World Journal of Educational Research
ISSN 2375-9771 (Print) ISSN 2333-5998 (Online)
Vol. 9, No. 2, 2022
www.scholink.org/ojs/index.php/wjer

Original Paper

Implementation of Chemistry Curriculum in Nigeria: Challenges for the 21st Century

Omoniyi A. Olubunmi[1] & Akinsete M. Aarinola[2]

[1] Department of Science Education, Adekunle Ajasin University, Akungba - Akoko, Nigeria

[2] Ministry of Adult Education, Akure Nigeria

Received: February 10, 2022 Accepted: February 26, 2022 Online Published: February 26, 2022

doi:10.22158/wjer.v9n2p36 URL: http://dx.doi.org/10.22158/wjer.v9n2p36

Abstract

The study examined the level of implementation of chemistry curriculum by teachers and the available material resources necessary for the implementation of the curriculum in Nigeria. The study adopted a survey design. A sample of 250 chemistry teachers in Nigeria were used for the study. The instrument tagged "Chemistry Curriculum Implementation and Material Resources Questionnaire (CCIMRQ) was used for study. CCIMRQ was prepared by the researcher and validated by experts in curriculum studies with a reliability co-efficient of 0.78. Data collected were analyzed using frequency counts, percentages and t-test. Results showed that more than 30% of Chemistry teachers in secondary schools in Nigeria did not implement effectively the four themes in the curriculum as they tend to skip some difficult concepts in the curriculum. Also, results of t-test analysis (t = 3.01, p=0.03) revealed that there was a significant difference between the teachers' view on the problem militating against the implementation of chemistry curriculum and the adequacy of material resources.

The study concluded that some chemistry teachers in Nigeria did not implement the chemistry curriculum effectively due to inadequate material resources and lack of mastery of the subject matter. To meet the challenges for the 21st century, chemistry teachers in Nigeria should be exposed to capacity building on the subject matter and be retrained on how to handle difficult concepts in the chemistry curriculum.

Keywords

implementation, chemistry curriculum, challenges, 21st century, difficult concepts, material resources

1. Introduction

Science is studied and practiced in all parts of the world, including Nigeria which is a developing nation with an increasing demand for science based skilled manpower. To meet the challenges for the

21st century, there is the need to have a chemistry curriculum that will be effectively implemented so as to inculcate into the lives of chemistry students the nature and benefits of chemistry to life and society.

For the purpose of this study, according to Omoniyi (2018), curriculum is defined as all learning activities that take place in school that will bring positive change and inculcate self-reliance into the lives of the learners to make them useful to themselves in particular and the society in general.

National curriculum is a common programme of study in schools that is designed to ensure nationwide uniformity of content and standards in education. Following the Federal Government reform in education and the need to attain the Sustainable Development Goals (SDGs), and the critical targets of the National Economic Empowerment and Development Strategies (NEEDS) such as: value orientation, poverty eradication, job creation, wealth generation and using education to empower the people, the existing chemistry curriculum in Nigeria should be implemented and geared towards self-reliance. It has become imperative that the existing curriculum for Senior Secondary School curricula be implemented and re-aligned to meet the challenges ahead.

Chemistry is a servicing subject to other science subjects. It is a subject that provides contents in the training of students who wants to study engineering, medicine, nursing, pharmacy, forestry, fisheries and so on. Hence, the need for a minimum of credit pass and above in chemistry for higher education in the aforementioned disciplines.

Table 1. Trends of Performance of Chemistry Students in the West African Senior School Certificate Examination May/June 2011-2019 in Nigeria

Year	Total Entry	Credit Passed (A_1-C_6)	% Pass
2011	565,692	280,280	49.54
2012	627,302	270.570	43.13
2013	639,296	462,517	72.34
2014	636,296	397,649	62.49
2015	680,357	412,323	60.60
2016	706,873	408,122	57.74
2017	65,889	32,050	50.43
2018	56,565	19,856	36.48
2019	48,250	18,998	40.98

Source: West African Examination Council, Nigeria (2020).

The persistent low performance of students in the above table could be due to poor implementation of the chemistry curriculum where chemistry teachers skip some “difficult concepts” and inadequate material resources for teaching of practicals.

Some of the difficult concepts as highlighted in Omoniyi (2001) include Thermodynamics, Mole concepts, Electrolysis, among others.

