

PERCEIVED INFLUENCE OF TEACHER PROFESSIONAL TRAINING ON PEDAGOGICAL PRACTICES AND STUDENTS PERFORMANCE IN BIOLOGY

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Abstract: *This research examines the perceived influence of teacher professional training on pedagogical practices and student performance in biology. In order to facilitate the investigation, three (3) research questions and two (2) hypotheses were formulated. A multistage sampling technique was employed to select a cohort of 14 biology educators and 200 students. A questionnaire was utilized to extract data from the educators, while student performance metrics were employed to gather information from the learners. Cronbach Alpha reliability coefficient was utilized to evaluate the instrument's reliability, resulting in a coefficient of 0.78. Statistical Package for Social Sciences (SPSS) was utilized to perform descriptive statistical analyses, specifically mean and standard deviation, to address the research questions, whereas inferential statistics was*

explored to evaluate the hypotheses posited at a significant level of 0.05. The findings indicate that teachers' training and development programme significantly influenced lesson planning and delivery ($\beta = .210$, $t = 3.32$, $p < .05$). Similarly, the coefficient of teachers' training and development programmes ($\beta = .124$, $t = 6.846$, $p < .05$) significantly influenced students' performance in Biology. Based on the outcomes of our findings, it is recommended that educators should engage in continuous training and professional development programmes to remain informed and current in both biological content and pedagogical methodologies.

Keywords: *training; biology; lesson plan; perceived; teacher; instructional delivery.*

Introduction

Teacher development encompasses the professional advancement attained by educators through the accumulation of experience and the systematic analysis of their pedagogical practices (Ganser, 2000). Professional development signifies the comprehensive and ongoing enhancement of professional competencies (Smith & Browne, 2024). Teacher professional training is intentionally structured to resonate with the practical experiences of educators (Gudeta, 2022). Through engagement in professional development, educators partake in reflective practices and concurrently augment their knowledge, skills, and attitudes, with the ultimate aim of enhancing instructional quality and facilitating student learning (Camburn & Han, 2017). Sustained and enhanced professional training has been empirically demonstrated to exert a beneficial impact on student learning outcomes (Nassereddine & Nasserddine, 2024). Consequently, the type of professional training experiences for teachers emerges as a critical determinant of the resultant educational outcomes (Osei-Owusu, 2022). According to Onipede et al. (2025), teacher training programmes should prioritize the development of robust content knowledge and practical skills in the field of Biology. The provision of high-quality professional training for educators is imperative to elevate student learning outcomes (Saderholm et al., 2016). Effective programmes for professional development must be delivered on a continual basis, with support and encouragement from policymakers and practitioners, encompassing training, practice, and feedback (Adarkwa et al., 2021; Saleem et al., 2021; Popova et al., 2022).

Professional development encompasses a variety of activities aimed at augmenting the quality of teaching, including ongoing training and support, which facilitates the meaningful integration of learning to tackle specific challenges encountered by educators in their instructional environments (Avalos, 2011; Kennedy, 2016). When professional development is both continuous and collaborative, it fosters teamwork and innovative partnerships among educators to collaboratively identify and address shared obstacles and needs (Cojorn et al., 2024). Continuous collaborative training is vital as it enables educators to exchange their prior knowledge and experiences, thereby enhancing their competence, confidence, and commitment to the pedagogical process (Adarkwa et al., 2021). Successful training involves educators in learning activities that mirror those they intend to employ with their students, thereby promoting the evolution of teacher learning (Buczynski & Hansen, 2010; Avalos, 2011). There exists an increasing interest in cultivating schools as institutions of learning, allowing educators to systematically share their experiences to bolster learning (Sierra-Huedo et al., 2023). The instruction and biology education within senior secondary educational institutions are designed to impart biological knowledge to students (Okenyi, 2015). This transmission of knowledge is broadly categorized into objectives as delineated in the biology curriculum.

According to the National Policy on Education (2013) as referenced in Ezeobi et al. (2020), the primary objective of teaching and learning biology is to provide students with adequate laboratory and field skills, meaningful and relevant biological knowledge, and the capacity to apply scientific knowledge to everyday situations concerning personal and community health, agricultural practices, and the cultivation of rational and functional scientific attitudes. Sonde (2021) asserted that in the execution of educational programs, educators represent crucial factors that must be acknowledged. Enhancing quality educators through the professionalization of the teaching vocation in Nigeria, alongside the provision of increased in-service training opportunities and additional incentives for educators (National Policy of Education, 2013), is imperative for the realization of the articulated objectives. to provide pupils with professionalization of instruction. The main focus of this study was the perceived impact that regular training and development programmes for teachers had on teachers' pedagogical practices and biology students' performance.

