EFFECT OF IMPROVISED INSTRUCTIONAL MATERIALS ON ACADEMIC ACHIEVEMENT OF BIOLOGY STUDENTS IN DUTSIN-MA METROPOLIS, KATSINA STATE

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Abstract
The study investigated the effect of improvised instructional materials on academic achievement of Biology students in Dutsin-Ma metropolis. Quasi-experimental Design involving pretest, posttest was used for the study. The population was 486 Senior Secondary 11 Biology students made up of 354 males and 132 females. Simple random sampling technique was used to select two secondary schools out of the six coeducational schools in Dutsin-ma metropolis. Intact classes of each of the two sampled schools which comprised total of seventy eight (76) students were used for the study. The experimental groups were exposed to Ecology concepts in biology with improvised instructional materials while the control group was exposed to ecology concepts without improvised instructional materials for six weeks. Posttest was administered immediately after the treatment. Ecology Achievement Test (EAT) with reliability coefficient of 0.79 was used as instrument for data collection. Two research questions and two hypotheses guided the study. The research questions were answered using Mean scores and t-test statistics was used to test the hypotheses at 0.05 level of significance. The result showed that students taught ecology concepts with improvised instructional materials performed better than those taught without improvised materials and also there is no significant difference in the performance of male and female biology students when taught with improvised instructional materials. The researcher recommended that biology teachers should try to improvise instructional materials and encourage students to do same.

Keywords: Improvisation, Academic achievement, Biology students, Ecology concepts

Introduction
Lesson without instructional materials is normally dull and boring and these make students to sleep during class and sometimes even hate the teacher and the subject. Learning of any school subject especially science subjects such as biology is more understandable to students when a teacher uses instructional materials that catches the attention of the students. Biology is a science subject that studies both living and non-living things, their existence and relationship with one another (Ogenevwede, 2012). It plays a very vital role in the life of every human being and is very vast with
many divisions such as zoology, botany, ecology, genetics, morphology, anatomy, physiology, histology, microbiology, biochemistry, evolution and the more advanced cell biology, molecular biology, among others (Bagley, 2017). Biology is also closely related with other science subjects like agricultural science, chemistry, geography, mathematics and physics. It also finds application in many specialized areas like medicine, pharmacy, food production and processing industries, biotechnology, genetic engineering, agriculture and horticulture, environmental protection, tourism industry (biological gardens) among others. In spite of the importance and popularity of biologist students’ performance at senior secondary school level in Nigeria has been poor (Adewale, Nzewuihe & Ogunshola, 2016).

This poor performance is attributed to not proper understanding of ecological concepts of biology which are perceived to be difficult by some students and lack of improvising instructional materials in teaching and learning where the original instructional materials are not available (Awolaju, 2016). Isola, (2010) also supported this assertion by saying that the teaching of Biology without instructional materials results in poor academic performance. Mboto, Ndem & Stephen (2011) added that the use of improvised instructional materials enhanced teaching of science and improved students’ performance. Improvisation and substitution of instructional materials are encouraged where original is absent or inadequate. Onasanya and Omosewa (2011) noted that improvisation demands adventure, creativity, curiosity and perseverance on the part of the teacher. The author added that such skills are only realized through well planned training program on improvisation. Findings by Eze (2017) revealed that, most science teachers do not improvise instructional materials nor use improvised instructional materials in the teaching of biology in schools.

Many researchers have defined improvisation in different ways. For example Shodeinde (2015) defined improvisation is the art of using local resources available within the school environment by a teacher to produce simple but attractive and effective instructional materials for teaching. Improvisation is seen by (Fatokun, 2009) as making available for use materials, which the teacher provides (substitutes) in the absence of ready-made standard materials in order to facilitate learning or make his lesson more interesting. Improvisation according to Awolaju (2016) is the act of using locally made materials to substitute for standard ready-made materials in order to facilitate teaching and learning in the classroom.

Many empirical researches conducted by researchers such as Mboto, Ndem and Stephen (2011), Onasanya and Omosewa (2011), Oladejo, Olosunde, Ojebisi and Isola (2011), Iji, Ogbole and Uka (2014), Saidu, Adekunle, Kaoje, Jibril and Muhammad (2015), Awolaju (2016), Adewale, Nzewuihe and Ogunshola (2016), Eze (2017) in different disciplines proved that using improvised instructional materials enhances academic performance of students however, in the field of biology particularly on the concept of ecology not much work has been carried out on the effect of improvised instructional materials on students’ academic achievement among secondary students in Dutsinma metropolis. Therefore, this study investigated the effects...
or otherwise of improvised instructional materials on academic achievement of biology students in ecology concepts.