Hence, there is still the need for improvement in the implementation process in order to reduce underachievement in chemistry education, therefore, it is deemed necessary to investigate the problems militating against the implementation of chemistry curriculum. The quest for improving the method of teaching and learning of secondary school chemistry began in1982 by the Nigerian Education Research Council (NERC, 2005). The Federal Government of Nigeria in collaboration with Essettee (Swedish non-governmental organization) initiated the National Secondary Science and Mathematics Project (NSSMP). They worked hand in hand with the Federal Government of Nigeria. The basic aim of that project was to inculcate learning through the use of wide variety of instructional materials. The outcome of this was the emergence of the new chemistry curriculum, first published in 1985 and revised 2004, 2009, and 2014 (FRN, 2014) by the Federal Ministry of Education. In this curriculum, more topics in chemistry were introduced and the number of years to be spent in secondary school increased from five years to six years. However, the level of implementation of the National Curriculum for secondary school chemistry is the focus of this study.

Implementation in this study is the extent at which teaching of chemistry curriculum content to secondary school students is achieved. The contents of Chemistry curriculum to Senior Secondary School chemistry curriculum as produced and presented to schools by the Federal Ministry of Education in 2009 is as follows:

Table 2. Summary of Nigerian Senior Secondary School (SSS) 1-3 Chemistry Curriculum

THEME/CLASS	**SSS1**	**SSS2**	SSS3
Chemistry and industry	Chemistry and industries	Periodic table, chemical reactions, mass volume relationship	Quantitative and qualitative analsysis
The chemical world	Introduction to chemistry, particulate nature of matter, symbols, formulae and equations, chemical combination, Gas law	Acid-base reactions, Water, Air, hydrogen, Nitrogen, Sulphur	Petroleum, Metal and ether compound iron Ethical, legal and social issue
Chemistry and environment	Standard separation techniques for mixtures, Acids, bases and salt, Water	Oxidation-C reduction (redox) reaction, Ionic theory electrolysis	

The chemistry of life	Carbon and its compounds	Hydrocarbons and Alkanols	Fats and oil, soap and detergent, giants molecules

The objectives of secondary school chemistry curriculum have been derived from the National Policy on Education first introduced in 1977 and revised in 1981, 1998, 2004 and 2014 (FRN, 2014). The cardinal objectives are to prepare students to acquire

1) basic literacy in chemistry for functional living in society,

2) basic concepts and principles of chemistry

3) essential scientific skills and attitudes as a preparation for technical application of chemistry and

4) enhance creativity

Chemistry is crucial for effective living in the modern age of science and technology. Giving its application in industry and any other profession, every student is given an opportunity to acquire some of its concepts, principles and skills.

Unfortunately, the teaching and learning of chemistry has been fraught with challenges, although many students have fair performance in the external examinations, there is the need to work towards excellent performance. From the researcher's experience as a chemistry teacher for more than two decades, it was observed that students are still lacking behind in the area of practical skills and creativity. The philosophy, objectives and content of the chemistry curriculum have been adjudged by professionals in the field to be satisfactory but results from WAEC was short of expectation because of lack of sufficient number of professionally qualified teachers, inadequate equipment to ensure the performance of student activities which aimed at enhancing meaningful learning in the areas where chemistry appears to evoke difficulty. The implementation of chemistry curriculum is the aspect that majorly concerns the classroom teacher for production of good results.

Teachers play a major role in the implementation of chemistry curriculum, what he/she does within the classroom setting determines whether the set goals would be achieved or not. How well the teacher carries out the planned activities are determined by the teacher's mastery of the content, professional training, competence, initiative, interest and motivation. Besides, some factors such as students' interest, readiness, physical environment, availability and adequacy of learning materials and equipment could be affecting the effectiveness of classroom situation and the learning of chemistry education.

Statement of the Problem

One of the major goals of science education in Nigeria is to produce scientists who are full of practical skills and creativity for national development (FRN, 2014). In spite of the desire of Nigeria government to promote and develop quality science education programme in the country, the quality of science students in terms of practical skills and creativity seems to be deteriorating especially in chemistry.

Adepoju (2007) reported that emphasis is placed on preparing students for examinations without regard for understanding or ability to apply the concept in solving real life problems. Very little attention is

given to the highest mental tests of thinking and application of skills. These include the ability to apply the knowledge in real world to analyse the information, synthesize new information based on what was learnt, and to evaluate the outcome of knowledge applied. This might have reduced the area of skills developments and self-reliance among graduates of chemistry in Nigeria. There is still doubt about the implementation of the National Curriculum in science subjects especially in chemistry education.

