

Effects of Improvised Teaching-Learning Materials on the Academic Performance of Junior Secondary School Students in Basic Science in Enugu State, Nigeria

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The study investigated the Effects of Improvised Teaching-Learning Materials (TLMs) on the academic performance of junior secondary school students in Basic Science in Enugu state, Nigeria. The study employed quasi-experimental research design. The population of the study was 33,548 JSS II Basic Science students, comprising of 14,821 male and 18,727 female students. Purposive sampling technique was used to sample a total of 140 JSS II students from four public secondary schools for the study. Two each were purposively assigned to experimental and control group respectively. The 73 students in the experimental group were taught with improvised teaching-learning materials while 67 students in the control group were taught without improvised teaching-learning materials. Two research questions guided the study while two null-hypotheses were formulated and tested at 0.05 level of significance. Data used for the study was collected through the pre-test, treatment and post-test using the researchers' made instrument (Improvised Basic Science Performance Test- IBSPT), the IBSPT consists of 30 objective test items. Data collected were analyzed statistically through the use of both descriptive statistics of frequencies, mean and standard deviation while Independent sample t-test was used to test the two null hypotheses. Major findings drawn from the study among others revealed a positive significant difference in the performance of students taught Basic Science with the use of improvised teaching-learning when compared with those taught Basic Science without the use of improvised teaching-learning materials. Also, finding shows a positive significant difference in the performance of males and females taught Basic Science using improvised teaching aids. It was concluded among others things that since the students taught Basic Science with the use of improvised teaching-learning materials had a better mean score than those taught without the use of improvised teaching-learning materials, there is need for teachers to be trained to improvise teaching-learning materials as this will enable them acquire the appropriate techniques and skills necessary for improvisation. Hence, it was recommended that teachers should be trained and re-trained through workshops, seminars and conferences for the purpose of skill acquisition necessary for effective use of teaching-learning materials.

Key Words: *Basic Science, Education, Teaching-learning materials, Improvisation, Teaching*

Date of Submission: 12-08-2020

Date of Acceptance: 28-08-2020

I. Introduction

Teaching is one of the oldest and probably most respected professions playing an important role in the preservation of societies. Teaching is a series of observable actions which can be reviewed, enhanced, changed, and repeated for effective learning achievement. It is the process of attending to people's needs, experiences and feelings, and intervening so that they learn particular things, and go beyond the given. The activities of educating, instructing, imparting knowledge or skills written or spoken directions for carrying out a procedure or performing a task is referred to as teaching. Teaching is a form of public service which requires teacher's expert knowledge and skills, acquired and maintained through rigorous study -UNESCO and the ILO cited by Baikie (2002). This definition of the teaching-learning process shows that the act of teaching is full of activities that a teacher must engage in for successful implementation of the teaching and learning process. The artistic

aspect of teaching was likening to the activity of a symphony conductor, who draws from a repertoire of skills and orchestrates a highly complex process. The quality of teaching is a crucial factor in promoting effective learning in schools.

Effective teaching requires individuals who are academically able and care about the wellbeing of children. An effective teacher must possess the skills of a detective in an instruction setting, to overcome such obstacles, a teacher must use observation, knowledge and skills to create instructional treatment that goes beyond simple memorization of facts to create new level of understanding within the learners. In every instructional setting, a teacher may be confronted by students with varied learning abilities, and topics that require many hours of preparation, and a limited amount of resources. The teacher's role in the learning process is changing as new technologies are introduced into the classroom, (Smith, 1999). The increase in the percentage of what is learned and remembered is greatly influenced by the judicious use of teaching-learning materials to task the various sense organs of the learners. Students learn effectively when such learning experiences and activities are illustrated with teaching-learning materials.

