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Comparative Effect of Improvised and Real Materials on Chemistry Students' Academic Performance in Senior Schools

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ABSTRACT

Instructional materials are used in teaching in order to minimizes rote learning and enhance students' practical experiences and creativity skills. Despite the importance it is worrisome that senior schools do not have adequate instructional materials with the huge sum of money spent by Government. This study investigates the effect of real and improvised instructional materials on chemistry students' academic performance in Ekiti State, Nigeria. Four purposively selected senior secondary schools in Ijero local Government area consisting of 180 senior secondary class II chemistry students of four intact classes made the sample. Two schools were assigned to experimental group which received treatment of involvement of teaching using improvised materials and the other two schools were assigned to the control group which were taught using real materials. Twenty-five (25) item chemistry test (CT) validated by science education experts and having reliability of 0.82 using Kudar Richadson 20 was used as the instrument. Three hypotheses were formulated and tested at 0.05 level of significance. Mean, standard deviation and t-test were used to answer the research hypotheses. The findings revealed no significant difference in the mean academic performance of the two groups before treatment but was significant after the treatment. The experimental group also performed significantly better than the control group in creativity skills. It is recommended that teachers should improvised materials in order to improve students' manipulative skills. While text book writers and curriculum developers should include activities in the textbooks and curriculum that will enhance creativity that are capable of leading students to self-reliance.

Keyword: Academic performance, Chemistry students, Real, Improvised, Materials and Comparative.

Aims Research Journal Reference Format:
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1. INTRODUCTION

Lack of instructional materials, non-availability of equipped laboratories among others in the teaching of science in schools is an established issue (Njoku, 2011). This is in line with Odigie (2011) and Dike (2013) who agreed that educational instructional materials and equipped laboratories are lacking in schools. Ibe (2014) is of the opinion that the use of instructional materials to facilitate teaching and learning should be a welcome development.

This is in conformity with Dike (2013) who asserts that science teachers should work beyond stereotyped science teaching-learning process and utilize the available materials in the environment to facilitate science teaching-learning process. Therefore for effective teaching of science subjects like chemistry, the use of instructional materials to enrich instruction is very vital. Ray (2003) defined science as all human activities that lead to learning about their world. Science is doing, finding out through organized activity, making careful observation, recording observations accurately and drawing deductions (conclusion) which are independent of the observers. Deductions from science activities are usually regarded as tentative until other scientist have verified and confirmed such deductions. Because science is dynamic, hence it is referred to as basic science at the primary/junior secondary school level today. Science can also be defined as a conscious and systematic search for an organized knowledge about events (Abdulahi 1982).

The system of education in Nigeria lays the foundation for the development of knowledge, skills and attitudes that will make the learner capable of understanding and manipulating the environment at the junior secondary school level. The development of skills that will later become useful in a variety of occupations is developed in the teaching of science. Science subjects also affords students the opportunity to learn about themselves.- the physical structure of the body, the various systems and their functions and their relationship with other components of the earth. The teaching of Basic science is sometimes regarded as the "gateway to the separate science subjects". It is the foundation of science learning in the school. Thus, at the junior secondary school (JSS), Basic Science is one of the most effective disciplines for the development of these important traits which must be taught and learnt in a way that maximizes the chances of acquisition of the expected knowledge, skills and attitudes from which students develop interest in the various branches of science subjects such as chemistry.

Chemistry is one of the core subjects of science. As a building block for a range of science disciplines, chemistry has the potential to link other sciences together and to foster greater scientific literacy (Tera, 2018). Chemistry is the basic gateway and the key to modern technology, medicine, engineering and other sciences (Okeke & Nwandinigwe, 2015). The development of meaningful chemistry curriculum is directed towards helping students develop interest in the subject.

The objectives of chemistry curriculum is expected to meet the following:

a. enable students acquire basic theoretical and practical knowledge and skills
b. allow learners to develop interest in science, technology and mathematics
c. help learners acquire basic Science Mathematics Technology knowledge and skills
d. ensure the development of reasonable level of competence in ICT applications that will engender entrepreneurial skills in students
e. provide learners the means to apply skills to meet societal needs of creating employment and wealth
f. create a position for learners to take advantage of the numerous career opportunities offered by chemistry and
g. encourage the learners to adequately get prepared for further studies in chemistry while meeting the individual needs of the learners and the needs of the society at large.

Chemistry is taught for the purpose of providing the required skills necessary for work, acquisition of scientific literacy in the citizenry and preparation of individuals with special abilities for further education. Surprisingly, students of chemistry perform poorly in the subject. This poor performance of students according to Alake (2013) may be traced to perceived content difficulty by teachers and students, abstract nature of the subject among others which has resulted in low enrolment in the subject.

