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INVESTIGATING TEACHER RELATED FACTORS AFFECTING THE EFFECTIVE IMPLEMENTATION OF CHEMISTRY CURRICULUM IN SECONDARY SCHOOLS

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Abstract

This study investigated the factors affecting the effective implementation of Chemistry curriculum in secondary schools. The study adopted a causal comparative research design. Four research questions and four hypotheses guided the study. The population of the study consist of all the 186 (84 male, 102 females) public senior secondary school students in the Nsukka Education zone. Census sampling technique was used to select all the teachers used for the study. The Chemistry Curriculum Implementation Questionnaire (CCIQ) instrument comprising 20 items was used for data collection. Three experts in the field of education validated the instrument. An internal consistency reliability index of 0.89 was obtained using Cronbach alpha method. Mean and standard deviation were used to answer the research questions while the hypotheses were tested using t-test and ANOVA at 0.05 level of significance. The results of the study revealed that chemistry teachers` gender, school location, years of teaching experience and academic qualifications are not significant factors that affect the effective implementation of chemistry curriculum in senior secondary schools. Based on these findings, it was recommended among others that continuous efforts should be made by the government and relevant stakeholders to ensure continuous and strict compliance with the guidelines in chemistry curriculum to ensure its effective implementation.

Key word: Chemistry, chemistry curriculum, curriculum implementation, Secondary school

Introduction

The importance of chemistry to a country's growth cannot be overstated. Chemistry instruction helps in instilling scientific knowledge and fostering a scientific outlook in students. When this mindset is employed correctly, it leads to the advancement of the person, the society, and the overall level of life of the populace (Igwe, 2015). Therefore, it is important to recognize the role that this particular science knowledge and abilities can play in the economic and industrial growth of Nigerian society by raising awareness, fostering constructive mindsets, and increasing aptitude and commitment of students (Toili, 2007). Additionally, chemistry makes a significant contribution to criminal justice, agribusiness, and healthcare. All of the aforementioned facts show that chemistry is crucial to the economic and all-round development of any country, and as such, it should be seen as necessary and therefore completely integrated into Nigeria's developmental efforts (Giginna & Nweze, 2014). However, there are numerous implementation problems with the secondary education chemistry curriculum, such as lack of classroom and laboratory space, lack of qualified chemistry teachers, lack of chemistry teachers' motivation, lack of instructional materials, underfunding, and lack of involvement of chemistry teachers in planning the curriculum (Igwe, 2015). These factors have posed a challenge on the performance level of students in WAEC Chemistry exams in the past years. WAEC Chief examiner 2018, 2019 and 2020 also pointed out the following

areas of difficult students face in chemistry to include; majority of the candidates did not adhere to the instructions; inability to differentiate between molar mass and relative atomic mass; application of wrong unit; inability to calculate mass concentration of solution; inability to identify colours; some candidates wrote clear solution instead of colourless solution; application of theoretical approach to practical questions; majority of the candidates carried out qualitative analysis on solid samples; some candidates carried out test directly on the solid sample instead of solution; lack of knowledge on recrystallization procedure; inability to calculate mass concentration of solution; poor knowledge of significant figures; non-adherence to instructions, especially with regard to stepwise tests; use of wrong symbols to represent ions; poor knowledge of the mole concept; arithmetic errors and omission.

A curriculum may be thought of as a structured instructional process (a schedule of lessons, a plan of actions, and a plan of steering the instructional delivery), a proposition or specific framework, with a time period for execution, assessment and review, and intended for the purpose of the (recipient) learners' overall growth. It is the blueprint for how learning is delivered, from which the curriculum, the module plan, and the lesson plan are generated (Sangoleye & Akaraonye, 2019). According to Kolawole (2006), curriculum and education could be compared to conjoined twins, and every endeavor in the classroom setting must incorporate a curriculum. In other words, the curriculum is linked to every aspect of education for quality assurance.

Quite crucially, curriculum evaluation-which is often carried out after a curriculum has been launched is the sole way to assess a curriculum's efficiency, applicability, significance, and functioning. It should come as no surprise that many good curriculum designs and other academic standards get lost in the shuffle during the implementation phase (Mkpa, 2005). Since there are many professionals in Nigeria, according to Kolawole (2006) the issue is not with the creation of curricula or the development of policies, but rather with their execution. Furthermore, the term "curriculum" may also be ascribed to a clearly laid out and necessary instructional plan that students must complete in a way to attain a particular form of knowledge. In other words, a curriculum is seen as the didactic components that comprise a certain academic setting (Ogundele, Okunlola, Damilola, & Godfrey, 2020; Mirici & Uzel, 2019).

