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MODELING OF TEACHER CHARACTERISTICS, SKILLS IN TEACHING AND STUDENTS' ACHIEVEMENT IN SECONDARY SCHOOL PHYSICS

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ABSTRACT

Introduction: Teachers with a significant amount of classroom experience and a strong background in physics, math, and education would exhibit suitable teaching abilities as evidenced by engaging lesson presentations, and assessments of the lessons' goals. Students would learn effectively and achieve better in physics if teachers demonstrated these suitable teaching techniques.

Purpose: This study looked at the associations between the qualities of a teacher and their ability to teach, as well as the implications of these associations for the physics achievement of senior secondary school students.

Methodology: The study used a correlation design, whereby path analysis was employed to evaluate the plausibility of the proposed model without manipulating any of the variables. Thirty senior secondary school physics teachers and nine hundred senior secondary school physics students were randomly selected from thirty senior secondary schools (SSS) in Taraba and Adamawa States, Nigeria. A Teacher-Students Interaction Observation Schedule was used to rate each teacher. The students took the Physics Achievement Test at the conclusion of the fourth week.

Result: The analysed data indicated a strong and favourable correlation between the qualities of teachers and their aptitude for presenting and evaluating lessons. Teachers with relevant experience and qualifications displayed effective teaching techniques.

Conclusion: Experienced and certified teachers were found to possess the necessary skills to get ready to teach physics in classrooms, and physics students' achievement was influenced by the qualities of their teachers.

Recommendation: Policy makers, educators and schools should hire qualified individuals to teach physics in senior secondary schools.

Keywords: Teacher Characteristics, Lesson Preparation, Lesson Presentation, Evaluation of Lesson Objectives, Physics Education, Students' Achievement in Physics

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PUBLIC INTEREST STATEMENT

The quality of education ultimately depends on the quality of teachers, making teacher competence a key factor in the education system. Developing teacher competence can be achieved through coaching and professional development programs, which enhance teaching effectiveness and efficiency. Overall, teacher competence is essential for ensuring quality education and facilitating students' all-round development. This study show-cased the importance effective and efficient teachers for physics classrooms, to help policy makers in education, educators and schools in making quality decisions.

INTRODUCTION

The field of physics is one of the major scientific disciplines that has made significant contributions to globalization by providing scientific knowledge for technological advancements in the fields of medicine, crime prevention, the invention of sophisticated electronics devices like high-power microscopes, the application and utilization of integrated circuits, information communication and technology (ICT), rocketry, satellites, refineries, and agricultural produce mechanization. Modern technology, industrialization, and civilization are all based on the principles of physics. Physics is a discipline that students learn by experience, giving them the chance to observe and experiment, apply knowledge, solve theoretical and practical problems, discover, and explore their environment, and further develop their talents. The major objective of education at all levels is to bring about a fundamental change in the student using a range of teaching and learning strategies or methods (Oigara, 2011).

The teaching approaches in teaching can make the subject interesting or boring. The types of principal and instructional strategies utilized are the best ways to categorize a teaching method. Depending on the knowledge or skill the teacher is trying to impact, there are different teaching methods available. Examples of some teaching methods that physics teachers have used to deliver lessons to their students include inquiry method, field trip method, demonstration, laboratory method, the traditional or lecture method among others. According to Thomas and Israel (2013) there isn't a single teaching strategy that can be considered the best in every situation. Instead, there are a variety of factors that can influence a teacher's decision, such as the material to be covered, the goals to be met, the time allotted, the number of students, the preferences and individual styles of the teachers, the type of lesson, the facilities available, and the students' needs and interests, among others. Badmus and Jita, (2022) suggested that teaching methods that encourage visualization should be used to enhance students' achievement in physics.

In order for the lesson to be relevant and engaging for the students and to lessen the degree of abstraction that they typically associate with the study of Physics topics, the teacher must also adeptly search for instructional/ learning aids. Lesson planning is a fundamental process that lies at the heart of effective teaching and learning (Strong, 2021). It serves as a roadmap that guides educators in creating well-structured and engaging instructional experiences for students. The aim of lesson planning is to outline the objectives, content, activities, and assessments that align with educational goals and meet the diverse needs of learners (Clark & Yinger, 2007;Singh, 2007; Tomlinson & McTighe, 2006).

