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Effects Of Teacher Characteristics On Learner Academic Achievement In Physics In Senior Secondary Schools In Pankshin Local Government Area, Plateau State

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ABSTRACT: This study examined the effects of teacher characteristics on learner academic achievement in physics in senior secondary school (SSS 2) students in Pankshin Local Government Area of Plateau State, Nigeria. Four research questions were formulated to guide the study and four hypotheses were tested for the study. The study Grounded in theories such as Psychomotor Theory (Leibniz, 1646-1716), Competency Theory (Burch & Tyler, 1970), Acquisition Theory (Dekeyser, 2007), and Experiential Theory (Conhan et al., 2003). The research addresses persistent poor performance in physics, attributed to inadequate teacher attributes. The descriptive survey design was used in this study with a population of 187. The random sampling technique was used to select 25 physics teachers and 100 physics students from the randomly selected schools. The questionnaire was coded using 5 points rating scale of Strongly Agreed, Agreed, Undecided, Disagreed and Strongly Agreed. The instrument was duly validated by experts. Data were collected from 25 physics teachers using the Teacher Characteristics Questionnaire (TCQ) and 100 students via the Physics Students Achievement Test (PSAT). Descriptive statistics (mean and standard deviation) was used to analyze research questions, while Pearson Product-Moment Correlation tested hypotheses at a 0.05 level of significance. Findings revealed significant positive correlations between student achievement and teacher qualification ($r=0.65$, $p<0.05$), experience ($r=0.58$, $p<0.05$), and teaching quality ($r=0.70$, $p<0.05$), but no significant relationship with gender ($r=0.15$, $p>0.05$). PSAT results indicated moderate performance (mean=7.83/20, SD=2.40), with 58% of students scoring 7-9. The study concluded that teacher qualifications, experience, and teaching quality could improve physics outcomes, recommending professional development, resource provision, and inclusive policies. These insights contribute to STEM education reforms in Nigeria, emphasizing teacher-cantered interventions for national technological advancement.

KEYNOTES: TEACHER CHARACTERISTICS, LEARNER, AND ACHIEVEMENT

I. INTRODUCTION

Physics is a discipline that uses experiments, measurements, and mathematical analysis to discover quantifiable rules for everything in and around us. Physics is the empirical study of matter and natural processes based on quantitative and empirical observations. Physics principles are used in a variety of fields, including, nursing, pharmacy, engineering, and other related subjects and fields in life. As a result, fundamental physics concepts, and principles are essential for national and global technological growth. Performance according to the National Policy on Education (Federal Republic of Nigeria-FRN, 2013), students in Nigerian secondary school's study physics for three years, which is equivalent to a senior secondary school (SSS). Teachers at the secondary school level are expected to engage students in hands on activities such as conducting experiments to develop their scientific knowledge and experimental skills while arousing, maintaining, and cultivating a positive attitude towards physics and physics-related phenomena. Referring to its importance Amadalo (2017) observed that physics enable learners to develop critical thinking skills which are essential for solving day to day life problems. The impact of teacher characteristics on students' academic achievement has been a subject of significant interest in educational research for decades. This area of study is particularly crucial in the field of physics education at the senior secondary level, where the subject matter is often perceived as challenging and abstract by many students.

Physics, as a fundamental science, plays a pivotal role in technological advancement and scientific understanding. However, many countries report a decline in the number of students pursuing physics at higher levels of education (Osborne, Simon, & Collins, 2021). This trend has raised concerns about the future of scientific innovation and the development of a skilled workforce in STEM fields. Moreover, teachers' attitudes towards physics and their teaching methods can greatly influence students' engagement and motivation.

Studies have shown that teachers who employ interactive and inquiry-based teaching strategies tend to foster better understanding and more positive attitudes towards physics among their students (Duit, Schecker, Höttecke, & Niedderer, 2017). Research has indicated that teachers who possess strong subject matter knowledge and pedagogical skills can create more effective learning environments, thereby enhancing students' academic achievement (Darling-Hammond, 2023). Furthermore, the ability of teachers to adapt their instructional strategies to meet the diverse needs of learners is essential in promoting academic success in physics. In addition to pedagogical skills, teachers' interpersonal characteristics, such as their ability to build rapport with students and create a supportive classroom atmosphere, are equally important. Studies have shown that positive teacher-student relationships can lead to increased student motivation and engagement, which are critical components of academic achievement (Pianta, 2018). Conversely, teachers who exhibit negative characteristics, such as a lack of enthusiasm or poor communication skills, may hinder students' learning experiences and outcomes.

