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Teachers' Qualification and Teaching Experience as Determinants of Physics Curriculum Implementation in Senior Secondary Schools in Kano State, Nigeria

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Abstract

This study examined teachers' qualification and teaching experience as determinants of physics curriculum implementation in senior secondary schools in Kano Central Senatorial Zone, Nigeria. The study was motivated by concerns over students' poor performance in physics and the need to understand how teacher-related factors influence effective curriculum delivery. A descriptive survey research design was adopted for the study. The population consisted of eighty-two physics teachers in public senior secondary schools in the study area, and a census sampling technique was used to include all teachers. Data were collected using a structured questionnaire titled Physics Curriculum Implementation Questionnaire (PCIQ) and analysed using mean and standard deviation. The findings revealed that teachers' qualification significantly influences the selection of instructional materials used in physics teaching, while teaching experience influences the selection of teaching methods during physics instruction. The results indicate that qualified and experienced teachers are more likely to utilise appropriate instructional resources and adopt effective teaching strategies that support successful curriculum implementation. The study concludes that teacher-related characteristics play a crucial role in the effective implementation of the physics curriculum. It therefore recommends the recruitment of qualified physics teachers and the provision of regular professional development programmes to improve instructional practices in secondary schools.

Keywords: Physics Curriculum Implementation, Teacher Qualification, Teaching Experience, Instructional Methods, Secondary Education

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Introduction

Education plays a critical role in national development by enabling individuals to acquire knowledge, skills, and competencies necessary for social and technological advancement (Don, 2020; Musa *et al.,* 2021). Within the education system, the curriculum provides the framework that guides teaching and learning by outlining educational goals, subject content, instructional methods, and assessment strategies (Wortham, 2022). Effective curriculum implementation occurs when teachers successfully translate curriculum objectives into classroom practices through appropriate instructional strategies, learning resources, and evaluation techniques (Nation & Macalister, 2021).

Teachers serve as the primary agents of curriculum implementation because they interpret curriculum guidelines, organise instructional activities, and assess students' learning outcomes. Their professional competence, including academic qualification and teaching experience, significantly influences the effectiveness of curriculum delivery (Penuel et al., 2020). Teachers with adequate qualifications possess strong subject knowledge and pedagogical skills, while experienced teachers develop practical teaching strategies and classroom management abilities that enhance instructional effectiveness (Shulman, 1986; Haque & David, 2022).

Physics is a fundamental science subject that contributes significantly to technological advancement and national development. It provides the scientific foundation for disciplines such as engineering, electronics, telecommunications, and energy technology (Halliday et al., 2020). Physics education also develops learners' analytical thinking and problem-solving skills required for innovation and scientific advancement (Mbamara & Eya, 2020). Despite its importance, students' performance in physics in many Nigerian secondary schools has remained unsatisfactory, often due to factors such as inadequate instructional materials, ineffective teaching methods, and poor curriculum implementation (Ajaja, 2019; Adeyemo, 2019).

Effective implementation of the physics curriculum depends largely on the teacher, who determines how instructional materials are used and selects appropriate teaching strategies during classroom instruction (Penuel *et al.,* 2020). Teacher qualification influences the depth of subject knowledge and pedagogical competence required to present complex physics concepts

effectively, while teaching experience enables teachers to refine instructional practices and adapt teaching methods to meet students' learning needs (Shulman, 1986; Haque & David, 2022).

Although previous studies have examined the influence of teacher characteristics on student achievement, there is limited empirical evidence on how teachers' qualification and teaching experience specifically influence the implementation of the physics curriculum in senior secondary schools in Kano Central Senatorial Zone of Kano State. This gap necessitates an investigation into how these teacher-related factors affect the selection of instructional materials and teaching methods during physics instruction.

The study was guided by the following objectives:

I. To determine the influence of teachers' qualification on the selection of appropriate physics instructional materials in senior secondary schools in Kano Central Senatorial Zone.

II. To examine the influence of teachers' teaching experience on the selection of appropriate teaching methods for physics curriculum implementation.

The following research questions guided the study:

I. What is the influence of teachers' qualification on the selection of appropriate physics instructional materials in senior secondary schools?

