The study examined the performance of senior secondary students in sciences using improvised and non-improvised objects. The purpose was to measure the magnitude and relationship between the performance of those students that were taught using improvised objects and those that were not taught with improvised equipments. 2700 students were randomly selected from Nigerian secondary schools. The data collected were subjected to t-test and multiple comparisons. The findings of the study showed that there were significant differences in the performance of those students that were in the improvised classes (improclax) and non-improvised classes. The study recommends that much attention and priority should be placed on the teaching of sciences with improvised materials, particularly in an environment where ready-made apparatus are scarce. This study condemned in its totality that; absences of the ideal tools should not resulted into nightmare for science teachers and students, but be overcome by improvising scientific equipments in other to enhance good learning.

Keywords: Apparatus, Improvisation, Kinesthetic, Laboratory, Science

INTRODUCTION

The concept of improvisation has become increasingly popular in the discourse of scientific experiments. This paper explores several aspects of improvisation, in the context of sciences and everyday activities, in order to address some of the philosophical and practical issues relevant to this emerging interest. One of the activities in science is experimentation. It provides a forum for practicalising the theoretical knowledge gained in the classroom and for demonstrating the psychomotor skills of a teacher and learner.

However, many students see science as abstract and irrelevant to their lives due to lack of engaging classroom laboratory equipment. (Kolawole and Oginni 2009) Laboratory and field work aids the understanding of difficult concepts in the curriculum; creates opportunity for the testing of facts and theories in science. It is believed that learners can achieve more if given the opportunity to improvise materials on what they have been taught in the classroom. Experimentation thus gives room for better attainment of lesson objectives, since it depends on the availability of science equipment for proper understanding, development and application (Ugwu, 2008)

One of the goals of Education in Nigeria is the acquisition of appropriate skills, the development of mental, physical and social abilities and competencies as equipment for individual to live in and contribute to the development of the society (Federal Government of Nigeria, 2004). The realization of this goal can be impeded by non-availability of science equipment that can ensure effective teaching and learning. Iwuozor (2000) observed that the teaching and learning of science can never be improvised, if the teaching materials that are not available but could be improvised are not properly used. Many authors have, however, reported the issue of inadequacy of science equipment in educational institutions in Nigeria. (Ogunleye, 2007 in Ugwu, 2008; Ogunmade et al 2006; Nwagbo, 2008; Bajah, 1982; Osobonye, 2002).

It is no excuse for any science teachers to hide under non-availability of funds as a basis for not conducting practical for his students if he knows his onus.. Isaac Newton, Pythagoras of Simos, Galileo Galileo and the rest pioneers in sciences started building themselves from objects around them to explain concepts that were still relevant till these day. (Adeyemi, 1990; 2007). Over the years, financial allocation to the education sector has been inadequate for the needs of the sector thus making
it impossible to procure adequate equipment for teaching and learning. In that case, teachers of sciences need to wake-up to their responsibility.

In Nigeria, performance in science subjects has often been dismal (Kolawole and Oginni, 2009). This poor performance is partly blamed on the increasing school enrollment, without a corresponding increase in teaching resources. The cost of effective science teaching resources is very high; Government has stated the reasons why some of the equipments cannot go round all Schools, thereby classified some schools as pilot or mega schools, where adequate provision are made for those pilot schools alone.. The National Science Center (NSC) endeavours to ensure that as much as possible teaching/learning materials of a low-cost nature are produced. This thinking is as a result of the difficulties faced in sourcing imported and expensive teaching aids that the schools cannot afford to buy.

Many factors make the call for improvisation of equipment in educational institutions in Nigeria expedient. One of these is the persistent poor funding of the education sector. Over the years, financial allocation to the education sector has been inadequate for the realization of educational objectives. There is therefore inadequate science equipment in educational institutions at all levels in the country. For instance, many authors have observed the ineffective teaching of Biology in educational institutions in Nigeria Due to non-use of science equipment for teaching, among other factors. Consequently, there is poor performance of students in Biology in internal and external examinations (Igusi, 2002; Iyekexpolor 2006), a situation that calls for urgent attention of all education stakeholders.

There are many active learning strategies that can be used in the mathematics chemistry and physics classroom.(Holman, 1995) They include: discussion, Games, Excursion, Role playing, Drama, project, Demonstration, Discovery, Brainstorming, Problem-solving method and process-based approach. These methods develop in students, critical thinking skills, creativity, open-mindedness, intellectual honesty, etc. These attitudes will not only help students in developing the process skills but also their entrepreneurial skills and their socio-economic lives. These activity-based strategies yield better quality and entrepreneurial learning.

