PERCEPTION OF CHEMISTRY TEACHERS ON SECONDARY SCHOOL CHEMISTRY CURRICULUM: THE NEED FOR ITS REFORM

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Abstract
The study investigated the perception of chemistry teachers on secondary school chemistry curriculum in terms of its content, relevance, adequacy and the need for reform. Four research questions guided the study. The design for the study was a descriptive survey. A sample of 148 chemistry teachers randomly sampled from 86 secondary schools drawn out of the 229 government owned secondary schools in Anambra state was used for the study. A validated questionnaire which had a reliability index of 0.89 using Cronbach Alpha technique was used to collect data for the study. The data collected were analyzed using mean, standard deviation, frequency and percentages. The results revealed that the chemistry teachers used for the study perceived that the chemistry curriculum used in secondary schools is overloaded with many contents that cannot be covered within the stipulated time, some topics are too abstract for the students to understand so they suggested that some of the contents need to be reformed to make the teaching of chemistry relevant, adequate and one that can instill skills in students. They also suggested that concepts on environmental changes and of our immediate societal concerns should be included in the curriculum to prepare students to be able to solve the problems of their immediate environment and that of the society as the need arises when they graduate. The researchers recommended among others that the topics in the chemistry curriculum should be reduced and topical issues relevant to our environment should be included in the curriculum.

Key words: Chemistry Teachers, Perception, Curriculum, Chemistry Curriculum, Reform

Introduction

One of the most rewarding things about teaching science is doing it in ways that cause effective communication and confidence with a willingness to try anything to make a fact or principle memorable. Chemistry is an important science subject and a prerequisite for further studying of a number of science related professional courses such as medicine, pharmacy, nursing, food technology, chemical engineering, agriculture and so on. Chemistry is central to everything. Asiyai (2005) observed that the failure rate in sciences and chemistry in particular at the Senior School C2ertificate Examination (SSCE) and other external examinations is high. Atherton (2011) opined that the main hurdle lies in student's inability to demonstrate a good understanding of the very basic concepts of the subject. Egolum and Igboegwu (2020); Eya (2011); Offiah and Egolum (2007) attributed the high failure rate in chemistry to a number of factors such as lack of well–equipped laboratory and other facilities, lack of qualified personnel, lack of prior knowledge of relevant mathematical concepts, alternative conceptions held by chemistry students, poor teaching methods and over-loaded curriculum.

Curriculum is an instrument that dictates the affairs of every educational system (Alebiosu, 2005). It is the vehicle through which knowledge and other learning activities are disseminated. Curriculum is a pilot on which economic, political, social and educational development challenges of a nation hinge (Ajewole, Nzewi & Aganga, 2001). Wasagu (2008) defined curriculum as a course of study that embrace the total spectrums of content, resources, materials and methods of teaching through which the purposes of education are achieved. Offorma (2005) regarded curriculum as the process of determining and pursuing set societal objectives through the instrumentality of the school. Curriculum is the totality of the environment in which education takes place. According to Adeyegbe (2004), curriculum generally is the number of activities in any educational endeavor since it dictates what is to be taught, at what level, by whom, with what materials and equipment, for what purpose and assessed by what means. Functional curriculum is determined by the quality of the curriculum content and its implementation (Offorma, 2005).

The success of any curriculum will depend on the availability of trained manpower for without proper development of human resources to implement the chemistry curriculum, chemistry education will continue to experience pit falls in the attainment of its goals. Chemistry teachers according to Ochu (2010), are crucial elements in chemistry curriculum delivery. The teacher plays a very important role in curriculum content implementation and dissemination by acting as a bridge that connects the curriculum to the learners i.e. he translates the content of the curriculum to the learners. Ogunkunle and Mbelede (2008) noted that no matter how well the curriculum is planned, it is useless if it is not implemented effectively. This is because the manner in which the teacher perceives the contents of the curriculum influences the way and manner the teacher relays it to be learner. This can of course influence the performance of the students.