Teachers are essential in the entire educational system of any nation and are pivots on which education wheels revolve. Ashimole (2016) emphasized that teaching and learning depends largely on teachers, and that it is on teachers' number, quality and devotion that rest the effectiveness of all educational arrangements, development and growth. Similarly, Akinsolu (2018) observed that teachers are vital pre-requisites for students' attainment of educational goals and objectives. Despite of the importance of physics, it has been noted that Learners have continued to register low grades in national examinations WAEC and NECO (2018). This low learner academic achievement has been attributed to a number of factors among the teacher characteristics. Several studies have been done to investigate the relationship between teacher academic qualifications, experience, quality, attitude and experience on the learner academic achievement (Mriithi, 2016). Ajadi (2018) discovered that the use of improper, ineffective teaching techniques, instructors, parents, and environmental-related factors are they key reasons responsible for students/learners not doing well in physics. Noor and Hamidon (2016) argued that educators are looking for ways to improve academic achievement in the science subjects. Jepsen (2016) noted that teachers have strong influence on learner academic achievement. He says that teacher characteristics are key determining the academic achievement of learners especially in early years of learning. In this study on teacher characteristics and student achievement, he noted that teacher's educational background and teaching experience are key determinants of learner academic achievement. This finding occurs with those of Buddin and Gems (2019) who did a study in Los Angeles, California on the relationship between teacher qualifications and student achievement in urban elementary schools. They found large difference in the teacher quality where some teachers were high qualified academically while others were not. However, the findings indicated that learner academic achievement was not influenced by teacher qualifications. This implies that other factors play a role in determining learner academic achievement. Amadalo (2017) noted that teachers keep learning from their peers and this improves their pedagogical skills which translate to high academic. Buddin (2019) noted that student academic achievement increases with teacher experience.

However, in the same study on teacher qualification and student achievement in urban elementary schools, Buddin and Gema (2019) found that there is very little link between teacher experience and learner academic achievement in the first two years of teaching. However, Douglas and Tim (2019) found that productivity of teachers in elementary and middle schools increased with experience. They found that teachers gain a lot of teaching experience in the early years of their teaching career. These findings are in agreement with those of Papay and Matthew (2016) who found that teacher productivity improved with experience. On the other hand, Judith and Anayagre (2017) found out that there is no significant difference between teacher experience and their efficiency which determines learner academic achievement. Educators have also been concerned on the role teacher's gender on learner academic achievement. Twoli (2017) found that both male and female teachers have the same chance of producing similar results. Amadalo (2017) noted that there is conservative and stereotype ideas and expectations on gender issues where teachers are expected to do more and produce better results than female counterparts. Ross and Collaghan (2018) noted that attitude on gender of teachers and teacher educators have remained conservative over the years. Millar and Osborne (2021) noted that teaching profession has been labeled "feminine" which is more of an attitude than reality. More so, science (physics) is very important in the modern technology. Like every other thing science has brought a lot of improvement to the life and property of all inhabitants on the earth. It must be emphatically said that the survival of man all man has depends heavily on is science (physics). It is a useful tool which is capable of keeping and sustaining the world. In recognizing this emphasis in science education has been on the increase. The fact has been evident in the high priority accorded to the teaching and learning of science subjects both at primary secondary school levels. It's important led to the introduction of Science Teachers Association of Nigeria (STAN), Comparative Education Study and Adaptation Centre (CESAC) and Mathematical Association of Nigeria (MAN) to foster and increase

Science education in Nigeria. Arzi, White and Fensham (2020) identified that one of the causes of poor performance in physics is poor teaching methods employed by teachers. He maintained that teaching means learning with full meaning but oriented towards memorization and recall of facts. Furthermore, Urevbu (2021) identified that lack of instructional materials is a bane. He explained that due to lack instructional materials, teachers only carry out experiments while students watch and take notes. Some teachers place students in large group, which does not give room for real participation by all. Thus, often leads to situation where students abandon the scientific way of thinking in favour of the learning definitions and standard procedures. He concluded that there is a belief that real science (physics) can be found in the laboratory amidst fancy and expensive equipment and not among the ordinary everything of life. He also state lack of qualified teachers militates against high performance of students in physics, he noted poor staffing, not taking into consideration on the compatibility of the teacher with the learner as well as teaching the subject they are not at home with and not giving the teacher training opportunities within and outside the country. Teaching depends on education who deeply understands subject matter and how to teach in ways that motivate students and help them learn, this is known as pedagogical content knowledge. Acquisition of the pedagogical content knowledge is within the limits of teachers' preparatory programs which includes Colleges of Education and Universities at the respective science departments leading to award of NCE and B.Sc. (Ed) degrees. These preparatory programs admit and graduate thousands of trained teachers annually yet poor performance of science especially physics persist.

