

Teacher Qualification and Experience as Determinants of Quality Chemistry Education in Nigeria

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Abstract

The drive for change is crucial for chemistry education advancement and so is teacher qualification and experience. This study investigated teacher qualification and experience as determinants of quality chemistry education in Akwa Ibom State of Nigeria. A survey research design was adopted for the study. Three research questions and three hypotheses were formulated to guide the study. The population consisted of all the chemistry teachers in the 31 Local Government Areas of Akwa Ibom State. The study sample was 130 chemistry teachers randomly selected from the 31 Local Government Areas of Akwa Ibom State during a chemistry training workshop on capacity building. The instrument for data collection was the questionnaire for teachers on quality of chemistry education which contained 20-items. Cronbach alpha analysis was used to determine the reliability of the instrument which yielded .79 and the data collected were analyzed using descriptive statistics, t-test and analysis of variance. All hypotheses were tested at .05 alpha level of significance. Results showed that there was significant influence of teacher qualification and experience on quality of chemistry education. Based on the findings, it was recommended amongst others, that chemistry teachers with appropriate pre-requisite subjects be admitted into teacher training institutions to enable them acquire needed qualifications, experience and skills for effective chemistry teaching.

Keywords: Qualification, experience, pre-requisite, interactive classroom, teacher training.

Introduction

Chemistry teacher education awareness is growing and providing sound foundation for well-articulated researches and skills development in developed and emerging economies because it is the backbone for sustaining any nation's economy. Chemistry education aims at equipping learners with diverse basic scientific skills, competencies and creativity needed to provide opportunities for wealth creation. These aims will remain a mirage if teachers of chemistry do not have the pre-requisite qualification and experience needed for an engaged chemistry interactive classroom to enhance their productivity.

Chemistry education is a potent tool that focuses on achieving economic growth and development for a nation's sustainable goals. It is both advantageous and laudable as it has all it takes to provide its recipients with basic scientific literacy, life skills as well as basic skills in chemical science and technology. These aspects, when appropriately incorporated enable learners live effectively within the global community. Chemistry education is the vehicle through which chemical knowledge and skills reach the people who are in need of capacities and potentials for development (Emmanuel, 2013). This therefore, hinges on the need to improve the type of education given teachers in training institutions to impart on building their capacities as regards qualification and experience.

Chemistry is a practical-oriented course that needs appropriate qualification and experiences to teach. Teachers must have these basic requirements for teaching to enable them respond effectively to the growing challenges of societal changing demands.

Wikipedia (2014) defines teacher education as the policies and procedures designed to equip prospective teachers with the knowledge, attitudes, behaviours and skills they require to perform their tasks effectively in the classroom. According to Osuji (2009) teacher education refers to professional education of teachers towards attainment of attitudes, skills and knowledge considered desirable so as to make them efficient and effective in their work in accordance with the need of a society. These enhance teaching quality and make the teaching of chemistry more dynamic and goal-oriented. The Federal Government of Nigeria (FRN, 2004) clearly outlined the objectives of teacher training to include: producing highly motivated, conscientious and efficient classroom teachers for all levels of its educational system; to encourage further, the spirit of enquiry and creativity in teachers; to help teachers fit into social life of the community and the society at large; to enhance teachers commitment to national goals by providing them with the intellectual and professional background adequate for their assignment to help them adapt to changing situations, and to enhance their commitment to the teaching profession. Teacher training programme involve practices and methods that aim at promoting creativity and skill for professional qualification.

The teacher training programme in Nigeria has as its goals: training on content areas of specialization; retraining to further acquire basic science skills for enhanced impartation on learners through evolving such

skills on new knowledge and ideas; application of different methods of learning to benefit all classes of learners' pedagogy; develop initiatives on engaged practical activities for creativity in theory and practice. Teacher education in Nigeria is aimed at providing trainees with intellectual and professional background adequate for their assignment and to make them adaptable to any changing situations in the country and the world. Teacher quality therefore, must be highly rated to meet these laudable objectivities and professional standards to qualify one for teaching.