Some concepts involving mathematical calculation such as thermodynamics, mole concepts, electrolysis among others are tagged to be difficult and are therefore skipped by teachers (Omoniyi, 2021). This could be due to teachers' lack of understanding of the content/subject matter, inappropriate use of teaching strategies and inadequate material resources.

This might have contributed to the underachievement in chemistry. Hence, this study examined the level of implementation of the National Curriculum for Senior Secondary School chemistry in Ondo State, Nigeria.

Also, the study find out the level of adequacy of the available material resources for the teaching of chemistry practical in secondary schools in Ondo State, Nigeria.

To guide the study, two research questions were raised

(i) What is the level of implementation of the National Chemistry Curriculum by chemistry teachers in secondary schools in Nigeria?

(ii) How adequate are the available material resources for the teaching of chemistry curriculum in Secondary Schools in Nigeria?

One hypothesis was generated for the study.

- There is no significant difference between the teachers' view on the problems militating against the implementation of chemistry curriculum and the adequacy of material resources for the teaching of chemistry in Secondary Schools in Nigeria.

2. Methodology

The study adopted the descriptive survey design. The study sample was 250 chemistry teachers representing 72% of chemistry teachers in Ondo State, Nigeria. The chemistry teachers were selected using stratified random sampling. An instrument "Chemistry Curriculum Implementation and Material Resources Questionnaire" (CCIMRQ) was used to collect information from the respondents. It consisted of 40 items that elicited information on the behavioral disposition of chemistry teachers toward the implementation of the chemistry curriculum and also on the adequacy of material resources necessary for the implementation of the chemistry curriculum. The CCIMRQ had an internal consistency reliability of 0.78. Data collected were analyzed using frequency counts, percentages and t-test.

3. Results

Tables 3, 4 and 5 present the results.

Table 3

Descriptive statistics of the level of implementation of chemistry curriculum by teachers the chemistry curriculum is divided into four themes-namely: chemistry and industry, the chemical world; chemistry and environment and the chemistry of life.

Table 3. Frequency Counts and Percentages Showing the Level of Implementation of Chemistry Curriculum by Chemistry Teachers in Secondary Schools in Ondo State, Nigeria

Theme(s)	Frequency	Percentages (%)
Chemistry and industry	156	62.4
The chemical world	186	74.4
Chemistry and environment	192	76.8
The chemistry of life	148	59.2

Results from Table 2 shows the level of implementation of chemistry curriculum by teachers. Considering the four themes in the Senior Secondary School chemistry curriculum in Nigeria, 62.4% of chemistry teachers implements theme 1-chemistry and industry; 74% of teachers implements theme 2-The chemical world; 76% implements theme 3-chemistry and Environment while 59% of chemistry teachers implements theme 4- the chemistry of life.

Table 4

Frequency counts and percentages showing the available material resources for the implementation of chemistry curriculum. Data collected on the available material resources for the implementation of chemistry curriculum

Tabulation of material resources available in the selected secondary school. They are categorized as follows:

Table 4. Tabulation of Material Resources Available in the Selected Secondary School

Materials Resources	Frequency Counts	Percentages (%)
Volumetric experiment materials (20 items are listed)	12	60%
Qualitative experiment materials (20 items are listed)	09	45%

Results from Table 4 shows that only 60% of equipment needed for volumetric experiments are available for teaching chemistry with 45% of equipment needed for qualitative experiment were available for the teaching of chemistry

Table 5

Significant difference between teacher's view on the problems militating against the implementation of chemistry curriculum and the adequacy of material resources for the implementation of chemistry curriculum.

Table 5. Significant Difference between Teacher's View on the Problems Militating against the Implementation of Chemistry Curriculum and the Adequacy of Material Resources for the Implementation of Chemistry Curriculum

Variables	N	X	SD	Df	t	Decision
Teachers' view on the problems militating against the implementation of chemistry curriculum	250	42.55	14.83	498	3.01	0.003
Teachers view on the adequacy of material resources for the implementation of chemistry curriculum	250	46.26	12.48			

From Table 5 above, the t-value of 3.01 was significant at 0.03 level. This shows that there was a significant difference between the mean score of teachers' view on the problems militating against the implementation of chemistry curriculum (X=42.55) and the adequacy of material resources for the implementation of chemistry curriculum (X = 46.26). When the mean scores were subjected to t-test, it yielded a value of 3.01 which was significant at 0.003. This means that there was a significant difference between the teachers' view on the problems militating against the implementation of chemistry curriculum and the adequacy of material resources available for the implementation of chemistry curriculum.

