
Influence of Teachers' Characteristics on Academic Achievement of Secondary School Biology Students

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Abstract

The study adopted Ex-post facto design. Sample consisted of 19 teachers and 326 SS2 Biology students. Purposive sampling was used to select all the Biology teachers of SS2 in 19 schools. Instrument for data collection was a researcher developed observational schedule of 35 items divided into two sections. A elicited information on teachers qualifications, years of experience and gender. B had two clusters that elicited information on teachers' interpersonal relationship with students and knowledge of subject matter. The teachers were scored with the instrument as either Yes or No against each of the items in the clusters and the percentage of Yes or No in each cluster determined. A teacher was marked in each cluster Good if the number of entries the teacher was scored Yes were up to 50% or Poor if the number was below 50%. Students' results for 3 terms were collected from the 19 teachers. Mean and standard deviation were used in answering research questions and hypotheses tested at 0.05 level of significance using t- test and ANOVA. Findings reveal that teachers' gender, teaching experience, qualifications, interpersonal relationship with students and knowledge of subject matter influenced students' achievement in Biology. Based on the findings Recommendations were made.

Key words: Teacher characteristics, Biology, Secondary School, Academic achievement

1. Introduction

Teachers are essential in the entire educational system of any nation and are pivots on which education wheels revolve. Ashimole (2011) 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 (2010) observed that teachers are vital pre-requisites for students' attainment of educational goals and objectives. The Federal Republic of Nigeria in the National Policy on Education (FRN, 2006) also recognized the importance of teachers by stating that no nation's education system can be greater than the standard of their teachers. Therefore, teachers remain the major factor in any educational system, and their quality of teaching is undoubtedly one of the most important factors shaping the teaching /learning and achievement of students (Fenstermacher & Richardson, 2005). The teacher is ultimately responsible for translating educational policies and principles into actions based on practice during interaction with the students. Researches abound on contributions of teachers to educational achievements of students (Mushtaq & Kahn, 2012). However, students' academic achievement in both internal and external examinations has persistently been reported low and has always been attributed to classroom characteristics of teachers (Ibe, 2013). Teacher characteristics in this study are those attributes, characters and behaviors exhibited by teachers in the classroom and during teaching and learning process. Teachers' characteristics examined in this study are teacher's Gender, teaching experience, qualification, interpersonal relationship with the students and teachers' knowledge of subject matter. The prevailing conditions of these factors would definitely have a negative or positive influence on the instructional quality in schools, which may translate to either good or poor academic achievement of Secondary school students.

Orlando (2013) listed nine behaviours/characteristics of an effective teacher which are respect for students, creating a sense of community and belonging in the classroom, warm, accessible, enthusiastic and caring, ability to set high expectations for all students, has his own love for learning, a skilled leader, ability to "shift-gears" and flexible when a lesson isn't working, collaboration with colleagues on an on-going basis and maintenance of professionalism. However, the big question is: Do our secondary school teachers of Biology in Nigeria possess these characteristics of an effective teacher? Why has our students' achievement in Biology been persistently reported low? These are the questions/problems addressed in the present study.

Anita (2013) carried out a study on Teacher characteristics and students' academic achievement in Biology in schools in Nandi south district, Kenya. A sample of 20 schools and 20 Biology teachers were purposively selected. Data collected were analysed using descriptive and inferential statistics (SPSS Version 17). Findings revealed that teachers' qualification does not influence students' academic achievement. On the contrary, Thomas (2014) conducted a study on effects of teachers' qualification on students' performance in secondary schools in Ikere Local Government Area of Ekiti state, Nigeria. A sample of 300 students was selected from 16 schools. Data were analysed using mean, standard deviation and t-test. The findings revealed a significant difference in achievement of students taught by teachers whose highest qualifications were National Certificate in Education (NCE) and Bachelors of Science degree in Education. The author recommended that NCE teachers should strive to further their studies while graduate teachers without professional qualification should be encouraged to proceed on Post graduate Diploma in Education to enhance teaching in their special area. It can be seen that there is a disagreement between

Anita (2013) and Thomas (2014) on teacher qualification as a predictor of students' achievement. Research on influence of teacher qualification on achievement of students is therefore inconclusive. For this study five teacher characteristics were considered namely teachers' gender, years of experience, qualification, inter personal relationship with their students and knowledge of subject matter.

