



## TEACHER FACTORS INFLUENCING SENIOR SECONDARY SCHOOL STUDENT ACHIEVEMENT IN CHEMISTRY

<sup>+1</sup>Chinda, W., & <sup>2</sup>Pepple, T.F.

Department of Chemistry, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, NIGERIA

<sup>+</sup>Corresponding author(email): [worokwu.chinda@iaue.edu.ng](mailto:worokwu.chinda@iaue.edu.ng)

### Abstract

The study examined the influence of teacher-related factors on senior secondary school students' achievement in senior school Chemistry in Bayelsa State. For the study, five research questions were formulated. The research adopted the survey design. The population of the study consists of all senior secondary schools in Bayelsa State. There are a total of 297 secondary schools in Bayelsa State. Using the simple random sampling technique, 10 senior secondary schools were selected from five (5) Local Government Areas in the state (2 schools from each of the 5 L.G.A), a school was selected if it had a permanent chemistry teacher. A simple random sampling technique was used to collect data from 200 respondents (10 principals, 10 vice principals, 180 students). Two research instruments were used for the study: The Teacher Quality Questionnaire (TQQ) and Chemistry Achievement Test (CAT). The instruments were validated. The reliability of the instrument was established using appropriate tools. The data collected were analysed using mean and standard deviation. The findings of this study revealed that; there is a positive relationship between Teachers academic qualification and students achievement in senior school chemistry, a negative relationship exist between teachers professional qualification and students achievement in senior secondary school chemistry, a positive relationship between teacher years of experience and student achievement in senior school chemistry, a positive relationship exists between teachers exposure on the job training and students achievement in senior school chemistry. The result also showed a positive relationship between chemistry and teachers interest in the subject. It is recommended that the government and stakeholders in education should employ teachers with prerequisite qualifications, experience, exposure on the job training, mastery of the subject matter.

**Keywords:** Teacher, Factor, Achievement, Secondary School Chemistry

### Introduction

The enviable place which the science education structure of many countries of the world holds as well as Nigeria is possibly justified. The motive is that science can wield a prevailing, if not significant effect on the life of the individual as well as on the progressive strength of a nation (Pepple & Chinda, 2012). The global acknowledgement of the above submission is accountable for the principal place that has been given to science and specifically Chemistry globally. Within the framework of science education, Chemistry has been recognized as an essential school subject and its significance in the scientific and technological growth of any country has remained extensively reported. The significance of the acknowledgement given to Chemistry in the advancement of the individual and the country is that it is made a core subject among the natural science and other science-related courses in the Nigerian education system. Its inclusion as a core subject in science in secondary schools calls for the necessity to teach it efficiently. This is because real science teaching can lead to the achievement of scientific and technological prominence.

Education is a vital human action that aids people in fashion and models persons to function properly in their environment. According to Boit, et. al., (2012), education aims to train the populace to reform their humanity and eradicate disparity. In particular, secondary education is a vital segment in national and individual progress. It plays a major role in producing a country's human resource base at a level higher than primary education (Ashoka, et al., 2007). The dynamic part played by secondary education could relatively define the Nigerian government cum Bayelsa state government resolution to announce free education in public secondary schools to increase demand. Providing quality education is thus significant in creating the chances and benefits of social and economic growth (Onsumu, et al., 2006). One of the gauges of the worth of education being delivered is the cognitive accomplishment of students (United Nations Educational Scientific and Cultural Organization, [UNESCO], 2005). According to Adediwura and Tayo (2007), educational success is designated by test and

examination scores or grades given by the subject teachers. It can also be said to be an expression used to denote learners' academic standing. Wasanga and Somerset (2011), stated that the academic attainment of students at the secondary school level is not only an indicator of the efficacy of schools but also a key factor of the well-being of youths in specific and the country in general. Nasongo (2009) noted that the achievement of students in any academic assignment has continually been of distinct concern to the government, educators, parents and the society at large. Schools are normally assessed using students' achievement data (Holland, 2011). Tutors cannot be disconnected from the schools they teach and the academic results of schools. It would consequently be rational to use standardized students' assessment results as the basis for adjudging the performance of teachers. Teachers are celebrated and compensated when their schools and teaching subjects are exceedingly ranked. In Chile, for example, teachers are compensated jointly when they work in schools that are branded as high performing by the national performance evaluation system of subsidized schools. (Organization for Economic Co-operation & Development, 2005).