Lesson planning serves as a crucial preliminary step before the commencement of the learning process. It aids teachers in organizing their instructional strategies, thereby avoiding potential pitfalls (Neisari & Heidari, 2014; Planet, 2015). An essential indicator of teacher competence lies in their ability to proficiently prepare lesson plans. These plans hold significant importance in the learning process as they serve as guiding frameworks for teachers during each instructional session (Lineage & Bartlett, 2008; Sanjaya, 2016). A comprehensive lesson plan typically includes several key components. Firstly, it delineates precise and quantifiable learning goals, clearly defining the anticipated achievements for students by lesson (Daniels, 2008). Secondly, it incorporates a detailed outline of the instructional content, resources, and materials to be used during the class. Thirdly, the plan includes various teaching strategies, activities, and assessments that align with the learning objectives and promote active student involvement (Woolfolk & Margetts, 2019; Hanane, 2016). Lastly, an effective lesson plan incorporates strategies for differentiation, catering to the diverse learning needs of students. Lesson planning, in the words of Rhalmi (2010), is providing teachers with specific instructions to follow throughout the day. With it, a teacher can effectively organize and save time. A teacher does not have to explain things in great detail because the lessons are well-organized.

The introduction comes first in the lesson's presentation. The term "introduction" refers to the several exercises designed to pique pupils' interest as they are being introduced to a new topic. This could be accomplished by oral inquiry, a brief narrative, or occurrences that are comparable to the lessons being learned. The teacher must be able to connect the new subject to the students' prior knowledge. When presenting the lesson's material, teachers should be adept. Ayeni (2016) stated that teachers should maintain clarity and simplicity in presentation of ideas. Students appreciate teachers who use ordinary language and avoid technical jargon. They should be able to use appropriate verbal, diagrammatic or symbolic forms as demanded by the subject matter. Technical language should be used only when it is absolutely necessary to do so and when they are used, they should be introduced systematically. New and unfamiliar terms should be clearly explained by the teacher. Sometimes, it might be difficult for teachers to project some difficult concept or adopt a relaxed style of communication. Afolabi, Loto, Akindutire and Fasakin (2018) opined that in such situations, effective teachers will try to provide effective demonstration, give a clear explanation and give specific and clear examples and analogies of such complex materials while directing student attention to key ideas and relevant attributes. When students are guided from the known to the unknown or from the easy to the difficult, they acquire more knowledge.

Evaluation of cognitive learning involves gauging students' knowledge and comprehension of a subject through written or oral tests; this allows the teacher to ascertain the degree to which students have mastered the material covered in the lesson. According to Anikweze (2014), through evaluation of the lesson objectives, teachers are able to give a value or quantify the progress which the students have made in his or her learning. During the evaluation phase, a proficient teacher ought to pose questions that span the six behavioural objectives levels identified by Benjamin Bloom. Findings of Udoukpong and Okon (2012) showed that students who perceived their teachers' formative evaluation practices as "enhancing to learning[1]' (positive) performed better than their counterparts who viewed same as "not enhancing to learning" (negative).

Furthermore, Olagunju (2015) study revealed that formative evaluation has a strong significant difference in the mean achievement score of Mathematics students that are exposed to it. Adeoye (2010) results indicate that allowing systematic attributes of continuous assessment to come into play in physics teaching has significant effect on remembering of physics concepts across all the students' cognitive style-gender groupings. Ugodulunwa and Okolo (2016) findings revealed that formative assessment reduced anxiety level and improved mathematics performance of the students. Alade and Kuku (2017) indicated that achievement scores in mathematics significant)} differ among students exposed to varying test frequencies. Ajogbeje, Ojo and Ojo (2013) revealed that formative testing with feedback is significantly effective on students' achievement in junior secondary school mathematics.

Students' academic achievement has been linked by researchers to teachers' years of teaching experience. Researchers have identified that teacher experience is one of the factors that affect students achievement in school. Agharuwhe (2013) pointed out that students under teachers with more teaching experience will achieve better. Experienced teachers can draw from a wider range of experiences and can offer insight and ideas to the teaching and learning process. They are also more receptive to criticism and less authoritarian in the classroom. According to Gibbons, as cited in Agharuwhe (2013), students who are taught by more experienced teachers achieve better because these teachers are more adept at both teaching the subject matter and dealing with a variety of classroom issues, and that the effectiveness of a teacher increases systematically with increase in number of years of teaching.

