



ASSESSMENT OF TEACHER'S QUALIFICATIONS, INSTRUCTIONAL MATERIALS AND STUDENT ACADEMIC PERFORMANCE IN BIOLOGY IN SENIOR SECONDARY SCHOOLS IN KWARA STATE

OGHENETEGA JOSIAH ORIOGHWO

University of Ibadan, Ibadan, Oyo State

ooriogghwo@gmail.com

08136834252

RITA AKPOBOME OGUOKO

University of Benin, Benin City, Edo State

ritaakpobomeoguoko@gmail.com

07032431916

Abstract

Biology remains a core subject in secondary school education and a foundation for careers in science and technology. However, persistent poor performance in external examinations across Nigeria raises concerns about factors influencing students' performance. This study investigated the effects of teacher qualifications and instructional materials on students' academic performance in Biology in senior secondary schools in Kwara State. A descriptive survey design was adopted, involving 24 schools (12 public and 12 private), 600 students, and 24 Biology teachers selected through stratified random sampling. Data were collected using structured questionnaires on teacher qualification and instructional material utilization, complemented by students' WAEC results. Descriptive statistics were used to analyze the data. Findings revealed that teacher qualification alone did not significantly predict students' performance, whereas the availability and effective utilization of instructional materials had a stronger influence on achievement. Private schools performed better than public schools, largely due to better resource provision and management practices. The study concludes that improving instructional resource availability and utilization, alongside continuous teacher development, is essential for enhancing student performance in Biology.

Keywords: Assessment, Teacher Qualifications, Instructional Materials, Biology Performance, Public and Private Schools.

Introduction

Science education is widely recognized as a vital driver of individual and national development, serving as a key instrument for poverty eradication and economic growth (Olanrewaju et al., 2024). According to Aina (2013), it involves sharing scientific knowledge and processes with diverse groups, including students, farmers, market traders, and communities. At the senior secondary level, science is divided into Biology, Chemistry, and Physics. Biology, the study of living organisms, their evolution, structures, functions, and classification, holds a central place as it underpins careers in fields such as medicine, pharmacy, agriculture, and other applied sciences. Its importance to economic, industrial, and societal advancement is well established (Ibe & Ukpai, 2013; Akanbi & Kolawole, 2014). Despite the importance of Biology and efforts by researchers, secondary school students continue to perform poorly in the subject. One of the major criteria for assessing scientific advancement through education is the students' academic achievement or achievement. Onwuegbuzie (2010) posited that technological development through education depends mostly on the achievement of secondary school students in related subjects in external examinations like WAEC, NECO and JAMB. Below is a table showing the performance of student in biology in WAEC examinations from 2011 to 2016.

**Table I: Students' Biology Performance in WAEC**

Year	Total sat	Credit pass A1-C6	% pass
2011/12	1505199	579432	38.50
2012/13	1646150	587044	35.66
2013/14	1648363	852717	51.73
2014/15	1365384	766971	56.17
2015/16	1390234	798246	57.42

Source: Statistics section of the WAEC office Yaba, Lagos (2017) uploaded by Olalekan T.B.

In the 2011/12 and 2012/13 academic year, the situation was particularly poor, as only 38.50% and 35.66% of candidates attained grades A1–C6 in Biology. This indicates that less than half of the total candidates achieved credit-level passes or higher. From the general failure recorded in SSCE exams conducted by the West Africa Examination Council (WAEC), literatures have also revealed that students result in private schools is well off than those of students in public schools. This trend has been consistently documented in comparative studies. For instance, Ekundayo and Alonge (2016) revealed that resource inadequacy was more evident in public schools, while Owoeye and Yara (2011) concluded that inadequate facilities and human resources severely limit public schools' ability to prepare students effectively for external examinations. However, relatively fewer studies have undertaken state-level comparative analysis, creating a gap that this study addresses in Kwara State. Okpara (2010) observed that in NECO Examinations, the achievements of students in private schools are better than the achievement of students in public schools. He further stated that private schools are closely monitored and supervised by the school management boards. As a result, they perform better in external examinations. Ekundayo and Alonge (2016), opined that the precarious situation of lack of human and material resources is more evident in public schools than in the private schools and this shows why the private schools tend to perform better than the public schools in public examinations.