Chemistry is a hands on activity based subject which should be taught with instructional materials. Availability of the real materials for the teaching of chemistry in senior schools are low due to high exchange rate resulting in inability of government and the schools to purchase such materials. This is due to the hyperinflation in the country as opined by Ibe, Obikezie & Chikendu (2021). For these reasons and even more, chemistry teachers have been called upon to be creative in improvising these instructional materials. Ibe, (2014) stated that the use of materials within the environment is an alternative to the real materials.

Researchers have argued that the best way to teach science subjects in schools is by the use of instructional materials. Ibe (2014) is of the opinion that the use of instructional materials would facilitate teaching and learning should be a welcome in the classroom. This gives the learner the opportunity to identity the various creativity skills, critical thinking and innovative skills. The purpose of this study is to determine the comparative effectiveness of improvised material (IMP) in the teaching of chemistry in senior schools in Ijero local Government area of Ekiti State, Nigeria. Specifically, the impact of creative skill on the academic performance of chemistry students was also investigated.

Research Questions

The study focused on the following research questions:
1. Will the pre-test mean scores of chemistry students taught with improvised materials be significantly better than their counterparts taught with real materials?
2. Will the post-test mean scores of chemistry students taught with improvised materials be significantly better than their counterparts taught with real materials?
3. Will the creative skills of chemistry students taught with improvised materials be significantly better than their counterparts taught with real materials?

Research Hypotheses

The following hypotheses were generated and tested at 0.05 level of significant in this study.

HO_1. There is no significant difference in the academic performance mean scores of students in experimental and control groups before treatment.

HO_2. There is no significant difference in the academic performance mean scores of students in experimental and control groups after treatment.

HO_3. There is no significant difference in the creative skill mean scores of students in experimental and control groups after treatment.

2. RESEARCH METHOD

The study adopted pre-test, post-test control group quasi-experimental design. This design was used as a result of its distinct advantage and ability to both internal and external validities of the comparative study, and the design allows for the use of intact classroom, as it does not involve disorganization of the school setting. The population consist of twenty-two government owned (public) senior school class II chemistry students in Ijero local Government area in Ekiti State, Nigeria. Purposive and stratified random sampling techniques was used to select a total of 180 SSII chemistry students of four intact classes from four public senior schools in Ijero local government area of Ekiti State, Nigeria. Ninety SS II chemistry students were grouped into the experimental (IMPM) and the other ninety SS II chemistry students belong to the control group (RELM).

The instrument adopted for the study consist of twenty-five (25) item chemistry test (CT) drawn from topics in bonding, solubility and saponification with four options (A-D). The reliability of the instrument was determined through Kudar Richadson 20 method with the reliability coefficient of 0.82, which was found to be suitable enough for the research study. The pre-test was administered to the two groups for two weeks, treatment using improvised materials for the experimental group and real materials for the control group for four weeks and the post-test two weeks. Three null hypotheses were tested at 0.05 level of significant. Data collected were analysed using mean, standard deviation and t-test.

3. RESULT

HO_1. There is no significant difference in the academic performance mean scores of students in experimental and control groups before treatment.

Table1: t-test analysis of Pre-test performance mean scores of chemistry students in IMPM and RELM
The result show that no significant difference exist between the experimental and control groups. The hypothesis 1 was therefore rejected. This implies that the two groups of chemistry students were on the same level of academic performance in the concepts tested.

Group	N	X	S D	df	t_cal	p-value	Remarks
Improvised Material	90	21.74	10.23	178	1.39	1.98	NS
Real Material	90	21.15	9.22				

0.05 level of significance

HO_2. There is no significant difference in the academic performance mean scores of students in experimental and control groups after treatment.

Table 2: t-test analysis of Post-test performance mean scores of chemistry students in IMPM and RELM.

Group	N	X	S D	df	t_cal	p-value	Remarks
Improvised Material	90	36.44	3.28	178	3.23	2.17	Sig.
Real Material	90	28.34	2.94				

0.05 level of significance

At 0.05 level of significance, the table 2 revealed that the calculated t-value was 3.23 and 2.17 for improvised (Experimental group) and real materials (Control group) respectively. The calculated t-value is more than the t-tab, hence the null hypotheses 2 is rejected. This shows that there is significant difference in the mean scores of the students taught using improvised materials and the control group.

HO_3. There is no significant difference in the creative skill mean scores of students in experimental and control groups after treatment.

Table 3: Post-test creativity skills of IMPM and RELM

Strategy	N	X	SD	df	t_cal	p-value	Remarks
Improvised Material	90	18.54	3.98	178	0.51	0.477	Sig.
Real Material	90	16.80	3.02				

0.05 level of significance

The table 3 revealed that the use of improvised material has a greater impact on the students' creative skills in experimental group than those in control group who used real materials. At 0.05 level of significance, the calculated t-value is 0.51 while the t-tab value is 0.477. This implies that the null hypothesis 3 is rejected meaning that there was a significant difference between the mean scores of students taught using improvised material in experimental group and their counterparts in the control group taught using real material.

