

Improvisation as a Means of Improving Laboratory Facilities for Effective Teaching of Chemistry

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Abstract

The importance of science education in our secondary schools cannot be over emphasized, this is because science subjects are seen as catalyst to technological development. The performance in science has often been dismal. The poor performance is partly blamed on the increasing school enrolment without a corresponding increase in teaching resources. Therefore this paper examined the use of laboratory as a teaching device, the need for improvisation, the cost and social benefit of improvisation, and some of the commonly used materials /simple apparatus that can be improvised in the chemistry laboratory were highlighted and recommendation were made among which are science teachers association of Nigeria (STAN) should commission a committee to produce a suitable and up to date course book on improvisations, this should be purchased by various education ministries for distribution to the schools. Also, government cooperatives, organizations, communities and wealthy individuals should help in funding schools to enable them purchase tools and materials needed for improvisation.

Keywords: science education, improvisation, chemistry, laboratory.

Introduction

One of the major constraints slowing down the pace of implementation of science education programmes at all educative levels in the country is lack of laboratory resources. The situation has remained virtually unchanged and perhaps deteriorated.

Science as a field of study has done a lot for mankind, life has been made easy, standard of living has improved as a result of the advancement in science, through science man has been able to better understand his environment and this has enabled him to manipulate the conditions of his environment to suit his own benefit. Bassey (2002) opined that science is resource intensive and in a period of economic recession, it will be very difficult to adequately some of the electronic gadget and equipment for science in schools. A situation that is further compounded by the galloping inflation in the country and often relatedness of some of the imported sophisticate material and equipment hence the need to produce materials locally.

Science teaching is still suffering from numerous constraints such as lack of adequate equipped laboratories, poor teaching facilities, and even now there has been no sign of improvement in our school laboratories. Researches such as Ogunleye (2000), Okonkwo (2000), Mkpanang (2005) & Obioha (2006) reported that there were inadequate resources on the dishing

of science subjects in secondary schools in Nigeria, they further stated that where there were little resources at all, they are not usually in good condition while the few that were in good condition were not enough to go round those who needed them, hence there is need for improvisation. This findings is also supported by Nbina (2012) who said the wide spread poor performance and the negative attitude towards chemistry of secondary school student has been largely ascribed to teaching problems which involves lack of improvisation in our schools. Many other investigation has showed that students in secondary schools are also not very much interested in science and the factors that have contributed to this such is teaching strategy which is as a result of lack of instructional materials in the laboratories (Esiobu, 2005 & Okonkwo, 2000).

Science comprises the basic disciplines in secondary schools such as chemistry, physics , mathematics, biology. Scientist operate generally through scientific method which involves observing carefully, reporting carefully, organizing information acquired, generalizing on the basics ; of acquiring information, predicting as result of generalization, designing experience meant to check predictions, using models to explain a phenomenon and continuing the process of enquiry where new data do not conform to predictions. In other therefore for a learner of science to deploy his cognitive , affective and psychomotor domain remains in the study of science, the necessary facilities which is the (laboratory, equipment, staff etc.) have to be made available.

Chemistry as a subject has a significant importance in our daily life and the society in general, everything on the earth is made up of chemicals, chemistry helps us understand how items around us are made in our daily life. All matters is made of chemicals so the importance of chemistry is that it's the study of everything. Chemistry is a very important branch of science, it is the study of science that deals with constituents of matter like atoms, molecules, ions and its properties, structures of behavior and interaction among them, since everything is made up of atoms and molecules, we can see the chemistry all around us. Chemistry is one of the science subjects, whose importance among the science subjects cannot be over emphasized hence science rests on assumption about the nature of reality and about our ability to comprehend reality. Owolabi (2004) defines science as an integral part of human society, its impact is felt in every area of human life so much that it is intricately linked with the nations development while Ogunleye (2000) observed that science is a dynamic human activity concerned with the understanding of workings of our world. Science is the foundation upon which the bulk of present day technological breakthrough is built ,the world is turning scientific and lives itself depend greatly on science hence nations all over the world including Nigeria are striving hard to develop technologically and scientifically.

Laboratory as a Teaching room

The adequacy of laboratory facilities has been reported to have a significant effect on the students' academic performance in chemistry Okafor (2000), However a study of the influence of the adequacy of laboratory facilities and academic performance in chemistry found that adequacy had a significant influence on students academic performance in secondary school chemistry teaching, Aburime (2004).Laboratory has contributed to students performance and development by enhancing mastery of science subject matter developing scientific reasoning abilities , increase understanding of the complexity and ambiguity of empirical work, developing practical skills, increasing understanding of the nature of science.

A teaching laboratory is an exciting place to investigate, analyse and reflect. They test and apply theories and make abstract concepts concrete.