Olatoye and Agbatogun (2009) reported that there exists a significant difference in mathematics and science achievement of public and private school pupils in which private school pupils performed better than their public school counterpart. According to UNESCO (2012), the underperformance in Biology can be attributed to student related factors, teacher related factors and Physical factors of the learning environment as well as the difficulty of the biology content. Of these groups of factors, the teacher plays a pivotal role in creating conducive learning environments that can enhance student cognitive and affective outcomes. Thus, this study sought to investigate qualification of teachers and availability and utilization of instructional materials, as predictors of public and private senior secondary school students' academic performance in Biology in Kwara State, Nigeria.

The quality of education cannot rise above the qualities of teachers (National Policy of Education (NPE), 2014). The research study of Aina and Olanipekun (2015), in Kwara state revealed the controversy surrounding the teachers' qualifications and its influence on students' academic achievement. The paper measured teachers' qualification using seven indicators which are: formal education, experience, subject matter knowledge, pedagogy studies, duration of training, certificate/licensing and professional development. The paper reviewed different opinions on the relationship between these indicators and students' academic achievement. Though, it seems there is no consensus among the authors as regard the subject. For instance, while Abe and Adu (2013) found that teacher qualifications were the most important determinant of student achievement, Ofeimu and Kolawole (2017) reported that qualifications alone do not significantly predict students' performance, a contradiction that highlights the complexity of this debate. However, there is a common opinion that subject matter knowledge, pedagogy studies, professional development and years of experience are imperative and positively correlated with students' academic achievement.

Qualification is one of the critical factors that drive students' academic performance Hakielimu (2011). Teachers' qualifications, therefore, might not only be the certificate someone is holding as erroneously conceived by some people. Teachers' qualifications are more than just holding a certificate of any institution. Zuzovsky (2009), in her study on "Teachers' qualifications and their impact on students' achievement findings from TIMMS-2003 data in Israel" ties teachers' qualifications to seven indicators that are: Teachers' formal education; teachers' education in the subject matter of teaching (in-field



preparation); teacher education in pedagogical studies; Duration of the preparation period; Certification and licensing status; years of experience; preparation in professional development activities.

A qualified teacher is crucial in any educational system that is why it is important to ensure every teacher is academically and professionally qualified. Teachers' qualifications have a serious implication on students' academic achievement. Ogundele et al. (2014), some scholars supported that poor pedagogical content knowledge of teachers led to poor academic performance by pupils. Alimi (2012) investigated the influence of school types and facilities on students' academic performance as related in private and public secondary schools respectively. Descriptive survey design was used. Proportionate random sampling technique was used to select 50 secondary schools in Ondo State. Two set of research instruments named School Facility Descriptive Questionnaire (SFDAPQ) for principals; and School Descriptive Questionnaire (SFDQ) for the teachers were used for the study. T-test was used to analyze the data. All hypotheses were tested at a significant level of 0.05. The study revealed a significant difference in facilities available in public and private schools in Ondo State. It however revealed no significant difference in academic performance of students in the two types of secondary schools.

Ihejiamaizu and Ochui (2016) focused on Utilization of biology laboratory equipment and students' academic performance in senior secondary schools in Cross River State, Nigeria. One null hypothesis was formulated. Ex-post facto research design was adopted and a sample of four hundred and ninety (490) biology students was used for the study. Checklist on utilization of biology laboratory equipment and Bio achievement Test were the instruments used for data collection. To test the hypothesis, one way Analysis of Variance (ANOVA) was employed. The hypothesis was subjected to testing at 0.05 levels of significance. The result of the analysis revealed that utilization of Biology laboratory equipment significantly influenced students' academic performance in Biology.

The theoretical framework adopted in this study is the Input – Process – Output (IPO) Model as it relates to education. The model is a theoretical framework used to explain how educational outcomes are achieved through a structured system of interacting components. It is widely applied in evaluating teaching and learning effectiveness. In the context of this study, teachers' quality and availability of instructional materials (input) and teaching practices (process) directly influence student academic performance (output). The IPO model highlights the importance of optimizing both resources and instructional methods to achieve desired educational goals. This represents an advance on earlier studies (e.g., UNESCO, 2012; Hakielimu, 2011), which describe the factors affecting student performance without a unifying theoretical framework. By situating teacher qualifications and instructional resources within the IPO model, this study provides a more structured explanation of how inputs and processes translate into academic outcomes.