The amount of a teacher's subject-matter expertise, which Mullens (2019) recognized as a primary influencer of students' academic achievement, might be used to gauge effective teaching. Therefore, Teachers' experiences can either improve or lower students' academic achievement. By implication, teachers with less years of experience have a lower academic accomplishment rate than those with more. Papay and Kraff (2014) stated that inexperienced teachers are teachers with few years into the teaching profession trying to survive in the classroom because they are building key classroom management skills, learning the curriculum and adding to their instructional skills.

A study conducted by Jega and Julius (2018) showed that all teachers' qualifications and experience when taken together made significant effects on students' achievement in mathematics. In a similar study, Yusuf and Dada (2016) found that students taught by teachers with professional teaching qualification in Education such as B.Ed, M.Ed, M.AEd, M.Sc Ed Ph.D in Education performed better than those taught by non-professional teachers without teaching qualification. Agbor, Onnoghen and Etan (2023) investigated the relationship between teachers qualification and students academic achievement in Environmental Education in the University of Calabar. Findings revealed that teachers with environmental education qualification positively relate with students' academic achievement. In a related study carried out by Casian, Mugo and Claire (2021) on the impact of teachers' qualification on students' academic performance in public secondary schools in Rwanda. Findings showed a significant relationship between teacher qualification and students academic achievement.

Kingsley and Omoregie (2020) carried out a study on the influence of teachers qualifications on academic achievement of secondary school students in Delta state. Results revealed that there was a significant relationship between teachers qualification and students academic achievement in secondary schools. Ichazu & Omoregie (2020) carried out a study on the influence of teacher's qualifications on academic achievement of secondary school students in Delta state. Result revealed that there was a significant relationship between teachers' qualification and students' academic achievement in secondary schools. Also, students taught by experienced teachers performed significantly better than those taught by inexperienced teachers. The present study is to demonstrate how a teacher's qualities and instructional abilities relate to the physics achievement of their students. In order to do this, a path analytic model of classroom behaviour, teacher traits, and students' achievement in secondary school physics in Nigeria was put out.

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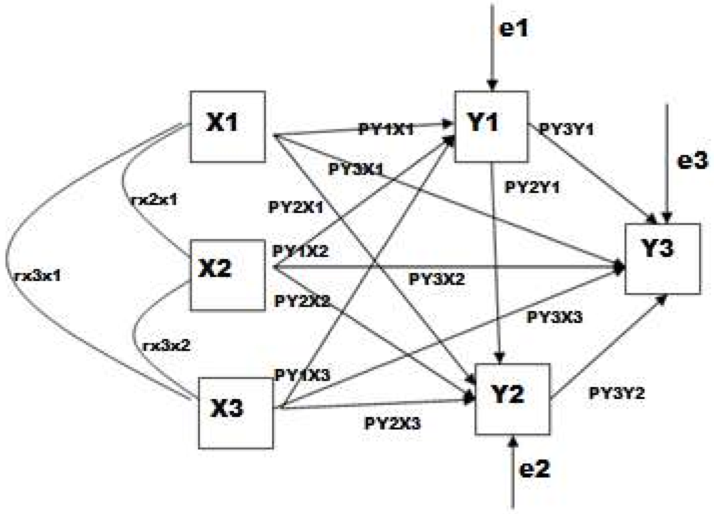

Figure 1. Recursive Path Model of Students' Achievement in Physics Factors

Key: X1 = Teacher Qualification; X2 = Teacher Teaching Experience; X3 = Skills in Lesson
Preparation; Y1 = Presentation of Lesson; Y2 = Teacher Evaluation Skills; Y3 = Students
Achievement in Physics; pxy = Path Coefficient; ei = Error
The path diagram above has three structural equations. The structural equation can be seen as below:
Y1 = PY1X1 + PY X + PY X3 + e1 (First structural equation)
Y2 = PY X + PY X2 + PY X3 + PY Y + e2 (Second structural equation)
Y3 = PY3X + PY3X2 + PY3X3 + PY3Y2 + PY3Y + e3 (Third structural equation).

