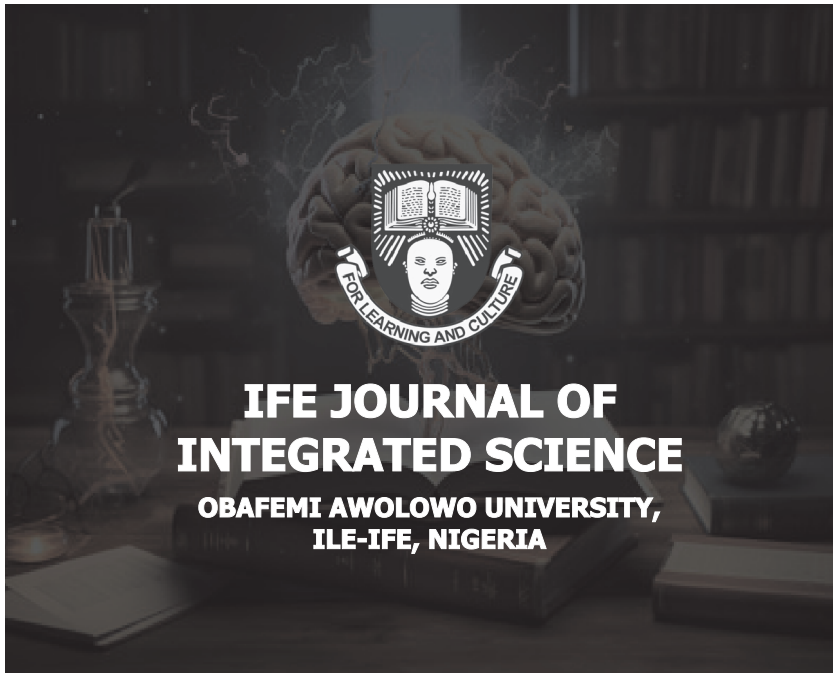

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TABLE OF CONTENTS

INFLUENCE OF TEACHERS' QUALIFICATION ON SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN CHEMISTRY IN IFE-EAST LOCAL GOVERNMENT AREA OF OSUN STATE, NIGERIA
Timilehin Christianah ADEDEJI 1-18

ASSESSMENT OF CHEMISTRY CURRICULUM IMPLEMENTATION IN SENIOR SECONDARY SCHOOLS IN IFE CENTRAL LOCAL GOVERNMENT AREA OF OSUN STATE
Elijah Oluwatobi ADEWUYI 19-41

LOCUS OF CONTROL AND SELF-EFFICACY AS PREDICTORS OF SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN CHEMISTRY IN IFE CENTRAL LOCAL GOVERNMENT AREA, OSUN STATE, NIGERIA
Olamide Rofiat TIJANI 42-60

EFFICACY OF SELF-DIRECTED AND COLLABORATIVE CONSTRUCTIVISM INSTRUCTIONAL STRATEGIES ON JUNIOR SECONDARY SCHOOL STUDENTS' ENGAGEMENT IN BASIC SCIENCE AND TECHNOLOGY IN ADAMAWA STATE
Samuel Akinola OGUNDARE, Ph.D, & Ahmed IBRAHIM, Ph.D 61-75

EFFECTS OF JIGSAW COOPERATIVE INSTRUCTIONAL STRATEGY ON SECONDARY SCHOOL STUDENTS' ACQUISITION AND RETENTION OF MATHEMATICS PROCESS SKILLS
Lucy ERAIKHUEMEN, Peter Akpojehih Agbarogi & Festus Osadebamwen Idehen 76-93

EFFECTIVENESS OF FLIPPED AND BLENDED CLASSROOM LEARNING APPROACHES ON STUDENTS' ACHIEVEMENT IN GENETICS CONCEPTS IN BIOLOGY
Blessing Izehiuwa EDOKPOLOR, C. N. OMOIFO, Ph.D & L. ERAIKHUEMEN, Ph.D 94-111

EFFECTS OF FLIPPED AND BLENDED CLASSROOM LEARNING APPROACHES ON STUDENTS' RETENTION IN GENETICS CONCEPTS IN BIOLOGY IN EGOR LOCAL GOVERNMENT AREA OF EDO STATE
L. ERAIKHUEMEN, Ph.D, C. N. OMOIFO, Ph.D & Blessing Izehiuwa EDOKPOLOR 112-130