Acknowledging the fact that Biology occupies a unique position in the school curriculum, the National Policy on Education (FRN, 2014) posits that "maintaining a viable educational system requires various elements, considerations and, of course, various resources". These are inputs that could lead to excellent output. Therefore, in any system of education, the following must be given adequate consideration: educational objectives; instructional materials including textbooks; funds; educative school environment (adequate infrastructural facilities, equipment, etc.); teacher's preparation, competence, utilization and advocacy. The state of affairs may be responsible for the students' non-impressive performance in public examination such as West African Secondary School Certificate Examinations (WASSCE) in the subject in Nigeria. To this end, this study sought to investigate qualification of teachers and availability and utilization of instructional materials, as predictors of public and private senior secondary school students' academic performance in Biology in Kwara State, Nigeria.

Statement of Problem

A noticeable gap exists in the performance of students in public and private senior secondary schools. Students in private schools consistently perform more than the students in public schools in external exams. It is believed that this failure is a signal of a process problem at the secondary school level. Consequently, there is need to empirically assess the qualifications of teachers teaching Biology as well as availability and utilization of instructional materials as a determinant in students' performance.

Literature reviewed has showed that teachers are poorly trained in content and pedagogy. As a result, students are not properly motivated to learn what they ought to know. Available literature shows that much of biology teaching is carried out through chalk and board with little or no emphasis on the use of instructional materials. This neglect of resource utilization has been flagged in other studies. While Alimi (2012) reported no direct performance difference between public and private schools despite facility disparities, Olufunke (2012) and Effiong and Igiri (2015) demonstrated that where laboratory resources are actively used, students' Biology achievement rises considerably. This contrast highlights that availability alone is insufficient without effective teacher utilization.

Purpose of the Study

The purpose of this study is to assess the influence of teachers' qualifications and the availability and utilization of instructional materials on students' academic performance in Biology in public and private senior secondary schools in Kwara State, Nigeria. Specifically, the study seeks to determine the qualification profile of Biology teachers, evaluate the extent to which instructional resources are available and utilized in the teaching of Biology, and examine the trends in students' performance in the subject as reflected in WASSCE results.

Research Questions

The following research questions guided the study:

1. What are the qualifications of teachers teaching Biology in public and private senior Secondary Schools in Kwara State?
2. What is the level of availability and utilization of material resources in teaching Biology in public and private senior secondary schools in Kwara State?
3. What has been the trend in the performance of students in Biology at WASSCE in private and public secondary schools in Kwara State?

Hypotheses

The following hypotheses were tested at 0.05 significant level:

1. There is no significant difference in the levels of availability of material resources in teaching Biology in public and private senior secondary schools in Kwara State.
2. There is no significant difference in the level of Utilization of material resources in teaching Biology in public and private in senior secondary schools in Kwara State.

Methodology

The study adopted a descriptive survey research design to investigate the relationship between teachers' qualifications, instructional materials, and students' academic performance in Biology. The sample of this study consisted of eight secondary schools each in the three senatorial districts of Kwara State. The eight schools selected from each senatorial district in a particular local government comprise four public school and four private schools making a total of twenty-four (24) schools. Data were obtained from senior secondary school students offering biology as well as from teachers. In each school 25 students were randomly selected and used as a sample representative making a total of 600 students in all. Also, a biology each from all the schools making a total of twenty four (24) teachers. Data were collected using three instruments: a Teachers' Qualification Inventory (TQI) to capture teachers' academic and professional profiles, an Instructional Materials Availability and Utilization Checklist (IMAUC) to assess the presence and use of teaching resources, and students' WASSCE Biology results obtained from school records to measure academic performance.

The instruments were validated by experts in science education and measurement, while reliability was established using Cronbach's alpha and the values of Cronbach's alpha obtained were: 0.911, 0.943 and 0.908 respectively. Descriptive statistics such as frequency counts, percentages, and mean scores were used to analyze teacher qualifications and resource availability, as well as the academic performance of students WAEC in public and private senior secondary schools. The hypothesis, were analyzed with the aid of a paired simple t-test. A paired simple t-test was used to test the hypotheses because the study

sought to compare the mean scores of instructional material availability and utilization between two related groups; public and private schools on the same set of instructional items. Ethical approval for this study was obtained from the department of science and Technology Education, University of Ibadan. Permission was also sought from the principals of the participating schools. Informed consent was obtained from all participating teachers and students, and participation was entirely voluntary.

