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Public School Teachers' Perceptions of Factors Influencing Teaching of Chemistry in Senior Schools in Minna, North-Central, Nigeria

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Abstract

The study sought to investigate the perceptions of public-school teachers on the factors influencing teaching of chemistry in senior secondary schools in Minna, North-Central, Nigeria. The study was undertaken to determine the extent to which some factors have influenced the effective teaching of chemistry in Nigerian public senior secondary schools. A total of thirty-one (31) teachers were purposively selected for the study, one teacher from each of the thirty-one public senior secondary school. The study adopted a qualitative research design which largely involved content analysis techniques in data collection and analysis. The results showed that majority of public-school teachers exhibit similar perceptions of factors influencing the teaching of chemistry and there is no difference in the perceptions of qualified and unqualified public-school teachers on the factors influencing the teaching of chemistry in senior secondary schools. However, some suggestions were offered on how to improve on the factors highlighted to make the teaching and learning of chemistry more effective and interesting.

Key words: teachers' perception, teaching chemistry, learning chemistry, student-related factors, school-related factors

Introduction

Science is a systematic and logical approach to discovering how things in the universe work. It is also the body of knowledge accumulated through discoveries about living and non-living things in the universe (Bradford, 2015). The importance of the knowledge of science in the development of any nation cannot be overemphasized and as such science education should be given maximum attention especially in developing country like Nigeria.

Science education according to Oyelekan (2016) is defined as "the process of transferring scientific knowledge, skills, and processes from one person to another" (p. 112). This includes scientific attitudes as well. Science deals with knowledge about nature, which comprises the physical earth and its living components. Despite the importance of science education, the teaching and learning of science have been confronted with various challenges (Omorogbe & Ewansiha, 2013). One of these challenges is the teacher related factors in terms of presenting science instructions to learners.

Chemistry is a branch of physical science which deals with the study of composition, structure, properties, and change of matter (Alan, 2020). Chemistry has become one of the most important disciplines in the school curriculum; its importance in the general education has gained world-wide recognition. Chemistry subject in secondary school is pivotal to the development of science and technology. In a complex and dynamic society as ours today, chemistry and chemical

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sciences are very essential. They are pivotal in our day to day lives and are helping the world in order to respond promptly to some of the great challenges faced today. Such challenges include global warming, environmental pollution and degradation, earthquake, energy problems, flooding and chemical weapon devastated areas across the globe (American Chemical Society, 2015).

As a teacher, it is necessary to motivate students and help them recognize their strengths and weaknesses. Educators are important role models for students and have a big impact on helping shape, create, support, and establish students' strengths, goals, and knowledge. Therefore, it is essential to be aware of the effective qualities, skills, and characteristics that one brings into a learning environment and how teacher influence plays a role (Karina, 2017).

There is growing interest in the professional development of educators as the demands, expectations, and requirements of teacher education increasingly come under scrutiny (Loughran, 2014). What the teacher does, influences the whole process of learning. Effective teacher produces better performing students (Akiri, 2013). Van den Bergh and Roos (2014) maintained that professional development of teachers can be effective and sustainable, if certain conditions are met (Curwood, 2014). Besides, the analysis of Van den Bergh and Roos (2014) suggested that the implementation of educational reforms, including reforms associated with technology integration and literacy education, is often dependent upon teachers' skills, values, and cultural models. While hiring of qualified teachers is encouraged for improvement of academic performance, theories from the study of Firestone (2014) caution that policies to remove ineffective teachers should not reduce autonomy or trust among effective teachers and that evaluations should provide teachers with useful feed- back and policy makers with information on the conditions that facilitate good teaching.

Sampson (2017) suggested that student performance will improve if the students have qualified teachers with good communication skills and competence in English Language. Also, the student will perform better if they are guided by qualified teachers. Abdu-Raheem (2017) concluded that students who were taught by qualified teachers perform better than those taught by unqualified teachers.

Allport (1966) described the psychological concept of perception as the way through which we evaluate people we are familiar with. Allport's explained the process involved in the concept of perception:

i. Common Judgment Sets: Allport argued that in evaluating a person there must always be a special reason in view. The reason for this study is to compare teachers' and students' perception on the identified factors influencing learning of chemistry and determine if there is any significant difference in their perceptions.
ii. Categorization Tendency: Allport asserted that one of the most important things to do in perceiving any object is to place it in a familiar category. This has prompted the categorizations of factors influencing learning of chemistry into four that is students' related factor, subject related factor, teacher related factor and school related factor.
iii. Combing Cues: Allport opined that judging people entails putting together many bits of information.