The secondary school chemistry curriculum should be dynamic and move with the current developments all over the world. It therefore needs to be reviewed from time to time to make room for changes to content and form and also in the techniques of pedagogy so that

chemistry teaching will be relevant. In view of the need to address the problems on chemistry education curriculum and make it more relevant and exciting, curriculum reform is called for. There is need to reform the chemistry curriculum to meet the emerging challenges. Reform refers to improvement by alteration, a correction of an error or removal of defects. Reforms are changes or amendments made to a system or organization in order to improve it. According to Yusuf and Yusuf (2009), reform in Nigerian education is a federal government induced and directed substantial alteration of the Nigerian educational system, program, curriculum, agencies, education levels etc. Curriculum reform may be seen as a deliberate attempt to improve existing practices or conditions in an educational institution in relaxation to certain desired objectives. Akpan (2007) observed that reform is much more than a crucial change; it is a drastic and extensive replacement of the former situation with a newer one whose effects could be difficult or even painful to accept. Curriculum reform can take the form of inclusion of new pedagogies, new assessment methods and change in leadership, teacher training, language policy, co- curricular activities or even matters of administration.

The concern for curriculum reform is largely created by the increasing gap between what is taught and what is learnt. Simply put when students are increasingly unable to apply the knowledge taught in the school to practical settings that require problem solving skills, creativity and critical thinking skills. The curriculum that we have that is not providing such knowledge needs to be reviewed. The major goals of reforming chemistry curriculum according to Eya, (2011) is to enable chemistry students to

- Acquire basic theoretical and practical knowledge and skills.
- Develop interest in the subject of chemistry.
- Acquire competences that will help them be self reliant upon graduation
- Develop reasonable level of competence in ICT applications.
- Develop skills for creativity, problem solving and entrepreneurship and thus be useful to their society upon graduation

According to Kolade, (2010), reforms in Science, Technology, Engineering and Mathematics (STME) education is a sine- quanon for attaining economic independence. To keys and Bryan (2001), the efficiency of educational reform rests largely with the teachers. To truly reform our chemistry curriculum and teaching, the teachers must be involved. Therefore the researchers investigated the perception of chemistry teachers on secondary school chemistry curriculum and the need for its reform.

Purpose of the study

The purpose of the study was perception of chemistry teachers on secondary school chemistry curriculum and need for its reform. Specifically, the study investigated.

1. The perception of chemistry teachers on the secondary school chemistry curriculum in terms of quality and relevance
2. The perception of chemistry teachers on the contents of the secondary school chemistry curriculum that needs reform.

3. The people chemistry teachers in secondary schools think should bring about reform in chemistry curriculum
4. The strategies that will enhance the reform of the secondary school chemistry curriculum

Research Questions

The study was guided by the following research questions

1. What are the perception of chemistry teachers on secondary school chemistry curriculum in terms of quality and relevance?
2. What are the perceptions of chemistry teachers on the content of the secondary school chemistry curriculum that needs reform?
3. Who do chemistry teachers in secondary schools think should bring about reform in secondary school chemistry curriculum?
4. What are the strategies that will enhance the reforms of the secondary school chemistry curriculum?

Methods

The research design is a descriptive survey; the study was carried out in government owned secondary schools in Anambra state of Nigeria. The population for the study comprised of all the chemistry teachers in government owned secondary schools in Anambra state. 86 secondary schools were randomly selected out of the 229 gove2rnments owned secondary schools in the state. A total of 148 chemistry teachers formed the sample for the study. The instrument for data collection was a structured questionnaire developed by the researchers. The instrument titled ‘‘Questionnaire on perception of chemistry teachers on the secondary school chemistry curriculum and the need for its reform was made up of two parts 1 and 2. Part 1 contained items on personal data of the respondents. Part 2 had four sections A, B, C and D. Section A had 11 items that addressed teachers on their perception of the chemistry curriculum in terms of its content, relevance and quality. Section B had 46 items and sought information on the teacher’s perception of the contents of the chemistry curriculum that needs reform. Section C had seven (7) items and sought information on who secondary school chemistry teachers think should bring about reform in chemistry curriculum. Section D had ten (10) items and sought information on the strategies that will enhance reform of the secondary school chemistry curriculum.

