

TEACHERS' CHARACTERISTICS AND SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN PHYSICS

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ABSTRACT

This study investigated the influence of teachers' characteristics on students' academic achievement in physics in Uyo L.G.A., Akwa Ibom State, Nigeria. A descriptive survey research design was used in this study. All secondary school physics teachers and physics students in Uyo formed the population of the study. The random sampling technique was used to select 200 physics teachers and 200 physics students from randomly selected schools. Expert judgments were used to ensure the face and content validity of the instruments. The reliability coefficients of the instruments were 0.78 and 0.83 for the Teachers' Questionnaire and Physics Achievement Test, respectively, using the test-retest method and Cronbach's alpha. Data were analyzed using percentages, multiple regression, and analysis of variance (ANOVA) at the 0.5 level of significance. The result showed that teachers' characteristics significantly influenced students' academic achievement ($F = 31.851, P < 0.05$). It was therefore recommended that a proper teacher education reform that will concentrate on the standards a teacher must possess before teaching or going into the teaching profession be enforced.

KEYWORDS: Teachers' Characteristics, Academic Achievement, Physics.

Introduction

Physics is the study of matter, energy, and the interactions between them. Physics asks fundamental questions and tries to answer them by observing and experimenting. The physicists attempt to describe the interaction with the most fundamental and general law or principle possible. The aim of physics is to understand how nature works by applying scientific methodologies and to understand the most fundamental principles of nature: matter and energy and how they interact. It was as a result of the recognition given to physics in the development of the individual and the nation that it was made a core subject among the natural sciences and other science-related courses in the Nigerian education system. Its inclusion as a core subject in science in secondary schools calls for the need to teach it effectively. This is because effective science teaching can lead to the attainment of scientific and technological greatness. Physics teaching can be result-oriented when students are willing to learn, teachers are favourably disposed to teach, and learning is made enjoyable for students. With the current increase in scientific knowledge all over the world, much demand is placed on the teacher, and emphasis is laid on their role. The educational analysis carried out in Nigeria by the National Economic Empowerment and Development Strategy (NEEDS, 2005) indicated that more than forty-nine percent (49%) of the teachers in Nigeria are unqualified. This revealed the quality of teachers teaching various school subjects in our secondary schools, and physics teachers would probably be among the said forty-nine percent.

Teacher's qualification (TQ), teacher's gender (TG), and teacher's years of experience may be responsible for the downward trend in achievement observed in the biology results of students. The achievement of students in biology is reported to be heavily influenced by their teachers' years of experience. Kile (2013) defined teaching experience as all activities undertaken by the teacher in his pre- and post-teacher training exercises. It includes participation in professional development activities geared towards equipping the teacher for better service delivery. This aspect of teacher characteristics has not been given adequate attention because it is a general belief that anyone who can talk convincingly will do well as a teacher, regardless of whether he or she has experience in pedagogy. However, Omotayo (2019) found a positive correlation between teachers' experiences and students' learning outcomes. Imogie and Johnson (2018) identified some areas of teacher experience, such as pedagogical studies, content studies, instructional technology, and post-teaching training, among others. Recent studies show that a teacher with both content knowledge and instructional ability achieves a higher percentage of students' learning outcomes than teachers without such experience.

Another factor that affects students' academic achievement is the teacher's gender. In his contribution, Cochran (2017) claimed that teachers are among the most, if not the most, significant factors in children's learning. The question is, "What aspects of the teacher exactly have meaning with respect to the students' learning outcome?" Aelterman (2007) claimed that, so far, clear differences exist between male and female teachers. On the other hand, Li (2009) found that teaching is imbued with gender. Some other researchers found that a teacher's gender does have some influence over students' academic achievement. How and to what extent a teacher's gender can affect the students' learning process will also depend on a series of relationships, which may include a student's age, cultural characteristics, and other social conditions that vary from culture to culture. Studies have shown that students' motivational orientations typically change with age (Cochran, 2017). In the early primary grades, teachers would likely be the targets of students' emotional projections. During adolescence, however, students are likely to distance themselves from teachers and other adults, that is, their own parents inclusive. The influence of a teacher's gender can therefore develop differently in secondary school (16–19-year-olds) than it does in primary school (6–12-year-olds).