SUSTAINABLE STEM EDUCATION IN THE IOT ERA: BALANCING THE PARADOX OF APPLICATIONS, BENEFITS, AND CHALLENGES FOR BETTER PROSPECT
Ezekiel Adedayo ADEOLA 131-157

TEACHERS' TEACHING METHOD PREFERENCES AND RESOURCES UTILISATION AS PREDICTORS OF SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN CHEMISTRY IN OSUN STATE, NIGERIA
Damilola Monsurat ELUYERA & Omowunmi Sola AGBOOLA, Ph.D 158-188

ENVIRONMENTAL LITERACY AMONG OSUN STATE CLASSROOM TEACHERS
Omowunmi Sola AGBOOLA, Ph.D, Simeon Olayinka OLAJIDE, Ph.D, Olusegun Ojo BAKARE, Ph.D & Muraina Olugbenga OMIYEFA, Ph.D 189-207

EFFECTS OF BI-MODALSCHOOLYARD PEDAGOGY AND GENDER ON SCIENCE PROCESS SKILLS OF PRESCHOOLERS IN OYO STATE, NIGERIA
Florence Taiwo. OGUNYEMI, Ph.D. & Fatimah ZAKARIYYAH 208-226

STUDY HABIT AS PREDICTOR OF JUNIOR SECONDARY SCHOOL STUDENTS' INTEREST IN BASIC SCIENCE IN IFE CENTRAL LOCAL GOVERNMENT AREA, OSUN STATE
Oluwaseun Newton AJEWOLE 227-234

ROLE OF SCHOOL FARMS IN DEVELOPING ENTREPRENEURIAL SKILLS AMONG SECONDARY SCHOOL STUDENTS IN IFE CENTRAL LOCAL GOVERNMENT AREA, OSUN STATE, NIGERIA
Oluyemisi Dolapo ADISA & Ibironke Ibiwumi IDOWU 235-248

TEACHERS' SELF- EFFICACY AND JUNIOR SECONDARY SCHOOL STUDENTS' LEARNING OUTCOMES IN BASIC SCIENCE IN SOUTHWESTERN NIGERIA
Abosede Adenike OYAGBILE, Ph.D. & Theodora Olufunke BELLO, Ph.D. 249-262

ASSESSMENT OF CHEMISTRY CURRICULUM IMPLEMENTATION IN SENIOR SECONDARY SCHOOLS IN IFE CENTRAL LOCAL GOVERNMENT AREA OF OSUN STATE

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Abstract

The study assessed the implementation of chemistry curriculum in senior secondary schools in Ife Central Local Government. The study adopted descriptive survey research design. The population consisted of senior secondary schools Chemistry teachers in Ife Central Local Government Area. The researcher used two instruments namely Questionnaire on the Assessment of Chemistry Curriculum Implementation (QACCA) and Chemistry Instructional Resources Observation Checklist (CIROC). The QACCA was used to elicit information from the teachers about their qualification and level of compliance with the appropriate teaching method recommended for use while Chemistry Instructional Resources Observation Checklist (CIROC) was used to find out the availability of the resources put in place to implement Chemistry curriculum. Data collected were analyzed using appropriate descriptive statistics mean, frequency distribution and percentages. The result revealed that majority of the teachers (85.7%) implementing the Chemistry curriculum hold a Bachelor's degree in Education (B.Sc. Ed), while a smaller proportion (14.3%) possess advanced degrees such as M.Sc., M.Ed., or equivalent. The analysis of the availability of instructional resources indicates that while basic and essential resources like ammeters, beakers, Bunsen burners, and volumetric flasks are generally available (mean < 1.5), there are notable deficiencies in more advanced and safety-related equipment. Resources such as calorimeter, fire extinguishers, and

fume cupboards were marked as unavailable, with mean scores above 1.5. This disparity in resource availability could hinder the comprehensive implementation of the Chemistry curriculum, particularly in conducting advanced experiments and ensuring safety during laboratory sessions. The findings suggest a significant reliance on student-centered methods such as the Discovery Method, which was frequently used by 71.4% of the teachers. This preference for active learning methods is supported by contemporary educational research, which advocates for strategies that promote critical thinking and student engagement. The study concluded that teachers implementing Chemistry curriculum are well qualified with adequate experience to anchor the subject effectively. Also, most materials needed for Chemistry curriculum implementation are readily available but not adequate. Finally, it was revealed that teachers adhere with the instructional strategies specified in the curriculum which are learner centered.
Keywords: Assessment, Chemistry, Curriculum Implementation, Senior Secondary Schools

Introduction

The level of development in science has been a major developmental index for all nations. This is why many developed countries continue to invest heavily in science, technology, and science education (UNESCO, 2011). In the United Kingdom, United States of America, and many European and Asian countries, monitoring students' performance levels and providing feedback are continual activities to improve the educational system. Evaluation of national or regional curricula is thus considered vital (Schönherr, 2015).