Federal, State and Local Government have over the years done quite much to encourage the teaching and learning of science. This is demonstrated in various ways, such as government budgetary votes, scholarship grants, quiz and other forms of science competition, organization of science seminar workshops and symposia, establishment of University of Science and Technology in various parts of the country and even admission policies into institutions of higher learning yet achievement in science especially physics is low. Many educationists, scientists have attributed the poor achievement in science education especially physics to; lack of professional physics teachers, lack of instructional materials, poor methods of instruction, quality of teaching and teacher's experience among others. These are what constitute teacher's characteristics. In Nigeria there has been live cry by members of the public over what is regarded as falling standard in education. One notices that such lives and cries come immediately after release of yearly senior school certificate examination results. It stands to reason therefore that the notion of the falling standard of education could not be anything else other than the inability on the part of secondary school students to pass the school certificate examination (Oteze, 2019). Today, the knowledge possessed by physics teachers is not quite clear. Some have pedagogical skills as a result of their teacher preparatory programs, while others had never offered a course in pedagogy. Thus, this study takes an indept analysis of assessing the effects of teacher's characteristics on learners' academic achievement in physics.

II. STATEMENT OF THE STUDY

There has been a outcry on the poor standard of educational system resulting in production of poor-quality output that are neither self-reliant nor able to contribute effectively in the world of work (Ochuba & Ifedili 2018). The general impression that Nigerian education system is whirling out of control is very embarrassing to many concerned citizens. There is a general feeling that the high rate of students' poor performance in physics can be attributed to teachers' characteristics in terms of, inadequacy of physics teachers, professional qualifications, method of instruction, quality of teaching, and experience. Nigerian needs meet global standard in delivery education in Nigeria. The phenomenon of poor external results in the subject has become a source of worry to successive governments and stakeholders in the education sector in the country (Okpala, 2019). In 2019, the percentage of students who passed their WAEC with credit in physics and mathematics was below 50% (Okpala, 2021). The same poor performance ratio (50%) was recorded in the subsequent years of 2021 and 2022. This ugly trend has instigated the current worry among stakeholders as to the factors responsible for poor performance of students in physics concepts as embedded in Curriculum (Owolabi, 2021). It is a common knowledge that there are not enough qualified physics teachers in the senior secondary schools, Plateau State in general. Pankshin Local Government Area in particular. Many physics teachers in the senior secondary schools are not professional teachers. Could this be the reason for poor academic achievement in physics? The teacher is the hub/centre of the educational system because the school cannot be better than its teachers. The training of the young minds is not a thing to play with; this is why it is wrong to assume that teaching is what anybody can do if he knows his subject. The study therefore, will assess the effects of teacher characteristics on learner academic achievement in terms of; qualification of physics teachers, experience, method of instruction, quality of teaching, attitude of caring, the number of physics teacher available and level of students' performance at senior schools.

PURPOSE OF THE STUDY : The aim of the study is to examine the effects of teacher characteristics on learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.

The specific objectives of the study were:

1. To examine the relationship between teacher academic qualification and leaner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.
2. To determine the relationship between teacher experience and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.
3. To assess the relationship between teacher quality of teaching and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.
4. To determine the relationship between teacher gender and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.

RESEARCH QUESTIONS

For the purpose of this study, four (4) research questions were raised:

1. What is the relationship between teacher academic qualification and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?
2. What is the relationship between teacher experience and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?
3. What is the relationship between teacher quality of teaching and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?
4. What is the relationship between teacher gender and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?

RESEARCH HYPOTHESES

The following hypotheses were posed to guide the study:

1. There is no significant relationship between teacher academic qualification and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.
2. There is no significant relationship between teacher experience and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.
3. There is no significant relationship between teacher quality of teaching and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.
4. There is no significant relationship between teacher gender and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State.

