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The Challenge of Effective Teaching of Chemistry: A Case Study

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Abstract

Chemistry education has been identified to be one of the major bedrock for the transformation of our national economy, and hence must be accorded adequate attention. In this study, an attempt was made in ascertaining the remote causes for the poor performances reported in recent times in chemistry at the senior secondary level of education. About 80 persons were interviewed in the course of this work ranging from ex-students, students to teachers. Teacher variables, student variables and environment-related variables were investigated and the findings showed that these all contribute greatly to the poor performances of students in science subjects and chemistry in particular. The chemistry teacher, students, parents, senior secondary school administrators, curriculum planners, and the government are therefore faced with the daunting challenge of re-awaking interest and providing enabling environment for the effective teaching of chemistry in particular and the sciences in general.

Keywords

Chemistry; Laboratory; Performance; Variable; Science; Teachers.

Introduction

Education, particularly Science and Technical education, is the 'factory' for the production of the needed technologists, technicians and craftsmen as well as skilled artisans who are required to turn the nation's economy around and usher in the desired technological advancement which is very much required for the elevation of Nigeria from a 'consumer nation' to a 'producer nation'; from a 'developing nation' to a 'developed nation' [1]. Acquisition of appropriate scientific and technological skills is necessary to cope with the challenge presented by the evolving needs of modern work place in our industries and the ever growing non-formal sector. Education and training systems that responds adequately to these demands will therefore, contribute to the efforts to overcome the growing unemployment and marginalization of majority of the populace. By providing access to appropriate learning experience designed to broaden skills and knowledge can increase productivity and significantly improve the fortunes of the unemployed, thereby reducing poverty and unemployment amongst our youth.

It is against this background that science education has been accorded a prime position worldwide. Within the context of science education, Chemistry has been identified as a very important science subject and its importance in scientific and technological development of any nation has been widely reported [2]. It was as a result of the recognition given to Chemistry in the development of the individual and the nation that it was made a core – subject among the natural sciences and other science – related courses in Nigerian education system [2]. It has been a pre-requisite subject for offering most science oriented courses in the tertiary institution and this calls for the need in teaching it effectively.

Chemistry teaching is suppose to be result oriented and students centred, and this can only be achieved when students are willing and the teachers are favourably disposed, using the appropriate methods and resources in teaching the students [2]. Students by nature are curios; they need to be actively involved in the learning process in which they are continuously equipping, testing, speculating and building their own personal construct and knowledge. It is only by personalizing such knowledge that it becomes valid, meaningful and useful to them. In chemistry, students need to actively construct their own personal awareness and meaning [3]. To substantiate the argument, Usman [4] remarked that the brain is not a passive consumer of information and to learn with understanding, a learner must actively

construct meaning of what to be learned.

Despite the prime position chemistry occupies in our educational system and the efforts made by researchers to enhance performance, students' performance in chemistry and sciences in general are still low. Some of the reasons identified for this failure are laboratory inadequacy, teachers' attitude, examination malpractice, time constraint for conduction of practice's, non-coverage of syllabus, class size, non-professionalism and environment.

Science practical in schools is aimed at giving the students the opportunity to gain meaningful learning, acquire appropriate skills and attitudes that enable them live and contribute to the development of society.

Statement of Problem

In view of the above factors suspected to be some of the reasons why students performance in chemistry continue to decline, this study was to investigate the low achievement in chemistry within some selected schools in Zaria ranging from teacher variables (attitude, qualification, attendance at chemistry workshop, condition of service), students variables (choice of career, attitude) and environmental- related variables (class size, school location and laboratory adequacy).

Methodology

An in-depth interview was used for this work. Ten chemistry teachers from three selected schools in Zaria were interviewed. A total number of sixty students selected from SS1 and SS2, selected randomly, from the same three schools were also interviewed. Five ex-students who failed chemistry from those schools were also interviewed to ascertain some claims by some students. A number of questions related to teacher attitudes, qualification, retraining, students choice of discipline, attitudes and environmental related variables where asked and there response recorded and analyzed.

Findings

Attitudes: It was discovered that most teachers are in the teaching profession not by choice,

they consider it to be a waiting ground for better jobs. “We have not gotten better jobs, we are just passing time” said one of the teachers. Such teachers have no passion teaching the subject. “I have been teaching for the past fifteen years now but my heart is not here”. This was another comment from a teacher, so how can he put his best into what he does not consider a serious job?

Under students’ attitudes towards chemistry, some students had this to say “sometimes I use to fail chemistry because, it is difficult to understand so I don’t have much time for it”; “I did not like it too much, I prefer Physics to it”; “I did not concentrate that’s why I failed while in school, but the moment I concentrated I had a credit pass”.

Non-professionalism: This study revealed that some teachers are teaching chemistry but they are not graduates of chemistry. “I read textile science and technology”; “I read electrical electronics but because of lack of teachers I have been asked to teach chemistry”, yet another teacher remarked that he was a graduate of chemical engineering but teaches chemistry.

Time Constraint: In some schools, where the student population is large, the classes are divided into sets (set I, II…) with two contacts of 40 minutes every week. While in some schools it is four contacts of 40 minutes for other days, and 35 minutes on Fridays. When asked if it is possible for them to cover their syllabus before the students face their external examinations, some had this to say; “it is not possible to cover unless you do some extra work outside your normal schedule but I am not ready to do that now”; “you can’t cover because the syllabus is too wide, in fact we use to carry SS2 work to SS3, one of my colleague who just came in claim she use to cover the syllabus but for me I have been teaching for years and I have not been able to cover it; “it is so hard to cover, what we do is to skip some topics and brush over others”. Since most of the topics are better understood when demonstrated, the teachers were asked whether it is possible for them under 40 to 80 minutes. Their response was “if you try that you encroach into another person’s period” ;”I don’t because the time is not enough, we leave everything till when the students are preparing for WAEC and NECO”.