II. How does teachers' teaching experience influence the selection of appropriate teaching methods for physics curriculum implementation?

Methodology

This study adopted a descriptive survey research design to examine teachers' qualification and teaching experience as determinants of physics curriculum implementation in senior secondary schools in Kano Central Senatorial Zone, Nigeria. The population of the study comprised 82 physics teachers in public senior secondary schools within the study area. Due to the manageable size of

the population, a census sampling technique was employed to include all the teachers in the study.

Data were collected using a self-developed instrument titled *Physics Curriculum Implementation Questionnaire (PCIQ)*. The instrument consisted of two sections: Section A collected demographic information of the respondents, while Section B contained items designed to measure teacher-related variables and curriculum implementation practices. The questionnaire items were structured on a four-point Likert scale.

The instrument was validated by experts in science education, curriculum studies, and measurement and evaluation to ensure clarity, relevance, and adequacy of the items. A pilot study was conducted to determine the reliability of the instrument, and a Cronbach's Alpha coefficient of 0.73 was obtained, indicating acceptable internal consistency.

Data collection was carried out with the permission of relevant school authorities, and the questionnaires were administered directly to the respondents and retrieved upon completion. The collected data were analysed using descriptive statistics, specifically mean and standard deviation, to answer the research questions. Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS).

The population of the study comprised all physics teachers in public senior secondary schools within Kano Central Senatorial Zone, Nigeria. According to records from the Kano State Senior Secondary School Management Board, the total number of physics teachers in the zone was 82 as of 2024.

Because the population size was relatively small and manageable, the study adopted a census sampling technique, which involved including all members of the population in the study. The sample size was therefore 82 physics teachers, ensuring complete representation and eliminating sampling error.

Table 1: Distribution of Physics Teachers in Kano Central Senatorial Zone

S/N	Local Government Area	Number of Physics Teachers
1	Dala	18
2	Dawakin Kudu	9
3	Garun Malam	2
4	Kano Municipal	22
5	Warawa	1
6	Kumbotso	13

S/N	Local Government Area	Number of Physics Teachers
7	Kura	10
8	Gezawa	7
Total		**82**

Note: Data obtained from the Kano State Senior Secondary School Management Board, Department of Planning, Research and Statistics (2024).

Data were collected using a self-developed questionnaire titled "Physics Curriculum Implementation Questionnaire (PCIQ)". The instrument consisted of two sections. Section A collected demographic information about the respondents, while Section B contained 40 items measuring teacher qualities and physics curriculum implementation. The items were structured on a four-point Likert scale ranging from *Strongly Agree* to *Strongly Disagree*.

The questionnaire was validated by experts in science education, curriculum studies, measurement and evaluation, and experienced physics teachers. The experts assessed the clarity, relevance and adequacy of the items in relation to the research objectives. Their suggestions and corrections were incorporated into the final version of the instrument to ensure both face and content validity.

A pilot study was conducted using 41 physics teachers to test the reliability of the instrument. Cronbach's Alpha was used to determine internal consistency, and the instrument produced a reliability coefficient of 0.73, which is considered acceptable for educational research (Nunnally, 1978). This indicates that the questionnaire items were sufficiently consistent for data collection.

The researcher obtained permission from the Kano State Senior Secondary School Management Board and subsequently contacted principals of the selected schools. Questionnaires were administered directly to physics teachers with the assistance of school administrators. Completed questionnaires were retrieved immediately after completion to ensure a high response rate.

The data collected were analysed using descriptive statistics, specifically mean and standard deviation, to answer the research questions. Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 27.

Results and Discussion

Respondents' Demographic Characteristics

A total of 82 physics teachers from public senior secondary schools in Kano Central Senatorial Zone participated in the study. The demographic characteristics considered include gender, teaching experience, and academic qualification.