Teacher qualification is a pre-requisite requirement for meeting the objectives of the chemistry curriculum. It is the most important factor in improving students' achievement in chemistry. Teacher qualification refers to academic and professional qualifications that enables a person to become a registered teacher at all levels of education. It also relates to the acquisition of relevant knowledge, skills and competence and creativity needed for quality productive engagement in the teaching profession. Teachers' certification status and degree in area of specialization are very significant and positively correlated with students learning outcomes in science and mathematics (Dovrat Committee, 2005). Darling- Hammond (2007) defined a well qualified teacher as one who is fully certified and holds the equivalent of a major in the field being taught. Teachers therefore, are those who are trained and equipped to respond to growing changing societal challenges. They should be able to inculcate in the learners knowledge and skills needed for active, productive, lifelong career opportunities in chemistry. At present, teacher education programme in Nigeria is categorized into three levels on the basis of their training and certificates; Nigeria Certificate in Education (NCE) which is run for a minimum of three years and maximum of five years; Bachelor Degree in Education (B.Ed, B.Sc. Ed, & B.A. Ed) programme that is run for a minimum of three years and maximum of five years; Post-Graduate Diploma in Education (PGDE). It provides professional training for pre-service and in-service auxiliary teacher; M.Ed., and Ph.D. Certain basic requirements are needed for teacher training before one can gainfully be certified as a qualified teacher. The major training influence for teacher qualification is in terms of the magnitude, type and quality of professional preparation put into it. This is to say, while the academic qualification of the teacher may influence teachers' output, the particular kind and quality of pre-service and in-service exposure he has experienced is a crucial factor for consideration.

Udofot (2010) posited that the nation places importance on the quality of its teachers, and the education they receive is predicated on the high social demand society is making on education. Teacher pre-requisite qualification requirement therefore, needs to be given priority attention. If quality chemistry education is to be realized, appropriate qualification and experience are needed by teachers to impart skills for productive and engaging practical activities in the learners.

The Education and training commission of Europe (2010) posited that teacher qualification is an essential factor that provides learners with personal fulfillment, better social skills and more diverse employment opportunities. Afangideh (2011) observed that professional preparation is needed by science teachers and chemistry teachers in particular, through adequate and informed exposure to courses for teaching effectiveness as it influences students' performance. Emmah (1998) observed that adequately exposed teachers who employed probing questions, problem-solving skills, discussion and feedback during interaction performed significantly higher than teachers who lacked the exposure. The teacher cannot teach the student well, if he is not well trained and grounded in the subject he is teaching due to poor qualification. If a teacher is not well trained, the learning process will not be effective no matter how carefully a curriculum has been marked out, how detailed and scientifically accurate the textbooks, worksheets, equipment and operating instructions are and how adequate the physical facilities are (Akpan, 2012). Adedayo (2012) also examined the effects of teachers' qualification on the performance of senior secondary school students in physics. The result revealed that students taught by teachers with higher qualifications performed better than those taught by teachers with lower qualification. It was also shown that students performed better in physics when taught by professional teachers. The National Teachers Institute (NTI) recently identified what could be regarded as the major problem responsible for the falling standards of education in the country. According to the NTI, about 54% of teachers in the country are under-qualified to be engaged for the important job of imparting knowledge on the young ones. The institute blamed this ugly trend on the inability of some local governments in the country to adhere to its standing rule that only holders to National Certificate in Education should be employed to teach at the primary school level. The northern part of the country is singled out as most guilty in violating the rule regarding NCE certificate as the minimum qualification to teach in primary school. At the height of this appalling discovery the Plateau State Education Reform Committee made a startling discovery that out of the 11,000 primary school teachers in the state, only 4,000 are qualified leaving 7,000 unqualified to teach and in Niger State, out of its 22,000 teachers, 7,000 of them were unqualified, and were not supposed to have been engaged in the first-place (Emmanuel, 2013).

Teacher experience has to do with the increased awareness of diversifying search for new ideas, new commitments and new challenges. Teachers' experience and knowledge of subject matter are unique qualities for teaching effectiveness. According to Rice (2010) the magnitude of the effect of teacher experience varies

depending on the teacher's level of education and the subject area. He further opined that experience gained over time, enhances the knowledge, skills, and productivity of workers. These qualities facilitate students' skills and abilities to think about chemistry processes useful for exploration and analysis, and also enables thorough understanding of chemistry concepts. Experienced teachers are great asset to novice teachers who need advice, encouragement and continuous guidance. Okey (2012) stated that experience is directly related to teachers' ability to plan lessons, address divergent student responses, reflect on their teaching effectiveness and their ability to stimulate student inquiry. Akinyele (2001) and Commey-Ras (2003) commented that experience improves teaching skills while students learn better at the hand of teachers who have taught them continuously over a period of years. Senechal (2010) found that teacher experience has a significant positive effect on student achievement, with more than half of the gains occurring during the teacher's first few years, but substantial gains occurring over subsequent years; albeit, at a slower rate. Furthermore, teachers with long years of experience are confident that even the most difficult student can be reached if they exert extra effort; while teachers without experience feel a sense of helplessness when it comes to dealing with unmotivated students (Gibson & Dembo, 1987). With adequate pedagogical exposure, the teacher exhibits cordial relationships with students and participation in class increases. Domike (2002) outlined phase experiences in the teaching career. He opined that experiences in the teaching profession have to do with factors such as exploration, stabilization, experimentation and diversification. These phases are outlined as shown;