The respondents were to indicate their level of agreement or disagreement based on a four point scale of Stron2gly Agree (SA) – 4 points, Agree (A) – 3 points, Disagree (D) – 2 points and Strongly Disagree (SA) – 1 point for research questions 1, 2 and 4. The respondents were asked to indicate either agree or disagree for research question 3. The validated questionnaire (by two 2lecturers in science education department and one from measurement and evaluation all from Nnamdi Azikiwe University Awka) was trial tested on 30 chemistry teachers from secondary schools in Delta state. The result obtained was used to determine the reliability of the instrument using Cronbach Alpha technique. A reliability index of 0. 89 were established and this indicated that the instrument was reliable for the study. The questionnaire was administered to the teachers in their various schools with the help of four

research attendants. A total of 148 copies of questionnaire were returned. The research questions were answered using mean, standard deviation, frequency and percentages. The criterion mean value was 2.50. Items with mean scores of 2.50 and above were regarded as agreed while those with mean of 2.49 and below were regarded as disagreed. Also for research question 3, items with percentages 50 and above were accepted while those with below 50% were not accepted.

Results

The results were presented according to the research questions below.

Research Question One: What are the perceptions of chemistry teachers on the secondary school chemistry curriculum in terms of quality and relevance?

Table 1: **Mean ratings and Standard Deviations (SD) on the perception of chemistry teachers of the secondary school chemistry curriculum2**

S/N	Questionnaire Items	Mean	SD	Decision
1.	The curriculum is adequate for achieving the objectives of the national policy on education	2.52	0.81	Agreed
2.	It prepares the learner to be functional in the society	2.10	0.97	Disagreed
3.	The contents is relevant to the Nigerian child	2.20	1.52	Disagreed
4.	The contents is relevant to the learner in terms of acquisition of skills	2.32	1.11	Disagreed
5.	It prepares the learner for further study in higher institution	3.18	1.60	Agreed
6.	It specified clearly the practical work to be done at each level	3.47	0.23	Agreed
7.	It has enough practical's to make chemistry students self reliant	2.17	1.44	Disagreed
8.	It contains current issues that is useful to the learner and the society	2.23	1.12	Disagreed
9.	It contains so many topics that cannot be covered within the specified period	3.87	1.24	Agreed
10.	Some contents in the curriculum are two abstract for the students	3.30	1.21	Agreed
11.	All the topics in the curriculum can be taught effectively without laboratory equipments	1.10	0.84	Disagreed

In table 1, items 2, 3, 4, 7, 8 and 11 scored below the acceptable mean of 2.50 and above. Thus the respondents disagreed with those statements on the table. Items 1, 5, 6, 9 and 10 had mean ratings above the cut-off points of 2.50. Thus the respondents agreed with the statements on the questionnaire.

Research Question Two: What are the perceptions of chemistry teachers on the contents of the secondary school chemistry curriculum that needs reform?

Table 2: Perception of chemistry teachers on the content of the secondary school chemistry curriculum that needs reform

SN	Questionnaire Items	Mean	SD	Remark
1	Concept of matter, elements, compounds and mixtures	2.92	0.66	Agreed
2	Particulate nature of matter: atoms and molecules 2	2.87	0.57	Agreed
3	Daltons atomic theory, atomic& mass no, isotopes	1.60	0.53	Disagreed
4	Separation techniques for mixtures	3.06	0.80	Agreed
5	Chemical symbols, empirical & molecular formula	2.64	1.02	Agreed
6	The periodic table	2.62	0.87	Agreed
7	Laws of chemical combination	1.82	0.67	Disagreed
8	Chemical bonding	2.50	0.83	Agreed
9	Kinetic theory, diffusion, osmosis	2.68	0.65	Agreed
10	Gas laws; Boyles, Charles laws etc	2.10	0.54	Disagreed
11	The mole, molar volume of gases	2.95	0.70	Agreed
12	Acids, bases and salts	3.19	0.55	Agreed
13	Water and solutions	3.12	0.45	Agreed
14	Solubility	2.64	0.68	Agreed
15	Treatment of water and pollution	2.50	0.53	Agreed
16	Carbon and its compounds, allotropes of carbon	2.72	0.71	Agreed
17	Hydrocarbons and its classes	2.68	1.01	Agreed
18	Petroleum and its fractions	2.56	0.84	Agreed
19	Cracking and reforming	2.92	0.70	Agreed
20	Industrial chemistry; heavy & fine chemicals	2.88	0.93	Agreed
21	Mass- volume relationship – stoichiometry	2.57	0.67	Agreed
22	Electrolysis	2.81	1.17	Agreed
23	Electrolysis of compounds	3.00	0.32	Agreed
24	Redox reactions; electrochemical cells	3.89	0.87	Agreed
25	Rates of chemical reactions	2.51	1.10	Agreed
26	Energy profile; exothermic & endothermic reactions	3.81	0.29	Agreed
27	Heat of formation, combustion e.t.c	3.17	0.71	Agreed
28	Enthalpy, entropy, free energy	2.02	0.49	Disagreed
29	Chemical equilibrium	3.30	0.48	Agreed
30	Non metals and their compounds, hydrogen	2.80	0.42	Agreed