Conceptual framework

Conceptual structure Guskey's Model of Teacher Change serves as the foundation for the study. Guskey outlined three main goals for professional development programs: improving student learning

outcomes, changing educators' attitudes and beliefs, and changing their instructional practices. Numerous factors could make the process of change more difficult, and the relationships between these outcomes are complex and multidimensional (Fullan, 1991; Guskey & Sparks, 1996). However, professional development initiatives are deliberate and strategic endeavors, and the changes a professional development leader hopes to accomplish are usually clearly stated (Griffin, 1983). Efforts to promote change should consider the order of outcomes that are most likely to result in the desired change and the sustainability of that change, even though the relationships between the desired outcomes are somewhat reciprocal (Guskey, 2000).

Professional development is predicated on the notion that modifications in attitudes and beliefs are generally structured to secure acceptance, commitment, and enthusiasm from educators and educational administrators prior to the adoption of new practices or strategies. This involves engaging educators in planning sessions and conducting needs assessments to ensure that the new practices or strategies align well with educators' preferences (Joyce et al., 1976). However, despite the significance of these procedures, they rarely lead to substantial changes in attitudes or elicit strong commitment from educators (Jones & Hayes, 1980). The "Model of Teacher Change" illustrated in Fig. 1 proposes an alternative sequence among the three primary outcomes of professional development.

Fig. 1: A model of teacher change (Guskey, 2022).

According to the model, notable alterations in educators' attitudes and beliefs predominantly transpire after they have obtained evidence of enhancements in student learning. Such improvements typically stem from adaptations educators have implemented in their classroom practices, whether through the adoption of a novel instructional approach, the utilization of new materials or curricula, or simply a revision in teaching methodologies or classroom configurations. The salient point is that it is not the professional development itself that induces change, but rather the experience of successful implementation that reshapes educators' attitudes and beliefs. They come to believe in

its efficacy because they have witnessed its success, and that experience informs their attitudes and beliefs. Hence, according to the model, the pivotal factor in significant transformation in educators' attitudes and beliefs is unequivocal evidence of advancement in the learning outcomes of their students (Guskey, 1985, 1986, 1989). This model of change is based on the premise that change is fundamentally an experiential learning process for educators. Practices that are demonstrated to be effective namely, those that educators find beneficial in assisting students to achieve desired learning outcomes are retained and repeated, while those that prove ineffective or yield no substantive evidence of success are typically discontinued. Demonstrable results in terms of student learning outcomes are the key to the endurance of any change in instructional practice.

Research objectives

1. To ascertain how professional development and training affect teachers' lesson planning and delivery in the classroom.
2. To ascertain the impact of teachers' professional development and training on biology learning outcomes.

Research questions

1. What is the impact of teachers' training and development on effective lesson plan?
2. What is the impact of teachers' training and development on teachers' instructional delivery in biology?
3. To what extent does teachers' training and development influence students' performance in biology?

Hypotheses

H₀₁: Teachers' professional development does not significantly influence teachers' lesson delivery.

H₀₂: Teachers' professional development does not significantly influence students' learning outcomes in of biology.

Methodology

Research design

This research employed a descriptive survey methodology. The demographic scope of the investigation encompassed all accredited secondary educational institutions within the Abeokuta South Local Government Area of Ogun State.

Respondents of the study

The sample size consisted of 214 participants, comprising 14 Biology educators and 200 students from both private and public educational establishments within the designated area. A multistage sampling technique was utilized for the research. Initially, a stratified random sampling approach was implemented to categorize the schools into

seven (7) private and public secondary institutions. Subsequently, seven (7) private and seven (7) public secondary schools were randomly chosen for the research. Furthermore, fourteen (14) Biology educators were purposefully selected to engage in the study, while a random sampling technique was applied to select 200 students' scores in Biology to assess student performance in the subject.

The research instrument employed for data collection from the educators was an open-ended, structured questionnaire, which underwent both face and content validation.