Ecology literary means study of living things in their natural surrounding or habitat. Ahmed (2010) defined ecology as an aspect of biology that requires students to be taken out to see living organisms in their natural habitats. Ajaja, (2010) define ecology as the study of the relationships of living organisms with each other and their non-living or physical surroundings. The ecology concepts include the following: habitat, population, ecosystem, succession, adaptation, conservation, pollution, cycling material, biological control, community, biotic interaction, soil studies erosion, ecology and disease, sewage disposal, ecological study, feeding relationship, energy, environment to mention just a few. Since ecology has to do with interactions of living organisms and the non-living components of the environment, it is necessary to create the awareness of ecology as a subject early in the life of the students (Nzewi, 2008).

Gender differences in academic achievement have been among the contemporary issues in the current academic debate all over the world. Studies by Mboto, Ndem & Stephen (2011) and Iji, Ogbole & Uka (2014) on performance of male and female taught using improvised instructional materials, showed that male performed better than female students but, studies by Awolaju (2016) and Oladejo, Olosunde, Ojebisi & Isola (2011) revealed no gender difference in academic performance when taught with improvised instructional materials. This study therefore investigated the effect of improvised instructional materials in ecology concepts on male and female biology students’ achievement in Dutsin-Ma metropolis.

**Statement of the Problem**

Many biology teachers lack the ability to improvised instructional materials for teaching and learning science subjects especially biology (Fatokun 2009). This is attributed to many factors such as poor qualification of teachers, lack of providing of standard instructional materials by the government, teachers laziness and lack of creativity on the part of the teachers and students. Also some basic ecological concepts like population density, habitat among others taught in secondary schools require some basic measurements and calculations. Many students and teachers have a natural phobia for anything that has to do with calculations. Such teachers and students prefer a theoretical aspect that requires weighing and measuring. This trend has contributed to the general poor performance of candidates in question that deal with ecological concepts in the West African Senior Certificate Examinations (WASSCE) (Oyedokun, 2002). The problem of this study is what will be the effect of improvisation in ecology concepts on biology students’ achievement in Dutsin-Ma metropolis?

**Purpose of the Study**

The purpose of the study is to:

1. Determine the difference in the mean achievement scores of students taught ecology concepts with improvised materials and those taught without improvised materials.
2. To find out if there is gender difference of students taught ecology concepts with improvised materials.

Research Questions
The following research questions were formulated for the study:

1. What is the difference in the mean achievement scores of students taught ecology concepts with improvised instructional materials and those taught without improvised instructional materials?

2. Is there any significant difference in the mean achievement scores of male and female students taught ecology concepts with improvised materials?

Research Hypotheses
The following research hypotheses were to be tested at 0.05 level of significance.

**H01:** There is no significant difference in the mean achievement scores of students taught ecology concepts with improvised materials and those taught without improvised materials.

**H02:** There is no significant difference in the mean achievement scores of male and female students taught ecology concepts with improvised materials.

Methodology
Quasi-experimental Design involving pretest, posttest was used for the study. The population was 486 Biology students made up of 354 males and 132 females. Simple random sampling technique by balloting method was used to select two secondary schools out of the six coeducational schools that served as population of the study. Intact class of each of the two sampled schools was used. A total of seventy eight (76) students were used. Community Day comprised of 38 students served as experimental group while Darawa comprising of 38 served as the control group. Pretest was administered on the subjects, before they were exposed to the treatment to determine if they are different significantly in their ability level. The experimental groups were exposed to biology with improvised instructional materials while the control group was exposed to lecture method for six weeks. The posttest was administered six weeks after treatment. Ecology Achievement Test (EAT) was validated by two Senior Lecturers from Department of Science Education, Federal University Dutsin-Ma, a biology teacher from one of the sample school. They confirmed that the instrument was suitable for the students. In this study test retest method was used to get the reliability coefficient of 0.79 of the instrument used for data collection. Two research questions and two hypotheses guided the study. The research questions were answered using Mean scores while the hypotheses were tested using t-test statistics at P≤ 0.05 level of significance.

Results
**Answer to Research Questions:** In this study research questions were answered using mean and standard deviation. The results of the data analyzed were presented in the Tables as follows:
Research Question 1: What is the difference in the mean achievement scores of students taught ecology concepts with improvised instructional materials and those taught without improvised instructional materials?

Table 1: Post-test Mean Scores of Students in the Experimental and Control Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>Mean Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>38</td>
<td>13.26</td>
<td>4.73</td>
<td>0.77</td>
<td>1.05</td>
</tr>
<tr>
<td>Control group</td>
<td>38</td>
<td>12.21</td>
<td>74.11</td>
<td>0.66</td>
<td></td>
</tr>
</tbody>
</table>

The result in Table 1 revealed that students taught with improvised instructional materials achieved significantly better than those taught without it, this was seen from the mean scores of 13.26 and 12.21 for the experimental and control groups respectively.