Nigeria, a developing country, is also committed to educating its citizenry. This commitment has led to dramatic and far-reaching changes in the Nigerian educational scene over the last few decades. For the first time in its national history, Nigeria articulated a consensus document on educational direction, marking a positive change. The emergence of the National Policy

on Education marked a turning point in Nigeria's educational development. The system of education changed from five years to six years at the secondary school level, with attendant curricular innovations. The policy document prescribes core subjects for the various streams at the Senior Secondary School level, including Chemistry, which was identified as one of the important science subjects for achieving the nation's scientific and technological goals.

Science has become an indispensable tool for human survival. The recognition of the indispensable benefits derivable from science and technology has motivated many developed countries to invest substantial resources in these areas. This, in turn, has led to additional support for science education. In Nigeria, science and technology are highly recognized as important for development. To realize the educational goals, the philosophy of education is geared towards scientific and technological progress. Hence, science is included at all levels of education.

Chemistry is the foundation required for any nation to achieve technological development and scientific breakthroughs (Jegede, 2011). Chemistry education occupies a pivotal position in Science, Technology, Engineering, and Mathematics (STEM) education. Chemistry must be communicated in relevant ways to achieve developmental goals, and this is only possible through effective and functional curricula, which are hallmarks of quality education. The recognition of chemistry's importance as a foundational science subject for achieving scientific and technological goals led to its inclusion as a core science subject in the secondary school curriculum. Without an adequate and qualitative background in chemistry, the prospect of students living effectively in our modern age of science and technology or proceeding to higher education as scientists, pharmacists, doctors, nurses, engineers, environmentalists, agriculturists, geologists, and science teachers is very bleak (NPE, 2013).

The application of chemistry has greatly impacted food processing, solar and nuclear energy, industrialization, health, etc.

According to Njoku (2014), the enviable position chemistry occupies in the educational system of most countries, including Nigeria, is perhaps justified by its dominant influence on individuals' lives in areas such as industry, agriculture, education, infrastructure, and national development efforts.

Due to the importance of chemistry, what should be taught and how it should be taught in schools becomes a concern for groups, individuals, communities, governments, and nations. According to Iji (2017), the quality of education in any system and at any level is dependent on the quality of the curriculum used for teaching and learning. Curriculum, according to Karma and Bello (2017), is a course of learning activities set out for the learner to perform to achieve specific goals presented by the educational system. Ajeka (2018) viewed the curriculum as an aggregate of what an education system tries to do to achieve predetermined objectives. It is concerned with what students will be able to do or learn as a direct consequence of what they gain from instructional experiences or the expectations from learning outcomes.

According to Stotsky (2012), curriculum is a plan of action aimed at achieving desired goals and objectives. It is a set of learning activities meant to help the learner attain goals as prescribed by the educational system. It includes the subjects and activities a given school system is responsible for. Curriculum is a standards-based sequence of planned experiences where students practice and achieve proficiency in content and applied learning skills. It is the central guide for all educators on what is essential for teaching and learning so that every student has access to rigorous academic experiences (Ride, 2022). Kelly (2013) defines curriculum as the learning planned and guided by the school, whether carried out in groups or individually, inside or outside of school. Wiles (2018) sees curriculum as the totality of student experiences in the educational process. It is a planned sequence of instruction or a view of student experiences in terms of educators' or schools' instructional goals. The process of developing the curriculum involves three sets or levels of decisions: scope, selection, and simplification (Taber, 2019).

Chemistry must be communicated in relevant ways to achieve developmental goals, which is only possible through effective and functional curricula, hallmarks of quality education. The recognition of the importance of chemistry as a foundational science subject for achieving scientific and technological goals led to its inclusion as a core science subject in the secondary school curriculum. Without an adequate and qualitative background in chemistry, the prospect of students living effectively in our modern age of science and technology or proceeding to higher education as scientists, pharmacists, doctors, nurses, engineers, environmentalists, agriculturists, geologists, and science teachers is very bleak (NPE, 2013).