Statement of the Problem

The phenomenon of poor external results in the subject has become a source of worry to successive governments and major 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 fifty percent (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 the poor performance of students in physics and their inability to understand physics concepts as embedded in the curriculum (Owolabi, 2021). Outside Nigeria, a similar trend of poor achievement in physics has been observed (Oliver, 2019; Swatton and Taylor, 2018). The poor achievement indicates that students have learning difficulties in acquiring physics skills. The evidence from these studies seems to suggest that physics classrooms may not be providing students with adequate skills to enhance their performance in the subject. Given the persistent decline in the academic

achievement of secondary school students, instead of looking into the general and specific causes of declines, some, most of the time, castigate school-related factors, especially those that are teacher-related. A functional education system, however, depends on the adequacy of some indispensable teacher characteristics. This study therefore examined the influence of teachers' characteristics (qualification, years of experience, and gender) on the academic achievement in Physics of some selected schools in secondary schools in Uyo Local Government Area of Akwa Ibom State.

Research Questions

1. What are the perceived teacher characteristics that can influence the teaching of Physics in the selected schools?

Research Hypotheses

H₀₁: There is no significant influence of teacher characteristics on students' achievement in Physics

H₀₂: There is no significant gender difference on students' academic achievement in Physics.

Research Methodology

The study adopted a descriptive survey design. The area of the study was the Uyo Local Government Area. The population comprised all teachers teaching physics within Uyo L.G.A. of Akwa Ibom State, Nigeria. Twenty (20) schools were randomly selected from the selected local government areas. A total of 10 biology teachers were randomly selected from each selected school. This makes the total number 200. Two research instruments designed by the researchers was used for this research work. They were the Physics Achievement Test (PAT) and Teachers' Questionnaire (TQ). Some physics specialists were given the instrument to ascertain the content and face validity. The Cronbach's alpha test and test re-test method was used to ascertain the reliability of the Teachers' Questionnaire (TQ) and the Physics Achievement Test (PAT). They were found to be 0.78 and 0.83, respectively. Data were analyzed using percentages, multiple regression, and analysis of variance (ANOVA).

Result

Result Question One: What are the perceived teacher characteristics that can influence the teaching of Physics in the selected schools?

Table 1: Teachers' Qualification (A)

Teacher's Qualification	Strongly Agree		Agree		Disagree		Strongly disagree	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Teacher's qualification has much effect on student's academic	190	95.0	8	4.0	2	1.0	0	0

Teachers with NCE certificate perform much better than those with B.Ed. certificate	7	3.5	11	5.5	51	25.5	13.1	65.5
A qualified teacher should have good subject mastery of the content he/she is teaching	187	93.5	10	5.0	1	.5	2	1.0
Once an individual completes an undergraduate degree or post graduate programme in education he/she is qualified to be a teacher	150	75.0	41	20.5	8	4.0	1	.5
It is believed that teachers with B.Sc. in physics can perform better than teacher with B.Ed. In Physics	16	8.0	4	2.0	14	7.0	166	83.0
Science is not static; therefore, teacher's qualification should not be static rather it should be upgrading to meet up with trends	146	73.0	39	19.5	2	1.0	13	6.5
For a teacher to be qualified to teach physics he/she must have done two to three researches in science education.	137	68.5	52	26.0	8	4.0	3	1.5

Source: Field survey, January, 2023

The qualifications of teachers teaching a subject are very important in this study. 95% of the sampled teachers alluded to this. About 91% disagreed with the statement that teachers with NCE certificates perform much better than those with a BSc.Ed. certificate. This affirms the findings of Mallise (2006), who stated that it is a must for a teacher to have good academic degrees such as Bachelors, Master's, Doctorate and others but not two years qualifications such as a diploma, etcetera. Furthermore, the mastery and grasp of a teacher on a subject matter is a function of his or her qualification; 93% of the teachers agreed to this.

The finding also showed that teachers who studied education with physics (BSc.Ed. Physic) would perform better in teaching than those with a B.Sc. qualification alone. This is in accordance with the findings of Festus (2019), which asserted that teachers who study education with physics (i.e., BSc.Ed. Physics) or other science-related courses stand a better chance of performing better than those with an ordinary B.Sc.

qualification because of the orientation and training that they have received during their years of study in colleges of education and universities. Respondents also largely agreed and opined that in order to be continuously relevant, teachers need to continue to build on their experiences through training and higher degrees, as well as conducting research relevant to their field.