Research Question 2: Is there any significant difference in the mean achievement scores of male and female students taught ecology concepts with improvised materials?

Table 2: Post-test Mean and Standard Deviation of Male and Female Students Performance in the Experimental Group

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>Mean Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>44</td>
<td>12.61</td>
<td>3.94</td>
<td>-0.28</td>
<td>-0.3</td>
</tr>
<tr>
<td>Female</td>
<td>32</td>
<td>12.91</td>
<td>5.09</td>
<td>-0.27</td>
<td></td>
</tr>
</tbody>
</table>

Result from Table 2 showed that the male had a mean post-test score of 12.61 with standard deviation of 3.94 and the female had a mean post-test score of 12.91 and standard deviation of 5.09, which is almost the same. This shows that there is no significant difference in the performance of male and female taught with improvised instructional materials.

H01: There is no significant difference in the mean achievement of students taught ecology concepts with improvised materials and those taught without improvised materials.

To test this hypothesis, t-test was used as seen in Table 3

Table 3: Hypothesis 1: t-test Analysis of the Post-test mean Score of Experimental and Control Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>Df</th>
<th>P-value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>38</td>
<td>13.26</td>
<td>4.73</td>
<td>1.04</td>
<td>74</td>
<td>0.03</td>
<td>S</td>
</tr>
<tr>
<td>Control group</td>
<td>38</td>
<td>12.21</td>
<td>4.11</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The result from Table 3 showed that p-value obtained was 0.03 at p< 0.05 level of significance at df=74. Since the p-value of 0.03 is less than 0.05 level of significance the null hypotheses is rejected. This means that there is significant difference in the academic achievement of students in the experimental and control groups.
Hypothesis 2
There is no significant difference in the mean achievement scores between male and female students taught ecology concepts with improvised materials.

Table 4: t-test Analysis showing the Mean Achievement of Male and Female Students in the Experimental Group

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Means</th>
<th>SD</th>
<th>SE</th>
<th>Df</th>
<th>P-value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>44</td>
<td>12.61</td>
<td>3.94</td>
<td>0.59</td>
<td>74</td>
<td>0.78</td>
<td>NS</td>
</tr>
<tr>
<td>Control group</td>
<td>32</td>
<td>12.91</td>
<td>5.09</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The result from Table 4 revealed that p-value 0.78 at df 74, is greater than 0.05 level of significance. Thus, the null hypothesis that says there is no significant difference between the male and female students in the experimental group is not rejected. This means that the use of improvised instructional materials in teaching ecology has no significant different effect on students’ achievement with respect to gender.

Discussion
The study was designed to find out the effect of improvised instructional materials on academic achievement of secondary school students in ecology concepts in Biology. In Table 1 and 3, the result showed that there is significant difference in the mean achievement scores of students taught ecology concepts with improvised instructional materials and those taught without improvised instructional materials. The finding however, is in line with the findings of Mboto, Ndem and Stephen (2011), Onasanya and Omosewo (2011), Oladejo, Olosunde, Ojebisi and Isola (2011), Iji, Ogbole and Uka (2014), Saidu, Adebunle, Kaoje, Jibril and Muhammad (2015), Awolaju (2016), Adewale, Nzewu and Ogungbola (2016), Mohammed (2016), and Eze (2017) who stated that experimental group taught with improvised materials achieved higher than the control group.

Table 4, showed that the mean difference observed between male and female students’ achievement is not significant. This means that gender factor has no effect on students’ achievement in ecological concepts when improvised instructional materials are used. This finding is in line with the findings of Oladejo, Olosunde, Ojebisi and Isola (2011), Awolaju (2016), who revealed that gender factor has no significant influence on students’ achievement but, contradict that of Mboto , Ndem & Stephen (2011) and Iji, Ogbole & Uka (2014), which showed that male performed better than female students when taught with improvised instructional materials.

Conclusion
The results of this study showed that improvised instructional materials have significant effect ofon students’ achievement in ecology concepts. This is because students taught using it performed significantly higher than those taught without it. However, the results of this study found no
significant difference in the achievement of male and female students taught with improvised instructional materials. This showed that male and female students performance is not significantly difference when improvised instructional materials were used. Thus the study is not gender bias to instructional treatment

Recommendations
Based on the findings of this study, the following recommendations are made:

1. Teachers should try to improvise instructional materials and encourage students to do same as this will give students enough understanding of biology concepts.
2. Effort should be made by government from time to time to organize workshops for biology teachers on improvisation and needs for the use of instructional materials. This is to compliment the efforts of the Millennium Development Goals (MDGs) for the re-training of Science teachers.

References


