognized globally as an essential tool for the development of society, benefiting both individuals and communities (Baroody, 2017; Kpodoe *et al.*, 2023; Dontoh *et al.*, 2023). The Federal Republic of Nigeria (2014) has emphasized the importance of enhancing the teaching and learning of science. This initiative aims to establish a strong foundation of technologically skilled individuals that aligns with the nation's development goals. Hence, the significance of learning science extends beyond individual benefits to encompass societal well-being. Recognizing its crucial role in national development, science was integrated into the Nigerian education system, beginning with Primary Science at the basic education level. At this level, the teaching of Basic Science aims to equip children with essential science process skills. These skills include observing, organizing acquired information, making generalizations, predicting based on these generalizations, and designing experiments to test predictions (Federal Republic of Nigeria, 2014).

Assessment for learning, classroom management, and teacher-student relationships are crucial aspects of evaluating teachers' effectiveness, as they have a significant impact on students' academic success in Basic Science. Assessment for Learning entails continuously gathering and analyzing evidence of student learning to enhance teaching methods and offer timely feedback (Ezugwu, *et al.*, 2019; Dadzie, & Ahorsu-Walker, 2022). In education, classroom management encompasses the methods and approaches used by teachers to establish a conducive and effective learning atmosphere within the classroom (Annan-Brew, *et al.*, 2023). Teacher-student relationships revolve around interactions characterized by trust, respect, and support, which foster a positive learning environment, student motivation, and socio-emotional development (Dadzie, 2022).

An examination of students' academic performance in Basic Science in Enugu State, as indicated by the Basic Education Certificate Examination (BECE) results from 2018 to 2022, shows a troubling pattern of below-average achievement. Data obtained from the Enugu State Ministry of Education (2023) reveals a concerning trend in Basic Science performance over the past five years. The percentage of students achieving below average in the subject has shown a steady increase: 42.86% in 2018, 45.9% in 2019, 50.9% in 2020, 54.9% in 2021, and 62.84% in 2022. The persistent increase in below-average performance signals a deteriorating scenario, notably peaking in 2022. Should this trend persist unchecked, there is a risk of students opting out of science and technology-related courses in favour of non-science disciplines. Such a shift could carry substantial long-

term consequences for individuals and the wider educational framework of the country. Despite ongoing efforts to enhance science education in Enugu State, students here continue to face academic challenges, performing below expected levels in both internal and external examinations. This pressing concern has prompted the Department of Education (DepEd) to ramp up instructional initiatives and undertake additional investigations to pinpoint the root causes within the educational system (Chanco, 2021; Dadzie *et al.*, 2024).

Recent research by Lee *et al.* (2019) delved into the role of assessment for learning in enhancing students' comprehension of fundamental science concepts. Their study revealed that educators who incorporated assessment for learning strategies witnessed notable enhancements in students' academic performance indicators. Similarly, Chen *et al.* (2020) conducted a longitudinal investigation into the influence of the teacher-student relationship on students' academic achievement in basic science throughout an academic year. Their research uncovered a positive association between the quality of teacher-student interactions and students' performance in basic science. Furthermore, Wang and Liu (2021) conducted a meta-analysis synthesizing findings from various studies to examine the impact of classroom management on students' academic performance in basic science. The meta-analysis concluded that effective classroom management significantly contributed to student achievement in basic science. However, contrasting findings were reported in a study by Dadzie *et al.* (2024), which explored the influence of assessment quality and assessment literacy on students' academic performance. Their results indicated that neither assessment quality nor assessment literacy significantly predicted student academic performance. Specifically, factors such as pedagogical expertise, subject-matter knowledge, classroom management skills, test construction understanding, and assessment feedback practice did not demonstrate a statistically significant impact on student academic performance.

The fluctuating academic performance of students in Basic Science has sparked considerable worry among different stakeholders in the education sector, especially in Enugu state. This concern arises from the potential repercussions of the issue, such as the likelihood of reduced participation in science courses at the senior secondary school level. Significantly, the variation in students' academic performance has been linked to the quality of teacher-student relationships, classroom management practices, and the implementation of assessment for learning strategies. Failure to address this issue could have wide-ranging consequences for students, teachers, parents, guardians, and other individuals involved in the educational journey (Dadzie, & Annan-Brew, 2023; Dadzie *et al.*, 2023)

Previous research examining students' academic achievement in Basic Science has primarily concentrated on factors such as insufficient teaching and learning resources, students' negative attitudes toward studying, and ineffective teaching methodologies. However, there is a noticeable gap in the literature regarding the exploration of factors like teacher-student relationships, assessment for learning strategies, and classroom management techniques, and their impact on students' academic performance in Basic

Science. Despite various suggestions from scholars on potential solutions to address this issue, including the introduction of innovative instructional methods and materials, the problem persists. Therefore, the current study sought to investigate the predictive power of teacher-student relationships, assessment for learning, and classroom management strategies on students' academic performance in Basic Science.