Curriculum implementation entails a dialogue between instructors, students, and other concerned and relevant bodies and personnel the kind that is oriented towards realizing the goals of learning at a specific standard as contained in the fourth edition of the Nigerian curriculum document. The goals of the secondary school chemistry curriculum can be summarized as follows: to make the shift to using empirical principles and ideas easier and to effectively choose and structure the information in order to impart fundamental understanding of scientific ideas and principles; also, to demonstrate connections between chemistry and other science disciplines and to demonstrate chemistry's connection to business, everyday living, risks, and advantages. Furthermore, to give the learners who are not pursuing post-secondary education a solid basis for other prospective occupations (Igwe, 2015). Chemistry instructors must play a pivotal role in achieving these goals. This is so because the chemistry instructor acts as a liaison between the learner and the curriculum. It is true that chemistry teachers are in charge of carrying out the curriculum in a successful manner. The Senior Secondary Chemistry Curriculum has not been well implemented, despite the significance of chemistry in the nation's goal for rapid innovation and this calls to question the responsibilities that chemistry teachers play in its implementation (Igbonugo, 2013; Achimugu, 2016).

The instructors' adaption of the curricular materials is the key issue with the implementation of the chemistry curriculum in many nations, even in China (Chen & Wei, 2015). A chemistry teacher's teaching competence, external assessments, time restraints, instructional materials and class size in particular, have a considerable impact on how the teachers adapt curricular materials (Chen & Wei, 2015).The following factors affect how well the

chemistry curriculum is implemented in South Africa: dull classes, ill-equipped labs, and unprofessional behavior by teachers while they are teaching, lack of continuous training of teachers at trainings and conferences (Ijidike, 2015). The case is not different in Nigeria as the same issues have been reported by research showing similar challenges . Achimugu (2016) also demonstrated that the location of the school had no discernible impact on the average reaction of the chemistry instructors to the variables influencing the execution of the chemistry curriculum. This pins a special emphasis on teacher factors influence on effective curriculum implementation, this study places a special focus on four teacher variables; gender, location, teachers' experience and academic qualification.

Teacher gender which can either be male or female could be a factor influencing curriculum implementation. The term gender is used to indicate the distinction between human beings on the basis of masculinity and femininity in regards to their expected roles. Gender differences imply difference in roles played at home and society (Momanyi, 2010). The type of task a student performs, may be peculiar to the gender of the student. More difficult tasks are sometimes, reserved for males while less difficult tasks are considered feminine in social settings. Equally, teachers in urban, peri-urban and rural may be effectively different when it comes to curriculum implementation, just as teacher growth in experience and qualification which is mostly assessed and evaluated in terms of student success increases during the length of a teacher's vocation, it is described as the improvements in a teacher's effectiveness as a result of years spent in the profession. The first few years of a teacher's employment are considered to be when these benefits are the greatest, but they remain substantial as the teacher enters the next ten to thirty years of experience in their profession (Kini & Podolsky, 2016). Longer durations of teaching experience within teacher education programs in the universities and colleges of education have given for opportunities to use theoretical knowledge during classroom teaching practice, as Darling-Hammond (2014) outlined. Since theory and practice are combined, newly graduated teacher education students may be just as productive as their more seasoned peers. Other research (Etiubon & Benson, 2014; Kenni, 2019) also corroborates this to state that teacher experience has significant effect on the quality of education in chemistry.

Other researchers have also examined teachers` variables with respect to curriculum implementation abounds. As Olaniyan and Omosewo (2013) reported, teachers` qualification and years of experience does not significantly influence curriculum implementation. Ohadiugha (2022) reported that teachers experience significantly influences curriculum implementation. However, gender does not influence the implementation of curriculum. Unimna, Essien, Edinyang, Unimke and Opoh (2020) found that teachers` qualification and years of teaching experience significantly influence curriculum implementation. Onnogen (2020) reported a significant influence of teachers` gender on implementation of curriculum. Olaosebikan, Ibrahim and Abdullahi (2021) in their study showed that school location influence curriculum implementation.