Teaching-Learning Materials (TLMs) are the tools that are used by teachers and instructors within schools to facilitate learning and understanding of concepts among students. Teaching/Learning Materials (TLM) are also known as instructional materials, are any collection of materials including animate and inanimate objects and human and non-human resources that a teacher may use in teaching and learning situations to help achieve desired learning objectives (Lewis, 2018). TLMs form an integral part of classroom lessons. They perform several functions in the classroom. They are resource for teachers, students and examiners. The process of teaching and learning in the classroom depends on different types of TLMs. There are visual, audio, and audio-visual teaching materials. Teaching-learning materials are key factor in creating effective teaching and learning environments. Victor (2017) contended that teaching-learning materials are used in teaching and learning process to support various activities among students. These aids directly address to the five senses so the chances of forgetting become less and process of learning becomes more effective. These are the educational materials that are used within the classroom setting. Its importance is demonstrated in the popular adage that when we hear alone in the class, we forget much of what we heard, while when we hear and see we forget much less and recognize better, but whenever we hear, see and do, the rate of forgetting is significantly lowered.

Creating a learning environment where constructing and sharing knowledge, skills and understanding is valued and a goal that every teacher must strive to reach. Ekpo (2006) advised that the modern day teachers should not attempt teaching without a careful selection and use of teaching-learning materials. This implies that the use of appropriate teaching-learning materials is a ticket to success in the classroom and could extend the scope and power of instruction. Teaching-learning materials are essential aid to effective instruction but are not commonly found in contemporary schools in Nigeria due to high cost of production, rushed coverage of syllabus; and teachers reluctant to spend their time, effort and money on improvisation. Improvised teaching materials give teachers and students the pride of using their talents, allows a teacher to reproduce his potentials, in concrete form and increase teacher's knowledge of the subject matter. It could also help to bridge the gap between the teacher and students in terms of understanding different concepts in the lesson, thereby making learning more immediate and more relevant. Teachers must venture on their own creative thinking in building a life-long mastery with technology as the world is changing rapidly. Teachers must develop their potential abilities to defeat the accompanying challenges. The need for new techniques in teaching and learning will continue to grow stronger and faster. Hence, this study investigated the need to encourage teachers to look for an ideal and creative ways to beat technological limitations by improvising teaching-learning materials for effective teaching and learning that leads to better academic performance of students especially in Basic science and other subjects.

The study of Basic science (Integrated science) is a new way of studying science, according to Omiko (2012) and Anaekwe et, al (2010). Basic science principally refers to the scientific disciplines of Physics, Chemistry, Biology and Mathematics as well as to their sub-disciplines. The principal idea behind something being labelled as basic science is that study of basic science leads to a better understanding of natural phenomena. Basic Science students learn when their thoughts and expectations interact with materials, ideas, and people; such interactions gives learner meaningful developmental learning experience. Basic Science is unique given its orientation. It emphasizes the cognitive, affective and psychomotor domains. It fosters the development of spontaneity, self-reliance, flexibility of mind, critical thinking, tolerance, initiative, ability to solve problems, creativity and a sense of purpose and direction in life. Basic Science was introduced into this country, Nigeria a few decades ago. It started with few schools, and now all the junior secondary schools in the country have adopted it.

The National Policy on Education (NPE, 2004) specified the aims of secondary education to equip students to live effectively in the modern age of science and technology and inspire students with a desire for national achievement and self-reliance. Moreover, secondary education aims at preparing individuals for useful

living within the society and for higher education. Education sector in Nigeria has series of challenges. Education is one of the most important single instruments of change in any society, and the main avenue of delivering such education is the school. The school has been recognized as an enduring human institution. Changes in schools, in most cases have been on physical structure rather than of the condition of teachers and their students. One important area of the challenges is lack of availability and utilization of teaching aids in the post-primary school level to cope up with the modern technological challenges. The success of any system of education depends to a large extent on the availability and quality of teaching-learning materials properly utilized by the teacher. The availability and utilization of teaching materials at lower levels will help to enhance the quality of inputs into the higher level and consequently impact positively on the outputs of the higher levels. Thus, the major challenge for the educational system in contemporary Nigeria is the lack of qualified teachers to teach at various levels of education (Hamza, 2010), this also has adverse effects on the teachers' improvisation of teaching-learning materials for teaching at all levels, which also affect the quality delivery of educational institutions, teachers' training and production. The scarcity of teaching-learning materials in junior secondary schools is a problem to students learning, they do not learn at the same space (UNESCO, 2004). The poor quality or lack of teaching-learning materials for different levels of learning increases the teacher's difficulties in teaching (UNESCO, 2004). The major causes of inadequate use of teaching-learning materials in junior secondary schools according to Awosiyan (2005) can be summarized as:

- High enrollment rates, inadequate facilities and materials as well as irrelevant curriculum.
- Teachers not properly trained in terms of material development and utilization.
- Poor access to materials to most junior secondary schools teachers in both urban and rural areas.
- Poor environment to store and maintained such material for future uses.