To ensure the reliability of this instrument, a pilot test was conducted on a sample that did not belong to the target group but possessed similar characteristics. The Cronbach Alpha reliability coefficient was utilized to evaluate the instrument's reliability, resulting in a coefficient of 0.78. This outcome indicated that the instrument was both reliable and suitable for the study.

Data collection

Data was gathered by the researcher through the administration of questionnaires and the collection of students' Biology scores.

Statistical analysis

Inferential statistics were employed to test the hypotheses formulated, maintaining a significant level of 0.05.

Results

Table 1: Demographic Characteristics of the Respondents (Biology Teachers)

Demographic Respondents	Characteristic of the Respondents	Frequency (F)	Percentage (%)
Gender			
	Male	4	28.57
	Female	10	71.43
Age			
	22-30yrs.	3	21.43
	31-40 yrs.	6	42.85
	41-49 yrs.	5	35.71
Qualification			
	NCE	2	14.28
	B.Sc/B.Ed	7	50.0
	M.Sc/M.Ed.	5	35.71
Year of Experience			
	1-5yrs	2	14.23%
	6-15yrs	3	21.43%
	16-20yrs	5	35.71%
	21-25	4	28.57%

Result in table 1 revealed the respondents' demographic variables. The result shows that 71.43% of the respondents' biology teachers were female while the remaining 28.57% are male; 21.43% of the respondents are within the age of 22-30 years, 42.85% fall between the age 31-40 while 53.71% are with the age of 41-49 years of age. Also, 14.28% of the respondents had NCE, 50.0% had B.Sc/B.Ed while 54.71% had M.Sc./M.Ed. This indicate that majority of the respondent had teaching qualification. In addition, the result revealed the teaching experience of the respondents: it was observed that 14.23% of the teachers had 1-5 years of experience in teaching profession, 21.43% had 6-15 years of experience, 33.71% had 16-20 years of experience while 28.57% of the respondents had 21-25 years of experience in the teaching profession.

Research Question One: What is the impact of teachers' training and development on effective lesson plan?

Table 2: Impact of Teachers' Training and Development on Effective Lesson Plan?

S/N	Items	\bar{x}	Std.dev
1	Professional development helped me proffer solutions to challenges I encounter during lesson planning.	3.71	.469
2	Professional development has helped me incorporate new strategies in my lesson plan.	2.86	1.099
3	Professional development has helped me achieve effective lesson planning.	2.00	.961
4	Attending professional training programmes has enhanced my ability to include activities that would engage my students in my lesson plans	3.21	.1251
5	Attendance at professional seminars and workshops had improved my ability to align my lesson plans with curriculum standards	3.93	.267
6	Regular attendance at professional training has supported me in adapting lesson plans for students with diverse learning needs	2.94	.531

Results above (Table 3) revealed the result of impact of teachers'

professional training and development on effective lesson plan. The result showed that all the items had mean value of $\bar{x} = 3.71, 2.86, 3.21, 3.93$ and 2.94 which is above the criterion mean value of 2.50 which indicates that the respondents strongly accept the statements.

Research Question Two: What is the impact of professional training and development on teachers' lesson delivery in Biology?

Table 3: Impact of Professional Training and Development on Teachers' Lesson Delivery in Biology

Items	\bar{x}	Std.dev
1 Professional training and development inspire innovative approaches to presenting information, making lessons more engaging.	3.93	.267
2 Professional training and development train teachers to adapt their delivery methods on classroom dynamics and student feedback.	3.93	.267
3 Professional training and development equip teachers' interpersonal skills to foster trust and rapport with students	2.86	1.027
4 Professional training and development build self-assurance through mastery of teaching techniques and content.	3.57	.646
5 Professional training and development programmes enhance teachers' ability to explain concepts clearly and respond to student queries effectively.	3.14	1.099
6 Professional training and development programmes introduce cutting-edge pedagogical strategies, enriching lesson delivery with creativity and variety.	3.29	.743

The findings in Table 3 above demonstrate how professional development and training affect biology teachers' delivery of lessons. The findings showed that the respondents strongly agreed with every item, with mean values of 3.93, 2.86, 3.57, 3.14, and 3.29, respectively, above the criterion mean value. This suggests that the respondents believed that regular training and development programs for biology teachers would improve the way that biology lessons were taught.

Research Question Three: To what extent does teachers' training and

development programmes influence students' performance in Biology?

Table 4: Impact of teacher training and development initiatives on biology students' performance.

