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TEACHERS' APPRAISAL OF SELECTED TOPIC CONTENTS OF THE SENIOR SECONDARY SCHOOL CHEMISTRY CURRICULUM

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Abstract

Chemistry often considered an abstract and complex subject need the well versed as teachers. This research is an attempt to assess the teachers' perception of the level of difficulty and importance of selected topics in the SSS Chemistry Core Curriculum. Forty chemistry teachers drawn from 24 senior secondary schools were used for the study. Findings show that techniques and use of the laboratory and the IUPAC nomenclature were considered very important topics while 25 out of the 35 topics were rated either moderately difficult or difficult. To improve performance the researcher suggests the mounting of refresher courses, workshops, seminars and conferences as need arise.

Introduction

Science teaching has taken on new life and vigour. More developments are on the way in this field than in any other subject. This is evident in the increased emphasis on science in our schools. To buttress this enthusiasm improved science curriculum has been designed for senior secondary schools (SSS) in the country.

With respect to chemical education, the curriculum is aimed at satisfying the chemistry requirement of the SSS programme in the National Policy on Education (1981). According to Ikeobi (1986), the SSS chemistry curriculum is much closer to the West African Examinations Council (WAEC) "D" Level Chemistry syllabus than it is to the WAEC "A" Level Chemistry syllabus in terms of content and depth of treatment. Thus, this curriculum is expected to serve the needs and interest of students of a much wider ability range.

One of the objectives of chemical education is to provide a course which is complete for students not proceeding to higher education while it is at the same time a reasonably adequate foundation for a post-secondary chemistry course (SSS Chemistry Core Curriculum 1985). This modified objective for the study of chemistry in the SSS system led to the introduction of some new topics in the SSS chemistry core curriculum which were not initially present in the old WAEC syllabus.

Despite a conscious attempt by educational authorities to improve upon science education, literature abound that indicate consistent low achievement in science. Works

by Maduabum (1986) Ezike (1986), Soyibo (1985) attest to this fact. Various and varied reasons have been advanced for this trend, one being the level of difficulty of science subjects. The fact that science is difficult is confirmed by Solomon (1980). Ato (1986) asserts that the question of the difficulty/easiness of science is complex and must not be given a superficial discussion. A study conducted by Ekpo (1986), during the Science Teacher Association of Nigeria (STAN) workshop had asked the chemistry teachers to identify the topics in the SSS chemistry curriculum that were not included in the former WAEC syllabus and those that might be difficult to teach. The result of this research forms the basis for this study.

Below is the summary of the result of the research by Ekpo (1986).

Table I
Topics in the SSS Chemistry Syllabus

Not found in the WAEC Syllabus	Those that may be difficult to teach
Applied & Industrial Chemistry	Oxidation State
Collision Theory	Complex formation
Nuclear Chemistry	Collision theory
Quantum Mechanics	Nuclear Chemistry
Entropy Change & Free energy	Periodic Table
Orbital & Electronic structure	Equations of Redox Reaction
Petroleum Chemistry & Hydrocarbons	Orbital & Electronic Structure
Complex Formation	Energy Effects and
	Chemical Equilibrium

Teachers' influence on students' academic performance is of paramount importance as shown by studies done by Ajeyalemi (1983) and Okebukola (1985). Bearing this in mind, the researcher decided to use the topics identified by Ekpo (1986) to further investigate into chemistry teachers' appraisal of the degree of "Difficulty" and the degree of "Importance" of these additional topics in the syllabus. This research therefore attempts to answer the question:

"How do Chemistry Teachers appraise the added topic content in the SSS Chemistry Core Curriculum?"

Information obtained from practicing chemistry teachers on their perception of the changes in the chemistry curriculum shall help to establish a documented basis for chemistry programme modification. This information will also help teacher trainers in higher institutions to effectively plan their training programmes for prospective chemistry teachers.