The study seeks to address the following objectives:

- 1) the amount of variation in students' academic achievement in Basic Science that is predicted by teachers' use of assessment for learning.
- 2) the amount of variation in students' academic achievement in Basic Science that is predicted by teachers' classroom management.
- 3) the amount of variation in students' academic achievement in Basic Science that is predicted by the teacher-student relationship.

## 2. Research Questions

To address the problems of the study, the following research questions were posed to guide the study:

- 1) What amount of variation in students' academic achievement in Basic Science is predicted by teachers' use of assessment for learning?
- 2) What amount of variation in students' academic achievement in Basic Science is predicted by teachers' classroom management?
- 3) What amount of variation in students' academic achievement in Basic Science is predicted by the teacher-student relationship?

### 2.1 Hypotheses

The following null hypotheses were formulated and tested at 0.05 ( $\alpha$ ) level of significance:

$H_{01}$ : Teachers' use of assessment for learning does not significantly predict the academic achievement of students in Basic Science.

$H_{02}$ : Teachers' classroom management does not significantly predict the academic achievement of students in Basic Science.

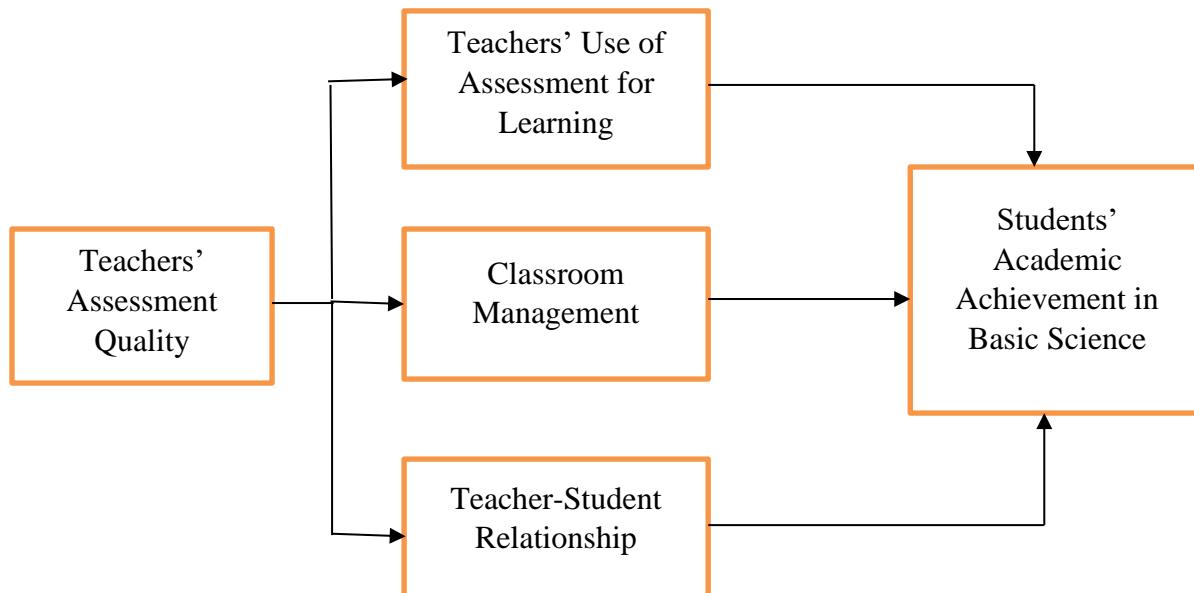
$H_{03}$ : Teacher-student relationship is not a significant predictor of the academic achievement of students in Basic Science.

