CURRICULUM REFORMS: A CASE STUDY OF CHEMISTRY CURRICULUM IN SECONDARY ANDTERTIALLY INSTITUTIONS

Nwoji Ijeoma Hope Nonyelum (Ph.D.)
Chemistry Unit, Department of Science Education
Faculty of Education, University of Nigeria, Nsukka
e-mail: hope.nwoji@unn.edu.ng

Abstract

The paper discussed some of the needed paradigm shifts for reforming Chemistry curriculum for skill acquisition and sustainable education in Nigeria. It went further to talk about the views of various scholars about reforming Chemistry education curriculum for skill acquisition and sustainable education which is globally accepted and acknowledged. This is because no nation can grow adequately without an appropriate curriculum that will reflect the changes in society. This paper examines the concepts of chemistry education, chemistry curriculum, curriculum as a bridge between education road map and curriculum change, the importance and factors that bring about the reforming of chemistry education curriculum. The paper recommends that the chemistry curriculum should not be static but dynamic to meet the changing needs of the society. Curriculum planners should reduce the content of the chemistry curriculum. The chemistry curriculum should be reformed and structured in such a way that the learners will acquire relevant skills which will enable them to develop themselves, the society and also contribute to sustainable education development.

Keywords: Curriculum Reform, Chemistry Education Curriculum, Secondary and Tertiary Institutions

Introduction

Chemistry is a science subject that play a fundamental role in human advancement, nation building and sustainable national development. Thus, chemistry enhances sustainable development through basic research skills, chemical innovations and technology (Ayodele, 2018). Advancement in chemistry is essential for advancement in other areas of science and technology. According to Riaz (2018), chemistry is a branch of science that is concerned with the properties and composition of different substances with their chemical reactions and properties. However, Helmenstine (2020), referred to chemistry as the systematic study of the properties and activities of organic and inorganic substances and various elementary forms of matter. These definitions imply that chemistry is concerned with human understanding of the constituent and composition of matter as well as its properties and characteristics. Since, the study of chemistry is concerned with matter, it could mean that chemistry plays numerous importance to mankind

Chemistry is one subject area through which the educational objectives are to be achieved. Chemistry education is, therefore about achieving educational goals through a context of chemistry. Chemistry is taught in the second stage of secondary education, that is, senior secondary school stage. Secondary school chemistry serves as a preparation for further training in chemistry and prepares students to be useful citizens within the society (Nwoji & Chukwunwogor, 2019). However, in order to achieve the objectives of chemistry education at this level of education, the government has taken good, consistent and impressive policies and actions regarding chemistry education. Chemistry education is an important area of focus in educational development all over the world. This is because chemistry education plays a

vital role in the technological transformation of any nation (Achimogu, 2017). The implementation of the chemistry education programme in secondary school has been for a couple of decades at the senior secondary school level in Nigeria (Akaegbu, 2023; Egolum & Igboegwu, 2013). Research reports such as those of Eya (2011), Offiah and Egolum, (2007) and Asiyai (2005) indicated that there are several problems that confront its effective implementation at all levels. These problems include inadequate material resources, ineffective teaching strategies, lack of relevant mathematical concepts, inadequate qualified teachers, poor attitude of teachers to work, poor remuneration/motivation for chemistry teachers and overloaded curriculum.

Curriculum has been defined variously by different scholars depending on their interpretation of education and the various functions institutions should perform to the individual and to the society at large. Curriculum is the experience a school system provides for its students. Curriculum according to Offorma (2009) is defined as the document, plan or desirable learner's behavioral changes". Curriculum is the roadmap of teaching and learning. It becomes relevant if it addresses current and anticipated needs, problems and aspirations of the learner and his/her society (Okoli & Egbunonu, 2011).

The chemistry curriculum must prepare the learners for change. Some aspects of the chemistry curriculum specify hands-on -processes and skill acquisition, most students are not exposed to these real situations in our schools. This means that the scientific and technological aspects of our education are not effectively implemented but the success of any chemistry curriculum depends on the availability of scientifically trained human capital, that is, chemistry teachers (Nwoji, 2017).

In some schools, chemistry curriculum is not effectively implemented because there is no human capital, laboratories and workshops for practical work. Therefore, the curriculum policies and practices in secondary and tertiary institutions have some yawning gaps (Offorma, 2005). The implication of this is that the current chemistry curriculum calls for reforms in the secondary and tertiary institutions. The focus of the reform must therefore be on development of skills and sustainable education.

Reforms is to make changes in something especially an institution or practice in order to improve it. Education reform is the term for the goal of changing public educational theory and practice. Education reform was used to focus on outputs such as student achievement.Curriculum reform can be defined as the process of implementing changes to the curriculum with the intent of making learning and teaching more meaningful and effective (www. curriculum. Org> research, > cu...). The curriculum reform process being undertaken include:

-Needs Assessment

-Conceptualization and policy formulation.