Obadina (2019) investigated the perception of teachers on some variables (gender, teachers'

qualification, teaching experience and school location) associated with senior school chemistry teaching in Ogun State, Nigeria. The study reveals that there was no significant difference in perception of teachers on the factors influencing the teaching and learning of chemistry in secondary schools in Ogun State.

The discipline of science education is concerned with "discovering, developing, and evaluating methods and strategies to be used in teaching science" (Olorundare, 2014, p. 8). It also involves conducting research focused at advancing the teaching and learning of science. The training of teachers for a career in science teaching also falls within the purview of science education.

Despite the importance of science education and in particular chemistry as one of the science subjects in the school curriculum, many studies have shown that what the teacher does, influences, the whole process of learning and effective teacher produces better performing students (Akiri, 2013). More so, senior secondary school education is a determinant of the academic success of students at the tertiary level. Despite, the poor performance of students in the West African Senior School Certificate Examination (WASSCE) due to several factors, researchers have not devoted much attention to public school teachers' perceptions of factors influencing teaching of chemistry and how these factors hindering effective teaching of chemistry which could be properly addressed to boost the students' understanding of chemistry which led to better performance. This study was therefore designed to investigate the public-school teachers' perceptions of factors influencing teaching of chemistry in senior secondary schools in Minna, Niger State, Nigeria.

Purpose of the Study and Research Questions

The study was an attempt to determine chemistry teachers' perceptions of factors that influence the effective teaching of chemistry. The study, therefore, investigated the Minna public senior secondary school teachers' perceptions with respect to three categories of factors influencing students' learning of chemistry, comprising (i) teacher-related factor, (ii) students-related factors, and school-related factors. The study was, therefore, guided by the research questions: What perceptions do public senior secondary school teachers' hold about teacher-related, student-related, and school-related, factors that influence students' learning of chemistry in Minna in Niger State of Nigeria?

Methods

The study adopted a qualitative research design. This type of research enables a researcher to gather in-depth insights on a phenomenon. According to the rule of thumb, a researcher can use qualitative research if there is need to understand something (concepts, thoughts, and experiences) deeply.

The population for this study comprised of all chemistry teachers from public secondary schools in Minna, Niger state. There are eighty-four (84) senior secondary schools in Minna, made up of fifty-three (53) private senior secondary schools and thirty-one (31) public senior secondary schools (Department of Planning and Research Statistics, 2022). There are seventy-one (71) chemistry teachers in Minna; 40 in private senior secondary schools and 31 in public senior secondary schools. Thirty-one (31) chemistry teachers, one from each of the public senior secondary schools, were purposively sampled to enable the researcher collect data and provide answers to the research questions.

An interview protocol was developed to elicit responses from the participants. The interview

protocol contains twenty-two (22) open-ended items for the teachers in the sample. To ensure face and content validity, the interview protocol was given to five experts, three lecturers in the Department of Science Education, Faculty of Education, University of Ilorin, Ilorin, Nigeria and two professionally qualified experienced chemistry teachers to scrutinize. Their corrections and suggestions were utilized in revising the instrument for data collection.

A letter of introduction collected from the University was used to seek the consent of the teachers participating in the study. The researcher took few minutes to explain the motive and benefit of the study to the teachers and the need to be sincere when responding to questions asked by the researcher. In each school, the researcher took about forty minutes to interview a respondent. The data collection exercise took three weeks. The data collected were transcribed, coded and transformed into themes that were analyzed using content analysis techniques to answer the research questions.

Results

Demographic characteristics of participants

The qualifications of teachers who participated in the study were HND, B. Sc and B. Ed. Four out of the thirty one teachers (representing 13%) having HND, eight out of the thirty one teachers (representing 26%) having B.Sc, and nineteen out of the thirty one teachers (representing 61%) having B. Ed. The qualification(s) of public-school teachers who participated in the study were categorized into two, namely: qualified and unqualified. The results indicated that for public school teachers who participated in the study, 12 out of 31 (i.e., 29%) are unqualified (as teachers with HND and B.Sc in chemistry were categorized as unqualified).

