



An Investigation of the Relationship Between Teachers' Teaching Experience, Classroom Practices and Students' Achievement in Senior Secondary School Physics

Titilayo A. Ajadi

Department of Science and Technology Education, University of Ibadan, Nigeria

Corresponding Author: adeoyeta@yahoo.com

Abstract

In this paper, the author examined the relationships between teaching experience, classroom practices, and students' achievement in physics. Forty senior secondary school physics teachers and 1125 senior secondary school Physics students were randomly selected from forty senior secondary schools (SSS) in Ogun and Oyo States, Nigeria. Two instruments were used to collect data: Teacher-students Interaction Observation Schedule (Cronbach alpha = 0.63), and Physics Achievement Test (KR-20=.84). The result of Pearson Product Moment Correlation Coefficient among teaching experience has the highest relation with lesson preparation ($r=.44$, $p<.05$), 80% have a direct causal effect while 20% of the variables have an indirect effect on students' achievement in Physics. Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), and Comparative Fit Index (CFI) are 1.00 respectively. All these are perfect which reflects a good model fit. Results showed that there was a significant relationship between teacher's teaching experience, classroom practices and students' achievement in physics. However, it was, therefore, recommended that teachers with requisite characteristics can impact students' achievement.

Keywords: Teaching Experience, Physics education, Students' achievement in physics.

Introduction

Physics is the study of matter, energy and their interaction. It is vital to any country's scientific and technical growth and plays a fundamental part in man's progress. Technology refers to a person's ability to change materials and tools with skills to shape and transform the physical world to fulfil their needs. Physics is one of the most fundamental courses in the science curriculum, and it lies at the heart of most technological developments. Because there is a positive association between physics and technology, as well as economics and industrial development, it provides an exciting intellectual edge in a technological society (Adegoke, 2011).

Man's reliance on technology demonstrates the importance of physics. In other words, physics-based technologies are the indices of development for every country (American Physics Society [APS], 2011). Cell phones, motorized equipment, and computers are just a few instances of world-changing physics-based technology breakthroughs. Other sciences, such as chemistry, geography, oceanography, seismology, and astronomy, rely on physics skills. It's a must for careers in engineering, medicine, and pharmacy. Other areas, such as chemical biology, agricultural science, medicine, astrophysics, and cosmology, benefit from it. The principles of upper and lower atmosphere physics employed in environmental

research have aided in the prevention of natural disasters. Physics is critical to our understanding of the world around us, the world inside us, and the world beyond, according to the American Physics Society (APS) (2001). It is the most fundamental science, and it tests our ability to think and imagine.

Despite the importance of physics in a nation's pursuit for technological growth, enrolment and performance figures in the West African Examinations Council (WAEC) and National Examinations Council (NECO) senior secondary certificate examinations fall short of expectations. The government, educators, and scholars in the field of education are all concerned about this (Adegoke, 2010; Nwagbo, 2006; Iroegbu, 2004; Okebukola, 2002). Evidence from the literature in Nigeria indicates that students' achievement in the subject at public examinations such as the Senior Secondary School Certificate Examinations (SSSCE) decreases yearly, though it improved in some years from 2007 to 2014 (May/June) (51 per cent in 2010, 64 per cent in 2011, 69 per cent in 2012, and 60 per cent in 2014), this time, the pass percentage was average, although low performance was seen in 2007, 2008, 2009, and 2013, with 43 per cent, 48 per cent, 48 per cent, and 47 per cent, respectively.

When a teacher supervises class activities, he or she impacts students by offering commands and asking questions that encourage students to

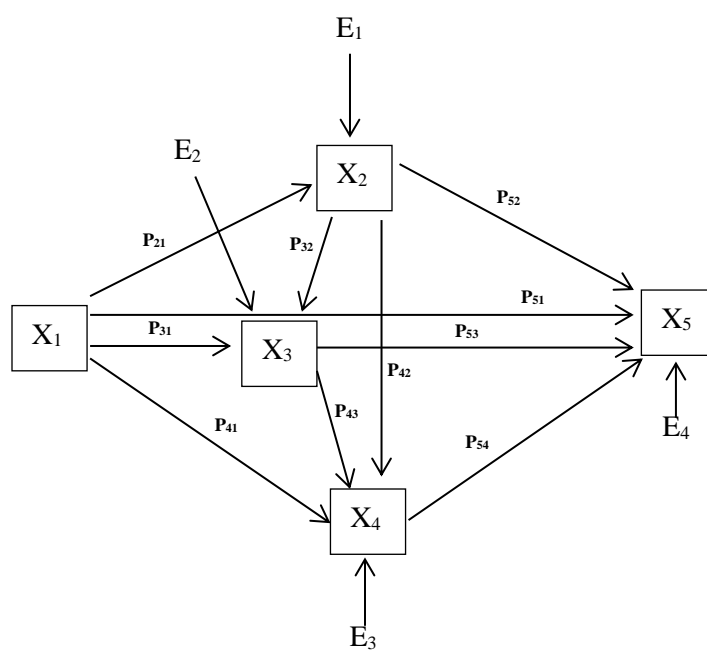
participate, as well as sparking students' attention through classroom demonstrations (Kuti, 2006). Physics classes will attract students' interest, and they will no longer regard the topic as abstract or difficult. As both teacher and students work in engaging and conducive teaching-learning classroom activities, students will have more relevant learning experiences and better time management (Ajadi, 2017). Many strategies that are related to the material being taught are used in teaching. Teacher variables (such as gender, job satisfaction, attitude toward work, teaching experience, qualification, teaching methods, pedagogical content knowledge, classroom practices – lesson preparation, presentation, communication, development, content mastery, classroom organization, and lesson evaluation) may have a significant impact on students' physics achievement. The focus of this study was on instructor teaching experience as well as specific classroom practices.