## 3. Conceptual Framework

This study explores the intricate connections among Teachers' quality assessment components, including assessment for learning, classroom management, and teacher-student relationships, and their effects on students' academic performance in Basic Science. The diagram visually represents these interconnected factors, illustrating how they synergistically influence students' learning outcomes in the subject. Assessment for learning involves the ongoing process of gathering and analyzing evidence of student learning to inform instructional decisions. Effective assessment practices not only

measure student achievement but also provide feedback to guide further learning and improvement. In this study, assessment for learning plays a crucial role in understanding how teachers assess student performance and adjust instruction to cater to individual learning needs. Classroom management and the learning environment encompass the strategies and practices teachers use to create a conducive and productive learning atmosphere. Effective classroom management entails establishing clear expectations, maintaining discipline, and fostering positive interactions among students. The learning environment significantly impacts students' engagement and motivation, ultimately influencing their academic achievement. Teacher-student relationships are characterized by the quality of interactions, trust, and rapport between educators and their students.

**Figure 1:** Conceptual relationships among the variables in the study



**Source:** Researchers, 2024

Positive teacher-student relationships cultivate a supportive and nurturing learning environment where students feel valued, respected, and motivated to succeed. These relationships contribute significantly to students' academic success by promoting active participation, self-confidence, and a sense of belonging in the classroom. Overall, the diagram emphasizes the interconnected nature of assessment for learning, classroom management, and teacher-student relationships, highlighting their collective impact on students' academic achievement in Basic Science. Understanding these interrelationships can inform educational practices and interventions aimed at enhancing teaching effectiveness and fostering student success in the subject.

### 3. Literature Review

#### 3.1 Classroom Management

Classroom management is crucial for maximizing instructional time and ensuring a conducive learning environment (Van-Tartwijk & Hamerness, 2011; Mbonu-Adigwe *et al.*, 2021). Effective management involves establishing efficient routines for common tasks and monitoring student behavior to address issues proactively (Uzoma, 2019; Umar, 2018; Stephanou & Doulkeridou, 2020; Ezugwu *et al.*, 2022). Efficient routines minimize disruptions and maintain a high ratio of time on task to lesson duration (Prakash, 2012). While disruptions are inevitable, effective management mitigates their impact on learning (Prakash, 2012). However, despite its significance, classroom management is often overlooked in educational reforms, leading to negative consequences for student academic performance and school reputation (Mbanefo, 2018). Discipline is a key component of classroom management, requiring teachers to create and enforce rules based on mutual understanding (Mahona & Demetria, 2020; Nnenanya *et al.*, 2022). Professional teachers certified by the Teacher Registration Council of Nigeria (TRCN) are crucial for effective classroom management and positive academic outcomes (Mahona & Demetria, 2020).

#### 3.2 Teacher-Students Relationship

The relationship between teachers and students is a critical factor influencing student academic achievement (Stephanou, 2014). Various aspects of teacher relationships have been studied, including teacher efficacy, professional communities, instructional interactions, expectations, autonomy, leadership, personality, burnout, and support (Kim & Seo, 2018; Danişman, 2017; Vandenbroucke *et al.*, 2018; Tao, Meng, Gao & Yang, 2022). Positive teacher-student relationships, characterized by high intimacy and low conflict, contribute to students' civic learning and the development of a positive identity (Tao, Meng, Gao & Yang, 2022; Kim, Jörg, & Klassen, 2019; Socha, 2019). Conversely, negative relationships, marked by low intimacy and high conflict, hinder academic achievement (Stephanou & Doulkeridou, 2020; Roorda, Zee & Koomen, 2020). Emotional support from teachers allows students to express their social, emotional, and academic needs, contributing to positive interactions and classroom management (Madigan & Curran, 2020).

#### 3.3 Assessment for Learning

Assessment is a crucial aspect of the education process, with summative assessments being the most common in schools, used to measure student learning outcomes at the end of a unit or to determine eligibility for advancement or certification (Titsworth *et al.*, 2015). However, the focus is shifting towards formative assessment, which involves frequent assessments of student progress to identify learning needs and adjust teaching accordingly (Hooper, 2018). Formative assessment provides instant and specific feedback to students, enabling timely corrections and improving the quality of teaching (Shen *et*

al., 2020). Unlike summative assessment, which focuses on measuring outcomes, assessment for learning aims to support the learning process by engaging students in self-assessment and self-correction (Çoḡaltay & Karadağ, 2017). This shift towards formative assessment promotes lifelong learning goals and enhances student academic achievement in subjects like Basic Science (Ateş & Ünal, 2021).