This bleak outlook projected by the prevailing situation of disinterest (Aghenta, 2013; Ato, 2012; Baike, 2012; & Comparative Education Study and Adaptation Centre (CESAC), 2013) and poor performances (Ajayi, 2012; CESAC, 2013; and Ross-Imuewarin, 2011) in science and chemistry led to the introduction of the senior secondary school chemistry curriculum into Nigerian schools in 1985. The curriculum was expected to alleviate the factors responsible for the situation. These included teacher-dominated and theoretical classroom transactions (Ajeyalemi, 2012; Bajah, 2011; and Teibo, 2010), inadequate laboratories (Olamousi, 2012), failure to match course content to students' cognitive levels (Nwosu, 2013; Heron, 2011; Olamousi, 2012; McKinnon and Renner, 2011; and Teibo, 2010), and the lack of relevance of school chemistry to the everyday lives of the students (Abidoye, 2013).

The chemistry curriculum is designed to show the interrelationships between chemistry and other science subjects (biology and physics) and to satisfy requirements for the senior secondary school program in the National Policy on Education. Students are required to learn chemistry by understanding, which demands mastery of reasoning capabilities at the formal operational stage. Onwu (2011) contends that secondary school chemistry should be developed along basic chemical theory, importance, and relevance to everyday life. The Comparative

Education Study and Adaptation Center (CESAC) originally prepared the content of the chemistry curriculum in December 1984. After the Federal Ministry of Education, Science and Technology (FMEST) critiqued it, it was moderated by the Joint Consultative Council (JCC) at the Reference Committee meeting in April 1985 and subsequently approved for use in Nigeria for senior secondary schools by the Federal Ministry of Education, Lagos, in 1987. The curriculum content is organized around major concepts of energy, periodicity, and structure, which encompass many other chemical concepts.

The objectives of the secondary school chemistry curriculum, as specified in the Senior Secondary School syllabus according to Igwe, 2012 are to:

a) facilitate the transition in the use of scientific concepts and techniques acquired in integrated science (now basic science) with chemistry.
b) provide basic knowledge in chemistry concepts and principles through efficient selection of contents and sequencing.
c) show interrelationships between chemistry and other science subjects.
d) show chemistry and its links with industry, everyday life, hazards, and benefits. e) To provide students not proceeding to higher education with an adequate foundation for other future careers.

The relevance of chemistry to national development is inestimable. The teaching of chemistry helps imbibe scientific knowledge and stimulate science-oriented attitudes in learners. This attitude, when directed to the world of work, results in the development of the individual, society, and the general standard of living. Therefore, the place of chemistry knowledge and skills in economic and industrial development in Nigerian society cannot be underestimated.

Prior to the introduction of the present curriculum, chemistry was taught based on a general syllabus, a collection of topics and content emphasized for the secondary school certificate

examination. The present chemistry curriculum had a precursor in an alternative West African School Certificate Examination (WASCE) chemistry syllabus originally prepared by the Science Teachers Association of Nigeria (STAN) but adopted by CESAC in 1970 (Busari and Ajeyalemi, 2012). The syllabus operated as an alternative to the general WASCE syllabus between 1970 and 1984 (Ivowi, 2012). The students' performances in the alternative syllabus were found to be superior to those of students who offered the general syllabus (Ajayi, 2012; Ivowi, 2012; CESAC, 2012). This alternative syllabus had been systematically structured by CESAC along a five-stage model of curriculum development, starting with situation analysis and ending with summative evaluation, revision, and renewal of the curriculum. Other stages included stating objectives, determining curriculum content, trial testing, and installing materials.

However, like many other lofty Nigerian ideas and projects, the absence of maintenance and sustenance observed at the trial stages once projects are put in place appears to have affected this curriculum (Federal Ministry of Education (FME), 2018; Onwuerne, 2015; Nwagwu, 2018; Sofolahan, 2017; FRN, 2019). Students' performances in chemistry still appear to be below expectations, as shown by WASSCE Chief Examiners' reports over the years (WAEC, 2015, 2017, 2019). The curriculum has been in operation for more than two decades, and the three-year cycle has been repeated more than sixteen times since inception, yet no conscious or empirical study of the senior secondary school chemistry curriculum has been undertaken in a systematic manner to determine its quality and relevance.