Chemistry Workshop: Of the number of teachers interviewed, only one had not attended a workshop on teaching chemistry. “I have not attended any workshop since I started teaching chemistry”; “I have attended many workshops and it has helped me in teaching”.

Class Size: Some teachers were asked to what extent the size of their classes affect their teaching. Their comments; “I have an average number of 90 students in a class and I teach three classes, it has a negative effect on my efficiency because, firstly, class management is a

problem, secondly, I can't be sure whether each student is understanding or participating in the learning process". Another teacher responded; "I have a total 70 students in each of the classes I teach, so I spend a lot of time controlling the class and the actual time for teaching is very small and this affects the student's performances in their final examinations"

Conditions of service/ Remunerations: Poor remuneration and poor staff welfare has destroyed the morale of most teachers. One of them noted; "With this kind of chicken change I am collecting, do you think if a parent bring ₦40,000.00, for me to teach his child during the exam, I will not collect? I have a family to cater for". Because of poor remuneration many have become petty traders while abandoning their primary responsibilities. "I jump inside the bus travel through the night to Lagos to buy clothes for sale just to make ends meet".

Laboratory Adequacy: Chemistry is a subject that involves a lot of demonstrations and can only be effectively taught in the laboratory for easy access to instructional materials; however, most schools lack essential facility. One of the students said "I wanted to be a science student and started offering chemistry, but we have no lab and no teacher, in fact the only experiment we did was simple pendulum in physics till we wrote WAEC, and I failed chemistry".

Another student had this to say on the same issue "I am now about to finish SS2 and we have just been introduced to the lab, but I don't enjoy the experiment because the place is not conducive, it is a zinc house". In the same school, some students denied having a lab, "it still under construction and we have never done any practical since we started offering sciences".

Some teachers had this to say: "We have a temporary laboratory and not well equipped, the place is not conducive and this makes the student not to concentrate during practical lessons"; "we don't conduct practical often, it is usually a fire brigade approach when WAEC and NECO are approaching".

Examination Malpractice: One of the teachers noted that: "Most of the students choose to relax because of what will come from their teachers and parents". Another teacher observed that, "exam malpractice affects the students to a very great extent, the students, teachers, parents and invigilators are all involved. I have had to seize many solved exam questions sent in by parents". Yet, it takes an intelligent student to cheat successfully.

Choice of Career: Some of the students interviewed said they are into sciences by their own personal choice not by compulsion, but one of them said "my parents insisted I must be a science student because all my brothers are arts students and at least on of you must be an

engineer".

Discussion

It could be understood from the findings that the teaching profession has been reduced to a transit job. For people awaiting better jobs, they don't have passion for teaching. Such attitude reflects in the way they teach their subjects, and this has adverse effect on students' performance. From the study it is evident that students negative attitude towards chemistry is what often led to the low performance we experience today, this is consistent with Ojo [5] and Adesokan's [6] assertions.

The study also revealed that time constraint is one of the major factors responsible for the poor performance. It is the reason while syllabuses are not covered, science practical are not conducted. Students are also discouraged because it requires so much attention and they are not ready to sacrifice the time meant for other things. The number of periods given to chemistry per week and the time allocated for each lesson is usually not enough for effective learning because the teacher cannot conduct any meaningful practical within the time limit.

Also reported to have a negative impact on students' performance in chemistry is laboratory adequacy, which is an environmental factor [7]. From this study it was observed that some students really felt they would have performed better if exposed to practical lessons in good time. This is in line with Farounbi [8] who argued that students tend to understand and recall what they see more than what they hear as a result of using laboratories in the teaching of sciences, but most schools lack functional laboratories.

On the effect of examination malpractice, it was reported by some respondent that this has done so much harm than good to students' performance not only in chemistry but generally in the sciences. It is obvious that students who did not learn cannot perform and since examination is still the common index for measuring performance especially in our society, passing has become a do or die affair such that a teacher who did not do his work very well probably because of lack of time but want to please the school and the parents indulge in exam malpractice and the students come out colourful but no good knowledge of the subject. The students are aware that even if they are not serious and well taught, they will still be made to pass at the end either by their parents or teachers. These findings collaborate

with those of Angaye [9]. This could also be explained as one of the reasons why Universities are now conducting Post-UME.

Class size was also identified by most respondents as a major hindrance for effective teaching and learning. Chemistry requires getting the students involved, as most of the topics involve demonstration, if they could be well understood but this becomes very difficult when the class is large. This is also consistent with Onocha [10] who found out that large class size is unconducive for serious academic work.

Another serious factor militating against students' performance in sciences and Chemistry in particular is that of non-professionalism. Most graduates claim to teach or are compelled to teach any subject. This is more common in private and state schools. We have cases where Engineers taught they could teach Physics, Mathematics and Chemistry better than those who are actually trained to teach the subject and in most cases are compelled to do so.

Poor remuneration has also been identified as one of the factors which distracts most teachers from their primary assignment as they get involved in other activities that will enhance their living standard. Those who are not enabled, commercially, are demoralized; they keep lamenting and seeking for better opportunities. Those in private schools see themselves as been exploited. Anyone who works with such a mindset cannot be effective, hence, with the obvious consequence of poor performance on the part of the students.

Conclusion

It has been established by this study that teacher-related factors and school environment such as attitude, time, remuneration, laboratory adequacy and others, exert remarkable influence on students' positive achievement in chemistry. These factors directly and indirectly points to areas which have to be addressed in order to enhance the learning outcomes of students in chemistry. If the government and other stakeholders in education industry could improve on the learning environment of students and motivate teachers who are the curriculum implementers, students performance will definitely improve.

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