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INFLUENCE OF TEACHER CHARACTERISTICS ON SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE IN CHEMISTRY IN OWERRI MUNICIPAL COUNCIL

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Abstract

The study investigated teachers' characteristics on students' academic performance in chemistry in senior secondary schools in Owerri Municipal Council of Imo State. Teachers' characteristics were based on professional qualification, experience and quality of teaching on students' academic achievement in chemistry. The research design used was the survey research design. One hundred and fifty (150) senior secondary class 2 chemistry students and twenty of their chemistry teachers were randomly sampled from all the senior secondary schools (private and public) in the area of the study. Questionnaire, standardized objective test and teachers' interview were instruments used to collect data. Three hypotheses formulated in the study were tested and analyzed using t-test of independent samples. The result of the study showed that there is no significant difference in achievement in chemistry between students taught by professionally qualified teachers and students taught by non-professionally qualified teachers. Experienced teachers are more effective than the inexperienced teachers because students taught by the experienced teacher performed better than those taught by inexperienced teachers. Teachers' quality of teaching did not influence students' (private and public schools) achievement in chemistry. Recommendations made among others were that monitoring of serving teachers should be intensified to make them more effective in the delivery of their duties and that particularly public school teachers should be encouraged to do their work well by motivating them sufficiently. Some of the perceived anomalies in the result of the study should be further investigated.

Keywords: Teachers, Characteristics, Academic Achievement, Chemistry.

Introduction

Chemistry is the study of nature and properties of all forms of matter as well as substances that make up our environment and the various changes the substances undergo in different conditions. According to (Ojukuru, 2016), all forms of human endeavour and absolutely nothing goes on in the world of science without the involvement of chemistry. The importance and role of science education (especially chemistry) cannot be over-emphasized. Chemistry has long been a traditional part of the academic curriculum in schools and it is usually studied alongside other related subjects, such as biology, physics and mathematics. Of all the science subjects, chemistry is vital for preparing scientists and technologists both at the middle and upper manpower levels. It is one of the basic sciences which are essentially the prerequisite for technological breakthrough.

Buttressing the above point in their observation Adesoji and Olantubosi (2008) stated that within the context of science education, chemistry has been defined as a very important school subject and its importance in scientific and technological development of any nation has been widely reported. They further argued that the effective teaching of science can further lead to the attainment of scientific and technological greatness.

The Impact of teachers on performance in any subject is very high. Teachers are the facilitators in communicating the theories and concepts to students. The teacher is therefore the major manpower saddled with the responsibility of imparting the concept considered fundamental to the advancement of technology through the learning of these basic concepts in the secondary school. This is what Ukah (2019) noted while citing Adeniyi (2001) that a country's manpower development depends on the quality of her well qualified teachers. By implication, the objectives of the educational sector of any country cannot be achieved when the students are taught by incompetent teachers, such teachers would not be able to properly and adequately impart the concepts to the students.

The professional qualities of a well-trained teacher Ajayi (2009) outlined include the following: mastery of the subjects, sense of organization, ability to clarify ideas, ability to motivate students, good imagination, ability to involve students in meaningful activities throughout the period of teaching, management of details of learning and frequent monitoring of students' progress through test and examinations. Many educationists, scientists have attributed the poor achievement in science education especially chemistry to lack of professional chemistry teachers, lack of instructional materials, poor method of instruction, quality of teaching and teachers experiences among others (Ewetan, 2010, Akinsolu, 2010, Daso, 2013, Chhinh, and Tabata, 2003). These are what constitute teachers characteristics. Various other studies conducted have also itemized what constitute teacher characteristics and listed them as follows: teacher professional qualifications, methods of instruction, teaching experience, quality of teaching, teachers' instructional knowledge, teacher representational knowledge, teachers' subject matter knowledge, teachers' evaluation of students understanding (Daso, 2013, Akpo, 2012, Odiri, 2011, Ewetan 2010, Akinsolu, 2010, Bressou, Kramarz and Prost, 2008). All these according to them affect student's achievement in chemistry.

Several studies have been carried out to address the issue of influence of teacher characteristics, Igwe (1990) in his study on the influence of teacher qualification on academic performance of students in Kano found out no significant relationship between teachers' qualification and students' performance. The study of Anita, Jairo, Odhiambo and Mary (2012) found out similar result while that of Ogbonna (2015) even though carried out in tertiary institution found out that there is significant relationship between teacher

qualification and students' academic performance in science education. Ojukwu (2016) found out that poor method of teaching and lack of experience are the causes of students' poor performance in chemistry. Asikhia (2010) observed that teachers' qualification and students' environment do not influence poor academic performance. Sulton (2011) stated that having a very effective teacher rather than an average teacher raises each pupils' attainment. Corroborating this, Temitope and Olabanji (2015) stated that better students' results are indicators of experience and effectiveness of teachers.