Curriculum serves as a pivot on which challenges such as economic, political, social, and educational development of a nation hinge. The chemistry curriculum for senior secondary schools has been organized in such a way that, if well implemented in various schools across the federation, it would yield excellent results, achieve the stipulated objectives, and meet the national goals for science education. Curriculum implementation entails putting into practice the officially presented courses of study, syllabuses, and subjects (Gautam,

2015). Curriculum implementation refers to how the planned or officially designed course of study is translated by the teacher into syllabuses, schemes of work, or lessons delivered to students. Implementation, as an essential part of curriculum development, brings into existence the anticipated changes (Bediako, 2019). Ivowi (2014) sees curriculum implementation as the translation of "theory into practice" or "proposals into actions." Okebukola (2014) defined curriculum implementation as the translation of curriculum objectives from paper to practice. Curriculum implementation is important because it makes the teacher systematic in delivery and helps make the curriculum relevant to the learner's and society's needs.

The curriculum implementation process involves helping the learner acquire knowledge or experience. It is important to note that curriculum implementation cannot take place without the learner. The learner is therefore the central figure in the curriculum implementation process (Bediako, 2019). Although research materials and facilities also influence curriculum implementation, the teacher, the learner, the school environment, culture and ideology, instructional supervision, and assessment are the major factors influencing curriculum implementation. The teacher is the crucial person in the curriculum implementation process. Teachers, with their knowledge and competencies, are central to curriculum development efforts. Better teachers support better learning because they are most knowledgeable about teaching practices and are responsible for introducing the curriculum in the classroom.

Evaluation has been defined as the process of delineating, obtaining, and providing information about a program useful in describing and understanding the program and making judgments and decisions about it (Straton, 2012). It is a vital component of any program that strives for relevance and quality. Relevance and quality are essential characteristics for a functional curriculum (Chinapah and Miron, 2016; Cooper, 2015). According to Odunusi (2018) and Rehman (2019), the quality of an educational system is determined by the quality of the curriculum, and without curriculum evaluation, it is not possible to determine the curriculum's quality.

Since education is a dynamic process and chemistry is a very important science subject, a situation where performances are below expectations and the curriculum's operations are left to chance cannot continue unchecked. A systematic curriculum evaluation to authenticate the curriculum proposal and pinpoint areas for review or renewal is therefore called for.

Statement of Problem

Despite the national emphasis on science education and the pivotal role of Chemistry in fostering scientific literacy, there is a noticeable gap between the intended curriculum objectives and the actual outcomes experienced by the students. The persistent occurrence of suboptimal performance and lack of interest among students in Chemistry, as evidenced by consistently poor results in examinations, prompts an urgent need to examine the specific issues within the local context. Furthermore, the potential misalignment between the intended curriculum and its implementation processes raises concerns about the effectiveness of the educational system in preparing students for scientific pursuits. Thus, the study aims to systematically identify and analyze the challenges hindering the successful implementation of the Chemistry curriculum in senior secondary schools in Ife Central Local Government, Osun State, to inform targeted interventions and improvements in science education.

Purpose of the Study

The main aim of the study is to assess the implementation of Chemistry curriculum in Senior Secondary Schools in Ife central local government. Specifically, the objectives are to:

a. examine the qualifications of teachers implementing Chemistry curriculum in senior secondary schools in Ile-Ife.
b. assess the availability of instructional resources for the implementation of Chemistry curriculum in senior secondary schools in Ile-Ife.
c. determine the appropriateness of teaching methods used in

implementing Chemistry curriculum in Senior Secondary Schools In Ile-Ife.

Research Questions

The following research questions will be answered in the course of this study:

a) What are the qualifications of teachers implementing Biology curriculum in Senior secondary schools in Ile-Ife?
b) How available are instructional resources for the implementation of Chemistry curriculum in Senior Secondary Schools in Ile-Ife ?
c) How appropriate are the teaching methods used in the implementation of chemistry curriculum in senior secondary schools in Ile-Ife?

Methodology

The study adopted a descriptive survey research design. The population of this study consisted of all senior secondary schools Chemistry teachers in Ife Central Local Government Area. A sample of seven Chemistry teachers from about seven schools were selected using simple random sampling technique In Ife Central Local Government Area. The research adopted two instruments for data collection. The two instruments were Questionnaire on the Assessment of Chemistry Curriculum Implementation (QACCA) and Chemistry Instructional Resources Observation Checklist (CIROC). The QACCA was used to elicit information from the teachers about their qualification and level of compliance with the appropriate teaching method recommended for use while CIROC was used to find out the availability of the resources put in place to implement Chemistry curriculum. The content validity of QACCA was ensured through the help of researcher's supervisor and experts' suggestions. Corrections were made on the items of the instrument based on the suggestions of experts. The reliability coefficient of 0.69 was determined using Cronbach alpha. CIROCwas validated through experts' suggestion and supervisor's guidance. Three

experienced Chemistry teachers assisted in critiquing the items on the instrument. The study lasted for one week. The researcher got the permission from the schools head to check the laboratory for resources and observe Chemistry teachers during teaching. QACCA was administered to the teacher to elicit responses on their qualification and level of compliance with the appropriate teaching method recommended for use. CIROC was handled by the researcher to observe the availability of the resources put in place to implement Chemistry curriculum. The data collected were analysed using appropriate descriptive statistics of mean, frequency distribution and percentages.