### Meaning of Improvisation

Improvisation means the act of creating something or using something in the absence of the ideal tools. According to Webster’s dictionary (2004) improvisation is to provide, select or make substitute for something not available to use as the basis of free invention. Various authors have defined the concept ‘improvisation’ in different ways. Ogunbuiyi, Okebukola and Fafunwa (1990) defines it as the act of substituting for the real thing that is not available. Bajah (1991) takes it to be the use of substitute equipment where the real one is not available. Kamoru and Umeano (2006) further define it as the act of using materials obtainable from the local environment or designed by the teacher or with the help of local personnel to enhance instruction. According to Ihiegbulem (2007), it is the act of substituting for the standard equipment or instructional materials not available, with locally made equipment or instructional materials from readily available natural resources. National Teacher Institute in Omachi (2000) defines improvisation as the act of using alternative materials and resources due to lack or insufficient hand teaching aids to facilitate instruction from these opinions, improvisation entails the production of equipment using available local and cheaper resources and the use of such equipment for effective teaching.

### Importance of Improvisation

Improvisation serves the following purposes in the education system:

- Reduces the money spent on the purchase of equipment in educational institutions;
- Ensures the realization of lesson objectives;
- Helps in solving the problem of lack of equipment in educational institutions;
- Gives room for a teacher to demonstrate his creative skills;
- Gives room for the use of cheap local materials as alternatives to the expensive foreign ones;
- Encourages students towards the development of creative abilities;
- Strengthen enquiry, discovery and investigative method in sciences
- It provides a frame of reference on which students can key their attention during classroom activities.
- Enables teacher to think of cheaper, better and faster methods of making teaching learning process easier for students;
- Affords students the opportunity of becoming familiar with resources in their environment.

Without a gainsaying, experimental work in sciences always create a lasting picture in the memory of students, and discourage memorization of laws and theories. Concrete experiments help students see how the scientific concepts work in reality, particularly the kinesthetic learners will benefit from performing the experiment themselves Owolabi (2003) suggested that students should be given opportunity to discover and invent things; hence the teachers should allow the students to acquire skills that will make them learn on their own.. It must be noted that learners achieved more when they are allowed to manipulate apparatus rather
than mere listen or observe teachers’ idea.

Problems of Improvisation

Improvisation help in forcing students to think critically about the scientific concepts, yet there are many obstacles associated with the use of improvised materials. Balogun (1982) explained the two militating factors of improvisation as technical and human factors. Low degree of accuracy and precision affects some improvised materials are termed as “technical factor”. While the human factors problems are attributed to skillfulness, creativity and competence.

Accuracy and precision play a prominent role in science experiment, otherwise much error recorded during practical work will render the findings impotent, useless and unacceptable. Owolabi (1999) identified some common errors that can affect the accuracy in science practical results as, Environmental, Instrumental, Personal and Experimental errors.

Technical factors are problems associated with instrumental errors which result from inevitable errors during the manufacturing process. The problem of inconsistency in measurement will resulted to low level of reliability of the instrument. Iwuzor (2000) posited that the problem is more crucial at the secondary school levels and tertiary institutions where more sensitive experiments and observations are carried out.

Personal errors can also lead to low degree of accuracy. Scientists referred to this as human factor. These are problems associated with teachers' professional competency, creative ability and commitment. Once the teachers begin to understand the principle behind improvisation, they can begin to improvise their own tools, though a lot of teachers lack confidence in their ability to design their own experiments (Okebukola, 1998).

Statement of the Problem

The Nigeria vision 20-20-20 will be in mirage if the abysmal performance of students in sciences is not check on time. The researchers observed that memorization of facts have replaced experimentation in some of Nigerian schools. Hence, technological advancement and breakthrough remain a hope of many decades to come.

The study therefore attempted to examine the potency of some improvised materials on some selected science students in Nigerian schools.

Hypothesis

The hypothesis were formulated and tested.

There is no significant difference in the performance of students that was taught using improvised equipments and those that were not taught with the improvised equipments in the three groups.

METHODOLOGY

The population for this study is made up of all SS3 students in the South-West Nigeria. The sample for this study consisted of 1350 students drawn from 15 secondary schools across the States (Ekiti, Osun and Ondo), 5 secondary schools from each state were randomly selected for the study together with 450 students stratified randomly selected from each states considered for the study.