Still on the issue of the teacher as a factor that affects students' academic performance, Akpo (2012), examined the impact of teacher-related variables on students in Junior Secondary Certificate Mathematics in Nambia and found out that the teachers educational qualification, teaching experience, subject specialization, standard-based professional development, standard-based classroom activities and classroom managerial beliefs are related to students' academic achievement in junior school certificate mathematics. Daso, (2013), on teacher variables and senior secondary school achievement in mathematics in River State Nigeria, reported that there is a significant relationship between teachers' methods of teaching, teachers' attitude, teachers' quality and students' achievement in mathematics. Ayodele and Ige (2012) examined the relationship between utilization of teachers and students academic performance in senior secondary schools in Ondo State, Nigeria and found out that effective utilization of teachers rather than mere availability impacts students' academic performance. Adeyemi (2008) examined teachers' teaching experience and student learning outcomes in secondary schools in Ondo State Nigeria and observed that teacher teaching experience was significantly related to students learning outcomes, this agrees with the study of Clotfelter, Ladd and Vigdor (2007) who found out that teachers with more experience are successful at raising student scores than their less experienced colleagues. Another strand of literature found out a number of teachers variables which include teachers years of experience, teachers academic attainment or qualification, teachers-students ratio and teacher development programme had no significant influence on students' academic performance (Yaro and Surumo, 2012, Zaki, 1983).

In his study where performance of science students were found to be very poor, Akinola (2006) found out that among factors that contributed to the poor performance were inadequate learning facilities in secondary school which include science equipment and laboratories, shortage of qualified and devoted instructors, lack of ability of students to do well in practical and teaching methodology used by teachers. He explained that due to lack of instructional materials, teachers only carry out the experiment while the students watch and take notes, leading to a situation where students abandon scientific way of thinking in favour of cramming of definitions and standard procedures. This observation of Akinola was contrary to the opinion of Samuel (2017) who was of the view that public schools have what it takes to perform well in national examinations. According to him, they have trained human resources, abundant teaching and learning materials among others, so he wandered why the public schools still trail behind private schools. In their study earlier, Olatoye and Agbatogun (2009) had also reported that there is a significant difference in mathematics and science achievement of public and private school students in which private school students' performed better than their public school counterparts in mathematics and science. Igbinideon and Epumepu (2011) showed that the percentage performance trend of public schools was higher than those of private schools in both males and females in business studies. From both public and private schools outputs, Nigeria needs to meet global standard in her education delivery as a matter of necessity.

It is a common knowledge that there are not enough qualified chemistry teachers in the public secondary schools in Imo State in general and private schools in particular. Many chemistry teachers in the secondary schools are not professional teachers. Could it be the reason for the poor performance in chemistry as queried by Asikhia (2010) and Ojukwu (2016). The teacher is the hub of educational system because the school cannot be better than its teachers. The training of the young minds is not a thing to toy with, and this is why it is wrong to assume that teaching is what anybody can do just because he knows his subject.

In our secondary schools, teachers who are academically qualified (but not professionally qualified) and those who are professionally qualified but not well experienced are involved in teaching and instructional processes. According to Ogbonna (2015), academically qualified teachers are those who have acquired academic training by virtue of enrolment into educational institutions and have obtained qualifications such as HND, B.Sc, B.A, M.Sc, MA and so on, while professionally qualified teachers are those who have obtained academic qualification as well as professional training in education that equipped them with pedagogical knowledge, skills, techniques and aptitudes in teaching learning process from certified educational institutions. Such institutions in Nigeria are the Colleges of Education and Education Departments of universities leading to the award of NCE, B.Sc (Ed), B.A (Ed) and others. These institutions admit and graduate thousands of trained teachers annually yet the poor performance of science subject especially chemistry persists.

Experienced teachers by the definitions of teachers and administrators are those who have taught for many years and by virtue of their experience are able to motivate students and hold their attention, know how to manage their classroom effectively and can change courses in the middle of a lesson to take advantage of unforeseen opportunities to enhance students learning. Along the line of this definition of experienced teachers, Temitope and Olabanji (2015) expressed that in the state school systems, teachers with above ten years experience in teaching profession are classified as experienced teachers while those below ten years in the teaching profession are classified as inexperienced teachers.