### **3.4 Literature Gap**

Despite extensive research on classroom management, teacher-student relationships, and assessment for learning, there remains a notable gap in the literature regarding the interconnectedness and synergy among these three critical components of effective education. While studies have examined each aspect individually and highlighted their significance in influencing student academic achievement, there is a lack of comprehensive research exploring how these elements interact and reinforce each other within the educational context. Specifically, the literature gap lies in understanding how effective classroom management practices contribute to fostering positive teacher-student relationships, which in turn facilitate the implementation of formative assessment strategies for enhanced student learning outcomes, particularly in subjects like Basic Science. By bridging this gap and examining the interplay between classroom management, teacher-student relationships, and assessment for learning, educators, and researchers can gain deeper insights into optimizing teaching practices and promoting student success in diverse academic settings.

## **4. Methodology**

The study utilized a correlational survey research design to investigate the relationships between various teacher factors and students' academic achievement in Basic Science within the educational context of Enugu State, Nigeria. Enugu State, located in the Eastern region of Nigeria, comprises six education zones, hosting a total of 297 public junior secondary schools. Many of these schools are situated in rural areas, where teachers may encounter challenges balancing their teaching duties with other commitments, potentially affecting their performance and effectiveness in the classroom. Therefore, the research focused on this area due to a noticeable decline in students' performance in Basic Science from 2018 to 2022, as indicated by data from the Enugu State Examination Development Centre.

The sampling process involved multiple stages to ensure representative sampling. Initially, a simple random sampling method was used to select two education zones out of the six in the state, ensuring equal representation. Subsequently, two local government areas (LGAs) were randomly chosen from each selected education zone. Then, four public schools were randomly selected from each LGA, resulting in eight sampled schools. Finally, a systematic sampling technique was employed to select 50 students from each school, totaling 400 students for the study. This comprehensive sampling

strategy aimed to provide equal representation across education zones, LGAs, and schools, ensuring a diverse and representative participant sample.

Data collection utilized two instruments developed by the researchers: the Assessment Quality Enhancement Scale (AQES) and the Basic Science Academic Achievement Proforma (BSAAP). The AQES, completed by students, assessed teachers' performance in various aspects of Basic Science instruction, including assessment for learning, classroom management, and teacher-student relationship. The BSAAP collected existing academic achievement scores of sampled students in Basic Science from their 1st and 2nd term results for the 2022/2023 academic session.

The instruments underwent validation through face-to-face discussions with three specialists from the Department of Science Education, Faculty of Education, University of Nigeria, Nsukka. These specialists, well-versed in Educational Research, Measurement, and Evaluation, reviewed the instruments for clarity, language, and appropriateness. Corrections and suggestions provided by the experts were incorporated into the final versions. Additionally, the reliability of the AQES was assessed through Cronbach's Alpha reliability method, yielding satisfactory reliability coefficients ranging from 0.71 to 0.82 for individual clusters and an overall reliability estimate of 0.84 for the instrument. Data analysis was conducted using multiple regression analysis in SPSS version 27, with the coefficient of determination ( $R^2$ ) addressing research questions 1-3.

## 5. Result

**Research Question One:** What amount of variation in students' academic achievement in Basic Science is predicted by teachers' use of assessment for learning?

**Table 1:** Regression analysis on the amount of variation in students' achievement in Basics Science as predicted by teachers' use of assessment for learning

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	.53 <sup>a</sup>	.28	.28	7.90

a. Predictors: (Constant), UAfL

The analysis in Table 1 shows the regression analysis on the amount of variation in students' academic achievement in Basic Science that is predicted by teachers' use of assessment for learning. Based on the result, the correlation coefficient (R) of 0.53 was obtained. This implies a moderate relationship between teachers' use of assessment for learning and students' academic achievement in Basic Science. Furthermore, the result shows that a coefficient of determination ( $R^2$ ) of 0.28 was obtained. This indicates that teachers' use of assessment for learning has a predictive power of 28% on students' academic achievement in Basic Science.

**Hypothesis One:** Teachers' use of assessment for learning does not significantly predict the academic achievement of students in Basic Science.