One of the essential glitches facing science teaching today is the question of how recent the professional teachers are. The vast majority of teachers who have been engaged in the past decades have been undertaking the same thing, the similar way all along. They have no understanding of the modern designs and inventions that have taken place in the educational field in the current past. What accounts for this is that teachers have not been given the chance for re-training (Ogunbiyi, 2004). Hence he recommends that teachers should be invigorated to go for workshops training in their areas of speciality.

It has been verified that teachers have a significant effect on students' academic achievement. They play important role in educational achievement because the teacher is eventually answerable for interpreting policy into exploit and principles based on practice for the period of interaction with the learners (Afe, 2001). In their study, Wright, Horn and Sanders (1997), established that the most significant factor influencing students learning is the teacher. Teachers position in the interface of the transmission of facts, ideas and abilities in the learning process. If the teacher is not efficient, learners under the teacher's tutelage will attain poor performance academically and this can be ascribed to Chemistry.

Academics have studied the effect of teacher characteristics such as sex, educational qualifications and teaching experience on students' academic performance with different results. Akiri and Ugborugbo (2008), establish that there was a significant relationship between teachers' gender and students' academic achievement. This is contrary to Dee cited in Akiri and Ugborugbo (2008). Adeyemi (2010) found that teachers' experience and educational qualifications were the prime predictors of student academic achievement. However, Rivkin et al (2005) found that teacher teaching experience and educational qualifications were not significantly related to students' achievement. Goldhaber(2002) indicates that the worth of the teacher in the classroom is the most significant schooling factor predicting student results

Oredein and Oloyede (2007) established that teacher supervision of homework and assignments are given to learners affect student achievement particularly when it is well elucidated, motivational, revised and go through during class time and used as an occasion for response to students in any teaching-learning condition, the students, the teacher, the curriculum and the learning environment are the four pivots. But more emphasis was laid on the teacher for this study. This is because secondary education is the rudimentary condition for selection into tertiary institutions for advanced skills training (FME, 2005), underachievement of secondary schools students in the state weakens students likelihoods of joining institutions of higher learning and endangering chances of job placement, and in some cases decreases an individual's active contribution in national growth. Bearing in mind that teachers play a key role in the teaching and learning process, there is a need to study the correlation between teacher-related factors and students' academic achievement in senior school Chemistry. This study, therefore, sought to analyze the perceived influence of teacher-related factors on students' achievement in senior school Chemistry in Bayelsa State.

### **Statement of the Problem**

The incidence of poor performance of students in Chemistry has been of much concern to stakeholders in the field of science. Many studies had been conducted on the likely causes, still, no reasonable achievement has been achieved in the final SSCE [Senior Secondary Certificate Examination]. However, it has been observed that the teacher factors play an important role in students achievement in the subject. This study, therefore, investigated the influence of teacher factors on student academic achievement in Chemistry.

### **Research questions**

The following research questions guided the study:

1. Does teacher academic qualification affect student achievement in senior school Chemistry?

2. Does a teacher professional qualification affect student achievement in senior school Chemistry?
3. Does teacher years of experience have any effect on student achievement in senior school Chemistry?
4. Does teacher exposure on the job training have any effect on student achievement in senior school Chemistry?
5. Is teacher mastery of the subject matter a determinant of student achievement in senior school Chemistry?

## Materials and Methods

**Design of the Study:** This research adopted the survey design.

**Participants:** The population of the study consists of all the senior secondary schools in Bayelsa State, Chemistry teachers and SS3 students. According to the information obtained from the ministry of education, there are a total of 297 secondary schools in the eight local government areas of Bayelsa state. A simple random sampling technique was used in the selection of ten (10) senior secondary schools from five(5) Local Government Areas in Bayelsa state. A school was selected if it had a permanent chemistry teacher. The principals and vice-principals in the carefully chosen schools assisted as the evaluators because their remarks and rankings on teachers performance assessment form part of teachers' promotion. In each school, 18 students were randomly chosen and used for this study. Totaling 30 (2 principals and 2 vice principals, 26 students).

### Instrument for data collection

Two instruments were developed by the researcher for this study. These instruments are: I. Chemistry Achievement Test (CAT). II. Teaching Quality Questionnaire (TQQ).

**Chemistry Achievement Test:** The CAT is comprised of two parts "A" and "B". Part A comprised of students demographic information while part B is comprised of a 25- item test prepared by the researcher from past Senior secondary school examination questions (SSCE) used to measure the level of acquisition of ideas in Chemistry by the students. It was an objective test with four options, one correct answer, and three distractors. The accurate option attracts 1 mark and the total mark attainable. The researcher's ensured the question was written in clear and simple words to the students' level of understanding.