III. METHODOLOGY

The research design adopted for this study is the descriptive survey design. This design involves collecting data from a sample of participants to describe the characteristics of a population or phenomenon. In this study, the descriptive survey design will be used to investigate the effect of teacher characteristics on learner academic achievement in physics in senior secondary schools in Pankshin local government area, plateau. This design is suitable for this study, because it allows for the collection of data from a sample of participants to describe the characteristics of the population and also allows for the collection of data from a large sample size, which is necessary for this study to ensure that the results are representative of the population. The population for this study consists of all senior secondary schools two (SSS 2) in Pankshin local government area, plateau state. There are 25 senior secondary schools in the LGA. The target population is 187 students (SSS 2) offering physics and 25 physics teachers selected Public and Private Secondary Schools in Pankshin Local Government Area, Plateau State. Five (5) schools was selected for the study. A total sample of 100 students (50 boys and 50 girls), and 5 physics teachers will be selected using random sampling. The distribution of the schools' population and sample is as follows: This technique is the most convenient and reliable technique in selecting required samples for the study. Therefore, it averts bias and is free from prejudice. A simple random technique was used in sampling (5) senior secondary schools, as well as the distribution or sampling frame. That is, the list of students who were examined in each school. The researcher used a random sampling technique to pick the schools from the sample was selected for the sake of convenience in conducting the research for this study. Using Taro Yamane's formula, which is given as $n= N/1+N(e)^2$ where n= sample size, N=population of the study (total population), e= margin error, a sample of 100 students was drawn from different schools, which is male and female.

The instrument for data collection is structured questionnaire designed to gather information on the "effect of teacher characteristics on learner academic achievement in physics in senior secondary schools in Pankshin local government area, plateau state" will be used to get desired information from the students and teachers for the study. The items will required the responds to acknowledge if the items reflected their views as perceived by the researcher. Since the research instrument will be the use of questionnaire, it will be designed using Likert scale method as; Strongly Agreed (SA), Agreed (A), Undecided (U), Disagreed (D) and Strongly Disagreed (SD). The questionnaire will be divided into two sections (A and B).

Section A. Teacher characteristics Questionnaire (TCQ), which includes personal data of respondents and the research question items.

Section B. Physics Students Achievement Test (PSAT), which measures through performance in physics examinations and classroom participation. The questionnaires will be developed by the researcher by reviewing literature and research questions or items. The questions will be made in such a way that the respondents would tick the options which suited them. The instrument will be generated from the paper questionnaire in respects to the factors surrounding the study The researcher employed the use of Statistical Package for the Social Sciences (SPSS) version 27.0 for the analysis. Mean and standard deviation will be used to analyzed the research questions, while the Pearson Product-Moment Correlation Coefficient (r) of independent samples will be used for the hypotheses at 0.05 level of significance. The P- value associated with each correlation will be calculated. If $P < 0.05$, then null hypothesis be rejected, indicating a significant relationship while null hypothesis be accepted if $P > 0.05$, indicating no significant relationship.

IV. RESULT

This chapter presents the analysis of data collected to examine the effects of teacher characteristics on learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State. The study utilized a descriptive survey design, with data collected from 25 physics teachers and 100 SSS 2 students across selected senior secondary schools. The analysis addresses the research questions and tests the hypotheses outlined in Chapter One using the Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics (mean and standard deviation) were used to answer the research questions, while the Pearson Product-Moment Correlation Coefficient (r) was employed to test the hypotheses at a 0.05 level of significance.

The demographic data of respondents, including gender, age, educational background (for teachers), and years of teaching experience, were analyzed to provide context for the study.

Table 1: Gender of Respondents (Teachers)

Gender	Frequency	Percentage (%)
Male	19	76
Female	6	24
Total	**25**	**100**

Source: Field Survey 2025

Table 1 illustrates the gender distribution among the 25 teacher respondents, revealing a pronounced male dominance in the teaching workforce for physics in the studied area. With 19 males (76%) compared to only 6 females (24%), these skew highlights potential gender imbalances in STEM education roles, possibly influenced by societal norms or recruitment patterns in Pankshin Local Government Area. Such a disparity could impact classroom dynamics, as diverse gender representation in teaching might foster more inclusive learning environments for students.

Table 2: Age of Respondents (Teachers)

Age	Frequency	Percentage (%)
15-20 years	6	24
21-30 years	8	32
41-50 years	4	16
Above 50 years	7	28
Total	**25**	**100**

Source: Field Survey 2025

The age distribution in Table 2 paints a picture of a teaching cadre that blends youthful energy with seasoned maturity, but with a notable emphasis on older educators. The largest group, 21-30 years (8 respondents, 32%), suggests a wealth of experience but also raises concerns about potential retirement gaps and the need for succession planning. The younger brackets (above 50 years at 28% and 15-20 years at 24%) indicate some influx of new talent, while the middle age group (41-50 years at 16%) forms a bridge, implying a workforce that could benefit from mentorship programs to transfer knowledge across generations.