Laboratory work is important because it helps students learn scientific concepts and to enhance students' interest, motivate practical skills and problem solving abilities. The most important objectives for laboratory work are to link theory to practice. Laboratory work is often classified into two broad areas:

1. Science experiment; and
2. Standardized laboratory exercises.

The science experiments are described as those experiments which originate from learners and executed by the students themselves. Both types of laboratory work are observed to contribute to effective science learning. For instance, the real scientific experiments are meant:

- i. To stimulate students thinking about science.
- ii. To encourage student to develop the spirit of discovery as a method of acquiring knowledge of science.
- iii. To develop and challenge students manipulative abilities.
- iv. To familiarize students with the limitations in data analysis.
- v. To encourage students to learn the need for caution in drawing conclusions from work.

Need for Improvisation

Improvisation is the activity of making or doing something not planned before hand, using whatever can be found, it is a spontaneous performance without specific or scripted preparation. In other words the act of coming up with something on the spot.

The process of improvisation gives teachers the knowledge of creativity, manipulative skills and critical thinking; it helps in saving cost of looking for readymade instructional material which is more costly. It encourages self reliance and a feeling of confidence during instruction delivery.

Improvised materials are materials that are used in the absence of the real, original or delicate objects to bring about the same learning effect that the real or complicated materials would have brought. The use of locally produced instructional materials in the teaching learning situation has many advantages.

Innovation in education is the act of producing new things that are important and will enhance teaching and learning effectively. Ogunmola (2002) cited that improvisations are those visual or audio visual materials that facilitates the assimilation of organization for effective teaching.

Benefit of improvisation to the students, teachers and the government

Obviously, the situation of things is certainly not to improve in the nearest future judging from the political and economical state of affairs in the country. Consequently demand for science equipment will continue to remain high and the most feasible way to cope with high demand is to resort to the improvisation of teaching equipments and materials as much as possible. Hence, some of the benefits that can be derived from improvisation of materials and equipments are as follows:

- i. The process of improvisation gives teachers the knowledge of creativity, manipulative skills, and critical thinking.
- ii. Improvisation helps in saving costs of looking of readymade instructional media which are more costly. It encourages self reliance and a feeling of confidence during instructional delivery
- iii. The benefits of learning improvisation has been proven in both young people and adults to improve and promote; Communication, decision making, working as a team, social interaction, confidence, active listening, physical awareness and helping with anxiety.
- iv. It will promote, encourage and arouse the interest of students in teaching and learning of science.

- v. It has become too exorbitant to purchase many of these equipments and materials which use to be imported. The necessity to improvise those that can be improvised from locally available materials at affordable cost to the nation has become so important.
- vi. It will facilitate teaching learning processes.
- vii. It will make instructional effort on the part of the teacher more efficient, effective and productive in terms of teaching and growth.
- viii. Improvisation of teaching materials will help the teacher to teach concepts and principles, presents facts and information in a more acceptable way.
- ix. It guides thinking, induced the transfer of learning and sustains attention.
- x. It will help learners and the teachers to assess attainment of learning.
- xi. This approach will serve to supplement whatever is available for the educational resources center.
- xii. Improvisation will also enhance the country's quest for self reliance.
- xiii. On the part of the teachers, it will develop their constructive, designing and also their practical knowledge.

According to many scholars, the advantage of using low cost materials can be summarized as written by Silechi (2012) as follows:

- i. Use of local materials makes teachers and learners aware of the resources to be found in their environment and stimulates creativity to use them;
- ii. The experiments and models can be constricted in a very short time, with a few tools, with locally available materials even by unskilled persons as part of pre- and in-service teacher training;
The self construction develops a sense of proud ownership and promotes a more frequent use
- iii. Repair and replacement of broken parts are possible locally without technical or administrative problems
- iv. For the storage no special storage facility is needed; a lockable cupboard is enough. Security is no problem, because of the low material value.
- v. For the implementation no special infrastructure is needed. The innovation goes straight to the schools. What has been learned today in a training workshop can be applied tomorrow in the classroom

Some of the commonly used materials/simple apparatus that can be improvised in the Chemistry laboratory

Some essential laboratory facilities are dependent on the public utilities; examples are electricity, water and gas. Since the supply of some of these utilities are very erratic in the society, it is reasonable to expect that the school laboratories will suffer as a result of this, there are a number of things that should be done to ensure functioning utilities in the school laboratories:

- i. In areas where water supply is not regular, large overhead tanks should be placed near the school laboratory so that whenever there is water they will be filled and this will be available during the time of scarcity. There is danger of health hazard where running water is not available in the laboratory. The tank can also be connected to the roof water drainage so that rain water can be connected in the tanks provided there is a sieve to sieve the water.
- ii. In areas where electricity supply is erratic the school may have to buy a small electricity generating set for use in the laboratory. The set can also be made to serve other areas; of the school during and after school hours. It can also be rented to outsiders at a small fee so that it can be made to pay for its maintenance cost. The parent teacher association or school where we have old student association could help in these aspects of finance especially that some states have free education, operating at hand.