Teachers are regarded as implementers of curriculum and they also determine the quality in the school. The National Policy on Education equally recognizes the significance of teachers in the educational system (Ogunlade, 2005). The primary concern of all teachers is to teach. Teachers owe students their best efforts in providing meaningful learning through the use of different types of teaching-learning materials in teaching. The lack of available teaching-learning materials in secondary schools in Nigeria is a serious problem despite the fact that the rapid change in technology and the new techniques of instruction have made it necessary for schools to be adequately equipped with different types of materials, (Abdullahi, 2010). The production of teaching-learning materials in support of curriculum depends largely on government policy. The government promises of the availability of the materials are still very inadequate. The availability of teaching-learning material has long been recognized as an important factor in educational attainment. Educational performance is determined by the teachers' knowledge of the subject matter and pedagogical skills, the availability of learning materials as well as time spent by students in learning (UNESCO, 2000).

Improvisation is a teacher-oriented activity used to effectively carry out the teaching and learning process successfully. Improvisation according to Osuagwu (2010) is the provision of materials locally made by teachers, students or an educational agency to represent the original material or equipment. Improvisation in teaching refers to the act of using alternative materials and resources to facilitate instruction whenever there is lack or shortage of some specific first hand teaching aids (Enaiyeju, 2003). Generally, improvisation could be regarded as the act of using alternative materials or equipment obtainable from the local environment or constructed by the teacher or with the help of local personnel to facilitate instruction. In this content, the term local materials refers to those materials easily obtainable from the immediate environment irrespective of where they are produced. The skill of producing local instructional materials is applicable to many different abilities across all academic and non-academic discipline. Teaching and learning may not easily be achieved through the mere use of verbal words. As such producing locally made instructional materials becomes very necessary. The focus of teaching is on the natural reciprocating of comprehension and production in communication; on the functional and collaborative practice of language in flexible learning environment; and individual possession of skills. Students find it easy and joyful learning with teaching materials as such, improvisation reveals that there are possibilities of alternatives to teaching and learning aids. It should therefore meet specific teaching and learning situation.

Improvisations of teaching-learning materials in Basic Science by teacher that are innovative in concepts encourage students and teachers to be more creative, innovative and original. It also develops skills in the cognitive, affective and psychomotor domains. Ordinary words or verbalization has been found to be inadequate for effective teaching. Instructional materials serve as a channel through which message, information, ideas, and knowledge are disseminated more easily. The interactive nature of some of the teaching-learning materials makes the learner part of the learning process. Therefore, the teacher education programme must integrate material development whereby teachers learn how to design and construct various materials and equipment which could be used for teaching-and learning process. Ineffective methods of teaching coupled with

absence of teaching-learning materials were some of the factors responsible for students' inability to keep to the desired behavioural changes in the teaching and learning process (Jibril, 2006).

Traditionally, in the schools system today, teaching-learning materials might not be available or the skills of using them is missing among the teachers, in such cases, looking for an alternative might be the best way to get them to solve the additional problems in the schools'. The poor quality and uneven development and utilization of teaching aids for different levels of learning increase the teachers' difficulties in teaching (Baikie, 2002). Despite the effort made so far to achieve these objectives by the government, there is the issue of falling standards of education which manifested in students poor performance in public examinations. The lack of adequately trained and qualified teachers from primary school system to secondary school level have resulted in the learners being ill-educated and ill-prepared for junior secondary schools, (Baikie, 2002). This has affected every sector of Nigerian education system. The increasing need for teaching-learning materials in Nigerian junior secondary schools is in response to the challenges posed by the numerous problems associated with increases in student's enrolment, shortage of qualified teachers and materials in most of the schools. The objectives of this study is to determine the effect of students improvised teaching-learning materials and conventional materials on students' academic performance in Basic Science. The study objective was also to determine the influence of gender on students' mean academic performance scores in Basic Science when taught using students improvised teaching-learning materials in junior secondary schools in Enugu State.