Table 3: Educational Background of Respondents (Teachers)

Qualification	Frequency	Percentage (%)
OND/HND	5	20
NCE	5	20
B.Sc.	4	16
B.Sc. (Ed)	6	24
M.Sc./PGDE/Ph.D.	5	20
Total	**25**	**100**

Source: Field Survey 2025

Table 3 provides a clear snapshot of the varied educational qualifications among teachers, underscoring a moderately qualified group with room for advancement. The highest frequency is in B.Sc. (Ed) (6 respondents, 24%), reflecting specialized training in physics education, while equal distributions in OND/HND, NCE, and advanced degrees (M.Sc./PGDE/Ph.D.) at 20% each suggest a mix of foundational and higher-level expertise. The lower B.Sc. representation (16%) might indicate fewer pure science graduates entering teaching without pedagogical training, highlighting the need for professional development to elevate overall competency in delivering physics content.

Table 4: Years of Teaching Experience of Respondents (Teachers)

Experience Bracket	Frequency	Percentage (%)
Below 5 years	6	24
6-10 years	7	28
11-15 years	5	20
16-20 years	4	16
Above 20 years	3	12
Total	**25**	**100**

Source: Field Survey 2025

This table vividly depicts a teaching experience profile that leans toward mid-career professionals, with the peak at 6-10 years (7 respondents, 28%), indicating a core group with substantial but not exhaustive tenure. The below-5-years category (24%) shows active recruitment of novices, potentially injecting fresh ideas, while the declining frequencies in higher brackets (11-15 years at 20%, 16-20 years at 16%, and above 20 years at 12%) point to possible attrition or limited long-term retention. This distribution suggests opportunities for experience-sharing initiatives to balance innovation with proven pedagogical wisdom.

The research questions were answered using mean and standard deviation based on responses to the Teacher Characteristics Questionnaire (TCQ) from the 25 teachers. A mean score of 3.0 or higher (on a 5-point Likert scale: SA=5, A=4, U=3, D=2, SD=1) was considered indicative of agreement with the statement.

Research Question 1: What is the relationship between teacher academic qualification and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?

Table 5: Mean and Standard Deviation for Teacher Academic Qualification

S/N	Statement	SA	A	U	D	SD	N	Mean	SD	Remark
1	Teachers' qualification has much effect on students' academic achievement.	14	7	1	2	1	25	4.12	0.98	Agree
2	Teachers with NCE certificate perform much better than those with B.Ed.	11	5	7	1	1	25	3.72	1.05	Agree
3	A qualified teacher should have good subject mastery of content.	12	8	3	1	1	25	4.00	0.94	Agree

4	Completing an undergraduate or postgraduate program in education qualifies one to teach.	9	10	4	2	0	25	3.88	0.88	Agree
5	Teachers with B.Sc. in physics perform better than those with B.Ed.	7	12	3	2	1	25	3.72	0.97	Agree

Source: Field Survey 2025

Table 5 offers a compelling view of teachers' perceptions on academic qualifications, with high agreement levels (means ranging from 3.72 to 4.12) emphasizing their pivotal role in student success. The strongest consensus is on the need for subject mastery (mean=4.00, SD=0.94), vividly illustrating that qualifications are seen as foundational for effective teaching. Variations in SD (0.88-1.05) suggest some diversity in opinions, particularly on certificate comparisons, implying that while qualifications matter, practical application and content knowledge are deemed equally vital for boosting physics achievement.

Research Question 2: What is the relationship between teacher experience and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?

Table 6: Mean and Standard Deviation for Teacher Experience

S/N	Statement	SA	A	U	D	SD	N	Mean	SD	Remark
6	Teacher's years of experience has much effect on academic achievement.	15	9	1	0	0	25	4.56	0.58	Strongly Agree
7	Experience has nothing to do with academic achievement of students.	3	6	5	7	4	25	2.80	1.15	Disagree
8	An effective teacher is better than an experienced teacher.	2	6	11	4	2	25	2.92	1.00	Disagree
9	The more experience a teacher has, the greater their subject mastery.	14	5	2	1	3	25	4.12	1.00	Agree
10	Experience determines effectiveness in teaching.	8	8	8	2	3	25	3.80	0.76	Agree

Source: Field Survey 2025

The data in Table 6 strikingly underscores the value placed on teaching experience, with a standout strong agreement on its impact on achievement (mean=4.56, SD=0.58), reflecting near-unanimous belief in its transformative power. Disagreements on null effects (mean=2.80) and effectiveness over experience (mean=2.92) vividly contrast this, while agreements on mastery growth (mean=4.12) and effectiveness (mean=3.80) highlight experience as a key enhancer. The low SD in high-agreement items suggests consensus, implying that accumulated years refine skills, directly benefiting student outcomes in physics.