2. Research Method

The design of the study is Ex-post facto research design. The sample size of the study consists of 19 biology teachers and their SS2 students that are 326 in number. Nineteen (19) schools were randomly selected out of 31. Purposive sample was used to select all the Biology teachers of SS2 in the 19 schools in Nsukka Local Government Area of Enugu state, Nigeria. Instrument for data collection was a researcher developed observational schedule of 35 items divided into sections A and B. Section A elicited information on teachers qualifications, years of experience and gender. Section B consists of 2 clusters that elicited information on influence of teachers interpersonal relationship with the students and knowledge of subject matter on achievement of students. The teachers were scored with the instrument as either Yes or No against each of the items in every cluster and the percentage of Yes or No in each cluster determined proportionally. A teacher was marked in each cluster Good if the number of entries the teacher was scored Yes were up to 50% or Poor if the number was below 50%. The reliability of the instrument was ascertained using Cronbach Alpha and internal consistencies of 0.803 and 0.852 were obtained for the two clusters and an overall reliability of 0.924 was obtained. SS2 results for 3 terms were obtained from the teachers. Data collected were analyzed using mean and standard deviation in answering the research questions while t-test and ANOVA were used in testing hypotheses at 0.05 level of significance.

The present study used observational schedule in data collection. Data were analyzed using mean and standard deviation while t-test and ANOVA were used in testing hypotheses at 0.05 level of significance.

This study is based on Bandura's social cognitive theory of self- efficacy. Self- efficacy is the belief in one's capabilities to organize and execute the sources of action required to manage prospective situations (Bandura, 1986). It can be seen as the capacity to produce a desired effect. Bandura emphasized that self-efficacy is the very foundation of human motivations and achievement. Bandura's social cognitive theory of self-efficacy was offered in order to improve the current classroom practices as teachers continuously engage students in more of doing science (Biology) for high achievement

The problem of the study:

The teacher holds the 'axis' upon which the world of education rotates. That is why in Nigeria, the National Policy on Education emphasized that 'no educational system can rise above the level of its teachers'. This means that there can be no quality science (biology) education without equipped, prepared and motivated teachers who possess the pedagogical skills, teaching methods, attitudes, work ethics, responsibilities and interpersonal relationships. These are teacher characteristics that are capable of setting up a situation in which learners can learn to learn effectively vis a vis high achievement.

However, there are hues and cries amongst stakeholders in education over the growing rate of failure in science subjects especially and subsequent dropout in the Nigeria secondary schools in recent times. According to WAEC chief examiner's report there has been a downward trend in students' achievement in biology over the years. The results show that for the over one million students per year that registered for Biology, only 35.74%, 35.61%, 33.57%, 33.94% and 33.87% passed at A-C6 level for 2010, 2011, 2012, 2013 and 2014 respectively. Since the teacher is the key implementer of the curriculum and controls what goes on in the classroom, this sorry state of affair on students' achievement cannot be tackled without investigation into teacher characteristics with a view to proffering solutions.

Research questions and Hypotheses

The following research questions guided the study.

1. What is the influence of Teacher's gender on students' classroom achievement?
2. What is the influence of Teacher's teaching experience on classroom achievement of students?
3. What is the influence of Teacher's qualification on classroom achievement of the students?
4. What is the influence of Teachers interpersonal relationship on the classroom achievement of the students?
5. What is the influence of Teacher's knowledge of subject matter on students' achievement?

Hypotheses

The following null hypotheses were posed to guide the study:

HO₁: There is no significant influence of Teacher's gender on students' classroom achievement

HO₂: There is no significant influence of teacher's teaching experience on students' achievement

HO₃: There is no significant influence of teacher's qualification on students' achievement

HO₄: Teachers' interpersonal relationship with the students does not significantly affect students' achievement in Biology.

HO₅: There is no significant influence of teacher's Knowledge of the subject matter and achievement of students'.

3. Literature Review and Theoretical Framework

Biology is important for national development and incidentally serves as foundation for advance learning of professional courses in fields such as medicine, pharmacy, nursing and other allied courses. Biology therefore records the highest number of students when compared to other science subjects (chemistry and physics), and it is offered in secondary schools in Nigeria by both science and non- science majors. Considering the importance of the subject, the poor academic achievement in Biology should therefore be a thing of serious concern to the nation. The study investigated the Influence of Teachers' characteristics on academic achievement of secondary school Biology students.

Onyia (2010) emphasized that schools should exist to ensure productive learning. This implies that the teacher should not only possess the relevant required characteristics for

effective teaching, but should also equip the student with the enablement to transfer and utilize learning practically and meaningfully towards productivity.

Effective teaching in today's knowledge-intensive and information-technology-driven world demands Biology teachers that are competent in the possession of:

- Adequate knowledge of goals; philosophy of Science (Biology); subject matter content; inquiry based interactive teaching strategies; appropriate and authentic comprehensive assessment strategies; interest and needs; improvisation and adequate Information and Communication Technology (ICT) skills as well as other life skills such as science process and entrepreneurial skills.
- Ability to create conducive classroom environment where students will be given the opportunity to manipulate materials, discuss results, take rational decisions, relate their constructed ideas to societal needs and hence develop the capability of solving problems in a dynamic society.

Biology classrooms in Nigeria appear to lack teachers that possess characteristics that portray knowledge in the above stated dimensions.

