

INSIGHT INTO SCIENCE: A FOCUS ON THE TEACHING OF CHEMISTRY IN NIGERIA

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Abstract

This paper defines science with a view to make clear its nature. It outlines the purpose of science and gives an insight into the teaching of chemistry in Nigerian schools. The teaching of chemistry (and other sciences) is theoretically based instead of being experimentally based, as prescribed by science curriculum developers in Nigeria. Contributing issues to these problems are analysed to include: textbooks, teachers, infrastructure, student's background and the overloaded syllabus. Various indications and suggestions to resolve these issues are also given

Introduction

Science, as defined in the Oxford Advanced learner's dictionary (2000), is the knowledge about the structure and behaviour of the natural and physical world based on facts that can be proved. Science has to do with finding out a problem or identification of a problem, finding out the causes and how the problem could be solved (Ikuomola, 2005). It is a systematic way of solving the world's problems through the organized body of knowledge which leads to better understanding of the world by man who views it with the mind of improving its qualities thereby increasing the chances of man's survival on earth.

Science is an essential factor in determining the economic disposition of any nation. In view of the importance of science, Nigeria's government is making serious efforts to develop science and technology with the hope of meeting the challenges of modern science. In the National Policy on education (2004), the purposes of science education are as follows.

- i. to inculcate a positive attitude towards science in our youths;
- ii. to provide Nigerians who can man our economy;
- iii. to ensure a sound foundation of the basic principles and facts of the society as scientists.;
- iv. to ensure that every person has such grasp of science as to be ready to cooperate with understanding in the application of science to man's need. With these purposes of science

education, Nigerian students studying science are expected to be taught "what science is" (that is the nature of science), "how a scientists works (science process skill) and "what the attitudes of scientists are". They are expected to acquire scientific concepts and the scientific skills of "observing", "reporting" "organizing information"

"generalizing", "predicting or speculating" etc (Ajeyalemi, 1983).

Mackay (1971), in Shaibu (2002), pointed out that the understanding of the nature of science is a major goal of science teaching in schools. Therefore, the aim of this paper is to have an insight into the nature of science with a view to understand science and gain an insight into science teaching methods with particular reference to chemistry.

Insight into the Nature of Science

Understanding the nature of science is a necessary pre-requisite for effective teaching and learning of science. The nature of science is complex and difficult to understand without understanding the meaning of science itself.

Science is an intellectual endeavour to explain the workings of the physical world, informed by empirical investigation and carried out by community trained in specialized techniques. Also, the search for truth about natural phenomenon in the universe is called science.

The task of science is to produce a testable idea. According to Alexander (2004), the task of scientists is to make a large number of accurate experimental observations and then induce from such facts a general theory which providing it, is supported by a large body of consistent data.

Mackay (1971) in Shaibu (2002) distinguished science from its application and pointed categorically out that "science is not technology, it is not gadgets, it is not mysterious cult, it is not a great mechanical monster. Science is an adventure of human spirit. It is essentially an artistic enterprises, it is stimulated largely by disciplined imagination and based largely on faith in the reasonableness order and beauty of the universe of which man is part"

Abdulrahman (1979) viewed the nature of science to include:

- a. Processes by which scientific information is obtained (e.g. observing, experimenting etc)
 - b. The products of science (e.g. idea, law, theory etc)
 - c. The ethical systems which control and guide scientific activities (e.g. empiricism, open-mindedness, rationality etc). Shaibu (2002), broadly characterized the nature of science to
1. involve human activity and processes by which scientific knowledge is obtained,
 2. comprise of a body of knowledge (i.e. product of science);
 3. be guided by certain underlying mental and attitudinal imperatives; and
 4. comprises of ethical systems that provide standards for the conduct of the scientific enterprises.

For the above definition and description of the nature of science to be meaningful to science students and for them to develop the scientific ethics and skills, the enquiring methods of teaching and learning should be employed.

Insight into Chemistry Teaching in Nigerian Schools

The intentions of curriculum developers were that activity based and enquiring methods should be employed in the classroom implementation of science curricula in Nigeria. The teaching strategies prescribed for developing scientific skills and ethics in the classroom include:

- a. use of discovery teaching tactics wherever appropriate;
- b. the inclusion of problem-solving activities;
- c. the involvement of students in open ended field or laboratory work. Research evidence has consistently indicated the revise of these.

Results of opinion on method of teaching separately surveyed by Oyediji (1992) and Betiku (2002), favoured lecture methods.