-Development of curriculum designs

-Development of syllabuses and approval

-Development of curriculum support materials

-Piloting

-Teacher preparation

-National Curriculum Implementation

Monitoring and evaluation

Curriculum reform around the globe means more independence for teachers and increased student engagement and proficiency. Effective chemistry education is an essential integral for both science and technology sustainable development. Sustainable development cannot be attained without curriculum (www.academia.edu>Needs.

An ex post facto study was conducted to examine the effect of the curriculum reform on 60 Dilla University chemistry education students solving ability. The study shows that curriculum reform that shifted University introductory courses of the old curriculum into preparatory school levels in the new curriculum significantly hampered students' problem solving ability (www.ajol.info) It is not often that research accompanies large – scale science education reforms. In order for an educational reform to be sustainable and for its implementation to grow from small to large scale, one should account for policy, culture and assessment. This study investigated a large- scale rational level chemistry curriculum reform in Israeli high schools, which emphasized higher order thinking skills, learning in context, visualization and chemistry understanding at four levels. By the end of a five- year -long intervention, the implantation encompassed 4031 participants in the reformed curriculum representing approximately half of the chemistry majors in Israel.

The study investigated the effect of the nationwide implementation on (a) teachers' challenges in terms of the transition to a reformed-based curriculum that emphasizes thinking skills in a large-scale setting and (b) Students' knowledge, chemical understanding and thinking skills in specific questions in the national matriculation examination based on an analysis of the examination data. This paper focuses on one of the new learning units, Taste of chemistry, as a case in point to demonstrate higher order thinking skills, such as graphing skills and modelling skills. Theyanalysed the following sources: (1) interviews with teachers, (2) questions from the traditional matriculation examinations, (3) questions from the new matriculation examination, which featured higher order thinking, (4) the number of students who responded to the reformed examination compared with the number of their peers who responded to the traditional one, and (5) Students' scores in the two examination versions. They classified the reform scale-up challenges into two types: (a) Issues related to the teachers' pedagogical content knowledge and assessment knowledge and (b) system related policy issues. Between 2007 and 2010, the number of students studying the reformed curriculum increased exponentially, while the failure rate decreased and the percentage and average scores of students who elected to respond to the Taste of Chemistry question in the matriculation examination increased. They concluded that the reform was successful due to its emphasis on (a) a close collaboration between the three stakeholders, which included two academic institutions, the Ministry of Education, and the teachers and (b) on clear, consistent policy, longitudinal support and the implementation process (www.sciencedirect.com).

The secondary school chemistry curriculum must be dynamic and move with the current developments all over the world. The reformed curriculum is structured in such a way that it shows the interrelationships with other subjects, show chemistry and its link with industries, everyday life activities and hazards. The major goals of this curriculum are to enable students to

-Develop interest in the subject of chemistry

-Acquire basic theoretical and practical knowledge and skills

-Develop reasonable level of competence in ICT applications that will engender entrepreneurial skills.

This reform in the curriculum has a lot of implications in the study of the subject in Nigeria. Some of these implications include the following.

-Nigeria's educational system should ensure the establishment of working, credible and effective inspectorate to monitor the schools and enforce good standards of teaching and learning.

-There must be a change in the method of presentation and delivery of individual concepts in chemistry in our classrooms and laboratories.

-Our laboratories must be well equipped and stocked with the required chemicals.

-The curriculum being focused on practical activities with emphasis on locally available materials demands that the spirit of inquiry be imbibed in the students.

-Chemistry textbooks for use in teaching the subject must reflect the dynamic changing character of chemistry as reflected in the reformed curriculum.

However, if all these implications are considered, the rational for the reform in chemistry curriculum will be highly achieved leading to effective teaching and learning.

Nigeria witnessed the first major reform in her educational policy in 1954 when the colonial government changed her educational system from 8-6-2-3 to 6> 5-2-3. In 8-6-2-3 system of education pupils were expected to spend 8 years in primary, 6 years in secondary school, 2 years in higher school and 3 years in the University (Ifamuyiwa & Kehinde, 2011). Nigerians got aggrieved that pupils in the country were spending longer period in the primary and secondary schools. Nigerian's educated elites agitated for a kind of reform that will reduce the number of years' pupils spend in schools (Gusau, 2008). The nation succeeded in reducing the number of years' pupils spend in school, Nigerians were still unsatisfied with the products of these schools. The products of the 6-5-2-3 system of education relied heavily on white collar jobs, hence Nigerians started demanding for a kind of education that will make her products and graduates to be self-employed. The sputnik 1 launched by the Soviet Union in 1957 became an eye-opener needed by Nigeria to realize that something was still wrong with her curriculum and system of education. Therefore, there was stern agitation for urgent reforms in the education sector. The agitations eventually led to the first national curriculum conference in Nigeria held in Lagos in 1969.

Nigeria needed a system of education that will make her brake even technologically at that time, however, according to Gusau (2008), the participants at the conference criticized the colonial education system as lacking in vitality and relevance. The recommendation of the conference among others, was that the Nigerian educational system be changed from the 6-5-2-3 system to 6-3-3-4, an acronym for 6 years in primary school, 3 years in junior secondary school, 3 years in senior secondary school and 4 years in university education for all Nigerian children. A very significant outcome of the curriculum conference was the formulation of national education document known as the National policy on Education which was first published in 1977 and has since been revised in 1998, 2004, 2008 and 2014.