5. DISCUSSION

The study investigated the comparative effectiveness of improvised and real materials in the teaching of chemistry senior schools. As regards the calculated t-value in hypotheses one, it is evident that the students in both experimental and controls groups were on the same level of academic performance in the pre-test that is before the application of the treatment. So the hypothesis 1 was upheld because no significant difference exist between the two groups. Evidence from the table 2 shows that chemistry students taught with improvised material (Experimental group) performed significantly better than their counterparts who were taught using the real materials (Control group) align with the study of Landu, (2010). Reasons may be due to involvement of the students in the construction of the instructional materials that arouse the students' interest that made the concepts more meaningful to learn.

As a result, the hypotheses 2 was rejected meaning significant difference exist between the performance of the experiment group and the control group. This may be due to other factors; like critical thinking, creativity skills, easy accessibility to material and aroused interest in the chemistry.
The result of analysis of hypothesis 3 in relation to its calculated t-value showed that there was a significant difference in the creative skills using improvised materials than their counterparts taught using real objects. This implies that improvisation enhanced students' creativity skills and arouse their interest in the subject. This align with the findings of Ibe, et. al. (2021).

6. CONCLUSION

The study compared the impact of improvised and real materials on chemistry students' performance. It was evident that students learned and understood the concepts better using improvised materials than real material and at the same time pre-test showed no significant difference exist between the experimental group and the control group. While significant difference exist between the experimental group and the control group. This can be link to the arouse interest of the students by the use of improvised material which made the learning of the concepts more realistic and enhanced retention of the students. Hence, it was concluded that the use of improvised materials enhanced better students' performance in senior school chemistry and creativity skills.

7. RECOMMENDATION

In relation to the results obtained in analysing the data for this paper work, chemistry teachers should be encouraged by government to use improvised materials in the teaching of chemistry concepts because the materials are cheap and readily available in the environment. Curriculum developers and text book writers should incorporate improvisation activities in the curriculum and text books in order to for teachers and students to see the importance of improvisation and consequently resulting in critical thinking, creativity skills that would result in self-reliance.

REFERENCE

Abdullahi, A. (1982). Science Teaching in Nigeria Atoto Press Limited, P.M.B 1534 Ilorin.

Alake, E. M. (2013). Correlates of teachers and students' reason for content difficulties in senior secondary school chemistry syllabus. *International Journal of Science and Research (IJSR)* 2 (6), 396-399.

Bamgbose, A. (1990). Education in Mother Tongue". A new letter of the Federal Ministry of Education. 1 – 4.

Dike, R.C. (2013). Impact of substituting standard materials with local materials on chemistry achievement and interest of senior secondary school students in Imo state Nigeria. *An Unpublished Thesis submitted to the School of Postgraduate Studies, Nnamdi Azikiwe University, Awka*

Landu, I.T. (2010). Enriching science education; the place of improvisation in the classroom. In O.O. Busari (Ed), 41st*Annual Conference Proceedings of Science Teachers Association of Nigerian*. 51-53.

Ibe, E (2014). Effect of guided inquiry and demonstration of science process skills acquisition among Chemistry secondary school students. *Unpublished M.Ed. Thesis. University of Nigeria Nsukka*

Ibe, F. N, Obikezie, M. C & Chikendu, R. E (2021). Effect of improvised instructional materials on chemistry students' academic retention in secondary school. *International Journal of Research in Education and Sustainable Development.* 1 (5) 19 - 31 www.ijaar.org

Njoku Z.C. (2011). Engendering Learning Equity in Science and Technology Classrooms for Sustainable Development.*54th Annual Conference of STAN, 52, 372-401*.

Odigie (2011). Women in Biology Education; their improvisation ability in nonconductive working environment in Adeniran Ogunsanya College of Education, Lagos. *Annual Conference of Science Teachers Association of Nigeria, 46, 280-288* HEBN Plc

Okeke, P.N. &Nwadinigwe, C.A. (2015). Physical sciences: scope, career opportunities and contributions to national development. *Enugu: Prince Jerryflex Global Resources.*

Olarewaju, A.O. and Jimoh, M.A. (1995). Effects of media instruction on students' performance in Genetics. Journal of Science Teachers Association of Nigeria (STAN) 30, 12, 47-52.

Rey, J.W (2003). Methods toward a science of behaviour and experience wadsworth Inc U.S.A.

Tera, G.M. (2018). The importance of physics classes for a career in STEM. The Hechinger Report, Retrieved*, https://givingcompass.org/article/the-importance-of-physicsclasses-for-a-career-in-stem/*

Wellington J. & Osborne J. (2001): Language and Literacy in Science Education by Open University press, Buckingham.