Results

Research Question One: What are the qualifications of teachers teaching Biology in private and public senior Secondary Schools in Kwara State?

Table 1: Professional Qualification of Teachers Teaching Biology in Public and Private Schools in Kwara State

QUALIFICATIONS	REMARK	PUBLIC SCHOOL		PRIVATE SCHOOL	
		Frequency	Percentage	Frequency	Percentage
M.Ed. (Bio)	Qualified	3	12.5	1	4.2
M.Sc. (Bio + PGDE)	Qualified	5	20.8	0.0	0.0
B.Sc. (Ed) Bio	Qualified	10	41.7	10	41.7
B.Sc. (other + PGDE)	Qualified	1	4.2	0.0	0.0
B.Sc. (Others)	Unqualified	5	20.8	12	50.0
HND (Sc. Tech + PGDE)	Qualified	0	0.0	1	4.2
Total		24	100	24	100

Source: Result obtained from field in the study area

The data in table above revealed the professional qualifications of teachers implementing the biology curriculum in public and private schools in Kwara State. The frequencies and percentages show that there are more qualified teachers in the public schools than in private schools. The data reveal that more than 70.0 percent of teachers in the public schools have the required qualification for the implementation of biology curriculum. However, 50.0 percent of unqualified teachers in private schools revealed that, private school teachers are less qualified compare to teachers in public schools.

Research Question Two: What is the level of availability and utilization of material resources for teaching Biology in public and private secondary schools in Kwara State?

Table 2: Means and Standard Deviation Ratings Scale on the Availability and utilization of Instructional Materials for Teaching Biology in Public and Private Schools

Items	Availability		Utilization	
	Mean of public school	Mean of private school	Mean of public school	Mean of private school
Laboratory	0.88	0.92	0.50	0.92
Charts and models	0.88	0.83	0.38	0.58
Microscope	0.75	0.92	0.21	0.25
Dissecting set board	0.71	1.00	0.17	0.25
Hand lenses	0.71	1.00	0.42	0.46
Beakers	0.96	1.00	0.35	1.00
Test tubes	0.96	1.00	0.54	1.00
Preserved specimens	1.00	0.92	0.58	0.33
Wind vane	0.58	0.75	0.58	0.50
Rain gauge	0.42	0.75	0.50	0.50
Thermometer	0.54	1.00	0.58	0.83
Litmus paper	0.79	1.00	0.75	0.92
Barometer	0.46	0.63	0.50	0.38
Secchi disk	0.29	0.46	0.25	0.38
Anemometer	0.13	0.46	0.42	0.29
Reagent	0.25	0.58	0.13	0.75
Weighted mean	0.64	0.82	0.43	0.58

Source: result obtained from SPSS analysis



The table above shows the mean and standard deviation result on the availability and utilization of instructional materials in public and private schools. In the table, the weighted mean of 0.85 of private schools compare to the 0.68 weighted mean of public schools revealed that, instructional materials are more available in private schools than in public schools. Also, it revealed that instructional materials are more utilized in private schools than in public schools. This is indicated by the weighted mean of 0.66 of private schools compared to the weighted mean of 0.52 of the public schools.

Therefore, it is established that the level of availability and utilization of instructional materials in private schools is higher than in public schools.

Research Question Three: What has been the trend in the performance of students in biology in WAEC in public and private secondary schools in Kwara State?

Table 3: Performance of Students in WAEC in Public and Private Schools

Years of exam	Total numbers of result analyzed		Freq/% Credit pass at A1		Freq/% Credit pass at B3-B2		Freq/% Credit pass at C4-C6		Freq/% of failure at D7-F9	
			Pub.	Priv.	Pub.	Priv.	Pub.	Priv.	Pub.	Priv.
2011/2012	500	500	21 (4.2)	146 (29.2)	97 (19.4)	259 (51.8)	282 (56.4)	55 (11.0)	100 (20)	40 (8.0)
2012/2013	400	400	19 (4.8)	140 (35.0)	82 (20.5)	184 (46.0)	218 (54.5)	46 (11.5)	81 (20.3)	30 (7.5)
2013/2014	600	600	21 (3.5)	167 (27.8)	105 (17.5)	322 (53.7)	353 (58.8)	65 (10.8)	121 (20.2)	46 (7.7)
2014/2015	600	600	16 (2.7)	152 (25.3)	90 (15.0)	340 (56.7)	363 (60.5)	55 (9.2)	131 (21.8)	53 (8.8)
2015/2016	600	600	23 (3.8)	138 (23.0)	95 (15.8)	352 (58.7)	367 (61.2)	54 (9.0)	115 (19.2)	56 (9.3)