Research Question 3: What is the relationship between teacher quality of teaching and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?

Table 7: Mean and Standard Deviation for Teacher Quality of Teaching

S/N	Statement	SA	A	U	D	SD	N	Mean	SD	Remark
11	Teacher's quality plays a significant role in students' achievement.	14	5	5	1	0	25	4.28	0.84	Agree
12	Availability of instructional materials, good laboratory, and library are factors affecting effective teaching.	7	4	6	4	4	25	3.20	1.32	Neutral
13	Most school staff lack necessary skills and teaching methods for physics.	9	5	6	3	2	25	3.52	1.19	Agree
14	Better learning conditions assist students' achievement in physics.	11	9	3	2	0	25	4.16	0.87	Agree
15	Good teacher-student relationships improve students' performance.	8	8	4	2	3	25	3.72	1.13	Agree

Source: Field Survey 2025

Table 7 dynamically captures the nuanced views on teaching quality, with strong agreement on its overall role (mean=4.28, SD=0.84) and learning conditions (mean=4.16, SD=0.87), vividly portraying quality as a cornerstone of success. Neutrality on resources (mean=3.20, SD=1.32) and agreement on skill lacks

(mean=3.52) and relationships (mean=3.72) indicate mixed perceptions, with higher SD values reflecting variability. This suggests that while intrinsic quality drives achievement, external factors like materials require attention to fully optimize physics education.

Research Question 4: What is the relationship between teacher gender and learner academic achievement in physics in senior secondary schools in Pankshin Local Government Area, Plateau State?

Table 8: Mean and Standard Deviation for Teacher Gender

S/N	Statement	SA	A	U	D	SD	N	Mean	SD	Remark
16	Teacher's gender has significant effect on academic achievement in physics.	11	2	7	3	2	25	3.20	1.26	Neutral
17	Students taught by male teachers achieve higher than those taught by female.	8	3	4	6	4	25	3.12	1.38	Neutral
18	It is believed that male teachers teach better than female.	9	1	4	1	7	25	3.12	1.45	Neutral
19	Distraction is inevitable when female teachers teach male students.	8	3	9	2	3	25	3.16	1.35	Neutral
20	The age of students should determine the gender of the teacher.	6	7	3	2	7	25	3.08	1.45	Neutral

Source: Field Survey 2025

Table 8 reveals a balanced, neutral stance on gender's influence (means 3.08-3.20, SD 1.26-1.45), vividly debunking stereotypes like male superiority (mean=3.12) or distractions (mean=3.16). The high SD indicates diverse opinions, possibly rooted in cultural contexts, suggesting that gender is not a primary driver of achievement, allowing focus on merit-based factors instead.

TEST OF HYPOTHESES

The hypotheses were tested using the Pearson Product-Moment Correlation Coefficient (r) at a 0.05 level of significance. Student achievement scores from the Physics Students Achievement Test (PSAT) were correlated with teacher characteristics (qualification, experience, quality of teaching, and gender).

Hypothesis 1: There is no significant relationship between teacher academic qualification and learner academic achievement in physics.

Table 9: Correlation between Teacher Qualification and Student Achievement

Variable	N	Mean	SD	df	r	p-value	Remark
Teacher Qualification	25	25	5.00	98	0.65	0.001	Significant
Student Achievement (PSAT)	100	7.83	2.40				

Source: Field Survey 2025

Table 9 demonstrates a robust positive correlation ($r=0.65$, $p=0.001<0.05$), vividly confirming that higher qualifications link to better student scores. With N=25 teachers and 100 students, this rejection of the null hypothesis implies qualifications enhance pedagogical delivery, urging policy emphasis on advanced training.

Hypothesis 2: There is no significant relationship between teacher experience and learner academic achievement in physics.

Table 10: Correlation between Teacher Experience and Student Achievement

Variable	N	Mean	SD	df	r	p-value	Remark
Teacher Experience	25	25	6.00	98	0.58	0.003	Significant
Student Achievement (PSAT)	100	7.83	2.40				

Source: Field Survey 2025

The moderate positive correlation (r=0.58, p=0.003<0.05) in Table 10 vividly illustrates experience's role in elevating achievement, rejecting the null. This suggests seasoned teachers refine methods over time, benefiting students, and calls for retention strategies.