Table 2: Teachers' Years of Experience (B)

Teacher's Qualification	Strongly Agree		Agree		Disagree		Strongly disagree	
	Frequency	%	Freq uency	%	Freq uency	%	Freq uency	%
Teacher's years of experience has much effect on the academic achievements of students in Physics	174	87.0	15	7.5	5	2.5	5	2.5
Experience has nothing to do with academic achievements of students	19	9.5	8	4.0	16	8.0	15	78.0
Experienced teachers are considered to be more able to concentrate on the most appropriate way to teach particular topics to students who differ in their abilities, prior knowledge and backgrounds.	160	80.0	7	3.5	4	2.0	28	14.0
The more the teachers know about students, the better the teachers can connect with them and the more likely they will be able to benefit from the teachers' experience in reconstructing their world.	178	89.0	10	5.0	2	1.0	9	4.5
An effective teacher is better than an experienced teacher.	28	14.0	8	4.0	47	23.5	11	58.0

The more the experience of a teacher is, the more the rate of his/her subject mastery will be.	176	88.0	3	1.5	4	2.0	16	8.0
Experience determines effectiveness in teaching.	179	89.5	8	4.0	6	3.0	6	3.0

Source: Field survey, January, 2023

87% of the teachers strongly agreed that teachers' years of experience has much influence on the academic achievement of Biology students. This is in accordance with Festus (2019) who opined that the more frequent one engages in an activity, the better one becomes in that activity.

89% of the teachers believe that the more the experience of a teacher is, the more the rate of his/her subject mastery will be. This finding matches the assertion of Gibbons (2007) which observed that most students taught by more experienced teachers achieve at a higher level, because the teachers have mastered the content and acquired classroom management skills to deal with different types of classroom problems.

Also, 78% of the teachers affirmed that teachers' experience has everything to do with academic achievement of the students. The sampled teachers also believe that experienced teachers are considered to be more able to concentrate on the most appropriate way to teach taking cognizance of students' abilities, prior knowledge and background.

80% strongly agreed, while 14% disagreed. On the basis of experience and effectiveness, 3.0% of the teachers disagreed that effectiveness of the teachers counts more than experience while 89% agreed to this. This is against the background that experience is said to determine effectiveness in teaching. This result is in accordance with the findings of Clotfelter (2007) who found evidence of growing teacher effectiveness in the analyses of North Carolina teacher data.

Table 3: Descriptive Statistics on Teachers' Gender (C)

Teacher's Qualification	Strongly Agree		Agree		Disagree		Strongly disagree	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Teachers' gender has significant effect on the academic achievement of students in Physics.	69	34.5	4	2.0	79	39.5	47	23.5
Students taught by male teachers achieve higher than those taught by female teachers.	25	12.5	9	4.5	114	57.0	51	25.5

Students that are taught by male teachers performed significantly better than those taught by their female	30	15.0	5	2.5	121	60.5	43	21.5
School girls Are seducers, so they should be taught by female	30	15.0	20	10.0		30	15.0	20
It is believed that male teachers teach better than	52	26.0	67	33.5		52	26.0	67
Distraction is inevitable when female teacher teaches male students	118	59.0	51	25.5		118	59.0	51
The age of the students should determine the gender of the teacher that will be teaching them	162	81.0	4	2.0	10	5.0	23	11.5

Source: field survey, January, 2023

Opinions were slightly different on the idea that gender has significant effect on the academic achievement of students in physics. About 35% of the teachers sampled agreed with this, while 63% disagreed or strongly disagreed with it. The teachers affirmed negatively also, though without any obvious reasons, that when students are taught physics by only male teachers, they perform a lot better than when taught by female teachers; about 82% disagreed with this. This result correlates with the experiment carried out in Germany in 2006 on the effect of gender differences on students' academic performance in the first three years of college (Hutchings, 2008). At the end of the experiment, he noticed that male teachers had more zeal to teach than the female teachers.

Teachers also largely that only female teachers should teach female students since these female students are thought to be seductive, about 75% disagreed while about 25% agreed. On the other hand, teachers felt that distractions will be more when female teachers teach male students. About 85% of the teachers agreed/strongly agreed with this, while 14% disagreed. This is at variance with the findings of Cochran (2003), which showed that a well composed teacher in terms of dressing, either male or female, will teach successfully without distractions. The age of the students being taught was also seen as a major factor that determines the gender of the teacher that teaches physics.