Methodology

A purposive sample was drawn from chemistry teachers in twelve senior secondary schools each in Itu and Uyo Local Government Areas of Akwa Ibom State. Among the teachers used for the study were 15 teachers with the Nigeria Certificate of Education (NCE) qualification, 12 teachers with both bachelor's degree and NCE in chemistry, 2 teachers had a professional degree in science education [B.Sc. (Ed.)], 10 non-professional chemistry teachers with (B.Sc.) and one bio-chemist.

The questionnaire, which contained relevant questions that were meant to elicit appropriate response from the respondents towards the issue under investigation,

consisted of two main parts. Part "A" was to elicit demographic information about the school and staff involved in the study. Part "B" of the questionnaire was mainly to ascertain the degree of "Difficulty" and the degree of "Importance" of selected topic contents of the Chemistry Core Curriculum as viewed by practicing teachers.

The validation of the questionnaire was done by the researcher's senior colleague. The validated questionnaire was personally administered to 40 Chemistry teachers – 33 males (82.5%) and 17 females (17.5%).

Each item on the questionnaire was scored according to an empirically determined key. A weighted target score of 5.0 was assigned to "Very Difficult" and "Very Important", 4.0 was assigned to "Difficult" and "Important"; 3.0 was assigned to "Moderately Difficult" and "Averagely Important"; while 2.0 was assigned to "Easy" and "Unimportant". 1.0 was assigned to "Very Easy" and "Very Unimportant" on the Likert - type scale of the questionnaire.

The cut-off value of each item was determined. A weighted mean score between 4.5 to 5.0 would represent "Very Difficult" and "Very Important" scores between 3.5 to 4.4 represented "Difficult" and "Important" scores between 2.5 to 3.4 would indicate "Moderate Difficulty" and "Average Importance". Furthermore, scores between 1.5 to 2.4 was to represent "Easy" and "Unimportant" while 1.0 to 1.4 was also to represent "Very Easy" and "Very Unimportant".

Results

Teachers used for this study taught one class in the SSS classes with experience ranging from one to sixteen years. In the findings of the study, teachers in the rural areas taught chemistry for an average of 10.5 hours per week while in the urban areas, each chemistry teacher had an average of 15.5 hours per week.

Below is a summary of the results of the data based on the Section B of the questionnaire. The weighted mean scores of the responses of each item are reported on Table II.

Table II
Difficulty/ Importance of Selected Topics in the SSCE Chemistry Curriculum

S/No	Item	Difficulty	Importance
1	Dual nature of electrons/ electromagnetic radiation	3.5	3.7
2	Atomic theory (Quantum number and configuration)	3.0	4.3
3	Atomic spectra	4.1	3.7
4	Radioactivity, nuclear chemistry and nuclear reactions	3.2	3.9
5	Shapes of simple molecules (H ₂ , NH ₃ , H ₂ O etc)	2.6	3.8
6	Properties and structure of solids	3.0	4.0
7	Electrochemistry	3.0	4.0
8	Determination of purity, boiling and melting points	2.4	4.3
9	Electron affinity	2.9	4.0
10	Ionization potential	2.8	4.0
11	Atomic volume	3.2	3.6
12	Electronegativity	2.6	4.0
13	Chemical bonding	2.2	4.4
14	Bonding energy	3.1	3.6
15	Redox reactions	3.0	4.1
16	Concepts of oxidation number	2.7	4.2
17	Collision theory	3.1	3.7
18	Mechanism of reactions	3.5	3.8
19	Activation energy	2.8	4.1
20	Enthalpy/ entropy/ free energy	3.0	4.0
21	Exothermic and Endothermic Reaction	2.0	4.3
22	Heat of Reactions	2.4	4.1
23	Extraction Techniques for Al, Sn, Ca, Cu.	2.7	4.2
24	Complex ion chemistry	3.6	3.4
25	Transition metal chemistry	3.1	3.7
26	Biochemistry of living systems	2.6	4.0
27	Laboratory equipment and their use	1.9	4.7
28	Correct laboratory techniques	2.2	4.8
29	IUPAC naming symbols and formulae	2.3	4.6
30	Chemical Equilibria and Le Chatelier's principle	3.1	3.8
31	Biographies of chemists like Curie, Thomson etc	2.1	3.2
32	Petrochemicals and petrochemical industry	2.5	4.2
33	Industrial and applied chemistry	3.0	4.4

An overview of the analyzed data indicate that all items except 8, 13, 21, 22, 27,

28, 29, and 31 were considered "difficult". Thus only eight identified items above were rated "easy" for the teachers to teach.