**Teacher Qualification Questionnaire:** The TQQ is a standard measure that is widely used in measuring teaching quality. It was developed by Joe Hirschberg, Jenny Lye, Martin Davies and Carol Johnston. It is divided into two parts, part A and B. Part A comprised of teachers demographic information while part B comprises of the TQQ questionnaire on the Likert ordinal scale questionnaire. The scale ranges from (5) STRONGLY AGREE (SA), (4) AGREE (A), (3) NEUTRAL (NE), (2) DISAGREE (D), (1) STRONGLY DISAGREE (SD). This was done to capture the real influence of teacher-related factors on student academic achievement in senior school Chemistry in Bayelsa State.

**Validity of the instruments:** Validity was done on the instruments. The instruments were subjected to face and content validity by experts, and two other lecturers in the department of science education for a review of the designed items. This guaranteed that the contents were appropriate, clear and explicit. The corrections made by them were assimilated into the final draft.

**Reliability of the instruments:** Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. A pilot study using the test re-test method was done using 5% of the population not in the study sample. The test-retest was done by exposing the persons who were not respondents to the questionnaire, then after two weeks exposing them again to the same questionnaire and the responses matched to see if the questions were understood and answered consistently and reliably. A Pearson Product Moment Coefficient Correlation of 0.75 was used to establish the reliability of TQQ and 0.81 was obtained for CAT.

**Method of data collection:** Consent from the ministry of education in Bayelsa and, also from the Department of Science Education, Federal University Otuoke, Faculty of Education. Federal University Otuoke. The schools and those involved were informed and notified two weeks before the date of data gathering. The researchers visited the sampled education centres to make appointments and cultivate rapport after getting a letter of introduction from the Federal University Otuoke. On the appointed date the researcher administered the questionnaires and interview schedules. The administration and collection of all necessary information were done for the period of normal class hours.

**Method of data analysis:** In analyzing the data collected to carry out this research work, the use of simple percentages was employed. The table was used for presenting the data for simplicity and clarity. The statistical

tool used for the study was mean and standard deviation was used in testing and analyzing the research questions raised.

## Results

**Research question 1:** Does teacher academic qualification influence student achievement in senior school Chemistry?

**Table 1: Teachers academic qualification and students' achievement**

S/N	Questions	SA (5)	A (4)	NE (3)	D (2)	SD (1)	Total	Mean
1	All teachers in this school have adequate academic qualifications to teach the students at senior secondary level	6 (30)	10 (40)	4 (12)	4 (8)	6 (6)	30 (96)	3.20
2	Teachers' academic qualifications has an impact on the students' academic achievements	10 (50)	18 (72)	1 (3)	1 (2)	0 (0)	30 (127)	4.23
i	The quality of teachers are by their academic qualifications determined	6 (30)	12 (48)	0 (0)	7 (14)	5 (5)	30 (97)	3.23
4	Teachers with higher level of academic qualification are more effective in the classroom	4 (20)	9 (36)	2 (6)	6 (12)	9 (9)	30 (83)	2.77
5	Excellent mastering of one's subject as a teacher is dependent on one's academic qualification	5 (25)	10 (40)	1 (3)	10 (20)	4 (4)	30 (92)	3.07
<b>Weighted Mean</b>								<b>3.30</b>

Source: Field Survey 2021 Note: SA = Strongly Agree, A = Agree, NE = Neutral Disagree, SD = Strongly Disagree.

The mean scores in bold are higher than the weighted mean score of 3.30. The decision rule for the questions is to reject any item whose mean is lower than the weighted of 3.30. From the table above only item 2 was accepted, implying the rejection of items 1, 3, 4 and 5. From these responses, it is yet unclear whether all the teachers in these schools have adequate academic qualifications to teach at the secondary level.

**Research Question Two:** Does teacher professional qualifications influence student achievement in senior school Chemistry?