STATEMENT OF THE PROBLEM

Teacher's primary role of transmission of knowledge and skills is never in dispute. Therefore a teacher would need to demonstrate efficiency in this primary role. There is deficiency and poor academic achievement of students in physics and this could be traced to lack of teachers' competence and learning resources in our classrooms (Akanni, 2021). It has also been observed that the present state of physics teaching in Nigeria indicates that many people who teach physics in secondary schools are not professional physics teachers (Akanni, 2021). This might be one of the reasons for the poor achievement of students in the subject. What impact do a teacher's credentials and experience have on how they convey the lesson's material? How can a teacher's credentials and experience impact interactions between students and teachers in the classroom, and how does this eventually effect students' physics achievement? These are the questions that this study looked at.

PURPOSE OF THE STUDY

The purpose of this study is to demonstrate how a teacher's qualities and instructional abilities relate to the physics achievement of their students using a path analytic model of classroom behaviour, teacher traits, and students' achievement in secondary school physics in Nigeria

RESEARCH QUESTIONS

To guide this study, three research questions were answered. These were:

1. How much and in which direction does the variables of teacher qualities, classroom conduct, and students' physics achievement correlate with one another?
2. Is the model that explains the relationships between teacher

qualities, their classroom conduct, and the physics achievement of the students consistent with what has been observed?
3. Given a consistent model, what are the estimated total, indirect, and direct causal effects between the variables?

METHODOLOGY

Design

The study used a correlation design, whereby path analysis was employed to evaluate the plausibility of the proposed model and correlations among the variables were used to evaluate theoretical claims about cause and effect without manipulating any of the variables.

Population and Sample

The population of the study is all senior secondary school II students in north-eastern Nigeria Stratified and Simple random sampling was employed to select thirty senior secondary school physics teachers and nine hundred senior secondary school II students (SSS) as the study's participants. The sampled Physics Teachers' ages (standard deviation = 3.66 years) varied from 28 to 47 years old. Eighty percent (80%) of them were men, and twenty percent (20%) were women. Each of them has worked as senior secondary school Physics teacher for at least seven years. The students' ages (standard deviation = 1.08 years) varied from 17 to 24 years old. 40% of the participants were girls and 60% were boys.

Instrument for Data Collection

Two instruments were used in this study: the Physics Achievement Test and the Teacher-Student Interaction Observation Schedule (TsIOS).

TsIOS: The instrument was constructed and validated by Abanihe in 2008. This instrument is used at University of Ibadan's Institute of Education to teach postgraduate students classroom observation course. It has two portions, A and B. There are ten items on section A. the items on this section are: the teacher's gender, qualifications, class observed, start and end times of the lesson. Section B comprises forty items that cover six distinct aspects of the teaching-learning process: planning, development, communication, organization, and evaluation. As reported, the instrument's reliability coefficient is 0.88. The researcher pilot tested the instrument with similar sample and got reliability coefficient of 0.79 using Cronbach Alpha method. Only the portions on lesson planning, delivery, and assessment were used in this investigation.

PAT: This instrument was developed by the first author. The instrument was developed to test students' knowledge in seven specific senior secondary school physics themes (linear momentum, motion, work, energy, power, heat, and temperature). The draft copy of the achievement test has sixty items. The A, B, C, and D response formats were applied. Item Response Theory's 2-parameter model was utilized to calculate the item difficulty and discrimination indices. Items with difficult values between -1.40 and 1.76 were selected based on the test information function. Item discrimination index is between 0.25 and 0.50. The final copy of PAT consists of forty items. The thought processes used are Knowledge, Comprehension, and Application level of Bloom's Taxonomy of Educational Objectives. Table of specification was produced to ascertain the content validity of the instrument.

Procedure for Data Collection

Twenty research assistants were used in this study. They are my colleagues from Federal University Wukari's Science Education department. They are well accustomed to how to use teacher-student observation routine schedule. A teacher score is the mean score of two research assistants. The official schedule for physics on school time table is three period per week of 40minutes each, so each of the teachers were observed for eight lessons. The Physics Achievement Test was administered to the students at the end of the observation which lasted for four weeks. In all the schools, the physics achievement test was administered for sixty minutes.