Results

Socio-demographic Characteristics of Respondents

Table 1: School type of respondents and Gender of Respondents

School Type	Frequency	Percent	Valid Percent	Cumulative Percent
Co-educational	7	100.0	100.0	100.0
Gender				
Male	3	42.9	42.9	42.9
Female	4	57.1	57.1	57.1
Total	7	100.0	100.0	

Source: Field Survey, 2024

Data on the school type of respondents show that 100% of the respondents are co-educational members of staff.

Findings of the gender of respondents show that 42.9% of the respondents are Male while 57.1% are female

Research Question 1: What are the qualifications of teachers implementing Biology curriculum in Senior secondary schools in Ile-Ife?

Table 2: Academic qualification of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
B.Sc. Ed	6	85.7	85.7	85.7
M.Sc/M.Ed/M.B	1	14.3	14.3	14.3
M.Sc.Ed				
Total	7	100.0	100.0	

Source: Field Survey, 2024

Data on the Academic qualification of respondents revealed that 85.7% of the respondents owned a degree in the subject while 14.3% have M.Sc/M.Ed/M.B/M.Sc.Ed.

Table 3: Years of Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
1-5	4	57.1	57.1	57.1
6-10	3	42.9	42.9	42.9
Total	7	100.0	100.0	

Source: Field Survey, 2024

Data on the years of experience of respondents showed that 57.1% of the respondents are between year 1-5 years while 42.9% are between years of 6 and 10.

Research Question Two (2): How available are instructional resources for the implementation of Chemistry curriculum in Senior Secondary Schools in Ile-Ife ?

To answer this question, A list of Chemistry Instructional Resources were given to the Respondents and they were requested to mark which of the resources were available and which were not available.

The average mean of the responses is 1.5, responses with Mean below 1.5 signifies that the apparatus is available and responses with mean above 1,5 signifies that the apparatus is not available.

Table 4: Availability of the resources put in place to Implement Chemistry Curriculum in Secondary Schools.

	Resources	Mean	Standard Deviation	Remark
1	Ammeters	1.14	.378	A
2	Balance, automatic, electric	1.14	.378	A
3	Beakers 250m	1.43	.535	A
4	Beakers 100cm	1.43	.535	A
5	Burettes, 500cm	1.29	.488	A
6	Bunsen burners	1.00	.000	A
7	Candles	1.00	.000	A
8	Calorimeters, with stirrers	1.57	.535	NA
9	Cotton wool	1.00	.000	A
10	Crucibles	1.86	.378	NA
11	Centrifuge (Electric or hand type)	1.86	.378	NA
12	Dropping pipette	1.29	.488	A
13	Drying tubes, plain	1.57	.535	NA
14	Chromatographic jaroitan	1.57	.535	NA
15	Electrodes, platinum	1.71	.488	NA
16	Electrodes, zinc	1.71	.488	NA
17	Funnels, filter, plain glass	1.14	.378	A
18	Funnels, dropping	1.14	.378	A
19	Filter paper	1.29	.488	A
20	Filter flask	1.86	.378	NA
21	Asbestors mat 15cm by 15cm	1.29	.488	A
22	Fire blankets e.g. Asbestors cloth	1.86	.378	NA
23	Fire extinguisher, C02	1.57	.535	NA
24	First Aid box, fully equipped	1.43	.535	A
25	Flasks, distilling 250cm	1.43	.535	A
26	Flasks, volumetric 500cm	1.00	.000	A
27	Flasks, flat bottom 500cm	1.00	.000	A
28	Flasks, graduate 250cm	1.57	.535	NA
29	Glass rods, 5-6mm	1.00	.000	A
30	Graduated cylinders glass, 100cm	2.00	.000	NA
31	Indicator bottles, plastic	1.43	.535	A
32	Magnet bars	2.00	.000	NA
33	Pipette, 10cm	1.43	.535	A
34	Periodic table	1.00	.000	A
35	Reagent bottles, 250cm	1.00	.000	A