The perceptions public senior secondary school teachers' hold about factors influencing their students' learning of chemistry were considered under three categories (i) teacher-related factors, (ii) students-related factors, and school-related factors.

Teacher-related factors influencing teachers' perceptions

Teachers' Qualification: Both qualified and unqualified teachers have positive perception of factors influencing the teaching of chemistry as all the teachers who participated in the study, irrespective of their qualification(s) mentioned: lack of equipped laboratory; large class size; students' poor study habit; insufficient number of periods in the school timetable; lack of instructional materials; teachers teaching experience and qualification(s) as chemistry teaching/learning challenges in public senior secondary schools. Hence there is no difference in the perceptions of qualified and unqualified teachers on the factors influencing the teaching of chemistry in senior secondary schools. All the respondents are of the opinion that teachers' qualification or higher qualifications are likely to bring about better students' learning of chemistry.

Teaching Methods All the respondents who participated in the study mentioned "discussion method, field trip, experimentation method, group discussion method, lecture method, demonstration method" as methods used in the teaching of chemistry in their schools. 29 out of the 31 (i.e., 94%) respondents mentioned frequent use of "discussion method, class demonstration, and group discussion method" in the teaching of chemistry in their schools. Only 2 out of 31 (i.e., 3%) of the respondents

mentioned using experimentation method twice in a term in the teaching of chemistry in their schools.

Enrichment Activities Hands-on experiments, interactive demonstration, field trips, science fair and projects were the enrichment activities mentioned by all the respondents who participated in the study. Only 2 respondents out of 31 (i.e., 6%) respondents mentioned using Hands-on experiments/practical twice in a term. No single respondent mentioned the used of field trip as an enrichment activity to boost the students' interest in chemistry. 7 respondents out of 31 (i.e., 23%) mentioned using science fair and projects as an enrichment activity leaving 22 (i.e., 71%) of the respondents who did not mention any enrichment activities to boost the students' interest in chemistry in their schools.

Only 2 out of 31 (i.e., 6%) respondents attend seminars and workshops in the last ten years of teaching. Only 6 out of 31 (i.e., 19%) respondents benefited in an in-service program in the last ten years. All the respondents mentioned that regular attendance of seminars, workshops and in-service programs will empower the teachers to use enrichment activities effectively.

Student-Related Factors Influencing Teachers' perceptions

Students' Participation in Chemistry Lesson 20 **o**ut of the 31 respondents who participated in the study said that the students' responses to chemistry lessons in their schools is satisfactory. 11 out of the 31 respondents who participated in the study said that the students' responses to chemistry lessons in their schools is unsatisfactory. All the respondents held a perception that higher students' participation is more likely to bring about better students' learning of chemistry.

Students' Attitude to Learning Chemistry Eighteen out of the 31 (i.e., 58%) of the respondents who participated in the study rated the attitude of students toward chemistry as "positive" while 13 out of the 31 (i.e., 42%) respondents who participated in the study rated the attitude of students toward chemistry as "negative". All the respondents who participated in the study held a perception that negative attitude to chemistry is the cause of the poor students' learning of chemistry.

School-related factors influencing teachers' perceptions

Allocated Time to Teaching Chemistry All the respondents mentioned that, compared to other subjects, the time allocated to teaching of chemistry in their school time table is insufficient to cover chemistry syllabus. 22 out of the 31 (i.e., 71%) of the respondents said that the number of periods allocated for chemistry in their schools is "three periods per week", while the remaining 9 (i.e., 29%) respondents mentioned as low as "two periods" were allocated to chemistry per week

Resources for Teaching Chemistry All the respondents mentioned inadequacy of chemistry teaching resources in the laboratories. Only 4 out of the 31 (i.e., 13%) respondents mentioned having inadequate instructional materials for teaching chemistry and a separate chemistry laboratory fairly equipped with apparatus like distillation apparatus, titration apparatus and few table reagents. The remaining 27 (i.e., 87%) of the respondents mentioned not having chemistry laboratory and instructional resources like – textbooks, workbooks and periodic table chart in their schools.

Class Size All the respondents held the perception that "the number of chemistry students per class posed challenges to effective teaching and learning and classroom management.

