

# IMPROVING THE STANDARD OF TEACHING AND LEARNING OF PRACTICALS IN OUR SECONDARY SCHOOLS: EMPHASIS ON BIOLOGY AND CHEMISTRY PRACTICALS

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## **Abstract**

There is no doubt practical works have positive impact in the teaching and learning of science in our secondary schools. This paper focused on the importance of practicals to the teaching and learning of Biology and Chemistry. Major constraints towards effective teaching of practicals in the two subjects areas were identified to include. Poor laboratory conditions or status, inadequate staffing, non-availability of laboratory equipment, class size, teachers and students attitudes. The role of a teacher as facilitator of biology and chemistry practicals was emphasized to be very important in motivating and sustaining the interest of students in the subjects, hence improving performance in the subjects. It was recommended that standard and well-equipped laboratories be provided in our secondary school, while teachers should improve on their teaching methodology.

The fact that no country can advance in technology without a sound science background can be attributed to the increase in the teaching and learning of science globally. Verda (1983), opined that, it is through the teaching of science that the fundamental base to improve technology can be obtained and eventually used for the betterment of mankind. Knowledge acquired through science and technology will enable learners exert their maximal efforts in their bid to “tame” the environment. (Nwenkechukwu, (2001).

Ango (2002), stated that a scientifically literate society in African countries will be in a good position to make feasible, sane and valid decision on issues directly related to their lives. However, it is important to note that equal attention is not paid to the development of

science by different nations. In Nigeria adequate attention is yet to be paid to the teaching and learning of science in our schools. This is evident in the shortage of qualified science teachers, technologist laboratory facilities. It is obvious that there is need for improving the teaching and learning of science in Nigeria in line with the global trend.

According to Eniayeju, (1983), most school subjects can be taught if ordinary tools such as pencil, paper, chalkboard, textbooks and some other aids are available. But for effective science teaching well equipped laboratories are needed as science cannot be taught in vague. Teaching of science without adequate laboratory experience makes teaching teacher-centered, the students passive during lessons. It makes students prone to rout learning and does not develop in the students the attitude of scientific enquiry.

Laboratory work is indispensable to the understanding of science. (Ottader and Grelsson, 2006). The main purpose of laboratory work in science education is to provide students with conceptual and theoretical knowledge to help them learn scientific concepts, and through scientific methods, to understand the nature of science. This paper examines the disciplines of science: Biology and chemistry, importance of teaching and learning of practicals, constraints toward effective practical teaching; and relevant instructional materials that could enhance or improve the quality of practical biology and chemistry teaching.

## **Biology and Chemistry as Disciplines of Science**

Biology is defined as the basic science that deals with the study of living things, it

attempts to understand the teeming diversity of life on earth a diversity of level we are all part of (Adegbite 2005). Life is not a simple concept, which may be one of the reasons why the teaching of biology is important. There are two major branches of biology namely; Zoology (the study of animals) and Botany (the study of plants) and sub divisions such as ecology, physiology, histology etc.

Chemistry on the other hand can be defined as the branch of science that deals with the study of matter. It involves the identification of the constituents of a substance or mixture of substances and determination of the actual amount of a substance present alone or in a mixture. (Ghoshal, Mahapatra and Nad, 2004), The knowledge of chemistry is very vital on how substances reacts until with each other subdivisions of chemistry are; Organic, inorganic, physical and environmental. Any student who studies Biology or Chemistry may end up being a professional in sciences such as medicine, pharmacy etc.

According to Buraimoh and Ogunmade, (2000) majority of chemistry students failed to perform excellently in Senior Secondary Certificate Examination and other examination due to limited exposure or non – exposure to the basic rudiments of practical aspect of the subject, this is applicable to biology and other science subjects.

Biology and Chemistry pedagogy like in any other science subject revolves around the practicals, but the theoretical teaching and rhetoric learning within the contemporary Nigeria classrooms have become an obstacles in the bid to transform the knowledge of chemistry or biology into achievements. Biology and Chemistry curriculum should enable learners acquire the following:

- Meaningful and relevant knowledge in both subjects
- Reasonable and functional scientific attitude

- Adequate laboratory and field skills in subject
- Ability to apply scientific knowledge to everyday life

### **Importance of Laboratory Works (Practicals) in Teaching and Learning of Biology**

Glossing over the above objectives, it could be inferred that practicals or laboratory works are very essential to the teaching and learning of Biology and Chemistry. After theoretical teaching the practical reinforces learning and motivates development of scientific attitudes such as objectivity, open mindedness, honesty and critical think. Laboratory work in Biology involve observation, description or drawing; microscopy; dissection and experimental work. In Chemistry it involves volumetric or quantitative analysis; qualitative analysis of elements, mixtures and compounds which must be based on observation and experiment.