	Resources	Mean	Standard Deviation	Remark
36	Retort, glass stopper	1.00	.000	A
37	Retort stands	1.00	.000	A
38	Rubber stoppers	1.43	.535	A
39	Stands, burette, wooden	2.00	.000	NA
40	Spatula nickel	1.00	.000	A
41	Test tube brushes	1.00	.000	A
42	Test tube rack to hold ten tubes	1.57	.535	NA
43	Test tube boiling	1.00	.000	A
44	Test tubes holders	1.00	.000	A
45	Stop clock	2.00	.000	NA
46	Sand buckets	1.43	.535	A
47	Thermometers	1.43	.535	A
48	Tubes, delivery	1.00	.000	A
49	Tripod stands	1.57	.535	NA
50	Balance, triple beam	1.00	.000	A
51	U-tubes, long	1.57	.535	NA
52	Washbottles, polythene	1.43	.535	A
53	Weighing bottle glass 25 by 50mm	1.43	.535	A
54	Wire gauze	2.00	.000	NA
55	Water baths or hot plates	1.00	.000	A
56	Protective googles	1.57	.535	NA
57	Tiles, white	1.00	.000	A
58	Switches-electrical	1.57	.535	NA
59	Fume cupboard	1.57	.535	NA
60	Laboratory coats	1.43	.535	A

Source: Field Survey, 2024

From table 4, it is evident that most of the basic and essential chemistry instructional resources are available in the schools. For instance, resources such as ammeters, balances, beakers, Bunsen burners, cotton wool, crucibles, electrodes (platinum and zinc), and many other fundamental tools have mean values below 1.5, indicating their availability.

Certain resources critical for advanced experiments and safety measures are not as readily available. For example, items like calorimeter, drying tubes, cinematographic jars, electrodes,

and fire extinguishers have mean values above 1.5, signaling a lack of availability.

Safety-related items such as fire blankets, fully equipped first aid boxes, and laboratory coats also have varying degrees of availability, with some being less accessible, which could raise concerns regarding laboratory safety.

The standard deviations for most items are relatively low, suggesting consistent responses across the surveyed schools. However, for a few resources with standard deviations of 0.535, there's a slight variation in availability across different schools, indicating possible disparities in resource distribution.

Research Question 3: How appropriate are the teaching methods used in the implementation of chemistry curriculum in senior secondary schools in Ile-Ife?

The table below outlines the frequency with which various teaching methods are utilized by teachers in senior secondary schools in Ile-Ife for the implementation of the Chemistry curriculum. The data is categorized into three levels of use: "Frequently Used," "Often Used," and "Never Used."

Table 5: Teachers level of compliance with the appropriate teaching methods recommended for use in the Chemistry curriculum.

S/N	Teaching Methods	Frequently Used	Often Used	Never Used
1	Lecture Method	0(0%)	0(0%)	7(100%)
2	Project Method	0(0%)	3(42.9)	4(57.1%)
3	Demonstration Method	1(14.3%)	2(28.6%)	4(57.1%)
4	Discovery Method	5(71.4%)	2(28.6%)	0(0%)
5	Individualized Method	0(0%)	0(0%)	7(100%)
6	Discussion Method	3(42.9%)	4(57.1%)	0(0%)
7	Concept Mapping	1(14.3)	3(42.9%)	3(42.9%)
8	Inquiry Method	0(0%)	2(28.6)	5(71.4%)
9	Laboratory Works	3(42.9%)	2(28.6%)	2(28.6%)
10	Field Trip	3(42.9%)	1(14.3%)	3(42.9%)

Source: Field Survey, 2024

From Table 5, It is evident that traditional methods like the Lecture Method and Individualized Method are completely unused by the surveyed teachers, with all responses indicating "Never Used." This could suggest a shift away from more passive forms of instruction in favor of interactive or student-centered methods.

The Project Method and Demonstration Method show a split in usage. The Project Method is "Often Used" by 42.9% of the teachers, while 57.1% never use it. Similarly, the Demonstration Method is frequently or often used by a combined 42.9% of the teachers, but still remains underutilized by the majority (57.1% "Never Used").

The Discovery Method stands out as the most favored, with 71.4% of teachers frequently using it. This method encourages students to explore and discover concepts on their own, which aligns well with active learning strategies. The Discussion Method is also popular, with a combination of 42.9% of teachers frequently using it and 57.1% often using it, reflecting its effectiveness in fostering student engagement and critical thinking.