Phase 1: Career exploration phase which is starting out, (1-5 years) is a period of survival, discovery and enthusiasm. Teachers take up responsibilities during this phase with uncertainties and complexities of the environment. At the fourth year of the teacher's profession, stability plays a great role to characterize the teacher's response to commitment. With unattractive incentives, the teacher is interested in enhancing his educational attainment for greener pastures. Pedagogical mastery is identified and pursued with vigour and greater flexibility applied.

Between 1-10 years, beginning teachers were found to have pitfalls in their application of instructional methods and in group dynamics.

Between the 15-25 years of teaching, in mid-career years, teachers draw a balance sheet of their career lives and examine the possibility or unlikelihood of changing careers. At this stage, teachers are more critical, direct and dominance prevails. After the phase of uncertainty, from 26-33 years of professional experience, some teachers achieve serenity and greater confidence to invest in teaching.

Maduabum (2007) posited that newer teachers may be excited about new discoveries, but teachers with more experience can distinguish valuable ideas from passing facts; though, there may be exceptions. Experience brings humility, good judgment and ability to see the larger story. Experience and immersion in the subject affect teaching in diverse ways. It grows knowledge repertoire, improves utilization of more materials and ideas in profound ways. Experienced teachers are good assets to novice teachers who need encouragement, advice and guidance.

It is expected therefore, that chemistry teachers at all levels of education should possess pre-requisite qualification and experience before delving into the teaching of chemistry. Having these standards as benchmark ratings for teaching makes it necessary to examine the influence of teacher qualification and experience as determinants of quality chemistry education in Nigeria; hence, the focal interest of this study.

Statement of the Problem

Teacher qualification and experience as determinants of quality chemistry education have become recurrent issues. This is because, teachers are very vital to the type of education given learners considering the technological changes taking place in the world of work today. Chemistry teachers are in short supply no doubt, and the few available ones are not adequately qualified and experienced to handle chemistry teaching. According to the National Teachers Institute (NTI) about 54% of teachers in the country are under-qualified to be engaged for the important job of imparting knowledge on the young ones. Situations abound where teachers have different academic qualifications that make them unqualified to teach chemistry. Again, most teachers are inexperienced and do not have the required competencies to teach, yet they are employed to teach chemistry. This affects the quality of chemistry education. It is against this background that the study sought to investigate teacher qualification and experience as determinants of quality chemistry education.

The purpose of the study was to determine the influence of teacher qualification and experience on quality chemistry education in Akwa Ibom State of Nigeria. Specifically, the study answered the following research questions.

1. What qualification of teachers determine the quality of chemistry education in Akwa Ibom State of Nigeria?
2. What teaching experience of teachers determine the quality of chemistry education in Akwa Ibom State of Nigeria?
3. What is the interaction effect of qualification and experience as determinants of quality chemistry

education in Akwa Ibom State of Nigeria?

Research Hypotheses

The study tested the following null hypotheses:

1. There is no significant influence of professional qualification on quality chemistry education in Akwa Ibom State of Nigeria.
2. There is no significant influence of teaching experience on quality chemistry education in Akwa Ibom State of Nigeria.
3. There is no significant interaction effect of qualification and experience on quality chemistry education in Akwa Ibom State.

Research Method

A survey research design was used to find if teacher qualification and experience are determinants of quality chemistry education. The population of the study was all the chemistry teachers in Akwa Ibom State of Nigeria. The sample size was 130 chemistry teachers randomly selected during a chemistry training workshop on capacity building from the 31 Local Government Area of Akwa Ibom State of Nigeria. The instrument for data collection was the questionnaire for teachers on quality of chemistry education which contained 20 – items. The instrument was validated by two lecturers in measurement and evaluation and science education respectively. The questionnaire was a 4-point rating scale of Strongly Agree (SA, 4), Agree (A, 3), Disagree (D, 2) and Strongly Disagree (SD, 1). The reliability of the instrument was obtained through a field study on 30 chemistry teachers from the target population but were not included in the actual study. The data obtained were subjected to Cronbach-alpha reliability analysis which yielded a coefficient of .79. The instrument was administered by the researchers during the workshop and collected the same day. The data obtained were analyzed using descriptive statistics, t-test, Analysis of Variance (ANOVA) and Scheffe' Posthoc Analysis. All hypotheses were tested at .05 alpha significant level.