Discussion

The findings revealed that majority of respondents' exhibit positive perceptions of factors influencing the teaching of chemistry in senior secondary schools. This is attributed to the fact that, all the public senior secondary school in Minna are affected by school related factors, students' related factors and teachers' related factors influencing the teaching of chemistry. This finding is in agreement with the findings of Obadina (2019) who investigated the perception of teachers on some variables (gender, teachers' qualification, teaching experience and school location) associated with senior school chemistry teaching in Ogun State, Nigeria. The study reveals that there was no significant difference in perception of teachers on the factors influencing the teaching and learning of chemistry in secondary schools in Ogun State.

The findings of this study also revealed that majority of public-school chemistry teachers (63%) are qualified, though this does not translate into better performance in Chemistry by the students in Minna. Even with the higher number of qualified chemistry teachers in public secondary schools, they do the same things the same way all along, hence there is need for the teachers to attend training workshops in areas of their specialization. The finding is similar to the findings of Serin (2017) who reported that fewer number of teachers participate in professional development programmes thereby affecting their level of productivity. The study is also in line with Akpan and Ita (2015) who established that it is not just enough to recruit teachers for the programme, but to provide continuous in-service programme or development service programmes for the teachers to function effectively and efficiently.

Furthermore, it was observed that the most common teaching and learning methods employed by the majority of teachers in public secondary schools in Minna are lecture method, discussion method, class demonstration. This suggest that teachers should strive harder to regularly employ varieties of teaching methods, and the pedagogical aspect of teaching and learning be given upmost priority, as the students' attitude towards the subject is influenced by the methods the teacher uses in teaching. This is in line with the study conducted by Endurance, Tamunosis, (2020) and Woldeamanuel, Atagana, Engida (2014) in Ethiopia that students' positive attitude is influenced by the teachers' interest and effectiveness of the teaching methods used in teaching science.

The findings of the study revealed that large class size has been identified as one of the factors hindering effective teaching and learning of chemistry. For instance, the majority of the respondents agreed that "it becomes very difficult to conduct practical lessons, organize group activities and demonstrate the experiments when the class size is large". A reduced class size was suggested for chemistry lessons to be effective. This agrees with the finding of Edomwonyi-Otu, Avaa, (2011), who found that it is difficult to demonstrate the experiments when the class size is large as the teacher had to spend a lot of time controlling the class. This finding is in consonance with the study conducted by Shafie, Kadir, Asimiran, (2014) in Malaysia who found that the teachers are unable to develop materials for teaching because of large class and as a result lack innovation in teaching and learning.

In addition, time constraint was identified by the majority of the respondents from public

schools in Minna as one of the major factors that influences the effective teaching of chemistry. The time (three periods per week) allocated for the subject was not adequate for teachers to cover the stipulated content. The teacher has to adjust the practical class from the period allocated for the theoretical class as there was no separate period allocated for the practical lessons. The teachers were not able to perform effective practical within the time limit of three periods allocated for both the theoretical classes and practical classes combined. A minimum of 5 periods was suggested for the subject per week. This finding concurs with the findings of Edomwonyi-Out, Avaa, (2011), in a study which revealed that it is difficult to demonstrate adequate experiments when the class size is large as the teacher had to spend a lot of time controlling the class.

Conclusion

The study concluded that the teachers in public schools mentioned: teaching experience, teaching qualification, teaching methods, lesson duration, students' performance, parents' educational status, learning materials, students' interest and attitude, man power development and large class size as factors influencing teaching and learning of chemistry in senior secondary schools. There was no difference in the perceptions of qualified and unqualified public-school teachers on the factors influencing the teaching of chemistry in senior secondary schools.

Recommendations

The following recommendations have been made in line with the findings of this study:

1. Government and school administrators should create an enabling environment for teachers to attend seminars and workshops on regular basis in innovative practices in their area of specialization.

2. The teachers' academic and professional qualifications should be based on the required discipline, that is, chemistry. Non-chemistry graduates with no education background should not be employed to teach chemistry as this will affect their effectiveness in skipping of difficult topics in the chemistry curriculum.

3. Curriculum developers, Ministry of Education and school management should make provision for adequate periods for coverage of theory and practical lessons on the school time table in chemistry by revising periods allocated to chemistry on the time table from three periods to five periods per week.

4. Chemistry teachers should adopt varieties of innovative strategies and teaching methods or combination of lecture and other relevant teaching methods such as virtual learning inquiry, demonstration and fieldstrip among others.

5. Government, school administrators and Parent Teachers Association (PTA) should improve on infrastructural and instructional materials such as laboratories, science equipment and teaching aids to make chemistry activities based in senior schools.

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