Research Questions

The following research questions were formulated in order to obtain answer to the problems under investigation:

1. What is the mean performance scores of students taught Basic Science using students improvised teaching-learning materials and those taught without improvised teaching materials?
2. What is the influence of gender on students' mean performance in Basic Science when taught using improvised teaching-learning materials?

Hypotheses

The following null hypotheses were formulated for this study:

Ho₁: There is no significant difference in the mean academic performance of Basic Science students taught using improvised teaching-learning materials and those taught without improvised teaching materials.

Ho₂: There is no significant difference between the mean academic performance of female and male Basic Science students taught using improvised teaching-learning materials and those taught without improvised teaching materials.

II. Methodology

This study employed quasi-experimental design using the pre-test post-test, non-equivalent control group design. This implies that, intact classes (non-randomized groups) participated in the study. Quasi-experimental research design permits the use of intact classes according to Sambo (2005). This design was adopted because it was not possible for the researcher to randomly sample the subject and assign them to groups without disrupting the academic programme and the time table of the secondary schools involved in the study.

The design is illustrated as follows:

E **O₁ → X₁ → O₂**
C **O₁ → X₂ → O₂**

Where

E = Experimental group

C = Control group

X₁ = The treatment (Improvised Teaching Material)

X₂ = Teaching without teaching materials (no treatment)

O₁ = Pre-Test

O₂ = Post-Test

The population for this study consists of all the Basic Science students in JSS II in Enugu State. The total population is thirty three thousand, five hundred and forty eight (33,548) JSS II Basic Science students, comprising of fourteen thousand, eight hundred and twenty one (14,821) male and eighteen thousand and seven hundred and twenty seven (18,727) female students (Enugu State school census report, 2009/2010). Purposive sampling technique was used to sample a total of one hundred and forty (140) JSS II students for the study. Four public secondary schools were sampled out purposively for the study. Two each were purposively assigned to experimental and control group respectively. The 73 students in the experimental group were taught with improvised teaching-learning materials while 67 students in the control group were taught without improvised

teaching-learning materials. Students into both the experimental and control groups was selected from co-existing classes, that is, classes which are crossed with gender, for uniformity in the subjects and also to allow representation across gender among the four groups.

Data for the study was collected using a researcher made instrument (Improvised Basic Science Performance Test- IBSPT), the IBSPT consists of 30 objective test items designed to measure the effects of the instruction that was given during the experiment with the use of improvised teaching-learning. After a critical examination of the curriculum, the researchers selected the topics (Living things, Physical and Chemical changes, The Human body, Information and communication technology (ICT) from the JSSII Basic Science contents for the term. Furthermore, to provide comprehensive information of the contents, the researchers further broke down the selected contents into units and into teaching subtopics with achievable objectives. This is hoped to help the researchers at the item writing stage of the test. The test items were constructed and were tested by the researchers in order to ensure the inclusion of all the contents of the lessons covered in the treatment. The IBSPT instrument was employed to measure the students' performance.

In order to ensure the validity of the IBSPT instrument, two experts in Basic Science and Measurement and Evaluation from Enugu State University of Science and Technology (ESUT) carried out both the face and content validity of the instrument. The experts scrutinized and made necessary corrections or modifications and suggestions as to its construct and content before it was taken for pilot testing. In order to ascertain the reliability of the research instrument, pilot study was carried out with the use of two intact classes in G.T.C.Abakaliki. The main purpose of pilot study according to Kerlinger, Fred and Howard (2000) is to confirm the suitability of the instrument for its adequacy and for the effectiveness of the instrument. To determine the reliability coefficient (r) level of the Improvised Basic Science Performance Test (IBSPT) used for the study, data collected was subjected to statistical analysis. The reliability co-efficient was determined using Pearson Product Moment Correlation Coefficients (PPMCC) which yielded the reliability coefficient value of 0.89. Hence, this result show that the instrument is reliable because the closer the result to one (1) the more reliable the instrument becomes.