Concept Mapping and Inquiry Method show a more balanced distribution but with limited frequent use. Concept Mapping, which can help in visualizing relationships between concepts, is "Frequently Used" by only 14.3% of the teachers, with a near-equal split between "Often Used" and "Never Used." The Inquiry Method, a core aspect of scientific learning, is rarely used, with 71.4% of teachers indicating they never use it.

Laboratory work, crucial for Chemistry education, is "Frequently Used" by 42.9% of the teachers, though it's concerning that 28.6% of teachers never use it. Field trips, which offer experiential learning opportunities, have a similar usage pattern, showing potential but also facing significant neglect.

Discussion of Findings

The findings from this study provide critical insights into the implementation of the Chemistry curriculum in senior secondary schools in Ile-Ife, particularly regarding the

qualifications of teachers, availability of instructional resources, and the appropriateness of teaching methods used.

The study revealed that the majority of the teachers (85.7%) implementing the Chemistry curriculum hold a Bachelor's degree in Education (B.Sc. Ed), while a smaller proportion (14.3%) possess advanced degrees such as M.Sc., M.Ed., or equivalent. This high percentage of qualified teachers aligns with previous studies indicating the importance of adequate academic qualifications in enhancing the effectiveness of curriculum implementation (Adedeji & Owoeye, 2019; Ige, 2018). Moreover, the experience levels of the teachers, with 57.1% having between 1 to 5 years of experience and 42.9% between 6 to 10 years, suggest a relatively youthful workforce. This could have implications for the dynamism and adaptability of teaching practices, as less experienced teachers might be more open to innovative teaching methods (Aina & Ayeni, 2020).

The analysis of the availability of instructional resources indicates that while basic and essential resources like ammeters, beakers, Bunsen burners, and volumetric flasks are generally available (mean < 1.5), there are notable deficiencies in more advanced and safety-related equipment. Resources such as calorimeter, fire extinguishers, and fume cupboards were marked as unavailable, with mean scores above 1.5. This disparity in resource availability could hinder the comprehensive implementation of the Chemistry curriculum, particularly in conducting advanced experiments and ensuring safety during laboratory sessions. These findings are consistent with those of Oloruntegbe et al. (2016) and Okeke (2017), who highlighted the challenges posed by inadequate laboratory facilities in Nigerian secondary schools.

The study also examined the extent to which teachers adhere to the recommended teaching methods in the Chemistry curriculum. The findings suggest a significant reliance on student-centered methods such as the Discovery Method, which was frequently used by 71.4% of the teachers. This preference for active learning methods is supported by contemporary

educational research, which advocates for strategies that promote critical thinking and student engagement (Obi & Aladejana, 2021). However, traditional methods like the Lecture Method and Individualized Method were completely unused, indicating a possible shift in pedagogical preferences.

The Project Method and Demonstration Method were used by less than half of the teachers, suggesting a need for more emphasis on these approaches, which have been shown to enhance practical understanding and application of scientific concepts (Ogunleye, 2019). The limited use of the Inquiry Method, a core aspect of scientific learning, and the mixed usage of Laboratory Work are concerning, as these are essential for developing scientific inquiry skills and hands-on experience in Chemistry. This under-utilization may reflect a lack of resources or confidence in handling complex experiments, as suggested by Ayodele (2018).

In conclusion, while the findings indicate that the basic infrastructure for Chemistry education is in place, there are significant gaps in both resource availability and the application of diverse teaching methods. Addressing these issues will require targeted interventions, including professional development for teachers, improved resource allocation, and enhanced support for inquiry-based and experiential learning methods. The implications of these findings are critical for policymakers, educators, and stakeholders aiming to improve the quality of Chemistry education in Nigerian secondary schools.

Conclusion

Based on the findings of each research question, it was concluded that teachers implementing Chemistry curriculum are well qualified with adequate experience to anchor the subject effectively. Also, most materials needed for Chemistry curriculum implementation are readily available but not adequate. Finally, it was revealed that teachers adhere with the instructional strategies specified in the curriculum which are learner centered.

Recommendations

The following recommendations were made based on the findings of the study;

i. Enough qualified and experienced teachers with time to time in-service training on new pedagogical skills should be employed to implement Chemistry in senior secondary schools
ii. Adequate instructional materials should be made available to stimulate students' interest in learning Chemistry and selecting Chemistry related profession in the future.
iii. Teachers should incorporate pedagogical content knowledge and skills in implementing Chemistry in schools.

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