- iii. Stoves could also be used when it is safe in place of Bunsen burners.
- iv. Glass measuring cylinder; can be improvised using plastic materials, some of these plastic materials are already calibrated.
- v. Mortar and pestle can be substituted for ones made of wood e.g. as designed by Technical department of College of Education, Ikere-Ekiti.
- vi. Pipette; can be improvised by using transparent rubber tube. The tube could be designed to have the capacity for delivering either 20ml or 25ml is used to siphon water to its mark and this is delivered into the clipped. A permanent mark is then made to identify the water level on the tube. Some other things that can be improvised includes production of alkali using ashed indicators that can be gotten from the extraction of some flowers like the Hibiscus flower petals, those petals can be grinded and the juice can be extracted diluted and standardized in the laboratory. The P.H value can be determined by comparing it with the standardized one used in the laboratory.

Cost and social benefit of Improvisation

Some of the improvised apparatus discussed above are easily brought at a lower rate than the original materials and can also be found locally around our environment.

Also, these improvised materials are not breakable and can be very durable. Our chemistry laboratories can function well without having to wait for the imported materials.

Hence it is a good idea to have a corner in the schools mainly for storing "junks" or broken materials which under normal circumstances are due for the dustbin. Some uses would be found for them in the cause; of time, for example, paper pounded into pulp is improvised. parisclay or plasticine, cellophane shots will serve for overhead projector plain transparencies etc.

Conclusion and Recommendations

With the state of the nation's economy, any hope of receiving; large sum of fund from the government will continue to remain a dream. Government could supplement the little science equipment by resorting to improvisation from locally available materials.

To be able to attain this goal, the following recommendations are offered among others:

- i. Teachers should be adequately remunerated by placing on a special salary scales to motivate them to devote all their time to learning and teaching.
- ii. Government, cooperatives, organizations, communities and wealthy individuals should help in funding schools to enable them purchase tools and materials needed for improvisation.
- iii. Science teacher association of Nigeria (STAN) should commission a panel to produce a suitable and up-to- date course book on improvisation. This should be purchased by various education ministries for distributions to their schools.
- iv. Teachers should be trained on how to improvise alternatives to real object to enhance teaching and learning.
- v. Teachers should make use of only instructional materials that are relevant to them.
- vi. Lesson content.
- vii. Learners should be actively involved in sourcing for material.
- viii. The government, non government (NGO) and parents teachers association should contribute financially the promotion of improvisation of instruction to teachers in secondary schools.

References

- Abumme, E.T. (2004). Refocusing Research Teaching and mathematics education: A case for mathematics laboratory, Akure. *Proceeding of the 45th Annual conference of science Teachers Association of Nigeria*.
- Bassey, M.P. (2002). *Availability of resources for the leading of science subject in public secondary schools*. A case study of some selected secondary school in Alimosho local government.
- Esiobu, G.O. (2005). *Gender issues in science and Technology Education Development in science and Technology Education for Development*. Uvoivi, Umo (Ed). NERDC Press, Lagos.
- Mkpananny, T.T. (2005). Enhancing the professional physics teachers role in life education through professionalization of teaching. *Proceedings of 40th Annual Conference*.
- Nbina, J.B. (2012). Analysis of poor performances of senior secondary students in Chemistry in Nigeria. *African Research Review of multidisciplinary Journal of Ethiopia*. 4
- Obioha, N. E. (2006). *Physics for Senior Secondary Schools*. STAN, Hermann Publishers, Nigeria.
- Ogbu, S. (2006). *Effect of simulation games on students achievement and interest in Mathematics*. An unpublished M.Sc (Ed) Dissertation Enugu state University of Science and technology (ESUT), Enugu.
- Ogunleye, A.O. (2000). Towards the optimal utilization and management of resources for the effective teaching and learning of Physics in schools. Proceedings of the 41st Annual Conference of the science teachers Association of Nigeria (STAN), University of Nigeria.
- Ogunmola, A. (2002). Importance of improvisation in teaching integrated science in some selected secondary schools.
- Okafor, P.N. (2000). Developing improvisation skills for alleviating poverty in Nigeria: The place of chemistry in entrepreneurship education. *Academic leadership Journal*. 8 (4).
- Okonkwo, S.C. (2000). Relationship between some school teacher variables and students and achievement in mathematics. *Journal of Science Association, Nigeria*.
- Orisasanyi, S.A. & Omosaso, E.O. (2011). Effects of improvised and standard instructional materials on secondary school students academic performance in Physics in Ikere. Nigeria *Journal of scientific research*. 1 (1).
- Owolabi, T. (2004). A diagnosis of students' difficulties in Physics. *Educational Perspectives*. 7, 15-20.