Instrumentation

Standardized test consisting of 25 items developed by the researchers was the instrument used in collecting information. The alternative to practical items sought to find whether improvised equipments influences the academic performance of science students within South-Western Nigeria. The instrument was adjudged to have got face and content validity by four erudite scholars in Physics, and Chemistry Department. The instrument was trail-tested on 35 students from another location in other to verify the reliability of the instrument. Estimated using Cronbach-alpha and the reliability coefficient was 0.78.

FINDINGS

Group A of the table shows that there was significant difference in the performance of the students taught with improvised equipments and those that were not taught with the improvised equipment. Group B of the table shows that there was significant difference in the performance of the students taught with improvised equipments and those that were not taught with the improvised equipment. Group C of the table reveals that there was no significant difference in the performance of the students taught with improvised equipments and those that were not taught with the improvised equipment

DISCUSSION

The findings of the study in Group A and Group B revealed that the null hypothesis was rejected and there was a significant difference between the performance of the students taught with improvised equipment and those taught with non-improvised equipments. This is in line with Okebukola (1998) and suggested that improvisation requires that teachers use the resources available in the
Table 1. Shows the t-test comparison for the improvised and non-improvised classes in the three states

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>( \bar{x} )</th>
<th>S.D</th>
<th>df</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impro Clax (A) EKITI</td>
<td>450</td>
<td>66.40</td>
<td>20.7</td>
<td></td>
<td>898</td>
<td>20.29</td>
</tr>
<tr>
<td>Non- Impro</td>
<td>450</td>
<td>97.65</td>
<td>25.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>( \bar{x} )</th>
<th>S.D</th>
<th>df</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impro Clax (B) OSUN</td>
<td>450</td>
<td>66.4</td>
<td>20.7</td>
<td></td>
<td>898</td>
<td>21.16</td>
</tr>
<tr>
<td>Non- Impro</td>
<td>450</td>
<td>101.2</td>
<td>28.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>( \bar{x} )</th>
<th>S.D</th>
<th>df</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impro Clax (C) ONDO</td>
<td>450</td>
<td>97.65</td>
<td>25.3</td>
<td></td>
<td>898</td>
<td>1.90</td>
</tr>
<tr>
<td>Non- Impro</td>
<td>450</td>
<td>101.2</td>
<td>28.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

surrounding area.
The finding in Group C is contrary since the null hypothesis was not rejected. The reason for this development may be as a result of other variables that are not considered by the researchers. According to Akinsote and Okoruwa (2000) teachers do function as research director while students are the principal investigators. Sciences students are in other words used to a systematic and regular questioning. Teachers of science and technology benefit through workshops and seminars on matters of improvisation and development of learning materials. During such events teachers are shown how to improvise some teaching aids and also how to make low cost teaching materials using, as much as possible, locally available resources. Generally, this enables the teachers to enhance their teaching of mathematics, science and technology subjects.

CONCLUSION AND RECOMMENDATION

Conclusively, science teachers are enjoined not to wait aimlessly for the sophisticated (imported) materials, which they are not even sure of its arrival. Science should not be taught as a set of dogma anymore, but rather through improvised materials.

In view of the enviable role of improvisation in the teaching and learning of science, it is recommended that:

- Institutions' administrators should provide the enabling environment for teachers to improvise science equipment.
- Sufficient time should be created for science teachers to improvise. In this regard, excess work load of those that wish to improvise should be reduced to allow them more time to think and carry out the act.
- Provision of facilities for active participation of the learners;
- Periodic review of science (physics, biology, chemistry) curriculum;
- Indeed, the government should encourage science teachers to improvise equipment by granting them loans for the production of improvised equipment on a large scale. This will reduce the level of unemployment in the nation. Teachers should however establish collaboration with industries for assistance in this regard.
- Science teachers in educational institutions should be granted in-service training to acquire more knowledge and skills, which can help them to improvise equipment. Government should organize seminars, workshops and conferences for science teachers so that they can be taught the techniques of improvisation. Science teachers should however improve their skills by reading books, Journals and other scientific publications to garner adequate information about science equipment, particularly those to be improvised.
- Science teachers should involve students in the improvisation of equipment to give them the opportunity to acquire creative skills. Curriculum programmes at all levels of education should emphasize improvisation activities by teachers and students.

REFERENCES

Development Council (NERDC),