Method of Data Analysis

Quantitative data collected were keyed into a computer and all analyses were conducted using LISREL 9.2 (2015 Student Edition Jöreskog & Sörbom). This study employed a model that comprises three distinct types of constructs: (a) antecedent variables, which comprise teacher characteristics such as Qualification , Teaching Experience and ability to prepare lesson note, which are independent of other variables in the model; (b) mediator variables, which comprise teachers' proficiency in lesson delivery, and evaluation skills; and (c) criteria variable, which represents students' achievement in Physics as predicted by the other variables in the model.

RESULTS

Research Question 1: How much and in which direction does the variables of teacher qualities, classroom conduct, and students' physics achievement correlate with one another?

The first step involved creating a matrix of Pearson product-moment correlation coefficients between the achievement in Physics (criterion) scores, classroom behaviour (presentation, and evaluation skills), and teacher characteristics (experience, qualification and teacher's ability to prepare lesson note). This matrix is displayed in Table 2, 3 and 4.

Table 1: Correlation Matrix I

$R^2 = 0.36$	LP	TQ	TE	LNP
Lesson Presentation (LP)	1.00			
Teacher Qualification (TQ)	0.525*	1.00		
Teaching Experience (TE)	0.574*	0.933*	1.00	
Lesson note Preparation (LNP)	0.600*	0.854*	0.933*	1.00

Note* Reported correlation is significant at, $p < 0.05$

The effect of exogenous teacher qualification, teaching experience and lesson note preparation variables on a lesson presentation variable can be seen in table 1. The value of R square in the table above is 0.362. The variation of lesson presentation which can be explained by using exogenous variables of teacher qualification, teaching experience and lesson note preparation is equal to 36.2%; while the 63.8% is caused by other variables outside of this research.

There is linear relationship between teacher qualification, teaching experience and lesson note preparation with lesson presentation (sig value is 0.000 < 0.05). Accordingly teacher qualification, teaching experience and lesson note preparation affect lesson presentation. There is significant linear relationship between lesson note preparation (sig value is 0.031 <0.05) and lesson presentation.

Table 2: Correlation Matrix II

$R^2 = 0.625$	EV	TQ	TE	LNP	LP
Evaluation (EV)	1.00				
Teacher Qualification (TQ)	0.651*	1.00			
Teaching Experience (TE)	0.688*	0.933*	1.00		
Lesson note Preparation (LNP)	0.724*	0.854*	0.933*	1.00	
Lesson Presentation (LP)	0.684*	0.525*	0.574*	0.60*	1.00

Note* Reported correlation is significant at, $p < 0.05$

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The effect of exogenous teacher qualification, teaching experience, lesson note preparation and lesson presentation variables on evaluation variable can be seen in table 2. The value of R square in the table above is 0.625. The variation of evaluation which can be explained by using exogenous variables of teacher qualification, teaching experience, lesson note preparation and lesson presentation is equal to 62.5%; while the 37.5% is caused by other variables outside of this research. There is linear relationship between teacher qualification, teaching experience, lesson note preparation and lesson presentation with evaluation. There is significant linear relationship between lesson note preparation and evaluation (sig value is 0.031 < 0.05) and lesson presentation and evaluation (sig value is 0.031 < 0.05).

Table 3: Correlation Matrix III

$R^2 = 0.602$	PA	TQ	TE	LNP	LP	EV
Physics Achievement (PA)	1.00					
Teacher Qualification (TQ)	0.65*	1.00				
Teaching Experience (TE)	0.710*	0.933*	1.00			
Lesson note Preparation (LNP)	0.730*	0.854*	0.933*	1.00		
Lesson Presentation (LP)	0.548*	0.525*	0.574*	0.60*	1.00	
Evaluation (EV)	0.702*	0.651*	0.688*	0.724*	0.684*	1.00

Note* Reported correlation is significant at, p < 0.05

The effect of exogenous teacher qualification, teaching experience, lesson note preparation, lesson presentation and evaluation variables on physics achievement variable can be seen in the table 3. The value of R square in the table above is 0.602. This value shows the amount of variation of the physics achievement that can be explained by exogenous variables of teacher qualification, teaching experience, lesson note preparation, lesson presentation and evaluation. Accordingly teacher qualification, teaching experience, lesson note preparation, lesson presentation and evaluation variables affect physics achievement variable significantly (sig value is 0.000 < 0.05). There is significant linear relationship between evaluation and physics achievement (sig value is 0.002 < 0.05).