However studies have shown teachers' persistent low acquisition of characteristics and skills that are needed for application of the classroom practices that will induce higher order thinking capabilities, skills acquisition and achievement in the students (Zuelke, 2008; Olayele, 2011 and Onochie, 2013).

Zuelke (2008) carried out a study on the relationships among teacher qualifications, experience, instructional practices and students' science achievement of eighth grade students in the Florida Comprehensive Assessment Test. The population of the study was eighth grade science teachers and their students within two central Florida counties. Teacher participants taught regular education eighth grade science classes during 2006-2007 school years. Data collected via observational notes, interviews and documents were analyzed using constant comparative method. The findings showed no significant difference in the eighth grade mean science achievement scores of students taught by teachers with varying years of experience, qualification and instructional practices. The present study is related to Zuelke (2008) in the independent variables of teacher characteristics considered and the dependent variable (students' achievement). Also, Zuelke's study is similar to the present study in the use of observational schedule as part of data collection instrument. This study deviates from the above study in the research design (Expost-facto/ causal comparative) employed hence the present study investigated teacher characteristics and students achievement in secondary school Biology.

Olayele (2011) studied teacher characteristics as predictor of academic performance of students in Osun state. The study used a survey in investigation of the perception of SS3 students on teachers' characteristics in relation to students' academic performance. Using purposive sampling 16 secondary schools were selected (10 public and 6 private), and 100 SS3 students randomly drawn from each school. Sample size was 1600 students. Questionnaire tagged Teachers' Characteristics and Students Academic Performance (TCSAP) was used to elicit information. Data were analyzed using percentage, Pearson Product Moment Correlation and Chi-square to test the hypotheses. Findings reveal that students' academic performance correlate positively and significantly depending on teachers' attitude to teaching and learning in the classroom, knowledge of subject matter and teaching skills.

4. Results

Research Question one

Table 1 Mean and Standard Deviation on Teacher's Gender and achievement of Students

Teacher's gender	Number	Mean scores of students	Standard Deviation
Male	9	51.18	14.00
Female	10	48.38	16.05

Data on table 1 show that students taught by male Biology teachers had mean score of 51.18 and an SD of 14.00 while those taught by female teachers had mean of 48.38 and SD of 16.05

Hypothesis one:

Table 2 Independent t-test analysis of students' scores based on Teachers' Gender

	T	Df	Sig. (2-tailed)	Decision
Teachers' gender	0.39	16	0.69	Not Significant

Data on table 2 above reveal that the exact probability level of 0.69 is greater than 0.05 at 16 degrees of freedom. There is therefore no significant difference between the mean achievement scores of students taught by male and female teachers

Research Question two

Table 3 Means and Standard deviation scores of Teachers' teaching experience and students' achievement.

Teachers' years of teaching experience	Number	Mean score of students	Standard deviation
1 to 5 years	2	47.48	26.3
6 to 10 years	7	55.16	13.89
11 to 15 years	5	56.46	13.71
Above 15 years	5	55.66	13.38

Mean scores of students taught by teachers' with 1-5 years teaching experience was 47.48. Students taught by teachers with 6-10, 11-15 and above 15 years teaching experience had mean scores of 55.16, 56.46 and 55.66 respectively There is therefore a strong relationship between teachers teaching experience and students' academic achievement

Hypothesis two

Table 4 Analysis of variance (ANOVA) of students' scores based on years of their teachers' teaching experience

	Sum of Squares	Df	Mean Square	F	Sig	Decision
Between Groups	118.99	3	39.67	0.196	0.049	Significant
Within Groups	3028.06	16	201.87			
Total	3147.06	19				

Data above indicate that the exact probability level of 0.049 is less than the already set Alpha level of 0.05 at 3 degrees of freedom. Teaching experience had significant influence on student's achievement.

Research Question Three

Table 5 Mean and Standard Deviation scores on teachers' qualifications and students' achievement

Teachers' qualification	Number of teachers	Mean score of students	Standard deviation
OND/HND/NCE	3	35.23	5.65
BED/B.SC	11	50.35	10.70
MED and above	5	55.11	14.91

Students taught by teachers with OND/HND/NCE had mean score of 35.23. Students taught by teachers that possess BED/B.SC had mean score of 50.35 while those taught by teachers that possess MED and above had a mean of 55.11.

Hypothesis Three

Table 6 Analysis of variance (ANOVA) of the students' scores based on teacher's qualifications

	Sum of Squares	Df	Mean Square	F	Significant	Decision
Between Groups	1075.61	2	537.81	3.029	0.046	Significant
Within Groups	3906.07	22	177.55			
Total	4981.69	24				

Data on Table 6 indicate that the exact probability level of 0.046 is less than 0.05 at 2 degrees of freedom. Educational qualification of teachers had significant influence on students' achievement.