Research Question 1

What qualification of teachers determine the quality of chemistry education in Akwa Ibom State of Nigeria?

This research question is answered using mean and standard deviation as shown in Table 1.

Table1: Mean and standard deviation of responses of teachers of chemistry education based on professional qualification.

Qualification	N	\bar{X}	SD
Professional	66	62.33	6.26
Non-professional	64	57.34	7.37

As shown in table 1, the mean responses (62.33) of professional teachers is greater than the mean responses (57.34) of non-professional teachers. This indicated that professional qualification is a determinant of quality chemistry education in Akwa Ibom State. In order to determine whether the mean difference between professional teachers and non-professional teachers responses is significant, the mean responses and standard deviation were subjected to t-test analysis.

Research Question 2

What teaching experience of teachers determine the quality of chemistry education in Akwa Ibom State of Nigeria?

This question is answered using mean and standard deviation.

Table2: Mean and standard deviation of responses of teachers on the quality of chemistry education based on teachers' experience.

Experience	N	\bar{X}	SD
Below 10 years	46	55.59	7.62
10-20 years	44	63.70	5.26
Above 20 years	40	60.60	6.13

As shown in table 2, teachers with experience of 10-20 years had the highest mean response (63.70), followed by

teachers who had experience of above 20 years with a mean response of 60.60 and teachers with experience of below 10 years as the least with a mean response of 55.59. This indicated that the two groups of well experienced teachers had better mean response when compared to the other group of less experienced teachers (below 10 years). This implied that experience is a determinant of quality chemistry education in Akwa Ibom State. In order to ascertain if the differences were significant, the responses were subjected to the analysis of variance.

Research Question 3

What is the interaction effect of qualification and experience as determinants of quality chemistry education in Akwa Ibom State of Nigeria?

This question is answered using mean and standard deviation.

Table 3: Mean and standard deviation of responses of teachers on quality chemistry education based on the interaction of qualification and experience.

Qualification	Experience	N	\bar{X}	SD
Professional	Below 10 years	16	60.19	7.23
	10-20 years	27	64.48	4.63
	Above 20 years	23	61.30	6.68
Non- professional	Below 10 years	30	53.13	6.73
	10-20 years	17	62.40	6.07
	Above 20 years	17	59.65	5.33

As shown in table 3, the mean response 60.19, 64.48 and 61.30 of professional teachers with experiences of below 10 years, 10-20 years and above 20 years respectively was greater than the mean responses 53.13, 62.40 and 59.65 of non-professional teachers in their respective years. In order to ascertain whether these differences were significant, the responses were subjected to factorial analysis of variance.

Research Hypothesis 1

There is no significant influence of professional qualification on quality chemistry education in Akwa Ibom State of Nigeria?

Table 4: t-test analysis of teachers' responses on quality of chemistry education based on professional qualification of teachers.

Qualification	N	\bar{X}	SD	df	t_{cal}	Significance at $P < .05$
Professional	66	62.33	6.26	128	4.16	.000
Non- professional	64	57.34	7.37			

In table 4, the calculated probability value (P value) .000 is less than the declared probability (alpha level) .05. Therefore, the null hypothesis was rejected. This implied that there exists a significant influence of professional qualification on quality of chemistry education in Akwa Ibom State of Nigeria.

Research Hypothesis 2

There is no significant influence of teaching experience on quality chemistry education in Akwa Ibom State of Nigeria.

Table 5: Analysis of variance of responses of teachers on quality of chemistry education based on teachers' experience.

Source	Sum of Squares	Df	Mean Square	F	Significance at $P < .05$
Corrected Model	1512.12 ^a	2	756.06	18.23	.000
Intercept	465850.41	1	465850.41	11230.83	.000
Experience	1512.12	2	756.06	18.23	.000
Error	5267.91	127	41.48		
Total	472862.00	130			
Corrected Total	6780.03	129			

In table 5, the result showed that the calculated F value for the main effect of experience is less than the alpha level .05. Therefore, the null hypothesis is rejected. This implied that there exists a significant influence of teacher experience on quality of chemistry education in Akwa Ibom State of Nigeria.