31	Oxygen; preparation, properties, oxides, air pollutants	2.83	0.53	Agreed
32	Halogens, chlorine preparation, properties, reactions	2.83	0.65	Agreed
33	Nitrogen; laboratory and industrial preparation, properties and uses	3.03	0.72	Agreed
34	Sulphur – allotropes, uses, oxides, preparation, properties and uses of H_2SO4	2.90	0.52	Agreed
35	Organic chemistry, classification and nomenclature of organic compounds 2	3.06	0.50	Agreed
36	Homologous series; alkanes, alkenes, alkynes, alkanols, alkanoic acid, alkanoates	3.80	0.63	Agreed
37	Detergents, amino acids, aromatic hydrocarbon	2.80	0.32	Agreed
38	Polymers and giant molecules	3.38	0.78	Agreed
39	Carbohydrates; classification, properties and uses	3.33	0.59	Agreed
40	Quantum numbers, rules and principles of filling electrons	2.63	0.57	Agreed
41	Electronic structure of the atom	2.60	0.49	Agreed
42	Orbital's , s, p, d & f	3.37	0.52	Agreed
43	Radioactivity	2.90	0.56	Agreed
44	Qualitative analysis; identification of cations and anions	3.75	0.74	Agreed
45	Quantitative analysis: Acid-base titrations	3.12	0.74	Agreed
46	Preparation of standard solutions	3.83	0.62	Agreed

Results in table 2 indicated that only four items out of the whole items on the table had mean scores of less than 2.50 meaning that the chemistry teachers indicated that only four of the items should not be reformed in the secondary school chemistry curriculum while they agreed that all of the other items should undergo reform

Research Question Three: Who do chemistry teachers in secondary schools think should bring about reform in secondary school chemistry curriculum?

Table 3: Those that secondary school chemistry teachers thought that should bring about reform in secondary school chemistry curriculum

S/N	Questionnaire Items	Agreed Frequency	%	Disagree Frequency	%
1.	Teachers	121	81.8	27	18.2

2.	Government	104	70.3	44	29.7
3.	Society	82	55.4	66	44.6
4.	Curriculum planners	138	93.2	10	6.8
5.	STAN (science Teachers association)	95	64.2	53	35.8
6.	Researchers	89	60.1	59	39.9
7.	Employers of labour	56	37.8	92	62.2

In table 3, chemistry teachers used for the study agreed that all the items except item 7 were those that should bring about2 reforms in secondary school chemistry curriculum hence all have percentage scores of more than 50% except item 7 who's Percentage is 37.8

Research Question Four: What are the strategies that will enhance the reforms of the secondary school chemistry curriculum?

Table 4: Mean ratings and standard deviations of the strategies for the reform of chemistry curriculum.

S/N	Questionnaire Items	Mean	SD	Decision
1.	The content of the curriculum should be reduced	3.10	1.12	Agreed
2.	The contents should be one that will meet the needs of the learner and that of their community	2.94	0.97	Agreed
3.	Chemistry teachers should be involved in planning the curriculum	3.17	0.81	Agreed
4.	It should be one that will impart skills in students	2.82	1.01	Agreed
5.	Chemistry teachers should be motivated for better implementation of the curriculum	3.04	0.96	Agreed
6.	Issues like computer studies and internet applications should be included in the curriculum	2.75	0.66	Agreed
7.	Teachers skills should be improved through seminars, conferences and workshops	3.86	1.21	Agreed
8.	The curriculum should be learner centred	3.10	0.64	Agreed
9.	It should be problem – solving oriented	2.88	0.97	Agreed
10.	It should enable secondary school learners know the topical issues in their environment and how to tackle them	3.23	1.25	Agreed

Result in table 4 above showed that all the respondents agreed that all the strategies listed in the table can help in reforming of the chemistry curriculum hence their mean ratings were above 2.50.