Table 1: Teachers' Qualification and Selection of Physics Instructional Materials

Item	Mean	Decision
Qualification helps in selecting laboratory apparatus	2.73	Agree
Qualification assists in selecting visual teaching aids	2.79	Agree
Qualification supports the selection of teaching models	2.83	Agree
Use of laboratory manuals for practical work	2.61	Agree
Selection of diagrams and photographs in teaching	2.90	Agree
Use of textbooks and problem-solving booklets	3.05	Agree
Use of real-life examples and demonstrations	3.61	Agree
Use of virtual laboratories	1.95	Disagree
Use of videos and animations	1.88	Disagree

Grand Mean = 2.72

Note. Decision rule: Mean ≥ 2.50 = Agree; Mean < 2.50 = Disagree.

The data presented in Table 1 show that teachers' qualification has a significant influence on the selection of instructional materials used in physics teaching. The grand mean score of 2.72, which is above the decision benchmark of 2.50, indicates that respondents generally agreed that teacher qualification plays an important role in determining the choice of instructional resources. High mean scores were recorded for items such as the use of real-life examples and demonstrations (3.61), textbooks and problem-solving booklets (3.05), and selection of diagrams and photographs (2.90), indicating strong agreement among respondents. Similarly, the use of teaching models (2.83), visual teaching aids (2.79), and laboratory apparatus (2.73) were positively rated. However, the low mean scores for the use of virtual laboratories (1.95) and videos and animations (1.88) indicate that technology-based instructional materials are not widely utilised. This suggests that while qualified teachers effectively use traditional instructional resources, there is limited integration of modern technological tools in physics teaching.

Table 2: Teaching Experience and Selection of Teaching Methods

Item	Mean	Decision
Experience influences the choice of teaching methods	3.66	Agree

Item	Mean	Decision
Experience promotes collaborative teaching methods	3.64	Agree
Experience supports selection of appropriate teaching methods	2.50	Agree
Experience helps adapt methods to students' needs	3.57	Agree
Use of multiple teaching methods	3.37	Agree
Integration of theory with practical activities	3.64	Agree
Difficulty selecting methods due to limited preparation	1.59	Disagree
Experience supports technology integration	3.55	Agree

Grand Mean = 3.09

Note. Decision rule: Mean ≥ 2.50 = Agree; Mean < 2.50 = Disagree.

The data in Table 2 indicate that teaching experience significantly influences the selection of teaching methods used in physics instruction. The grand mean score of 3.09, which is above the decision benchmark of 2.50, shows that respondents strongly agreed that teaching experience affects instructional practices. High mean scores were recorded for items such as the influence of experience on teaching methods (3.66), promotion of collaborative teaching methods (3.64), integration of theory with practical activities (3.64), and adaptation of teaching methods to students' needs (3.57), indicating strong agreement. The use of multiple teaching methods (3.37) and the role of experience in supporting appropriate method selection (2.50) were also positively rated. Conversely, the low mean score for difficulty in selecting teaching methods (1.59) indicates that experienced teachers generally do not face challenges in choosing appropriate instructional strategies. These results suggest that teaching experience enhances teachers' ability to effectively select and apply appropriate teaching methods in physics instruction.

Summary of Major Findings

The study revealed that:

1. Teachers' qualification influences the selection of instructional materials used in physics teaching.

2. Teachers' teaching experience influences the selection of teaching methods used in physics curriculum implementation.

Discussion

The results of the study are presented based on the research questions guiding the study. The findings from Table 1 revealed that teachers' qualification

influences the selection of instructional materials used in physics teaching. The grand mean score of 2.72, which is above the decision benchmark of 2.50, indicates that respondents agreed that teacher qualification plays a significant role in determining the type of instructional materials used during physics instruction. Specifically, items such as the use of laboratory apparatus (2.73), visual teaching aids (2.79), teaching models (2.83), textbooks and problem-solving booklets (3.05), and real-life demonstrations (3.61) recorded high mean scores, indicating strong agreement among respondents. However, the low mean scores recorded for the use of virtual laboratories (1.95) and videos and animations (1.88) indicate that technology-based instructional materials are not widely utilised. This suggests that although qualified teachers effectively use traditional instructional resources, there is limited integration of modern technological tools in physics teaching.