Data for the study was collected through the following procedure:

- i. Pre-test: The researcher administered the pre-test to the experimental and control groups in their respective schools. In the pre-test, the Improvised Basic Science Performance Test- IBSPT was administered on the groups. Objective question sheets were provided for the students to fill in the correct answers for the IBSPT. The researcher marked the sheets of the IBSPT to obtain the students' scores before the treatment. The exercise provided baseline data on students' performance in Basic Science.
- ii. Treatment: Classroom teaching lasted for the period of 8 weeks using 8 lesson periods for all the classes involved. This was done by the regular Basic Science teachers for the classes whom were specially trained by the researchers. The topics for the instruction were extracted from the syllabus for the JSSII at the time of the study. The two groups was given the same content treatment but the experimental groups was taught with the use of improvised teaching-learning materials and the control group was taught without the use of improvised teaching-learning materials.
- iii. Post-test: Post-test was administered after treatment. During the post-test, the researcher administered the IBSPT instrument to both the experimental and control groups in their respective schools. Objective question sheets were provided for students to fill in the correct answers for the IBSPT. The researcher marked the sheets of the IBSPT to obtain the students' scores after the treatment. This was done in the eight weeks of the experiment.

Data collected was presented in a tabular form and responses were calculated in percentages followed by detailed interpretation. Also, mean and standard deviation was used to analyze the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

III. Results

Table 1: Frequency and percentage of respondents based on Groups

Groups	Frequency	Percentage
Experimental group	73	47.86
Control group	67	52.14
Total	140	100

The table 1 above shows the frequency and percentage of the respondents based on their group. Based on this table, 73 (47.86%) of the respondents are experimental group while the control group is made up of 67 (52.14%). This means that both experimental group and control group were properly represented in the study.

Table 2: Frequency and percentage of respondents based on Gender

Gender	Frequency	Percentage
Male	59	42.14
Female	81	57.86
Total	140	100

The table 2above shows the frequency and percentage of the respondents based on their gender. The result of the table above revealed that, 81 (57.86%). 59 (42.14%) are male while 81 (57.86%)are female. This shows that both male and female students were well represented in this study.

Research Question 1

What is the mean performance scores of students taught Basic Science using students improvised teaching-learning materials and those taught without improvised teaching materials?

Table 3:Mean and Standard Deviation on the effect of student’s improvised teaching-learning materials on Basic Science students’ academic mean performance.

Group	N	<i>Pre-Test</i>		<i>Post-Test</i>		<i>Gains</i>	
		\bar{X}	SD	\bar{X}	SD	Mean	SD
Experimental	73	8.01	3.9	24.80	21.80	16.81	18.7
Control	67	10.60	4.4	18.51	7.50	7.50	3.10

The result presented in Table 3 above shows that students taught with improvised teaching materials (experimental group) had a pre-test mean of 8.01 with standard deviation of 3.9 and a post-test mean of 24.80 with a standard deviation of 21.80. This makes a pre-test, post-test mean and standard deviation gains of experimental group to be 16.81 and 18.7 respectively. The students taught without improvised teaching materials (control group) had a pre-test mean of 10.60 with standard deviation of 4.4 and a post-test mean of 18.51 with a standard deviation of 7.50. The difference between the pre-test and post-test mean and standard deviation for the students taught with improvised teaching materials was 7.50 and 3.41 respectively. With this result, the students in the experimental group performed better than the students in the control group.

Research Question 2:

What is the influence of gender on students’ mean performance in Basic Science when taught using improvised teaching-learning materials?

Table 4: Mean and Standard Deviation on the influence of gender on students’ academic mean performance in Basic Science when taught using improvised teaching-learning materials

Group	N	<i>Pre-Test</i>		<i>Post-Test</i>		<i>Gains</i>	
		\bar{X}	SD	\bar{X}	SD	Mean	SD
Male	59	8.20	3.92	20.04	7.29	11.84	3.37
Female	81	10.02	4.40	21.14	6.90	11.12	2.50

Table 4 above shows the performance of male and femaleBasic Science students taught using improvised teaching-learning materials in junior secondary schools in Enugu State. The data presented in Table 3also, revealed that the male students in the experimental group had a mean score of 8.20 and a standard deviation of 3.92 in the pre-test and a mean score of 20.04 and a standard deviation of 7.29 in the post-test making a pre-test, post-testmean and standard deviation gains of male students in the experimental group to be 11.84 and 3.37 respectively. The female students in the experimental group had a mean score of 10.02 and a standard deviation of 4.40 in the pre-test and a mean score of 21.14 and a standard deviation of 6.90 in the post-test making a pre-test, post-test mean and standard deviation gains of male students in the experimental group to be 11.12 and 2.50 respectively. This implies that female studentstaught Basic Science using improvised teaching-learning materials slightly performed better than their male counterparts.