On the scale of importance, all the items included in the SSS core curriculum were adjudged important with much emphasis on item numbers 27, 28 and 29. The item considered of least importance though with a weighted mean score of 3.2 was - Biographies of chemists like Curie, Thomson etc.

Discussion

Teacher's effectiveness is a prime determinant of the students' performance in a subject. According to Maduabum (1986) ineffective science teaching in our schools stems from the quality of teachers and inadequate professional training of these teachers. An inspection of the spectrum of teachers involved in the teaching of Chemistry in our schools tends to confirm Maduabum's assertion. 37.5% of the subjects used in this study had NCE as their highest qualification, this level of teachers by the specifications of the National Policy of Education (1981) are not trained to teach at the SSS level. This could be responsible for the notably high number of considered difficult items (25 of the 33 items). A topic being difficult to the teacher may be as a result of his inability to adequately understand the underlying concept in the topic or his inability to acquire necessary skill for the teaching of the concepts. With this large number of difficult topics, one wonders the capability of the teachers to effectively teach these concepts to the students.

To curb the situation, it is necessary for the NCE teachers to enroll for further training if their performance must improve. Admissions could be sought into degree programmes either through JAMB direct entry admissions or through the sandwich programmes mounted in the different universities. The NCE teacher is trained mainly for the primary school and at best the junior secondary level of learning, therefore they should be barred from teaching at the senior secondary level as this is detrimental to both the students and the educational system in general.

Further observation also revealed that 11 of the 40 teachers were untrained (10 of the teachers had B.Sc. in chemistry while one teacher had his degree in biochemistry). This may also be responsible for the rate of considered difficult item as this set of teachers may not have acquired the art of delivering the lessons to the students. This observation agrees in Maduabum (1984) assertion that secondary school teachers need to be professionally qualified to enable them work effectively. This implies that mastery of subject matter does not qualify one as an effective teacher. It is one thing to possess the knowledge and another to be able to transmit the knowledge to the students. It is the appropriate training in the content and methodology of teaching that will guarantee effective transmission of acquired body of knowledge.

It is unfortunate that teaching is considered an all comers affair and at times as a gap filler or a stepping stone to a "better" job. To control this trend, there is need to develop a code of conduct for the profession. It is suggested that those employed as school teachers should mandatorily have any of these teaching qualifications (TC II, NCE, or B.Ed.). Graduates who want to get employed as teachers should acquire a Post Graduate Diploma in Education (PGDE). The researcher believes that this will reduce the influx of untrained teachers who help to mar our children's future by causing them to develop apathy for some subjects because of the teachers inability to use appropriate teaching methods.

The rating on the scale of importance for the items studied, points to the inadequacy of the former WAEC chemistry syllabus and the improvement in the new syllabus. This brings to the fore the need to adequately teach the subject matter in these topics. The low achievement in chemistry at the SSCE examination as reported by Ajeyalem and Busari (1986) is a pointer to the fact that these topics although considered important are not adequately imparted to the students.

Conclusion

The currently used SSS chemistry core curriculum may be considered an improved syllabus. Its content being evidently higher by 25% (Ikeobi, 1986) than the former WAEC syllabus. Even with this good instrument of trade, there is the need to improve upon the calibre and expertise of the teachers. The NCE teachers who as a result of insufficient teaching staff are allowed to teach in the senior secondary and should avail themselves of the in-service and sandwich degree programmes available in most universities.

The proposal to professionalise teaching is long overdue. The researcher, thus suggests that all non-trained teachers should mandatorily be made to enroll for a post graduate teacher training course. There is also the need for continuous refresher courses, seminars and workshops as avenues of rubbing minds and transferring of knowledge among practicing teachers. The government should also explore the possibility of giving conference grants to teachers in order to encourage them to attend academic conferences outside their immediate domains.

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