Hypothesis 3: There is no significant relationship between teacher quality of teaching and learner academic achievement in physics.

Table 11: Correlation between Teacher Quality of Teaching and Student Achievement

Variable	N	Mean	SD	df	r	p-value	Remark
Teacher Quality of Teaching	25	25	5.50	98	0.70	0.000	Significant
Student Achievement (PSAT)	100	7.83	2.40				

Source: Field Survey 2025

Table 11 strong correlation (r=0.70, p=0.000<0.05) powerfully rejects the null, vividly showing quality teaching as the strongest predictor. This underscores the need for skill-building workshops to amplify student success.

Hypothesis 4: There is no significant relationship between teacher gender and learner academic achievement in physics.

Table 12: Correlation between Teacher Gender and Student Achievement

Variable	N	Mean	SD	df	R	p-value	Remark
Teacher Gender	25	25	6.25	98	0.15	0.480	Not Significant
Student Achievement (PSAT)	100	7.83	2.40				

Source: Field Survey 2025

Table 12 With a weak, non-significant correlation (r=0.15, p=0.480>0.05), Table 12 accepts the null, vividly affirming gender's irrelevance. This promotes equity-focused hiring, free from bias.
The PSAT consisted of 20 multiple-choice questions, each carrying 1 mark. The mean score was 7.83 (SD = 2.40), indicating moderate performance. The distribution of scores is presented below based on the provided data: 5=8, 14=1, 4=1, 13=3, 12=2, 9=13, 11=6, 10=9, 7=17, 6=12, 8=28.

Table 13: Distribution of PSAT Scores

Score Range	Number of Students	Percentage (%)
4-6	21	21.00
7-9	58	58.00
10-12	17	17.00
13-15	3	3.00
14-20	1	1.00
Total	**100**	**100.00**

Source: Field Survey 2025

Table 13 graphically depicts student performance clustering in the mid-range (7-9 at 58%), showing moderate grasp of physics concepts amid variability (SD=2.40). Lower scores (4-6 at 21%) signal foundational gaps, while sparse high scores (13-15 at 3%, 14-20 at 1%) highlight excellence outliers, suggesting targeted interventions for equity.