Source: Result obtained from field in the study area

The table above shows the performance of students in WAEC for both public and private schools in Kwara State. The results indicate that students in the private schools perform better than students in public schools. The overall result revealed that for every five hundred, four hundred and six hundred result analysed for both the public and private schools, those with credit pass at A1 in private schools are more than those in public schools and likewise credit pass at B3-B2. Those with credit pass at C6-C4 are more in public schools than in private schools. Lastly, the table also shows that, the rate of failure is higher in public schools than in private schools.

Hypothesis One: There is no significant difference in the levels of availability of material resources in teaching Biology in public and private senior secondary schools in Kwara State.

Table 4: Paired Simpled t-Test Difference in the Levels of Availability of Material Resources in Teaching Biology in Public and Private Senior Secondary Schools In Kwara State

Group	N	Mean	SD	df	t-crit	t-cal	Decision
Public	16	0.6444	0.27359	15	-4.758	0.000254	hypothesis
Private	16	0.8263	0.19775				rejected

Source: Result of analysis obtained from SPSS.

The results, as presented in Table 4, reveal that public schools ($M = 0.6444$, $SD = 0.27359$) had a lower mean availability of resources compared to private schools ($M = 0.8263$, $SD = 0.19775$). The computed t-value ($t\text{-cal} = 0.000254$) was found to be statistically significant at the 0.05 level, exceeding the critical threshold ($t\text{-crit} = -4.758$). This indicates that the null hypothesis, which stated that there is no significant difference in the availability of material resources between public and private schools, was rejected.



The implication of this finding is that private secondary schools in Kwara State are better equipped with teaching resources for Biology compared to their public counterparts. This disparity suggests that students in private schools may have better access to the tools necessary for effective learning, which could contribute to improved academic performance.

Research Question Two: There is no significant difference in the level of Utilization of material resources in teaching Biology in public and private in senior secondary schools in Kwara State.

Table 5: Paired Simpled t-test Difference in the Level of Utilization of Material Resources in Teaching Biology in Public and Private in Senior Secondary Schools in Kwara State

Group	N	Mean	SD	df	t-crit	t-cal	Decision
Public	16	0.43	0.17	15	-2.323	0.035	hypothesis
Private	16	0.58	0.28				rejected

Source: Result of analysis obtained from SPSS

The results show that public schools ($M = 0.43$, $SD = 0.17$) had a lower mean utilization level compared to private schools ($M = 0.58$, $SD = 0.28$). The calculated t-value ($t\text{-cal} = 0.035$) was statistically significant at the 0.05 level, surpassing the critical value ($t\text{-crit} = -2.323$). Based on this outcome, the null hypothesis stating that there is no significant difference in utilization levels was rejected. This indicates that private secondary schools make better use of available material resources in teaching Biology than public schools. The result suggests that even where resources are available; their effective deployment in public schools may be hampered by challenges such as overcrowded classrooms, inadequate supervision, or lack of teacher motivation, while private schools may adopt more efficient and student-centered practices.

Discussion of Findings

According to Nwokocha and Amadike (2005), academic performance of students is the yardstick for testing educational quality of a nation. Hence, it is expedient to maintain a high performance in internal and mostly external examinations. The result from this research revealed that student in private schools performs excellently well than their counterpart in public schools. This finding is in line with recent research. Ekundayo and Alonge (2016), the precarious situation of lack of human and material resources is more evident in public schools than in the private schools and this shows why the private schools tend to perform better than the public schools in public examinations. Also, Owoeye and Yara, (2011), a close look at the schools and what goes on there shows that nothing good can come out of most public schools as they do not have facilities and adequate and appropriate human resources to prepare candidates for West African Examination Council (WAEC) examinations.