Table 2: ANOVA result on the significance of the prediction of teachers' use of assessment for learning on students' achievement in Basic Science					
Model		Sum of Squares	df	Mean Square	F
1	Regression	9650.392	1	9650.392	154.661
	Residual	24833.979	398	62.397	
	Total	34484.370	399		
a. Dependent Variable: AABS					
b. Predictors: (Constant), UAfL					

Table 2 displays the ANOVA results, indicating the significance of how teachers' use of assessment for learning predicts students' academic achievement in Basic Science. Based on the results, the obtained F-value of 154.661 corresponds to a probability value of 0.000. Since this probability value is less than the significance level of 0.05, we reject the null hypothesis, which suggests that teachers' use of assessment for learning does not significantly predict students' academic achievement in Basic Science. Therefore, we can infer that teachers' use of assessment for learning significantly predicts students' academic achievement in Basic Science.

**Research Question Two:** What amount of variation in students' academic achievement in Basic Science is predicted by teachers' classroom management?

Table 3: Regression analysis on the amount of variation in students' achievement in Basic Science that is predicted by teachers' classroom management				
Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	.51 <sup>a</sup>	.26	.26	7.99
a. Predictors: (Constant), CM				

The analysis of the results in Table 3 reveals the regression outcomes concerning the extent to which teacher's classroom management predicts variations in students' academic achievement in Basic Science. The findings indicate a correlation coefficient (R) of 0.51 between students' academic achievement in Basic Science and teachers' classroom management. This suggests that there exists a moderate relationship between teachers' classroom management and students' academic achievement in Basic Science. Furthermore, the result indicates a coefficient of determination (R<sup>2</sup>) of 0.26, indicating that teachers' classroom management accounts for 26% of the variance in students' academic achievement in Basic Science. This suggests that 74% of the variance in students' academic achievement in Basic Science is influenced by factors other than teachers' classroom management.

**Hypothesis Two:** Teachers' classroom management does not significantly predict the academic achievement of students in Basic Science.

**Table 4:** ANOVA result on the significance prediction of teachers' classroom management on students' achievement in Basic Science

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9069.797	1	9069.797	142.036	.000 <sup>b</sup>
	Residual	25414.574	398	63.856		
	Total	34484.370	399			
a. Dependent Variable: AABS						
b. Predictors: (Constant), CM						

The ANOVA analysis in Table 4 indicates the importance of teachers' classroom management in predicting students' academic achievement in Basic Science. Based on the results, the F-value (1, 398) = 142.036,  $p < 0.05$  was calculated. Since the obtained probability value of 0.000 is less than the set significance level of 0.05, the null hypothesis, which suggests that teachers' classroom management does not significantly predict students' academic achievement in Basic Science, was rejected. In conclusion, it can be affirmed that teachers' classroom management significantly predicts students' academic achievement in Basic Science.

**Research Question Three:** What amount of variation in students' academic achievement in Basic Science is predicted by the teacher-students relationship?

**Table 5:** Regression analysis of the predictive power of teacher-student relationship on academic achievement in Basic Science

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.41 <sup>a</sup>	.16	.16	8.51
a. Predictors: (Constant), TSR				

Table 5 presents the analysis of the results regarding the extent to which variations in students' academic achievement in Basic Science are predicted by the teacher-student relationship. Additionally, the table indicates a correlation coefficient (R) of 0.41, suggesting a moderate relationship between students' academic performance in Basic Science and their relationship with their teachers. Furthermore, the findings indicate a coefficient of determination ( $R^2$ ) of 0.16, which implies that 16% of students' academic achievement in Basic Science can be attributed to the teacher-student relationship.

**Hypothesis Three:** Teacher-student relationship does not significantly predict the academic achievement of students in Basic Science.

**Table 6:** ANOVA result on the significance of the prediction of teacher-student relationship on students` academic achievement in Basic Science

Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1	5646.896	77.936	.000 <sup>b</sup>
	Residual	398	72.456		
	Total	399			
a. Dependent Variable: AABS					
b. Predictors: (Constant), TSR					

The ANOVA result in Table 6 indicates the significance of predicting students' academic achievement in Basic Science based on the teacher-student relationship. The obtained F-value of 77.936 is associated with a probability value of 0.000. The p-value of 0.000, which is less than the predetermined significance level of 0.05, led to the rejection of the null hypothesis. Therefore, it can be inferred that the teacher-student relationship significantly predicts the academic achievement of students in Basic Science.