**Table 2: Teacher professional qualification and students' achievement**

S/N	Questions	SA (5)	A (4)	NE (3)	D(2)	SD(1)	Total	Mean
6	Majority of teachers in this school have 3 professional teaching and teachers' certifications	3 (15)	9 (36)	8 (24)	5 (10)	5 (5)	30 (90)	3.0
7	Teachers' Professional Qualifications has an impact on the students' academic achievements	5 (25)	13 (52)	1 (3)	7 (34)	4 (4)	30 (98)	3.27
8.	Teachers' with professional teaching qualification(s) have better teaching skills to impart knowledge to students	2 (10)	15 (60)	0 (0)	10 (20)	3 (3)	30 (93)	3.10
9.	Teachers' with professional teaching qualification(s) have better students' assessment and evaluation skills	5 (25)	8 (32)	1 (3)	12 (24)	4 (4)	30 (88)	2.93
10.	Teachers' with professional teaching qualification(s) keep their better records of students and their performances	7 (35)	11 (44)	2 (6)	4 (8)	6 (6)	30 (99)	<b>3.30</b>
<b>Weighted Mean</b>								<b>3.12</b>

Source: Field Survey 2021

**Note:** SA = Strongly Agree, A = Agree, NE = Neutral, D = Disagree, SD = Strongly Disagree

The mean scores in bold are higher than the **weighted mean score of 3.12**

The decision rule for the questions is to reject any item whose mean is lower than the weighted of 3.12, therefore only items 7 and 10 were accepted. From the table above, the respondents claimed they had no idea of other teacher's professional qualification status.

**Research Question Three:** Does teacher years of experience have any effect on student achievement in senior school chemistry?

**Table 3: Teachers years of experience and students achievement**

S/N	Questions	SA (5)	A(4)	NE (3)	D(2)	SD(1)	Total	Mean
11.	Majority of teachers in this school have at least 5 years teaching experience	3 (15)	10 (40)	5 (15)	9 (18)	3 (3)	30 (91)	3.03
12.	Teachers with good years of teaching experience do better in disseminating knowledge to their students	10 (50)	13 (65)	1 (3)	4 (8)	2 (2)	30 (128)	<b>4.27</b>
13.	Teachers with good teaching experiences have their knowledge and ability for students' control and class management	7 (35)	11 (44)	2 (6)	7 (14)	3 (3)	30 (102)	3.40
14.	Teachers with good teaching experience are more effective in the class	6 (30)	13 (52)	2 (6)	2 (4)	7 (7)	30 (99)	3.30
15.	Students taught by more experienced teachers perform academically better	6 (30)	10 (40)	1 (3)	8 (16)	5 (5)	30 (94)	3.13
<b>Weighted Mean</b>								<b>3.43</b>

Source: Field Survey 2021

**Note:** SA = Strongly Agree, A = Agree, NE = Neutral, D = Disagree, SD = Strongly Disagree

The mean score in **bold** are higher than the **weighted mean score of 3.43**

The decision rule for the questions is to reject any item whose mean is lower than the weighted of 3.43, therefore only item 12 was accepted.

**Research Question Four:** Does teacher exposure on the job training have any effect student achievement in senior school Chemistry?

**Table 4: Teacher exposure on the job training and student achievement**

S/N	Questions	SA (5)	A(4)	NE (3)	D(2)	SD(1)	Total	Mean
16.	Majority of teachers in this school have undergone at least 5 training and development programme on their respective fields.	3 (15)	11 (44)	1 (3)	8 (16)	7 (7)	30 (85)	2.83
17.	Training and exposure is a determinant of teachers efficiency and effectiveness	11 (55)	7 (28)	0 (0)	4 (8)	8 (8)	30 (99)	3.30
18.	Training and exposure has a positive impact on the students' academic achievements	9 (45)	9 (36)	5 (15)	4 (8)	3 (3)	30 (107)	3.57
19.	Teachers with good training exposure are more effective in classes	11 (55)	13 (52)	2 (6)	1 (2)	3 (3)	30 (118)	3.93
20.	Students taught by teachers with better exposure and training perform academically better	9 (45)	6 (24)	5 (15)	8 (16)	2 (2)	30 (102)	3.4
<b>Weighted Mean</b>								<b>3.41</b>

Source: Field Survey 2021

**Note:** SA = Strongly Agree, A = Agree, NE = Neutral, D = Disagree, SD = Strongly Disagree

The mean score in **bold** are higher than the **weighted mean score of 3.41**

The decision rule for the questions is to reject any item whose mean is lower than the weighted of 3.41. From the table above item 18 and 19 were accepted implying the rejection of items 16, 17 and 20.

The rejection of these items were based on the fact that there was not enough evidence to back the statements. From the finding, training though important, as teachers with good training exposure are more effective but is not a major determinant of effectiveness and efficiency of teachers.