Research Question 2: Is the model that explains the relationships between teacher qualities, their classroom conduct, and the physics achievement of the students consistent with what has been observed?

The proposed path model of Figure 1 was fitted to a covariance matrix created from the correlations and standard deviations of Table 1,2 and 3. In testing the proposed model, the overall fit of the hypothetical structural equation model of the data were examined. This tests whether the conceptually supported path specification offers a reasonable representation of the theoretical process that underlies the variables.

The sample variance-covariance matrix and the population variance-covariance matrix predicted by the model did not differ significantly, indicating an acceptable overall fit of the model ($\chi2$ (1, N = 900) = 2.79, p = 0.07). The Adjusted Goodness of Fit Index (AGFI) = 0.97, Comparative Fit Index (CFI) = 0.98, Parsimony Goodness of Fit Index (PGFI) = 0.03, and Root-Mean-Square Error of Approximation (RMSEA) = 0.05 (LO90 = 0.00 and HI90 = 0.13) were among the other fit indices that were also looked at. All of these indices' values are within the recommended ranges, indicating an overall excellent model fit (Hu & Bentler, 1999).The impacts of teacher training, teaching experience, lesson planning, lesson presentation, and lesson evaluation on students' physics achievement are represented by the structural equation model and the standardized estimates of the path coefficients is presented in Figure 2.

Research Question 3: Given a consistent model, what are the estimated total, indirect, and direct causal effects between the variables?

The next step is to determine the statistical significance of each of the proposed direct and indirect effects if the model has achieved an overall good fit. Regarding the direct effects, the hypothesis that the estimate = 0.00 cannot be rejected unless the z-value, the test statistic, is greater than ±1.96. Table 4, 5 and 6 shows the coefficients of the proposed direct, indirect and total pathways.

Table 4: Direct Path coefficient of Physics Achievement Model

To Lesson Presentation	
Teacher qualification	-0.015
Teaching experience	0.118
Lesson note preparation	0.503*
To Lesson Evaluation	
Teacher qualification	0.161
Teaching experience	-0.114
Lesson note preparation	0.460*
Lesson presentation	0.388*
To Physics Achievement	
Teacher qualification	-0.053
Teaching experience	0.24
Lesson note preparation	0.281
Lesson Presentation	0.034
Lesson Evaluation	0.344*

Note* Path coefficient is significant at $p < 0.05$

Table 5: Indirect Path coefficient of Physics Achievement Model Effects

Indirect effect on Evaluation through Lesson Presentation	
Teacher qualification	-0.0058
Teaching experience	0.045
Lesson note preparation	0.195
Indirect effect on Physics Achievement through Lesson Presentation	
Teacher qualification	-0.0005
Teaching experience	0.0040
Lesson note preparation	0.017
Indirect effect on Physics Achievement through Lesson Presentation	
Teacher qualification	0.055
Teaching experience	0.040
Lesson note preparation	0.158
Indirect effect on Physics Achievement through lesson Presentation and Evaluation	
Teacher qualification	-0.002
Teaching experience	0.015
Lesson note preparation	0.067

Table 6: Total Effect

On Evaluation through Lesson Presentation	
Teacher qualification	-0.021
Teaching experience	0.164
Lesson note preparation	0.698
On Physics Achievement through Lesson Presentation	
Teacher qualification	-0.015
Teaching experience	0.122
Lesson note preparation	0.520
On Physics Achievement through Evaluation	
Teacher qualification	0.216
Teaching experience	0.158
Lesson note preparation	0.618
On Physics Achievement through Lesson Presentation and Evaluation	
Teacher qualification	0.371
Teaching experience	0.472
Lesson note preparation	0.908