Research Question Four

Table 7 Mean and Standard Deviation scores on Influence of Teachers' inter personal relationship and students' achievement.

Teacher-students relationship	Number of teachers	Mean	Standard deviation
Poor	5	40.30	8.81
Good	14	54.63	13.79

Students taught by teachers with poor interpersonal relationship with students had mean score of 40.30 while those taught by teachers with good interpersonal relationship had mean score of 54.63 and SD of 13.79

Hypothesis four

Table 8 t-test of Students' scores based on Teachers' interpersonal relationship with the students

t- test for equality of means	T	Df	Sig. (2-tailed)	Decision
Teacher-students relationship	-2.7	17	0.014	Significant

The probability level of 0.014 is less than 0.05 at 17 degrees of freedom. Interpersonal relationships of teachers with students significantly influence students' achievement in Biology.

Research Question Five

Table 9 Mean and Standard deviation of students' scores on teachers' knowledge of subject matter and students' achievement in Biology

Teacher's Knowledge of the subject matter	Number of teachers	Mean	Standard deviation
Poor	11	44.01	9.11
Good	8	56.19	15.28

Students taught by teachers with poor knowledge of subject matter in Biology had mean score of 44.01 and an SD of 9.11 while students taught by teachers with good subject matter knowledge had mean of 56.19 and SD of 15.28.

Hypothesis Five

Table 10: t-test of students' scores based on teachers' knowledge of the subject matter

	T	Df	Sig. (2-tailed)	Decision
Teacher's Knowledge of the subject matter	-2.36	17	0.028	Significant

The exact probability level of 0.028 is less than already set alpha of 0.05 at 17 degrees of freedom, hence the null hypothesis of no significant difference is rejected.

5. Discussion of findings

The result of the findings as presented in table 1 show that there is no significant difference between the mean achievement scores of students taught by male and female Biology teachers. This finding is in disagreement with Odunaike, Ijaluola and Amodu (2013) who found that students taught by female teachers achieve better and that female teachers put extra effort in ensuring high standard of performance by students than their male counterparts. The finding agrees with Afolabi (2014) who found out that there is no significant difference between the performances of pupils taught by male or female teachers. As it relates to research question two, there is a strong relationship between teachers teaching experience and students' academic achievement as shown in tables 3 and 4. Teachers develop adaptability through experience and awareness, and experienced teachers are more likely to demonstrate adaptability compared to beginners. Akinsolu (2010) noted that the more a teacher lasts in teaching profession, the more he/she masters the art of teaching and is more effective in handling pedagogical challenges. Consequently with the passage of time, teachers get more command of their subjects and become more competent in the art of teaching through experience and students learn more from experienced teachers than they do from inexperienced ones.

Findings for research question three reveal that educational qualifications of teachers have a significant influence on the classroom performance of the students.

This agrees with the findings of Akinsolu (2010) that a positive correlation exists between teachers' qualification and students' academic performance. Similarly, Ololube (2005) pointed out that teachers require professional knowledge and professional teaching skills, as well as a broad base of general knowledge to function effectively.

Findings for research question four as presented on tables 7 and 8, results show that teachers' interpersonal relationship with students significantly influence students' achievement in Biology. This is in agreement with the findings of Landsford (2005) that interpersonal relationships whether positive or negative in nature, have profound effects on quality of life and achievement of students academically. Good interpersonal relationship with students is a leeway for the teachers' ability to create conducive classroom environment where students will be given the opportunity to manipulate materials, discuss results, take rational decisions, relate their constructed ideas to societal needs and hence develop the capability of solving problems in a dynamic society.

Findings for research question five reveal that Teachers knowledge of subject matter significantly affect students achievement in Biology. This result is in agreement with Taylor (2011) who found that, when combined with time on task, teacher knowledge leads to substantial gains in student learning. Carnoy and Arends (2012) also provided evidence of a positive relationship between teacher knowledge of subject matter and students' achievement.

6. Conclusion

Based on the findings, the following conclusions were made:

1. Gender has no significant influence on students' achievement.
2. Years of teaching experience of teacher has significant influence on students' achievement.
3. Teachers' educational qualifications influence their students' achievement in Biology.
4. Interpersonal relationships of teachers with their students had significant influence on the students' achievement in Biology.
5. Teachers' knowledge of subject matter influences their students' achievement.

Recommendations

Sequel to the findings of this study, the following recommendations were made:

- Government should encourage teachers to remain and grow on the job so that their accumulated experience will provide a leeway for students enhanced classroom achievement and societal development.
- Qualified teachers, irrespective of their Gender should be employed to teach Biology in Secondary schools.
- Government should organize periodic conferences, seminars and workshops to enable teachers' update themselves on knowledge of subject matter and development of teacher characteristics that engender good teacher interpersonal relationships with students.

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