Hypotheses

The following null hypotheses were formulated for this study:

Ho1:There is no significant difference in the mean academic performance of Basic Science students taught using improvised teaching-learning materials and those taught without improvised teaching materials.

Table 5
Analyses of Covariance of Students' academic performancescores of students taught Basic Science using improvised teaching-learning and those taught without improvised teaching materials.

SOURCES OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG
Covariates model	1550.852	8	193.856	5.987	.000
Intercept	4397.342	1	4397.342	135.811	.000
Pretest	468.147	1	468.147	14.459	.000
Methods	186.706	1	186.706	5.766	.018
Gender	69.301	1	69.301	2.140	.146
Error	4241.570	131	32.378		
Total	62153.00	140			
Corrected Total	5792.421	139			

The result in table 5 showed that there is a significant main effect for mode of teaching-learning on students' academic performance in Basic Science $f(1, 139) = 5.766, p < .018$. The null hypothesis therefore, was rejected indicating that there is significant difference in the mean academic performance score of students taught using improvised teaching-learning materials and those taught without improvised teaching materials.

H_{02} : There is no significant difference between the mean academic performance of female and male Basic Science students taught using improvised teaching-learning materials and those taught without improvised teaching materials.

Table 5 above revealed non-significant main effect of gender on students' academic performance in Basic Science $f(1, 139) = 2.140, p > .146$. The null hypothesis was therefore, not rejected indicating that there is no significant difference in the mean achievement scores of male and female students in Basic Science.

IV. Discussions

Based on the answers to research questions and result of the hypotheses, the major finding was that Basic Science students taught using improvised teaching-learning materials performed better than students taught without improvised teaching-learning materials. Consequently, those students exposed to treatment performed better in Basic Science than those that were taught without using improvised teaching-learning material. The students' improvised instructional materials were more effective because these materials are locally made and during captured students interest during teaching process which lead to maximizing comprehension of the subject matter. Even though students' improvised teaching-learning materials may not be aesthetically pleasing to the eyes than the standard teaching material, they were very effective in stimulating students' knowledge comprehension. This finding is in line with the observations of Mbajorgu (2003), Onasanya and Omosewo (2010), Adeyemi and Olaleye (2010) who found out that students' improvised instructional material affects students' achievement that conventional materials.

Influences of gender on students' mean academic performance scores in Basic Science when taught using improvised teaching-learning material. The results showed that male students did not perform better than their female counterparts in Basic Science did. Hence, female students significantly perform better than male students. The finding did not support Onasanya and Omosewo (2010) who found out that improvised instructional materials in the comparison of the male mean scores of experimental and control groups were the same entry level with regard to academic ability. In addition to this, the studies by Ogunleye (2002) show that science achievement depends on gender. Nevertheless, Nwosu (2001) found that students' acquisition of science process skills are not gender specific. However, Madu (2004), and Agomuoh (2010) found that gender influences students' conceptual shift in favour of the male.

V. Recommendations

The following recommendations were made based on the findings of the study;

1. Teacher should try to improvise teaching-learning materials and encourage students to do the same. This will give students enough understanding of Basic Science concepts as the child's local environment will be used to source for the materials.
2. Teachers should be adequately motivated to improvise and use instructional materials. This can be done by improving condition of service for teachers and better remuneration.

3. Teachers should be encouraged on the effective use of appropriate teaching-learning material as this will aid students' performance.
4. Teachers should be trained and re-trained through workshops, seminars and conferences for the purpose of skill acquisition necessary for the production and effective use of teaching-learning materials by teachers.

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Abigail C. Obodo (Ph.D), et. al. "Effects of Improvised Teaching-Learning Materials on the Academic Performance of Junior Secondary School Students in Basic Science in Enugu State, Nigeria." *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 10(4), (2020): pp. 23-30.