4. Discussion of Results

The result showed that 62% of chemistry teachers in the selected secondary schools implemented chemistry curriculum in the "theme-chemistry and industry-74% of chemistry teachers implemented chemistry curriculum under the sub-theme-The chemical world; 76% of chemistry teachers implemented the chemistry curriculum under the theme chemistry and environment while 59% of chemistry teachers implemented chemistry curriculum under the sub – theme – the chemistry of life. By implication, the results revealed that some of the topics in the chemistry were implemented while some were skipped. This observation is in line with Adegoke (2017) who revealed that problems militating against proper implementation of chemistry curriculum include: lack of enough time in the school official time table, lack of laboratory attendants and lack of motivation of teachers. The finding of this study also corroborates Kaharera (2010) who also noted that staffing and lack of in-service

training for teachers as challenges to effective implementation of curriculum.

Also, findings from researchers question 2 showed that 60% of the items needed to teach topics under volumetric analysis experiment were available to teach chemistry in the selected schools while only 45% of the items needed for qualitative analysis experiment were available to teach chemistry in the selected schools.

This implies that, there was inadequate material resources in the schools selected for the study. This inadequate material resources could have resulted into inefficient and improper implementation of chemistry curriculum for secondary schools in Nigeria. This is in line with Adegoke (2017) who revealed that students are not given enough time to engage in practical activities due to non-availability of equipment and facilities.

Furthermore, the results in Table 5 using t-test, showed that there was a significant difference between the teachers' view on the problems militating against the implementation of chemistry curriculum and the adequacy of material resources for the implementation of the curriculum ($t=3.01$, $p<0.05$). This observation disagree with Ifeobu (2014) submission that there is no significant difference between teachers' and learners' opinion on problems militating against the implementation of science subject.

5. Conclusion

The study concluded that some chemistry teachers in Nigeria did not implement curriculum effectively due to inadequate material resources and lack of mastery of the subject matter where some chemistry teachers skipped some topics either due to incompetency, lack of enough time allocated to the subject in the school official time table and lack of motivation of teachers.

It is thus recommended that chemistry teachers in Nigeria should be motivated in the area of capacity building by giving them in-service training in order to improve in the mastery of subject matter. Also, the time allocated for chemistry practicals in schools should be increased to 80 minutes so that chemistry teachers can effectively teach and cover wide areas during practicals.

Furthermore, government should provide adequate material resources for chemistry teachers for effective implementation of the chemistry curriculum.

References

Adegoke, B. A. (2017). Survey of laboratory activities in Senior Secondary School Physics in Nigeria. *British Journal of Education, Society and Behavioural Science*, *19*(3), 1-10. https://doi.org/10.9734/BJESBS/2017/30646

Dada, O. A., & Ogundare, O. G. (2017). Assessment of Teachers knowledge on curriculum Adaption for Inclusive Basic Education of Children with Special Needs in Nigeria. *Nigerian Journal of Curriculum Studies*, *24*(1), 175-186.

Duyilemi, A. A., & Olusola, O. L. (2016). Gender and performance in science subjects in secondary schools in Ondo State, Nigeria. *Journals of Science and Technology Education Akungba Akoko,*

Nigeria, *1*(2), 1-2.

Federal Republic of Nigerian. (2014). National Policy on Education. NERDC

Ifeobu, H. N. (2014). *Evaluation of the implantation of National Curriculum for Secondary School Biology in Anambra State, Nigeria*.

Kaharera, J. Z. (2010). *Factors affecting curriculum implementation in secondary schools in Kenya*. A case of Kakamega South District.

Omoniyi, A. O. (2016b). Effectiveness of problems solving Approach of Gender related Differences in teaching secondary school chemistry students' mathematical concept of chemistry in Ondo state, Nigeria. *European Journal of Education*, *2*(1), 53-60.

Omoniyi, A. O. (2018). Integrating Green chemistry Concepts into the Senior Secondary School chemistry curriculum to promote an Environmentally Acceptable Curriculum in Nigeria. *Journal of Science and Technology (JSTE)*, Adekunle Ajasin University, Akungba-Akoko, *2*(1), 89-95.

Rukaya, S. A., & Ape, T. S. (2017). Curriculum implementation, motivation of Teachers' and performance of students in National Examination in Government Secondary Schools in Kaduna State, Nigeria. *Nigerian journal of curriculum studies*, *24*(1), 29-36.