Also, observational study made by Ajeyalemi (1983), according to him, "revealed that the overall pattern of intellectual transactions was teacher dominated, extremely didactic and theoretical",

Specifically for chemistry teaching, recent personal classroom observational studies in some selected secondary schools in Benin City, Edo State indicated that instructional method is basically lecture method. The teacher presents the facts and principles contained in the textbook and the students were rarely involved in practical laboratory experiences other than very infrequent teacher demonstration experiments. Thus, students learning of chemistry are more of rote-memorization of the facts and principles presented by the teacher. Teaching is done in a way that merely requires the students to listen, record and regurgitate facts or ideas. Programmes and textbooks that encourage understanding through observation, classifying, counting, measuring and weighing are ignored. This teaching approach differs substantially from what is prescribed by the curriculum developers whose aim is to have students centered and activities based chemistry teaching.

Problems and Prospects

The relevance of chemistry as a requirement for technological advancement of any nation cannot be over emphasized. Chemistry is defined as the science that deals with structure and composition of matter and transformations it undergoes (Ivan 1993 in Jimoh 2003). The teaching of chemistry in Nigeria schools has become an issue. Chemistry teaching has tended to be too rigid with instruction, concentrating on presenting the "pure" substance of the field. So many issues have been raised on this observation. Some of the issues are discussed in this paper.

The Textbook Issue

One key factor easily identifiable is the great dependence of Nigerian chemistry teachers on the textbooks. (Ajeyalemi, 1983). These textbooks emphasize more on the theoretical than the experimental nature of chemistry. The textbook not only determines the content but the order of presentation, the examples and (lie applications of the content. Teachers adhere rigidly to these texts setting their tests and examinations questions from these texts.

The textbook problem can be solved by encouraging authors to produce textbooks, which emphasize more on the experimental nature of chemistry. The textbook that should be approved for chemistry teaching in our schools should not only place importance on scientific theories and principles, but on their applicability also. Science Teacher Association of Nigeria (STAN) textbooks are example of such.

The Syllabus/ Curriculum Issue

The Nigeria secondary school chemistry curriculum is overloaded and tended toward theoretical teaching. The WAEC and NECO syllabuses require practical skills of titration of simple acids and bases and qualitative analysis of some gases in their final examinations. Chemistry teachers therefore make their teaching theoretical until the last few months before the final examination when the specific skills required for titration and analysis are taught.

Also, due to time constraints the teachers strain themselves to cover the overloaded syllabus, which still contains some irrelevant theoretical content.

Infrastructure

Teaching chemistry experimentally definitely requires functional laboratories. Some Nigeria schools have little or no provision for chemistry teaching laboratories, some schools that have laboratory spaces are unequipped with apparatus, chemical reagents and other materials that are needed for smooth transfer of theory to practical. Even where there is some laboratory infrastructure, "qualified laboratory technical personnel are needed for effective operation of the laboratory.

It is however encouraging that the government (federal and States) are aware of these problems and efforts are being made by them to provide the schools with the necessary science; teaching and learning infrastructure. One of these efforts is the establishment of Education Trust Fund. (ETF). The ETF provides classrooms, laboratory and its infrastructures. The training of laboratory technologists and other laboratory support personnel is being embarked upon by the ETF. Teachers' are also being paid for attending in-training services seminars and conferences. This effort should be intensified and supported by non-governmental organizations and able private individuals.

The Teacher

The quality of any form of education rests more on the quality of its teachers (Akubudike, 2003). This assertion is considered right, because the teacher implements the curriculum at the classroom level.

The greatest hindrance to the teaching of chemistry as an experimental activity in Nigeria secondary schools is the shortage of qualified chemistry teachers. Many chemistry teachers in our schools are either pure chemistry graduates, industrial chemistry graduates or not specialists in the subject. These teachers' attitude to work tends to be negative since they lack interest in the teaching profession. This lack of interest makes it difficult to teach science as an experimental activity because more interest and commitment from the teachers are required.

Recommendations

To remedy the teacher's problem, employment into teaching professions should be restricted to qualified individuals who show good interest in the job and a high intellectual ability with good certificates in Education. It is on this note that some educators have argued for all teachers or lecturers to possess education certificate in our schools. Ideal science teacher according to Lapkins (2000), will

- provide a safe and stimulating environment for learning;

- be a model of active inquiry;

- get students to question facts;

- stress scientific literacy

- get students to apply scientific knowledge. These qualities should be looked out for before given employment to any individual seeking employment as a science teacher.

Also, Government should provide more funds for the purchase of new instructional materials in science. Extra laboratories should be renovated and equipped. New laboratories should also be built to cater for large number of students.

The development of an appropriate curriculum in chemistry should involve the classroom chemistry-teachers since they are the primary users and the practicability depends on them.

Conclusion

All the issues considered above, militate against activity-based chemistry. For chemistry and (general science) to be meaningful and thrive in the 21st century, students should be taught through the handling of these materials, the students will learn to observe, classify, hypothesize, and conclude on the basis of available data. By so doing, they learn the content of sciences; develop process skills and scientific attributes all of which are embodied in the nature of science

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