In order to ascertain the direction of significance, Scheffe' Posthoc pairwise comparison test was done as shown in table 6.

Table 6: Scheffe' Posthoc analysis of responses of teachers on the quality of chemistry education based on teaching experience.

(I) Experience	(J) Experience	Mean Difference (I-J)	Standard Error	Significance at P<.05
Below 10 years	10-20 years	-8.12*	1.36	.000
	Above 20 years	-5.01*	1.39	.002
10-20 years	Below 10 years	8.12*	1.36	.000
	Above 20 years	3.10	1.41	.092
Above 20 years	Below 10 years	5.01*	1.39	.002
	10-20 years	-3.10	1.41	.092

In table 6, results showed a mean difference of 8.12 for below 10 years and 10-20years of experience, 5.01 for below 10 years and above 20 years, and 3.10 for 10-20 years and above 20 years. This revealed that 10-20 years, and above 20 years contributed to the quality of chemistry education and were significantly better than those of below 10 years. Also, 10-20 years was better than above 20 years though not significant.

Research Hypothesis 3

There is no significant interaction effect of qualification and experience on quality chemistry education in Akwa Ibom State of Nigeria.

Table 7: Analysis of variance on responses of interaction effect of qualification and experience on quality of chemistry education.

Source	Sum of Squares	Df	Mean Square	F	Significance at P<.05
Corrected Model	2100.40	5	420.08	11.31	.000
Intercept	443826.24	1	443826.24	11760.42	.000
Qualification	391.06	1	391.06	10.36	.002
Experience	973.74	2	486.87	12.90	.000
Qualification*	187.73	2	93.86	2.49	.087
Experience	4679.63	124	37.74		
Error	472862.00	130			
Corrected Total	6780.03	129			

a. R Squared =.310

With respect to hypothesis 3, the result in table 7 showed that the calculated p-value .087 is greater than the alpha level .05. The null hypothesis is retained. This implied that there is no significant interaction effect of qualification and experience on quality of chemistry education in Akwa Ibom State of Nigeria. Table 7 also showed a regression squared of .310. This implied that 31.0% of the variation in the quality of chemistry education can be attributed to the influence of qualification and experience of teachers.

Discussion of Findings

The findings of the study showed that professionally qualified teachers contributed significantly to quality of chemistry education than that of non-professional teachers in Akwa Ibom State of Nigeria. This may be due to the specialized knowledge the teachers were exposed to during training. It could also be attributed to professionally qualified teachers being more competent because of their career preparation for teaching chemistry. This is in line with Afangideh (2011) that teacher qualification influences students' performance and professional preparation is needed by chemistry teachers through adequate and informed exposure to courses for teaching effectiveness. The education and training commission of Europe (2010) also asserts that teacher

qualification is an essential factor that provide learners with personal fulfillment, better social skills and more diverse opportunities.

The findings of the study also showed that teachers with long years of teaching experience contributed significantly to the quality of chemistry education compared to their less experienced counterparts. This may be attributed to constant interaction with students over the years, as they bring commitment to bear on their teaching experience. It could also be that experienced teachers brought novel practices, such as, creativity and new ideas into chemistry teaching. This finding is in agreement with Akinyele (2001) and Commey-Ras (2003) who posited that long years of teaching experience improves teaching skills and students learn better at the hands of teachers who have taught them continuously over a period of time.

This implied that long years of teaching experience is a strong determinant of quality chemistry education. The findings on interaction effect revealed that qualification and experience of professional teachers with their years of experience was greater than their respective non-professional teachers with the same years of experience. Teacher qualification and experience, therefore, are crucial factors for quality chemistry education.

Conclusion and Recommendations

Based on these findings, it was concluded that teacher qualification and experience have great influence on quality of chemistry education. These attributes facilitate learning with adequate exposure and functional human resources being in place to stimulate and motivate chemistry teaching. It was recommended that chemistry teachers need constant exposure for competence to promote quality teaching of chemistry in schools across Akwa Ibom State and Nigeria in general. All teacher training institutions providing chemistry training should admit only persons with pre-requisite requirements that would qualify them to teach chemistry.

Chemistry curriculum used for training teachers should be effectively designed to incorporate experiences of long-serving teachers to facilitate broad-based learner-centred activities that enhance the understanding of chemistry. Teacher training institutions should encourage industrial visits, conferences, seminars, use of resource centres and workshop. Frequent sponsorship and in-service training funded by schools and all levels of government is advocated.

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