**Table 5: Teacher mastery of the subject matter and students' achievement**

S/N	Questions	SA (5)	A(4)	NE (3)	D(2)	SD(1)	Total	Mean
21.	Willingness and interest on job is a determinant of teachers efficiency and effectiveness	7 (35)	14 (56)	4 (12)	3 (6)	2 (2)	30 (111)	<b>3.70</b>
22.	Majority of teachers in the school have mastered	7	16	5	7	0	30	3.77

	the subjects they teach	(35)	(64)	(10)	(14)	(0)	(113)	
23.	Teachers profound understanding of the subject matter is a determinant of teachers delivery and ability to impart knowledge to the students	12 (60)	10 (40)	0 (0)	6 (12)	2 (2)	30 (127)	<b>3.80</b>
24.	Teachers attitude and response to classes has a positive impact on the students' academic achievements	8 (40)	10 (40)	5 (15)	6 (12)	1 (1)	30 (108)	3.60
25.	Teachers' interest on the subject matter influences students attention to the subject	12 (60)	10 (40)	0 (0)	5 (10)	3 (3)	30 (113)	<b>3.77</b>
	<b>Weighted Mean</b>							<b>3.71</b>

Source: Field Survey 2021

**Note:** SA = Strongly Agree, A = Agree, NE = Neutral, D = Disagree, SD = Strongly Disagree

The mean score in **bold** are higher than the **weighted mean score of 3.71**. The decision rule for the questions is to reject any item whose mean is lower than the weighted of 3.71. From the above items 22, 23 and 25 were accepted implying the rejection of items 21, and 24. The respondents agreed that teachers mastery of the subject matter and interest and profound understanding of the subject is a determinant of teacher's efficiency and effectiveness.

### Discussion of Major Findings

The first finding of this research shows that there exists a positive relationship between teachers' academic qualifications and students' performance in the Chemistry Achievement Test (CAT). This implies therefore that teachers with more academic qualifications are more likely to impact significantly on students, enhancing their performance and achievement in Chemistry. This result was deemed significant as shown by the significant value of the t-statistics (0.000). This corroborates with the findings of Adeyemi (2010) who examined the impact of teacher academic qualification in high school Math and science courses and found a positive relationship between the Teachers content knowledge and students' scores on exit exams.

The second finding reveals that the professional qualification of the teachers does not affect on the students' performance in Chemistry. This indicates that even with the professional certificate of the teachers', students' performance in Chemistry did not improve, suggesting that professional qualification has little or no role to play in enhancing or boosting students' performance in senior secondary school Chemistry. This corroborates with the findings of Holland (2011) which stated that teachers who held a national board certificate did not have a statistically significant impact in Algebra 1, Biology etc (Science subjects).

The third finding also reveals that there exists a positive relationship between teachers' year of experience and students' performance in the Chemistry Achievement Test (CAT). The result showed that students taught by more experienced teachers in chemistry are more successful academically than those taught by less experienced teachers. This result was significant as indicated by the t-statistic (3.228). Therefore, we conclude that teachers' years of experience have a significant effect on students' achievement in senior school chemistry. This shows that teachers' experience is a major determinant of good student performance in chemistry. This corroborates with the findings of Goldhaber (2002), Wright, et al., (1997) who examined the years of experience of teachers on student achievement, was similar. Years of experience did have an impact on students achievement but the impact steadily increased for up to 10 years then began to level out and even decrease in some cases.

The fourth finding show there is a positive relationship between teachers' exposure to job training and students' achievement in senior school Chemistry. From the result, we conclude that teachers' exposure on the job training has no significant impact on students' achievement in senior school chemistry. This is shown by the t-statistics of .882 which is less than 1.96 critical value. This implies that training to improve teachers' effectiveness and competence in teaching, it should be backed by other factors as academic qualification and teaching experience.

The fifth finding reveals that there is a positive relationship between teachers' interest in the subject matter and students' achievement in senior school Chemistry. This result implies that teachers profound understanding and mastery of the subject teaching does guarantee good students' performance. Although the students have their roles to play too. This should be supported by other factors. The result however shows a significant relationship between teachers mastery of the subjects and students achievement in chemistry. This corroborates with the work of Akiri and Ugborugbo(2008) and Holland (2011) who in his study found a significant relationship between teachers knowledge of subject mastery and students achievement in English.

## Conclusion

Teacher qualification goes a long way in determining and enhancing the academic abilities and performance of students in senior secondary Chemistry. Chemistry is one of the most fundamental scientific disciplines that need the proper nurturing of students. The need for a professional teacher cannot be underestimated in teaching chemistry. The study showed that teacher qualification years of experience contribute to students' academic achievement in chemistry.

## Recommendation

Professional teachers should be employed and well-motivated to teach Chemistry at the senior secondary school level.

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