Other studies on classroom interaction, on the other hand, have come up with different outcomes. According to Alexander (2000) found that teachers interaction affects learning. Teachers can assist their students in overcoming academic challenges by focusing on solutions that make content relevant to the intended audience, increasing student participation and teacher-student interactions in the classroom, and encouraging conceptual understanding over rote memorization of facts (Okoronka, 2004). Classroom teaching skill directly influenced students' achievement (Smith & O'Neil, 2003). There is a need for more research on the impact of student-teacher interaction mechanisms on students' physics achievement (Yore, 2000). As a result, classroom teaching and learning activities include a variety of tasks such as lesson preparation, lesson introduction, presentation of lesson content, and evaluation. The teacher provides the lesson's concepts in the lesson note step by step throughout the planning stage. The oral questioning-and-answer approach is one of the techniques used to increase and maintain students' attention in the lecture. It not only functions as a tool for guiding pupils through the lesson but also as a means of transitioning from one stage to the next (Olaoye, 2005). Some of the questions and suggested solutions must be written in the lesson note by the teacher. Provision should be made for the use of relevant instructional resources and logical presentation of the topic using an acceptable method(s) of teaching during the introduction and presentation of the lesson (Ajadi, 2017).

The literature study revealed that a teacher's year of teaching experience affects students' achievement; however, the pattern of effects through moderators such as classroom practice in preparation, subject introduction, and lesson presentation has not been well investigated.

A major significance of the study is that it will point out the extent to which teachers' teaching experience can influence teachers' classroom practices in lesson preparation, introduction, and presentation and consequently enhance students' achievement in physics learning.

Figure 1: Recursive Path Model of Teaching Experience and Students' Achievement in Physics



Key: X₁ = Teaching Experience; X₂ = Lesson Preparation; X₃ = Lesson Introduction; X₄ = Lesson Presentation; X₅ = Students' Achievement in Physics.

Research Questions

To guide this study, three research questions were answered.

1. What is the magnitude and direction of the correlation among variables of teacher teaching experience, classroom practices (preparation, introduction, and presentation) and students' achievement in physics?
2. What are the fit indices of the hypothesised model for teacher teaching experience, classroom practices (preparation, introduction, and presentation) and students' achievement in physics?



3. What are the estimated direct, indirect, and total causal effects among the variables?

Methodology

The research adopted the correlational research design because it aimed at establishing the relationship between the teacher teaching experience, classroom practices and students' achievement in physics. Using simple random sampling technique, twenty schools were chosen from Ogun and Oyo state, resulting in a total of forty senior secondary schools (SSS2) with a total of 1125 students and forty Physics teachers participated in the study. Students (aged 15-17⁺) were sampled, with 67 per cent of boys and 33 per cent of girls, and Physics teachers in each sampled school were surveyed. The sampled physics teachers ranged in age from 34 to 53 years old, with males accounting for 61 per cent and women for 39 per cent. In this investigation, the researcher used and created two instruments. Teacher Students Interaction Observation Schedule (TSIOS) ($r = 0.78$) and Physics Achievement Test (PAT) ($r = 0.88$) are the Teacher-Students Interaction Observation Schedule and Physics Achievement Test, respectively. The TSIOS included two sections: Section A had five items on teacher gender, teacher qualification, class observed, time lesson started, and time lesson stopped, and Section B had five items on teacher gender, teacher qualification, class observed, time lesson started, and time lesson stopped. Section B had 20 questions covering four aspects of the teaching-learning process: preparation, introduction, development, and evaluation. Section B measured teacher qualification as NCE = 1; HND = 2, B.Sc. (Physics + Education) = 3; Master Degree in Physics = 4; PhD (Physics + Education) = 5 and scored as Poor = 1, Fair = 2, Good = 3; Very Good = 4 and Excellent = 5. PAT was used to assess students' intellectual ability in seven senior secondary school physics areas. A total of 40 items were used, each with a four-point response structure. Using a table of specifications, the test items were created based on the first three domains of cognition (knowledge, comprehension, and application). To establish the association and test the hypothesized

model among the variables, the data were analyzed using Pearson Product Moment Correlation with SPSS and AMOS 23.