From the foregoing, it can be said that in this study area, knowledge possessed by chemistry teachers is not quite clear (giving the fact that most of the studies cited investigating teacher characteristics and student academic performance are not from this area of study). Some of the serving teachers have pedagogical skills as a result of their training while others have never offered any course in pedagogy. Given the importance of chemistry to industrial and technological development, the need to investigate the students academic performance in chemistry based on teachers' characteristics becomes very important. Teachers characteristics which are assessed were those of professional qualification, experience and quality of teaching. These three were investigated to see how they affect students' academic achievement in chemistry as the purpose of this study. Consequently, three hypotheses were formulated to guide the study and tested at 0.05 level of significance. They are:

- There is no significant mean score difference in chemistry performance between students taught by professionally qualified teachers and those taught by non-professionally qualified teachers.
- There is no significant mean score difference in chemistry performance between students taught by experienced teachers and those taught by inexperienced teachers.
- There is no significant mean score difference in chemistry performance of private and public secondary school students and quality of teaching of professionally qualified teachers and non-professionally qualified teachers.

Method

The study employed a descriptive survey design. The population comprised all chemistry students the senior secondary schools in Owerri Municipal Council. Simple random sampling technique with replacement was used to select 5 public senior secondary schools and 5 private senior secondary schools in the study area making a total of 10 senior secondary schools. Fifteen (15) SS2 Chemistry students and 2 of their chemistry teachers were selected from each of the 10 senior secondary schools using stratified random sampling technique. This gave a sample size of 170 (chemistry students 150, chemistry teachers 20). From the sample of 20 chemistry teachers, 12 of them have taught for 10 years and above while 8 have taught for less than 10 years.

The method used in the data collection was a questionnaire titled Chemistry Teachers Teaching Characteristics and Students' Academic Performance (CTTCSAP). Participants were asked 36 questions using a four-point rating scale response format based on the three purposes of the study which are teachers professional qualification, experience and quality of teaching. The four-point rating scale response type options include Strongly Agree (SA) Agree (A) Disagree (D) and Strongly Disagree (SD) with weights as follow 4, 3, 2 and 1 respectively. The reliability of the questionnaire was tested using Cronbach's Alpha coefficient. Cronbachs coefficient Alpha of 0.80 was obtained. This result confirmed high reliability of the instrument. Other sources of data were the students' performance scores in the State Education Management Board (SEMB) end of session's examinations in chemistry and interview with the head of chemistry department of the sampled schools. Data was analyzed using inferential statistics of independent t-test. The analyses of the results are shown in the tables below.

Results

Table 1: t-test of independent analysis of difference in mean score performance of students taught chemistry by professionally qualified teachers and non-professionally (academically) qualified teachers.

Teachers Characteristics	No of students	Mean	SD	DF	T cal	T tab	Sig level	Result
Professionally qualified	79	8.74	5.37	148	1.12	1.96	0.05	Accept
Non- professionally qualified (Academically qualified)	71	7.81	4.92					

By the use of independent t-test statistic as shown in table I above, the calculated value of t-test is 1.12 as against the critical t-test value of 1.96 at 0.05 level of significance and 148 degree of freedom, since the t-cal of 1.12 is less than the t-critical value of 1. 96, the null hypothesis is accepted. Hence there is no significant difference in the mean score performance of students taught Chemistry by teachers who are professionally qualified and those not professionally qualified.

Table 2: independent t-test analysis of the difference in mean score performances in chemistry between students taught by experienced teachers and those taught by inexperienced teachers.

Subject	Teacher years of experience	No of Teachers	Mean	SD	DF	t-cal	t-tab	Sig level	Result
Chemistry	>10 years	12	72.3	8.1	18	3.71	2.101	0.05	Reject
Chemistry	<10 years	8	61.1	5.4					

The result as presented in table 2 above showed that the calculated t value is 3.71 greater than the table t-value which is 2.101. This indicates a significant difference in the achievement between students taught by teachers with above ten years of experience and teachers with ten and less than ten years of teaching experience in chemistry. Hence the null hypothesis rejected while the alternative hypothesis is accepted.

Table 3: Independent t-test analysis of mean score difference in chemistry performances between private and public school students and quality of teaching of professionally qualified teachers and academically qualified teachers.

Variables	No of Students	Mean	SD	DF	t-cal	t-tab	Sig level	Result
Private school	75	13.303	0.646	148	0.450	1.96	0.05	Accept
Private school	75	13.253	0.710					

The result on table 3 shows that there is no significant different in the mean score performances of private and public school students and quality of teaching of professionally qualified and academically qualified teachers. This is because the t-cal of 0.450 is less than the t-tab of 1.96

Discussion

The result of the study as revealed in table 1 showed a no significant mean score difference in the performances of students taught by professionally and non-professionally (academically) qualified teachers (t-cal=1.12 < t-tab = 1.96).