The foregoing shows differences in the findings of researchers on the influence of teachers` variables on curriculum implementation. Thus, there is need for further studies in order to determine whether or not teachers` factors such as gender, location academic qualification and years of teaching experience influence curriculum implementation. This article therefore discussed the concept of curriculum and its implementation, the secondary school chemistry curriculum, as well as the elements determining effective implementation.

The main purpose of the study is to investigate the teacher related factors that affects the effective implementation of chemistry curriculum in secondary schools. Specifically, the study sought to answer the following research hypothesis:

Hypotheses

The following hypotheses were formulated and were tested at 0.05 level of significance;

1. There is no significant difference in the mean responses on the effective

implementation of chemistry curriculum in secondary schools based on gender

2. There is no significant difference in the mean responses on the effective implementation of chemistry curriculum in secondary schools based on school location
3. There is no significant difference in the mean responses on the effective implementation of chemistry curriculum in secondary schools based on years of teaching experience
4. There is no significant difference in the mean responses on the effective implementation of chemistry curriculum in secondary schools based on academic qualification

Methodology

The study adopted non-experimental design of survey research type. The area of the study was Nsukka Education Zone of Enugu State, South-East of Nigeria. All the one hundred and eighty-six (186) Chemistry teachers in public schools in the three local government areas of the zone were used for the study, this comprises of 84 male and 102 female teachers in the Education Zone. The instrument for data collection was a structured questionnaire developed by the researchers Titled "Chemistry Curriculum Implementation Questionnaire (CCIQ)". The questionnaire had two sections; A and B. Section A sought to elicit demographic data of the respondents while section B comprised of 20 items statement that relate elements of curriculum implementation by chemistry teachers. In section B, the questionnaire was designed in four-point scale of Very Often (VO) = 4, Often Used = 3 (OU), Seldom Used (SU) = 2and Not Used (NU) = 1. The instruments was both face and content validated by two experts in Chemistry Education and one expert in Measurement and Evaluation all from Science Education Department, Faculty of Education, University of Nigeria, Nsukka. The questionnaire was trial tested on 30 teachers from secondary schools in Enugu North education Zone which is outside the area of study. After the trial testing, the data obtained was subjected to reliability estimate and a reliability coefficient of 0.89was obtained using Cronbach Alpha. The data collected using the instrument was analyzed using mean and standard deviation while t-test and analysis of variance (ANOVA) were used to test the hypotheses at 0.05 level of significance. In line with Arikpo & Odinko (2019) who reported that the criterion mean value was 2.50. This is considered as the bench mark since 2.50 is the average of the 4-point scale of 1, 2, 3 and 4. Items with mean value 2.50 and above indicated agreement (A) while items with mean value below 2.50 indicated disagreement (D).

Result

Hypotheses One: There is no significant difference in the mean responses on the effective implementation of chemistry curriculum in secondary schools based on gender

Table 1 : t-test analysis for the difference in the mean responses on effective chemistry curriculum implementation in secondary schools based on gender

Groups	N	Mean	SD	df	T	Sig(2tail)
Male	84	2.45	0.23	184	-1.446	0.150
Female	102	2.51	0.25			

Table 1 presented the t-test value of -1.446 with a probability value of 0.150. The probability value of 0.150 is greater than 0.05, the null hypothesis was not rejected. The researchers concluded that there was no significant difference in the mean responses on the effective chemistry curriculum implementation secondary schools based on gender.

Hypotheses Two: There is no significant difference in the mean responses on the effective implementation of chemistry curriculum in secondary schools based on school location

Table 2 : Analysis of variance on the difference in the mean responses on the effective chemistry curriculum implementation in secondary schools based on school location

	Sum of squares	df	Mean Square	F	Sig
Between groups	0.326	2	0.163	2.817	0.062
Within groups	10.578	183	0.058		
Total	10.904	185			

Table 2 shows that the F value of 2.817with a probability value of 0.062. The probability value of 0.062 is greater than 0.05, means that the null hypothesis was not rejected. The researchers concluded that there was no significant difference in the mean responses on the effective chemistry curriculum implementation in secondary schools based on school location.

Hypotheses Three: There is no significant difference in the mean responses on the effective implementation of chemistry curriculum in secondary schools based on years of teaching experience

Table 3 : Analysis of variance on the difference in the mean responses on the effective chemistry curriculum implementation in secondary schools based on years of teaching experience

	Sum of Squares	df	Mean Square	F	Sig
Between groups	0.314	4	0.078	1.340	0.257
Within groups	10.590	181	0.059		
Total	10.904	185			

Table 3 shows the F value of 1.340and a probability value of 0.257. The probability value of 0.257 is greater than 0.05, the null hypothesis was not rejected. The researchers concluded that there was no significant difference in the mean responses on effective implementation of chemistry curriculum in secondary schools based on years of teaching experience.