Results

Data analysis employed a matrix of Pearson product-moment correlation coefficients, presented in Table 1 among the teacher teaching experience; classroom practices (preparation, introduction, presentation) and achievement in physics (criterion) scores were calculated.

Table 1: Correlation Matrix and Descriptive Statistics of the Variables

S/ N	Variables	Texp	Prep	Intro	Pres	Pachi
1	Experience (Texp)	-				
2	Preparation (Prep)	0.44*	-			
3	Introduction (Intro)	0.22*	0.44*	-		
4	Presentation (Pres)	0.21*	0.10*	0.33*	-	
5	Physics Ach. (Pachi)	0.14*	-	0.07*	0.21*	-
	N	1125	1125	1125	1125	1125
	Mean	2.72	13.20	14.04	10.19	31.87
	SD	1.32	1.71	1.87	1.48	3.63

* Significant at, $p < .05$

Table 1 shows that the relationship between students' achievement in physics and each of the predictors was high, except for introduction (0.07, $p < .05$). Also Table 1 shows that there was very good relationship between teacher teaching experience and lesson preparation (0.44; $p < .05$); introduction (0.22; $p < .05$), presentation (0.21; $p < .05$) and physics achievement (0.14; $p < .05$). The table also shows a fair relationship between introduction and students' achievement in physics (0.07; $p < .5$). The relationship between classroom practices in lesson preparation, introduction, and presentation was also good. These relationships explain that teachers' teaching experience is related to teachers' classroom practice.

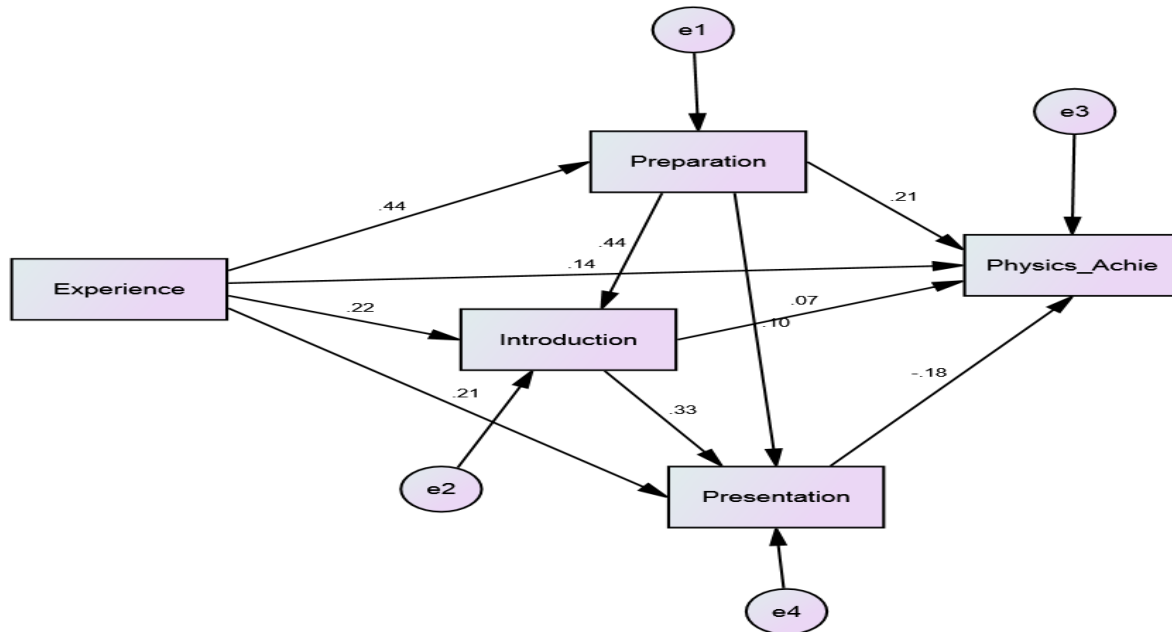


Figure 2: Structural Model of the antecedents, mediators and the criterion variables Results.