In view of the need to address the crisis of educational quality, curriculum reform is called for and serves as bedrock in addressing the educational crisis in Nigeria especially in this 21st century.

Conclusion

There is an urgent need for the reforming of the chemistry curriculum content, quality of teachers, teaching strategies, skill development and teachers' attitude to work for skill acquisition in sustainable education and life –long learning and development.

Teachers should teach chemistry using varying innovative and activity-oriented methods

Provision of well-equipped laboratories for effective practical

Chemistry teachers should be involved in curriculum planning

The curriculum planners should emphasize hands-on activity teaching.

Enough teachers should be employed to teach chemistry

There should be periodical training and retraining of teachers

Sufficient instructional resources should be provided and effectively managed

There should be school industry link to incorporate entrepreneurial skills in students

ICT and modern instructional materials should be used in teaching Chemistry

Government should provide sufficient fund for the purchase of enough material resources

Chemistry teachers should be paid science allowance to motivate them.

Recommendations

In this paper, it is recommended that:

- The chemistry curriculum should be reformed to enhance skill acquisition.
- The curriculum planners should reduce the content of the chemistry curriculum.
- The Government should employ enough chemistry teachers
- The Government should provide enough equipment and chemicals for the teaching of chemistry.

References

Achimogu, L. (2017), Parents' perception of the principals' and chemistry teachers' instructional efficiency is secondary schools in Idah Local Government Area , Kogi State, Science Teachers Association of Nigeria, 60th Anniversary Conference Proceedings, 259 – 266.

Akaegbu, D. A. (2023), Assessment of senior secondary school chemistry teachers' objective test – items construction skills in Enugu Education Zone, unpublished masters' project, Nsukka, University of Nigeria.A JOL African JOURNALS ONLINE www. A jol. Infowww. Academia. Edu..> Needs And S…www.curriculum. Org > research >cu… www. Sciencedirect.com

Asiyai, R. I (2005). Enhancing chemistry in secondary school through concept mapping instructional strategy, ScienceTeacher Association of Nigeria, 46th Annual Conference, Proceedings. 205- 209

Ayodele, O. D, (2018), Re- structuring Secondary School Chemistry Education for sustainable development in Nigerian developing economy. African Journal of Chemical Education 8(2), 93-111

Egolum, E. O. (2013), Meeting the challenges of mdgs through Chemistry curriculum reforms and implementation in secondary schools. Science Teachers Association of Nigeria, 54th Annual Conference Proceedings, 10 -15

Eya, N. M. (2011), Chemistry curriculum reforms in the 21st century, the need for human resource development. Science Teachers Association of Nigeria, 52nd Annual Conference Proceedings. 255 -260.

Gusau, U. (2008), Educational reform in Nigeria successive years of inconsistencies and confusion. Retrieved from www..gamji.com / article.

Helmenstine, A. M. (2020), What is Chemistry ? definition and description. Retrieved from https://www.thoughtco.com/what-is-chemistry-602019.

Ifanmuyuwa, A. S. &Kehinde, M. A (2011),Teachers' knowledge of and response to curriculum reforms in Mathematics education in Nigeria. Science Teachers Association of Nigeria, 52nd Annual Conference Proceedings, 321 – 329.

Igwe, I. O. (2015), Secondary education Chemistry curriculum implementation in Nigeria. Contending issues and innovative approaches for the future. *IJSAR – Journal of Life and Applied Science, 3* (1), 24 – 33.

Nwoji, I. H. N. (2017). Revision of senior secondary school Chemistry curriculum for sustainable development in teacher education, International Journal of studies in education, vol. 15 No. 2 June 2017

Nwoji, I. H. N & Chukwunwogor, E. O (2019), Improving senior secondary school Chemistry education curriculum for skills acquisition for sustainable education in ethics and teacher performance, Review of Education, Institute of Education Journal, vol. 31, Issue 2 August 2019.

Offiah, F. C, and Egolum, E. O. (2007). Effects of prior knowledge of some relevant mathematical concepts on students achievement in stoichiometry in Chemistry. Journal of Science, Engineering and Technology. (149) 7676 -7685.

Offorma, G.C. (2005), Curricula for wealth creation. A paper presented at the Seminar of the world council for curriculum and Instruction, Kano.

Offorma , G. C. (2009). Curriculum across languages. An Inaugural lecture of the University of Nigeria, Nsukka, delivered on June 5, Nsukka: University press ltd.

Okoli.. J. N.& Egbunonu R. N. (2011), Needed reforms for junior secondary schools based science curriculum for the attainment of MDGs. Science Teachers Association of Nigeria, 52nd Annual Conference Proceedings 192 – 197.

Riaz, S. (2018). 5 importance of Chemistry in daily life. Retrieved from https://www. Biomadam.com/importance-chemistry-daily-life.