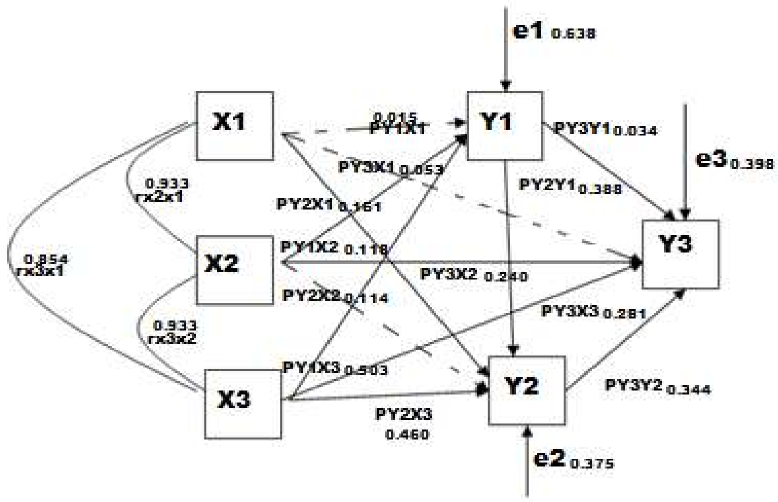

Figure 2: Structural model of the Antecedent, mediator and the criterion variables

Structural equations for the model above are:

sub structure 1: Y1 = 0.503 X1 + 0.118 X2 - 0.015 X3 + e 1

sub structure 2: Y2 = 0.460 X1- 0.114 X2 + 0.161 X3 + 0.388Y1 + e 2

sub structure 3: Y3 = 0.281 X1 + 0.240 X2 - 0.053 X3 + 0.344 Y2 + 0.034 Y1 + e 3

DISCUSSIONS

This study's primary objective was to create a causal model that would account for the hypothesis that the skill of the teacher in presenting and evaluating lessons could act as a mediating factor between the effect of experience and training on students' physics achievement. These findings are in line with the findings of other research, including those of Mayer Mullens and Moore (2000), Adeyemi (2008), and Allen (2010). Mayer Mullens and Moore (2000) stated that having a well-qualified teacher in every classroom is the most important factor in improving students' achievement. They also stated that good teaching is enhanced when teachers teach in the field in which they are trained and have more than a few years of experience. In their study, Rowan, Correnti and Miller (2002) reported a positive relationship between students' achievement in Physics and teachers with a major in Physics. Adeyemi (2008) indicated that teaching experience and subject matter mastery are crucial.

Adeyemi asserts that pupils instructed by more seasoned educators typically perform at a higher level than their peers instructed by less experienced educators. This is because seasoned educators have mastered the subject matter and developed the classroom management techniques necessary to handle a variety of challenging situations. Adeyemi went on to say that more seasoned educators can focus on the best approaches to impart knowledge on certain subjects to studentss with varying aptitudes and psychological backgrounds.

In support of these findings, Allen (2010) noted that novice teachers frequently voice concerns about not having enough efficient ways to manage students' really disruptive behaviour in the classroom. Akinsolu (2010), Oladokun (2010), Goldhaber and Brewer (2000), and other existing literature provide copious evidence that experienced teachers are more effective than novice ones. For instance, Oladokun found that when it came to learning science process skills, students taught by more experienced teachers outperformed those taught by less experienced teachers. According to Akinsolu's (2010) research, educators who devote more time to both study and teaching tend to be more effective overall. They also acquire higher order thinking skills that help them meet the requirements of a varied student body and ultimately improve student performance. The results of this investigation are consistent with those of earlier studies.

CONCLUSION

The study's results showed that the teacher experience, teaching qualification, and lesson preparation and evaluation skill all showed significant relationships, and evidence of a mediating effect between these factors and students' physics achievement.

RECOMMENDATIONS

Government, policy makers, educators and schools should make concerted efforts in employing competent, effective and efficient teachers to teach Physics in secondary schools in Nigeria.

Conflict of Interest: The authors declared no conflict of interest.

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Notes on the Authors

Fagbenro Waliu Ayoola is a Senior Lecturer in the Department of Science Education, Federal University Wukari. He holds a PhD degree in Educational Measurement and Evaluation with background in Physics. He is a member of Association of Educational Researchers and Evaluators of Nigeria; Nigeria Institute of Physics. His research area focuses on improving learners experiences in physics classroom.

Bulus Tangsom Comfort is a Master degree holder in Physics Education. She is currently a staff of Department of Science Education, Federal University Wukari. She is a member of Teacher Registration Council of Nigeria; Nigeria Institute of Physics. Her research area focuses on modelling of teacher characteristics for improving learners experiences in physics classroom.

Authors Level of Contribution:

Fagbenro waliu Ayoola drafted the proposal, developed the items in conjunction with the second author, participated in data collection and carried out the analyses

Bulus Tangsom Comfort proof read the work, refined the work for publication, participated in item development, data collection and data interpretation

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