The overall fit of the model was satisfactory $\chi^2(0, 1125) = .00, p < .05$. This indicates non-significant differences between the sample variance-covariance matrix and the population variance-covariance matrix implied by the model. Other fit indices were also examined including Root-Mean-Square Error of Approximation (RMSEA) = .32 (LO₉₀ = .31 and HI₉₀ = .34), Adjusted Goodness of Fit Index (AGFI) = 1.00, Comparative Fit Index (CFI) = 1.00, and Goodness of Fit Index (GFI) = 1.00. All the values of these indices overall satisfactory model fit (Hu & Bentler, 1999). The structural equation model and the standardised estimates of the path coefficients of the effects of teacher teaching experience, lesson preparation, introduction, and presentation on students' achievement in physics are presented in Figure 2.

Direct Effects

The second phase in model testing is to analyse the statistical significance of each of the hypothesised direct and indirect effects if the model has achieved an overall good fit.

Table 2: Direct, Indirect and Total Effect of the Path Coefficients of the Physics Achievement Model

Paths	Direct Effect (β)	Indirect Effect	Total Effect
To Lesson Preparation (Prep)			
Teaching	0.44*	0.00	0.44*
Experience (Texp)			
To Lesson Introduction (Intro)			
Teaching	0.22*	0.19*	
Experience (Texp)			0.41*
Preparation (Prep)	0.44*	0.00	
			0.44*
To Presentation (Pres)			
Teaching	0.21*	0.18*	0.39*
Experience (Texp)			
Preparation (Prep)	0.10*	0.15*	0.25*
Introduction (Intro)	0.33*	0.00	0.33*



To Physics Achievement (Pachi)

Teaching Experience (Texp)	0.14*	0.05*	0.19*
Preparation (Prep)	0.21*	-0.01	0.20*
Introduction (Intro)	0.07*	-0.06*	0.01
Presentation (Pres)	-0.18*	0.00	-
TOTAL	1.98	0.50	0.18*
			2.48

* Significant at $p < .05$

Table 3: Proportion of Direct and Indirect Effect of Variables on Student Achievement in Physics

Effect	Frequency	Percentage
Direct	1.98	80%
Indirect	0.50	20%
Total	2.48	100%

Table 3 shows the result that 80% of the causal effects among years of teaching experience, lesson preparation, lesson introduction, lesson presentation, and students' achievement in physics are direct while 20% of the causal relationship among the variables in the model is indirect. This result is in line with the recommendation that variables in the model should be directly influenced by the criterion variable than for the effects to be indirect (Kerlinger and Lee, 2000).

Indirect Effects

The product of direct and indirect impacts is used to calculate indirect effects statistically (Kline, 2005). They can also be simply understood as path coefficients. For example, the product of the standardised coefficients for the following routes is used to assess the standardised indirect influence of teacher qualification on physics achievement: (Texp to Prep) (Prep to Pachi) + (Texp to Prep)(Prep to Intro)(Intro to Pres)(Pres to Pachi) + (Texp to Prep)(Prep to Pres)(Pres to Pachi) + (Texp to Intro)(Intro to Pachi) + (Texp to Intro)(Intro to Pres)(Pres to Pachi) + (Texp to Pres)(Pres to Pachi). In numerical terms this equals $(0.00)(-0.01) + (0.00)(0.00)(0.00)(0.00) + (0.00)(0.15)(0.00) + (0.19)(-0.06) + (0.19)(0.00)(0.00) + (0.18)(0.00) = -0.0114$. Therefore, indirect effect of teaching experience on physics achievement is approximately 0.01.

Discussion

Although there were significant relationships between teachers' year of teaching experience, lesson preparation, lesson introduction, and presentation on students' physics achievement, the results of this study show that there were strong relationships between teachers' year of teaching experience, lesson preparation, lesson introduction, and presentation on students' physics achievement. In this study, the year of teaching experience is the most important component. This research supports the findings of Ajadi (2017), Allen (2010), and Adeyemi (2008), who demonstrated that a teacher's year of teaching experience affects students' performance in secondary school physics. Experienced teachers can focus more on the best ways to teach a specific topic to students with various learning abilities and psychological orientations. These findings back up Akinsolu (2010) conclusion that teachers who spend more time learning and teaching are more effective overall, develop higher thinking abilities for meeting the requirements of different students, and therefore improve their performance and often outperform their peers who lack experience. The availability of professional teachers is critical to the success of any educational venture. This is achievable because qualified teachers have been taught the technical skills required for effective learning in students (Ajadi, 2017).

Conclusion

In secondary schools, experienced teachers with strong classroom methods (preparation, introduction, and presentation) can have a positive impact on student's academic progress.

Recommendations

The following recommendations were made based on the study's findings:

- i. To improve students' academic progress, all secondary school physics teachers should have good classroom practice.
- ii. Teacher recruitment organizations like the Teaching Service Commission and the Ministry of Education are needed to ensure that only academically prepared individuals are hired to teach physics in secondary schools.

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