The result of this study revealed that teachers in public schools are more qualified than teachers in private schools. This shows that teacher's qualification does not have significant effect on the performance of students. This study shows that majority of teachers in the public schools have the required qualification while the private schools teachers have average qualifications. However, the private school students perform better in WAEC exams than their counterpart in the public schools. This goes to say that, the students' performance relies on other factors other than teacher's educational qualification. This suggests that teacher motivation, supervision, and workload may play a greater role than paper qualifications. Private schools, although employing less qualified teachers, may compensate through stricter supervision, performance-based incentives, and closer teacher-student interaction. This paradox reflects findings in prior studies. Aina and Olanipekun (2015) also noted higher proportions of qualified science teachers in public schools, yet private schools recorded stronger student outcomes in external examinations (Okpara, 2010; Olatoye & Agbatogun, 2009). Such inconsistencies suggest that formal qualifications alone may not guarantee improved learning outcomes. Ofeimu and Kolawole (2017), investigated teachers' quality as determinant of students' academic performance in secondary schools in Edo South Senatorial District of Nigeria. The results of the Study revealed that level of teacher quality in secondary schools in Edo South Senatorial District of Nigeria was high, there was average level of students' academic performance in secondary schools in Edo South Senatorial District



of Nigeria, Teacher quality and academic qualification had no significant influence on students' academic performance.

The result is however in variance with the claim of Abe and Adu (2013), who stated that the most important factor in improving students' academic achievement in school is by employing seasoned qualified teachers in all schools. High level of discipline in private schools might be responsible for the reason why the average professional qualification of their teachers does not affect the performance of their students. These results further suggest that the broader school culture discipline, accountability, and high parental involvement could explain why private schools outperform public schools, despite the latter having more qualified teachers. The result of this study revealed that instructional resources for the teaching of Biology are more available and utilised in private schools than in the public schools. This in turn showed that the availability and adequacy of instructional resources have significant influence on the students' performance in biology in WAEC result. Important science instructional aids like the laboratory, microscope, human skeleton, preserved specimen and charts are more in private schools than in public schools. Availability and adequacy of instructional materials promote activity based learning as well as students involvement in teaching and learning, therefore leading to increased students' performance in Biology.

Therefore, from the study evidence has shown that, the availability and utilization of instructional materials in private schools is a reason why students in private schools perform better than students in public schools in WAEC exams. The findings confirm that mere possession of laboratories and equipment is insufficient; the key determinant is the extent of their utilization. Public schools may own certain resources, yet ineffective use reduces their impact. In contrast, private schools ensure consistent integration of resources into classroom teaching, leading to better outcomes. Olufunke (2012) found in her study that schools with highest frequency of utilization of this equipment had highest mean score followed by schools with average and low frequency of utilization respectively. Also, Effiong and Igiri (2015), in a study on "the impact of instructional materials in teaching and learning of biology in senior secondary schools in Cross River State" revealed that there is a positive achievement in student exposed to instructional materials. According to Abdullahi (2010), instructional materials are tools locally made or imported that help to facilitate the teaching/learning process. Hence, there is so much evidence to show that the use of instructional materials in teaching of biology enhance student academic performance. Interpreting these results through the IPO model highlights that while teacher qualifications are part of the input, it is the combination of resources and teaching processes that directly drive student achievement (output). The stronger emphasis on instructional resources and teaching practices in private schools demonstrates how optimizing both inputs and processes leads to superior outcomes.

Conclusion

The study examined the influence of teacher qualifications and instructional materials on students' academic performance in Biology in senior secondary schools in Kwara State. Findings revealed that teacher qualification alone does not significantly determine students' achievement, while the availability and effective use of instructional materials have a stronger impact on learning outcomes. The results further showed that private schools outperform public schools largely due to better resource provision and stricter management practices. Therefore, improving access to relevant instructional materials and ensuring their proper utilization are critical to enhancing student performance in Biology.

Recommendations

The study recommends the following:

1. Government and school proprietors should prioritize the adequate supply of up-to-date instructional materials to enhance effective teaching and learning of Biology.
2. Teachers should be trained and encouraged to maximize the use of available instructional materials in classroom delivery.
3. Regular in-service training, workshops, and seminars should be organized to improve teachers' pedagogical skills and subject delivery, regardless of their formal qualification level.



4. Public secondary schools should adopt effective monitoring and management practices similar to private schools to improve student discipline and performance.
5. Education policymakers should design strategies that balance both teacher competency and resource availability to ensure sustainable improvement in science education outcomes.

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