In the teaching and learning of Biology and Chemistry laboratory work give the students the opportunity to experience science by using scientific research procedures and also to encourage the development of analytical and critical thinking. Skills and encourage interest in the subjects. The purposes of laboratory work have been the subject of discussion worldwide for many years. Multiple lists of those purposes have been prepared for different levels of education. Many of the lists focus on carrying out experiments through scientific methods and technical skills. While some strongly emphasized objectives, others have dwelled on other purposes (Reid and Shah, 2004)

The general importance of laboratory are enumerated as follows:

- supporting or strengthening theoretical knowledge
- experiencing the pleasure of discovery and development of their psychomotor skills,

- increasing creative thinking skills
- higher order thinking skills
- developing manual dexterity by using tools and equipment
- allowing students to apply skills instead of memorizing (Reid and Shahi, 2004).

Many research works have been carried out on the implication practicals in the learning and teaching of Biology and Chemistry. According to Ango, (2000), Biology comes alive when students are engaged on practical work. The work of Baruwa, (2006) affirmed that teaching Biology with practical activities helps students to get greater understanding of Biology.

Buraimoh and Ogunmade (2000) in their study emphasize the importance of practical in facilitating learning for understanding and help to reinforce the principles been studied in Chemistry. The authors also pointed out that Chemistry practical helps students to develop certain skills such as measurement and accuracy. In spite of the facts that the importance of practicals in the teaching and learning of Biology and Chemistry cannot be denied there are factors affecting students learning during practicals.

#### **Constraints to Students Learning During Biology and Chemistry Practicals**

There are many factors which constitute hindrance to effective learning during Biology and Chemistry Practical classes, some of these factors are listed below:

- poor Biology and Chemistry laboratory condition status
- inadequate staffing
- problem of large classes
- non-availability laboratory materials or reagents
- students and teachers attitudes

#### **Effect of Poor Laboratory Conditions on Practical**

Ideal conventional, contemporary chemistry and biology laboratories must possess

the following features: a fairly large room with demonstration or preparatory room and the stores. Long-tables containing sinks, 4-way type of gas points, 2 tailed Reagent shelves, water supply taps and drawers. Gas-chamber, Fume-cupboard, Refrigerator and Air-Conditioners, Raised-platform, safety devices.

Most of our secondary school laboratories fall short of this standard and hence, this has negative impact on students' performance in practical classes. Researches have shown that students in schools with adequately equipped and good laboratory conditions perform better than students from schools with poorly equipped laboratories and poor laboratory conditions. (Aganga, (1998); Adelani, (1984), Adose (1991).

#### **Inadequate Staffing and Class Size**

Lack of qualified or inadequate qualified Biology and Chemistry teachers is one of the reasons for poor performance of students in practicals (Adeleye, 2002). As a result of shortage of teachers most teachers have to teach more than the required number of students. The Author also identified class size as one of the problems that cause poor performance in science subject; most especially in Biology and Chemistry.

#### **Teacher and Students Attitude**

Teachers and students attitudes have been reported to have implications on students' performance in practicals (Adeleye, 2002). Teachers approach in teaching chemistry and biology practicals has effects on student attitude toward the subjects. A situation where teacher monopolizes the teaching and learning process with less participation of students could result in apparent lack of interest in the subject and hence poor performance.

### **Ways of Improving the Teaching of Biology and Chemistry Practical**

Researchers such as (vard (1983), Reid and Shahi (2007). have shown that most rewarding approach in teaching is method that actually involves student participation, resulting in new discoveries through activities and discussion. One of the main objectives of teaching biology and chemistry to enhance keen observation for identification of living things and the development of skills to handle chemicals respectively.

A conscientious teacher is expected to make available variety of specimens and reagents needed for practical classes. He is to act as facilitator, instructor and partners in the business of learning. The teacher's questioning skills must be brought into play to facilitate learners thinking and activities. Grouping system could be adopted for large class, this encourages interaction and team working. To effectively facilitate practical classes it is important for teachers to make adequate of deficiencies.

It is necessary for students to handle laboratory equipments regularly and adequate time need to be given to students to learn techniques of using equipment and developing skills for practical activities.

### **Conclusion**

The importance of practical work on the learning of biology and chemistry cannot be overemphasized. It is for this reason that practical work is conducted in schools. However, major constraints towards the teaching and learning of practical works and measures for improving these processes have been discussed.

### **Recommendation**

The following are recommended to facilitate continuous and better performance in Biology and Chemistry practicals.

- Provision of standard laboratory and adequate laboratory equipments for secondary schools.
- Teachers should improve their teaching methodology to sustain the interest of the students.
- Enough qualified Biology and Chemistry teachers should be employed to cater for increase population of students.
- Students should be allowed access to laboratory equipments

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