## 6. Discussion

### 6.1 Predictive power of teachers' use of assessment for learning on academic achievement in Basic Science

The findings of the study emphasize the substantial influence of teachers' utilization of assessment for learning on the academic performance of students in Basic Science. The results suggest that when Basic Science teachers consistently incorporate assessment for learning practices, students tend to achieve better academic performance in the subject. Assessment for learning involves frequent, interactive assessment methods aimed at identifying students' learning needs and difficulties, allowing teachers to adjust instructional delivery based on immediate feedback. This process enhances students' learning and understanding, ultimately leading to improved academic achievement. These findings are consistent with previous research by Umar (2018), Ferdinal and Isramirawati (2021), Ozan and Kincal (2018), Oviawe, Azman, Kiong, and Retnowati (2021), and Oyinloye and Imenda (2019), all of which demonstrate the significant positive impact of assessment for learning on students' academic performance.

### 6.2 Predictive power of teachers' classroom management on academic achievement in Basic Science

The study's findings reveal a noteworthy connection between teachers' classroom management and students' academic achievement in Basic Science. Additionally, teachers' classroom management shows a substantial predictive influence on students' academic performance in the subject. This suggests that the management style created by Basic Science teachers plays a crucial role in determining students' academic success in Basic Science. Effective classroom management ensures that lessons run smoothly and efficiently, maximizing instructional time and creating an organized and conducive learning environment that minimizes disruptions. These factors contribute to improved

academic achievement in Basic Science. These findings are supported by previous research conducted by George, Abisola, and Adam (2017), Safi, Hussain, Salamat, and Bakht (2018), Nisar, Amin, Khan (2019), Chalak and Fallah (2019), and Nwankwoala (2021), all of which demonstrate the significant impact of classroom management on students' academic achievement. However, the study of Akosubo-Ogun, Nwankwo, and Nweke (2020) presented conflicting findings, suggesting that differences in school location, teachers' characteristics, and the type of classroom management may influence the relationship between classroom management and academic achievement.

### **6.3 Predictive power of teacher-student relationship on academic achievement in Basic Science**

The study's findings indicate that teacher-student relationships play a crucial role in determining students' academic achievement in Basic Science. Positive relationships between teachers and students were found to positively influence academic outcomes, while the absence of such relationships could negatively impact students' achievement. This aligns with previous research by Mahona and Demetria (2020), Anakwue (2021), and Chikendu (2022), which also highlighted the significant influence of teacher-student relationships on academic achievement. Baafi (2020) and Jonh and Jiddah (2023) similarly emphasized the importance of these relationships in predicting students' academic success. Overall, the consistent findings among scholars emphasize the importance of fostering positive relationships between teachers and students to enhance academic achievement.

### **6.4 Implications of the Findings**

The conclusions of this study carry significant implications for stakeholders in science education. They highlight the need for ongoing professional development for teachers in areas like assessment for learning, classroom management, and fostering positive teacher-student relationships. School administrators and policymakers are urged to prioritize resources for such training to equip teachers with essential skills for enhancing students' academic achievement in Basic Science. Curriculum developers and instructional designers should integrate effective assessment strategies and supportive learning environments into Basic Science curricula to promote active student engagement. School leaders are encouraged to cultivate a positive school culture that values effective teaching practices and supports teacher-student relationships. Policymakers should consider these findings when designing education policies, including funding for teacher professional development and curriculum reforms, to improve academic achievement in Basic Science. Addressing these areas can contribute to creating a conducive learning environment and improving students' academic performance in Basic Science.

## 7. Conclusion

The study investigated the relationship between teachers' instructional practices and students' academic achievement in Basic Science, revealing several key findings. Firstly, there was a moderate positive relationship between teachers' use of assessment for learning and students' academic achievement, with assessment for learning predicting 28% of the variation in academic achievement. Similarly, teachers' classroom management showed a moderate positive relationship with academic achievement, predicting a 26% variation. The teacher-student relationship also exhibited a moderate positive relationship with academic achievement, predicting a 16% variation. However, it was unexpected to find that teacher-student relationships had a lower predictive power compared to assessment for learning and classroom management. These findings emphasize how effective instructional practices and classroom management significantly predict students' academic achievement in Basic Science. They also highlight the importance of fostering positive teacher-student relationships in enhancing students' academic achievement in the subject. Overall, the study contributes valuable insights into factors influencing academic success in science education and emphasizes the role of effective teaching practices and positive teacher-student relationships in promoting academic achievement.

### Funding Statement

The authors received no financial support for the research, authorship, and/or publication of this article.

### Ethics Statement

Ethical guidelines for research were followed throughout; in particular, participants gave written informed consent and were made aware that they were free to withdraw anytime during data collection.

### Conflict of Interest Statement

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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