S/N	Items	\bar{x}	Std.dev
1	There is no traceable impact of attending biology science seminars, conferences, workshops, professional meetings on my students' academic performance.	2.21	.802
2	There is a traceable impact of attending biology science seminars, conferences, workshops, professional meetings on my students' academic performance.	3.14	.949
3	There have been improvements on my students' performance as a result of my knowledge from biology seminars, conferences, workshops, professional programmes.	3.29	.994
4	Through the knowledge I gained during training and development programmes, my students now have better understanding of biological concepts and respond to queries effectively.	2.71	1.139
5	Professional training and development programmes had helped me to inculcate positive learning attitudes in my students.	3.71	.469

The result (Table 4) above shows the extent to which teachers' training and development programmes influenced students' performance in Biology. From the result, it was observed that the respondents strongly indicated that teachers' regular attendance at training and development programmes significantly predicts better performance of students' in biology. Also, the result further revealed the degree of the agreement on the items, the items with mean value of 3.14, 3.29, 2.71 and 3.71 indicates that the respondents' views on the impact of professional development inference were statistically significant since the weighted mean value of all the items are above the criterion mean value of 2.50.

Test of Hypotheses

Hypothesis One: Teachers' training and development programmes do not significantly influence lesson planning and delivery

Table 5: Regression Coefficients for the influence of Teachers' Professional Development on Lesson Planning and Delivery

	B	Std Error	Beta	t	Sig.
(Constant)	11.42	5.40		14.08	.000
Teachers' Development	0.315	0.03	0.210	3.32	.002

Findings revealed (Table 5) teachers' training and development programmes significantly influenced lesson planning and delivery ($\beta = .210$, $t = 3.32$, $p < .05$). As such, the null hypothesis is rejected while the alternative hypothesis is upheld.

Hypothesis Two: Teachers' training and development programmes do not significantly influence academic performance of biology students

Table 6: Regression Coefficients for the Teachers' Training and Development on Students' Academic Performance in Biology.

	B	Std Error	Beta	t	Sig.
(Constant)	48.422	0.735		65.855	.000
Teachers' Development	0.353	0.018	0.124	6.846	.000

Dependent Variable: Students' Performance in Biology

Result presented in table 6 showed that there exists a significant relationship between teachers' training and development programmes and students' performance in Biology. The coefficient of teachers' training and development programmes ($\beta = .124$, $t = 6.846$, $p < .05$) significantly influenced students' performance in Biology. Consequently, the null hypothesis is rejected while the alternative hypothesis is upheld.

Discussion of findings

Effective lesson planning is greatly impacted by teachers' training and development because it improves their competencies and encourages reflective practices. In order to give teachers, the tools they need to design and deliver lessons in an efficient manner, which will ultimately improve student learning outcomes, it is imperative that they participate in continuous professional training and development

programmes. Lesson planning and delivery were significantly impacted by teacher training and professional development programmes, according to the results of the hypothetical statement one. This supports Sabilah et al. (2021) findings that teachers' training and development greatly improved their comprehension of educational regulations and lesson plan design, which in turn led to higher-quality lesson planning.

According to Chowdhury (2024), teacher training and professional development programmes improved pedagogical skills, enabling educators to create effective lesson plans catered to a variety of learning needs. Muzaffar et al. (2023) supported the findings by finding that teachers' professional training significantly improved their instructional techniques and classroom management, resulting in more effective lesson planning. The findings also demonstrated that teachers who participated in continuous training and development programmes delivered lessons more effectively. This corroborates the findings of Anif (2019) and Hassan et al. (2024), who found that continuing professional development programmes improved the competencies of certified biology teachers, thereby improving the quality of their lessons. The results of the second hypothesis analyses showed that students' performance in biology was significantly impacted by continuous teacher training and development initiatives. This result is consistent with the findings of Borg (2018), Kiran et al. (2022), and Mohamed et al. (2024), who proposed that there is a positive relationship between students' academic performance and the frequency of teachers' attendance at workshops and seminars.

Conclusion

This research examines the perceived influence of continuous teachers' training and development programmes on pedagogical strategies and the academic performance of biology students in Abeokuta South Local Government Area of Ogun State. The results from this study revealed that the exposure of biology educators to regular training and development programmes significantly influenced their lesson planning, delivery, as well as students' performance in Biology. It is recommended that educators should engage in continuous training and professional development programmes to remain informed and current in both biological content and pedagogical methodologies.

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