Discussion

The findings of the study revealed that chemistry teachers perceived the chemistry curriculum as one that cannot prepare the learner for the world of work and one that is over loaded with so many topics that cannot be covered within the specified period. They believed that some in

the curriculum are abstract and so the students find them difficult to learn. This study is in agreement with the work of Akpan (2012) who opined that the science curriculum is outdated, not relevant, not- co2ntent driven and overloaded, and it does not prepare students for the world of employment. Also Adeyegbe and Oke (2004) lamented that the SSCE syllabus in each of the science subjects, chemistry inclusive are highly loaded in terms of contents

Findings in table 2 revealed that the chemistry teachers used for the study agreed that almost all the items in table 2 are contents in the chemistry curriculum that needs to be reformed so that chemistry teaching should be relevant and develop both entrepreneurial and creativity skills in both teachers and students. Teachers used for the study also agreed that the contents of the curriculum should be reformed to accommodate concepts on environmental changes and our immediate societal concern. This is in agreement with the study of Blades (2020) that focused on the need for reformation of the school science curricular to include issues on social changes such as the rising societal concern about the environment, environmental responsibility, and economic prosperity and so on.

Table 3 revealed that the chemistry teachers used for the study believed that the teachers, society, government, curriculum planners, organizations such as STAN and researchers should help bring about reforms in chemistry curriculum. The result of the study indicated that teachers (81.8%) and curriculum planners (93.2%) are the most important people in curriculum reform. This is in agreement with the study of keys & Bryan (2001) who posited that the efficiency of educational reform rests largely with the teachers.

Table 4 revealed that all the items on the table were among the strategies for the reform of chemistry curriculum. Hence the chemistry teachers agreed that secondary school chemistry curriculum can be reformed by reducing the content of the curriculum, making it student centered, putting only contents that will be of relevance to the leaner and his/her society and so on. This is in agreement with the study of Sewell (2003), who opined that the contents of the curriculum should be reduced to enable student's time to have thorough understanding of essential concepts. He also suggested that our science classroom should be made to be student centered and also problem solving method should be used in teaching science students to develop essential skills. Teachers used for the study also agreed that opportunities should be given to them for re-training through seminars, workshops and conferences to improve on their method of implementing the curriculum. They also agreed that topical issues should be included in the curriculum to make the teaching and learning of chemistry exciting, relevant and meaningful to the students. Such topical issues solid waste management, solutions to environmental issues, global warming, climate change, ozone layer depletion, over population and pollution.

Conclusion

The results of the study showed that the chemistry teachers perceived chemistry curriculum as containing too many topics (contents) that cannot be covered within the specified period and some of these contents are abstract and can only be taught using laboratory equipments

which are not available in the school laboratories. They also believed that the teachers should be involved in curriculum reform because they implement the curriculum and that the curriculum should be planned to inculcate entrepreneurial skills, creativity skills and problem – solving skills in students to help them become self-reliant when they graduate.

Recommendations

Based on the findings, the following recommendations were made

1. The content of the chemistry curriculum should be reformed to include contents relevant to a developing nation to help solve the needs of the learner and problem of the society as the need arises.
2. The topics in the chemistry curriculum should be reduced so that it can be covered within the specified period with enough practical.
3. It should be learner centered, problem based and project driven.
4. Contents that will help to develop creativity, problem-solving and entrepreneurial skills should be included in the reformed curriculum.
5. Serving chemistry teachers should be sponsored regularly to seminars, workshops and conferences to update their knowledge and learn innovative method of teaching for the reformed curriculum
6. School laboratories should be provided with enough materials and equipments for practical.
7. Curriculum planners should reform the chemistry curriculum by bringing in the use of mother tongue during linguistic difficulties.

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