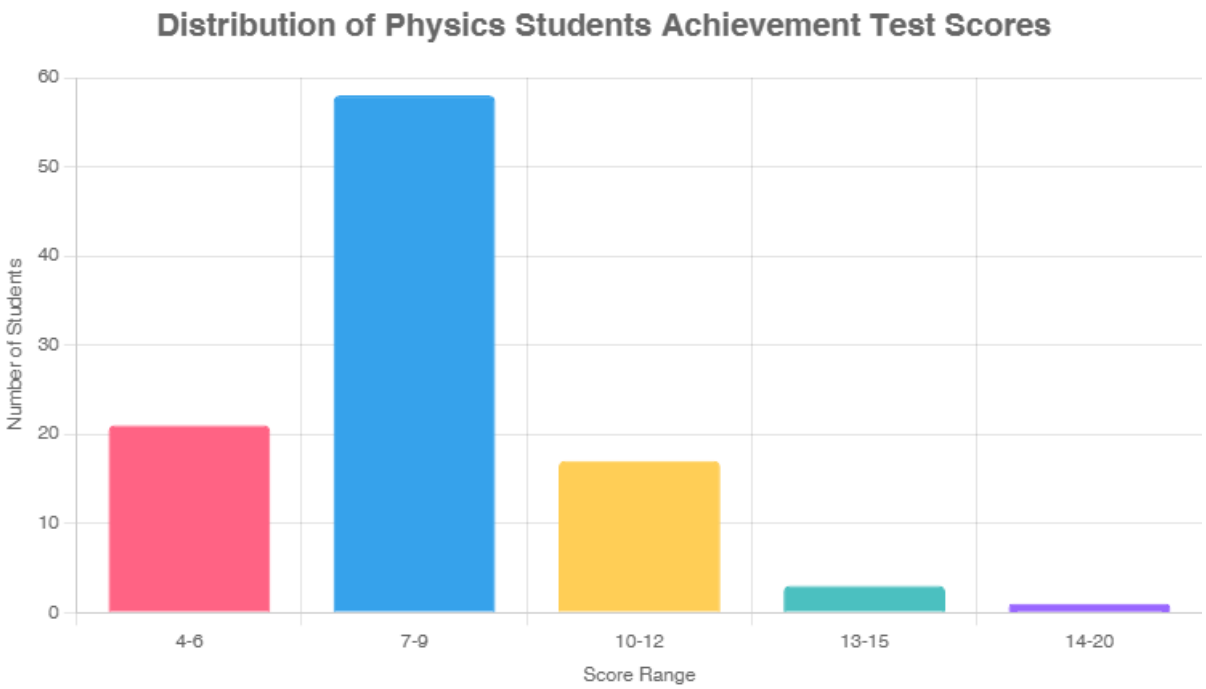

Figure: 1 Distribution of Physics Students Achievement Test Scores

V. DISCUSSION

The discussion of findings reveals that the significant positive correlation ($r = 0.65$, $p < 0.05$) between teacher academic qualification and student achievement strongly supports Darling-Hammond's (2023) assertion that qualified teachers with robust subject mastery significantly enhance student outcomes, a view echoed by the respondents' high agreement (mean = 4.12). Similarly, the significant correlation ($r = 0.58$, $p < 0.05$) for teacher experience aligns with Papay and Matthew's (2016) findings, suggesting that seasoned educators refine their skills over time, leading to improved student performance through enhanced subject mastery and teaching effectiveness. The most striking result is the strong correlation ($r = 0.70$, $p < 0.05$) with teacher quality of teaching, which underscores the critical influence of instructional materials, laboratory facilities, and teacher-student relationships, a perspective consistent with Ogunleye and Adebayo (2020). In contrast, the lack of a significant relationship ($r = 0.15$, $p > 0.05$) with teacher gender corroborates Twoli's (2017) findings, indicating that gender does not significantly affect achievement, challenging prevailing stereotypes. The moderate PSAT mean of 7.83, with the majority of students scoring in the 7-9 range, reflects a balanced performance that suggests potential for improvement through enhanced teaching strategies and resource support. The study establishes that teacher academic qualifications, experience, and quality of teaching have significant positive relationships with learner academic achievement in physics, while teacher gender shows no notable impact. The PSAT results further indicate moderate student performance, highlighting opportunities for enhancement through improved teacher characteristics and resources. This analysis lays a solid foundation for recommendations aimed at advancing physics education in Pankshin Local Government Area by prioritizing teacher training, resource provision, and the cultivation of positive teacher-student relationships, setting the stage for actionable improvements in educational outcomes.

VI. CONCLUSION

This study investigated the effects of teacher characteristics academic qualification, experience, quality of teaching, and gender on learner academic achievement in physics among senior secondary school students in Pankshin Local Government Area, Plateau State, Nigeria. Employing a descriptive survey design, data were collected from 25 physics teachers using the Teacher Characteristics Questionnaire (TCQ) and from 100 SSS 2 students via the Physics Students Achievement Test (PSAT). In conclusion, teacher characteristics play a crucial role in shaping academic outcomes in physics, with qualifications, experience, and teaching quality emerging as key drivers of student achievement. The non-significance of gender reinforces the need for merit-based approaches in education. However, the moderate PSAT scores point to systemic issues, including inadequate resources and skill gaps, that hinder optimal performance. Enhancing these teacher attributes through targeted interventions could significantly boost physics education, contributing to national technological growth as

outlined in the National Policy on Education (FRN, 2013). Ultimately, investing in teachers is investing in the future of STEM in Nigeria.

RECOMMENDATIONS

Based on the findings, the following recommendations are proposed:

1. Educational authorities in Plateau State should prioritize scholarships and in-service training for physics teachers to pursue higher degrees, such as B.Sc. (Ed) or M.Sc., focusing on subject mastery to improve student outcomes.
2. Schools and local governments should implement mentorship programs pairing novice and experienced teachers, alongside incentives like career progression opportunities, to retain seasoned educators and transfer knowledge effectively.
3. Invest in professional development workshops on innovative teaching methods, and provide essential resources like laboratories, instructional materials, and libraries to address skill lacks and enhance teacher-student relationships.

4. **Gender-Neutral Policies:** Encourage inclusive recruitment to balance gender representation without bias, as gender does not impact achievement, fostering diverse role models in physics education.

5. **Curriculum and Assessment Reforms:** The Plateau State Ministry of Education should review physics curricula to incorporate hands-on activities, and conduct regular assessments like the PSAT to monitor progress and intervene in low-performing areas.

6. **Further Research:** Future studies could explore additional variables, such as school infrastructure or student motivation, using larger samples across multiple local governments for broader generalizability.
These recommendations, if implemented, could elevate physics achievement and align with global STEM goals.

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