Again there is still no significant mean score difference revealed in Table 3 in the performance of private and public school students and the quality of teaching given to them by professionally and non-professionally (academically) qualified teachers (t-cal = 0.450 < t-tab = 1.96). This implies that teacher professional qualifications and quality of teaching were shown to have no effect on student's academic performance in chemistry. The above finding is in line with the views of many authors who found out that the teacher's academic attainment or qualification has no significant influence on students' academic performance (Yaro and Surumo, 2012, Ayodele and Ige 2012, Zaki 1983). Others who made similar findings in their studies are Igwe (1990) Anita, Jairo, Odhiambo and Mary (2012). The finding of the above researchers buttressed the statement made by Ayodele and Ige (2012) that effective utilization of teachers other than mere availability is what impact students' academic performance. The findings of the present study are not in line with Ogbonna (2015), whose study carried out at the university level found out that there is a significant mean score difference in the performance of students taught by professionally and academically qualified teachers. Professional teachers are supposed to perform better than the non-professional teachers given the pedagogical knowledge, skills, techniques and aptitudes their training is supposed to have equipped them with. The departure from the supposed norm as seen in the finding of this study raises a serious concern about the dearth of impact of professionalism in the teaching of chemistry. It is therefore, either that the professional teachers are not, for whatever constrains, applying the knowledge and skills they are supposed to have acquired through training or their training did not effectively impact the desired professional skills. This is to say but the least worrisome.

On the variable, type of school (private and public) and the quality of teaching that is offered between professionally and non-professionally or academically qualified teachers, a no significant mean score difference confirms the observation of Ayodele and Ige (2012) that what impacts students' achievement/academic performance is effective supervision of

teachers and not mere availability. Generally, the private schools are not known to have many professionally qualified teachers in their staff unlike public schools, yet they compare favourably in performance with the public schools and at times do better than them as found out by the studies of Olatoye and Agbatogun, (2009) and Samuel (2017). A look at the mean and standard deviation value of the just concluded study show that the private school chemistry students did better than the public schools, even though there was no significant mean score difference obtained when subjected to statistical testing. This result points to the generally observed poor performance of our public institutions (the secondary school system inclusive) in quality delivery, which is another cause for concern.

In Table 2, it was revealed that there was a significant mean score difference in chemistry performance between students taught by teachers with above ten years teaching experience and teachers with ten or less than ten years of teaching experience (t-cal= 3.71 > t-tab = 1.96). This by implication means the effect of teachers experience was shown on students' academic performance, with students taught by more experienced teachers performing better than those taught by less experienced teachers. This finding is in agreement with that of Adeyemi (2009) who found out that teachers teaching experience was significantly related to students learning outcome and that of Temitope and Olabanji (2015) who stated that the teachers years of experience is a measure of quality and this becomes imperative in the achievement of students academic performances. These findings also agree with the earlier study of Clotfelter, Ladd and Vigdor (2007) who found out that teachers with more experience are successful at raising students scores than their less experienced colleagues. The result of the interview with the chemistry head of departments of the sampled schools confirmed the above research findings. They stated that the more experienced teachers perform better than the less experienced teachers in the course of relevance, test construction skills and evaluation of knowledge of students understanding. This, they added, makes students taught by the more experienced teachers have an edge over the others in terms of answering examination questions more accurately.

Conclusion

The study was undertaken for the purposes of assessing teachers characteristics namely teachers professional qualification, teachers teaching experience and teachers quality of teaching on students' academic performance in chemistry. Findings resulted to the acceptance of the first and third null hypotheses and the rejection of the second null hypothesis. This showed that in the study carried out, professional qualification of teachers is not a major variable affecting students' performance in chemistry in secondary schools in the area covered by the study because students taught by professionally qualified teachers in chemistry did not perform significantly better than those taught by non-professionally or academically qualified teachers. Similarly there was no significant disparity in the mean score performance of students in the subject under study in private and public schools. This ought not to be the case since public schools are presumed to have more qualified staff than private schools and calls for more studies to further investigate the matter. Lastly, it was found out that the students taught by the more experienced teachers performed better than those taught by the less experienced teachers.

Recommendations

In view of the finding from the work, the following recommendations were made:

1. Monitoring of serving teachers should be intensified to ensure the effective discharge of their duties in the classrooms.

2. Serving teachers especially in the public schools should be properly motivated for effectiveness in service delivery.
3. In-service training and refresher courses should periodically be organized for serving teachers which will help to sharpen them in the exercise of their use of various techniques during teaching and assessment.
4. Government should consider giving very good retired teachers' contract appointment to serve longer in the secondary schools if they are in good health since experience has shown to be vital in the academic performances of students.
5. Some of the perceived anomalies in the result of the study should be further investigated.

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