Hypotheses Four: There is no significant difference in the mean responses on the effective implementation of chemistry curriculum in secondary schools based on academic qualification

Table 4: Analysis of variance on the difference in the mean responses on the effective chemistry curriculum implementation in secondary schools based on academic qualification

	Sum of Squares	df	Mean Square	F	sig
Between groups	0.108	3	0.036	0.607	0.612
Within groups	10.796	182	0.059		
Total	10.904	185			

Table 4 shows the F value of 0.036and a probability value of 0.612. The associated value of 0.612 is greater than 0.05, the null hypothesis was not rejected. The researchers concluded that there was no significant difference in the mean responses on the effective chemistry curriculum implementation in secondary schools based on academic qualification.

Discussion of Findings

The result of this study revealed that both male and female chemistry teachers are effective in implementing chemistry curriculum in secondary schools. Further analysis showed that the difference between male and female teachers on the effective implementation of chemistry curriculum in secondary schools was not significant. This result could mean that male and female teachers implement chemistry curriculum at the same extent. This result could have been like this because, the chemistry teachers adhered strictly to the guidelines in the chemistry curriculum. The finding of this study is supported by the study of Ohadiugha (2022) that gender does not influence curriculum implementation. However, the study of Onnoghen (2020) found a significant influence of gender. This disparity may be due to the location of the study and the subject area.

The finding of this study showed that location influence the effective implementation of chemistry curriculum in secondary schools. Urban and rural chemistry teachers were found to implement the chemistry curriculum more than the peri-urban teachers. Further analysis showed that the influence of location was not significant. This result means that the level at which urban, peri-urban and rural senior secondary school chemistry teachers implement the chemistry curriculum are the same. This result may have been like this because, the chemistry teachers in urban, peri-urban and rural schools are well qualified and competent enough to implement the curriculum. This could have resulted in the non-significant difference among them. The study of Olaosebikan et al (2021) found a contrary report that location influence curriculum implementation.

In this study it was found that teacher years of teaching experience influence their effective implementation of the chemistry curriculum in senior secondary schools. Further analysis showed that there exists no significant difference in the influence teachers` experience on their effective implementation of chemistry curriculum. This implies that the years of teaching experience of teachers do not determine how effectively they implement the chemistry curriculum. This result might have turned out the way it is because, the teachers could have been exposed to the same and sufficient level of training on how to effectively implement the chemistry curriculum. This might have determined the result of this study. Olaniyan and Omosewo (2012) are in support of this finding. Though, Ohadiugha (2022) and Unimna et al (2020) found that teacher`s qualification influence curriculum implementation.

This study also found that teachers' academic qualification influences their effective implementation of the chemistry curriculum. However, the influence of teachers` academic qualification on curriculum implementation was found not to be significant. This means that teachers with NCE, B.Sc., M.Sc. and PhD are equally effective in the implementation of chemistry curriculum. This result is plausible because, teachers with these qualifications are adequately exposed to the rudiments of education, teaching and learning. This could have made the teachers proficient in implement the chemistry curriculum. This result aligns with the findings of Olaniyan and Omosewo (2013) that academic qualification influences teachers` implementation of curriculum. Meanwhile, the report of Unimna et al (2020) contradicted this finding that teachers` qualification influences their implementation of curriculum.

Conclusion

In line with the findings of this study, it is concluded that senior secondary school chemistry teachers` gender does not influence their effective implement of chemistry curriculum. More so, school location does not influence how effective the chemistry

curriculum can be implemented in senior secondary schools. The study also concludes that teachers` years of teaching experience is not a factor to consider in the effective implementation of chemistry curriculum at the secondary school level. Consequently, Teachers academic qualification does not determine how effective the chemistry curriculum is implemented at the senior secondary school level.

Recommendation

In accordance with the result of this study, it is recommended thus;

1. Continuous efforts should be made by the government and relevant stakeholders to ensure continuous and strict compliance with the guidelines in chemistry curriculum to ensure its effective implementation.
2. School authorities should ensure that qualified chemistry teachers are always hired to ensure effective curriculum implementation.
3. Workshops and seminars on effective curriculum implementation should be organized for all concerned stakeholders.

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