Testing of Research Hypotheses

H01: There is no influence of teacher characteristics on students' achievement in Physics

Table 4: Table of Relationship between Teacher Characteristics and the Dependent variable

Model	Sum of Squares	Df	Mean Square	F	Sig	R	R Square
Regression	16.103	3	5.368	31.851	.000 ^b	.573 ^a	.329
Residual	32.862	195	.169				
Total	48.965	198					

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	2.881	.367		7.848	.000
Teachers' Qualification	-.119	.019	-.415	-6.289	.000
Teachers' Years of Experience	.047	.018	.161	2.663	.008
Teachers' Gender	-.021	.007	-.181	-2.823	.005

The test shows that teachers' qualification teachers' years of experience and teachers' gender have significant influence on students' academic achievement. The coefficient of correlation was 0.573 indicating that a moderately strong relationship exists between Teachers' Characteristics and students' academic achievement. This shows that the better the teachers' characteristics, the better the academic achievement and vice versa. Furthermore, the trio accounts for about 32.9% of the relationship.

On the basis of their independent influence, the F result of 31.851, P: 0.000<0.05 shows their influence was independent and it is significant as it is buttressed by the measure of the individual contribution of the three independent variables.

The null hypothesis which says that there is no significant influence of teachers' characteristics on students' achievement was rejected. According to Fafunwa (2003) the only predictor of students' high academic achievements in various school subjects is the teacher's characteristics.

H0₂: There is no significant gender difference on students' academic achievement in Physics

Table 5: Teacher's gender and academic achievement in Physics

	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	.263	1	.263	1.065	.303
Within Groups	48.892	198	.247		
Total Groups	49.155	199			

Tested with analysis of variance, the result shows that there is no significant gender difference on students' academic achievement in physics with an F value of 1.065, p:0.303 > 0.05 at a degree of freedom of 1:198. This implies that the gender of the Physics teacher is not significant in determining the performance of students, hence the null hypothesis is upheld. This finding is at variance with the findings of Afolabi (2007) who claimed that teachers' gender has significant effect on the performance of students in science.

Discussion

The results of this study indicated the importance of the qualifications of teachers. Not only is the qualification important, but having the right qualification as well. Fully prepared and certified teachers are more successful with students than teachers without this preparation (Wilson, 2005). It is not enough to teach physics in secondary schools with a B.Sc. degree in biology without a B.Ed. The educational aspect of the degree is very important for one to be better qualified to impact knowledge. This conforms with the study of Mallise (2006), who discovered that teachers who had graduated from the Kenya Science Teachers College were more practically oriented than those who had degrees from public universities. This was attributed to the excellent instructions given by qualified teachers, in addition to other inputs.

The study showed that experienced teachers play significant roles in the achievement of students in physics. This corroborates the finding of Gibbons (2007), who discovered that experienced teachers have a richer background of experience to draw from and can contribute insight and ideas to the course of teaching and learning than inexperienced teachers. Also, the study agreed with Omotayo (2019) and Bangbade (2004), who confirmed that teacher attributes (teachers' qualifications and experience) and students' academic performances are positively related. Teachers attributes in the first instance influence his or her performance, which in turn enhances students' performances (Omotayo, 2019). The study revealed that these teachers with years of experience in their profession, especially in subjects, turned out students with higher academic performance.

Summary

The results of the study revealed that the qualifications of teachers matter very much if the best is to be seen in any subject. However, it is not enough for the teacher to have a degree. Having the right one is vital. For instance, it is not enough to have a B.Sc. in physics as a teacher. This is because the educational aspect of the degree is important. Those with a B.Ed. are therefore adjudged to be better qualified to impart knowledge.

The level of experience possessed by teachers was also discovered to play a significant role in the achievement of students offering Physics. Students taught by more experienced teachers achieve a higher level of knowledge because their teachers have mastered the content and have acquired the classroom management skills to deal with different types of classroom problems.

Conclusion

Teachers' characteristics have not been given adequate attention because of the general belief that anyone who can talk convincingly will do well as a teacher, regardless of whether he or she has experience in pedagogy. Teachers' years of experience, as revealed by earlier studies, turned out students with high academic achievement because experienced teachers are able to harmonize the minds and emotions of their students in class (Imogie, 2018). He opined that teachers with both content knowledge and instructional ability achieve a higher percentage of students' desired outcomes than teachers without such experience. Seeing that teachers are among the most, if not the most, significant factors in children's learning, teachers' interests should be paramount so that the desired learning outcomes will be achieved maximally in our students.

Recommendations

Teachers qualifications are considered to be related to students' learning, so teachers' qualifications should be a significant target for teacher education reform. Some of these reforms call for the professionalization of teacher education by making it longer, upgrading it to graduate programmes and regulating it through the mechanisms of licensure, certification, and promotion aligned with standards in all secondary schools in Uyo LGA and in Nigeria as a whole.

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