The findings from Table 2 showed that teaching experience influences the selection of teaching methods used in physics instruction. The grand mean score of 3.09 indicates a high level of agreement among respondents that teaching experience affects instructional practices. The high mean scores for items such as the influence of experience on teaching methods (3.66), collaborative teaching methods (3.64), adaptation of methods to students' needs (3.57), and integration of theory with practical activities (3.64) suggest that experienced teachers are more capable of selecting and applying effective teaching strategies. The low mean score for difficulty in selecting teaching methods (1.59) further indicates that experienced teachers are confident in their instructional decision-making.

The findings of this study highlight the importance of teacher-related factors in effective curriculum implementation. The result that teachers' qualification influences the selection of instructional materials is consistent with the findings of Adaramola and Obomanu (2019), who reported that teachers with higher academic qualifications are more likely to utilise appropriate instructional resources in science teaching. Qualified teachers possess deeper subject knowledge and pedagogical competence, which enable them to select suitable materials that enhance students' understanding of physics concepts.

Similarly, the finding that teaching experience influences the selection of teaching methods supports the study of Haque and David (2022), who found that experienced teachers demonstrate greater instructional effectiveness and classroom management skills. Teaching experience enables teachers to refine

their instructional strategies, adapt teaching methods to students' needs, and effectively integrate theory with practical activities.

Overall, the results suggest that teachers who are both qualified and experienced are better equipped to implement the physics curriculum effectively. Their ability to select appropriate instructional materials and adopt effective teaching methods contributes significantly to improved teaching and learning outcomes in physics education. However, the limited use of technology-based instructional materials indicates the need for increased integration of modern instructional technologies in physics teaching.

Conclusion and Recommendations

This study examined the role of teachers' qualities in the implementation of the senior secondary school physics curriculum in Kano Central Senatorial Zone, Nigeria. A descriptive survey research design was employed, and data were collected from 82 physics teachers using a structured questionnaire. The study investigated key teacher-related variables, including academic qualification, teaching experience, professional competence, and instructional practices.

The analysis revealed that teachers' professional characteristics play a significant role in curriculum implementation. In particular, teachers' qualification influenced the selection of instructional materials, while teaching experience affected the choice of instructional strategies used during physics instruction. Teacher competency was also found to influence the effectiveness of content delivery, and teachers' age was associated with differences in the evaluation strategies used in assessing students' learning outcomes.

Overall, the findings highlight the importance of competent and professionally prepared teachers in achieving the objectives of the physics curriculum in secondary schools.

Conclusions

Based on the findings of the study, it is concluded that the successful implementation of the physics curriculum in senior secondary schools depends largely on teacher-related factors. Teachers who possess appropriate academic qualifications, adequate teaching experience and strong pedagogical competence are more capable of selecting suitable instructional materials,

adopting effective teaching methods and delivering physics content effectively.

Furthermore, the study indicates that teacher characteristics influence assessment practices and instructional strategies used in the classroom. Strengthening teachers' professional capacity and providing adequate instructional resources will therefore enhance the effectiveness of physics curriculum implementation and improve students' understanding of physics concepts.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

i. Educational authorities should ensure the recruitment and deployment of qualified physics teachers in secondary schools in order to enhance effective selection and utilisation of instructional materials.

ii. Regular professional development programmes, such as workshops, seminars and in-service training, should be organised to improve teachers' instructional skills and teaching methods in physics.

iii. School administrators should provide professional support and supervision to encourage teachers to adopt effective teaching methods in physics instruction.

iv. Government and school authorities should ensure the availability of adequate instructional materials and laboratory facilities to support effective physics teaching and learning.

v. Physics teachers should adopt appropriate learner-centred teaching methods, such as demonstrations, guided discovery and problem-solving approaches, to improve students' understanding of physics concepts.

Suggestions for Further Research

The following areas are recommended for further studies:

1. Investigation of the influence of school environment on physics curriculum implementation.

2. Examination of the relationship between instructional materials utilisation and students' academic performance in physics.

3. A comparative study between public and private secondary schools to determine differences in physics curriculum implementation.

4. Examination of the impact of teacher professional development programmes on the effectiveness of physics teaching.

5. Future researchers may employ experimental research designs to examine the effects of specific teaching strategies on students' achievement in physics.

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