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Effect of Improvised Teaching Aids For Teaching Separation Techniques And Student's Achievement In Chemistry In Misau Local Government Area, Bauchi State, Nigeria

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Abstract: *The study examined the effect of improvised teaching aids for teaching separation techniques and student's achievement in Chemistry in Misau local government Area, Bauchi State, Nigeria. The population for the study comprised of all Senior Secondary School I students of Misau local government area. However, due to the ample number of the population, a sample of 173 was drawn to represent the entire research's population. The design of the study was quasi-experimental with specifically the pre-test and post-test. Two research questions and two hypotheses guided the study.* Chemistry Achievement Test (*CAT) was used to collect data. Mean and standard deviation were used to answer the research questions while the t-test was used to test the hypotheses a 0.05 level of significance. The results shows that locally available materials increased students' achievement in Chemistry more than the conventional lecture method. There was no significant difference in the achievement of male and female students. Based on the results, it was recommended among others that the government and stakeholders in education should help in training and re-training of Chemistry teachers on the use of locally available materials in teaching. This can be achieved through organizing conferences, seminars and workshops for both the old and newly recruited science teachers*.

Keywords: *improvised, available, materials, education, students' achievement, Chemistry, and gender.*

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I. Introduction

Science was regarded as the bedrock on which modern day technological breakthrough was built. Nowadays, countries world over, especially the developing ones like Nigeria, are striving hard to develop technologically and scientifically, since the world was turning scientific and all proper functioning of lives depend greatly on science. According to Ogunleye (2002), science was a dynamic human activity concerned with understanding the workings of our world. This understanding helps man to know more about the universe. Without the applications of science, it would have been difficult for a man to explore the other planets of the universe. Science comprises the basic disciplines such a Physics, Chemistry, Mathematics and Biology.

Franzer, Okebukola and Jegede (1992) stressed that a professionally qualified science teacher no matter how well trained would be unable to put his ideas into practice if the school setting lacks the equipment and materials necessary for him or her to translate his competence into reality. Bassey (2002) opined that Science was resource intensive, and in a period of economic recession, it may be very difficult to procure adequate equipments for the teaching of Chemistry in schools.

Education has remained a social process in capacity building and maintenance of a society for decades. It was a weapon for acquiring skills, relevant knowledge and habits for surviving in the changing world. National Policy on Education (FRN, 2008) stipulated that Chemistry should be taught in the senior secondary schools from Senior Secondary 1-3(SSI-SS3) classes. A number of factors such as teaching methods, teacher attitude, the influence of parents, gender, age, cognitive style of pupils, career interest, and social implication of Chemistry and achievement among others have been identified as what affect students' attitude towards Chemistry. Adesoji (2008) submitted that Chemistry teaching can only be result-oriented when students are willing and the teachers are favorably disposed, using the appropriate methods and resources in teaching the students. With the current increase in scientific knowledge all over the world, much demand was placed and the emphasis was laid on the teacher and learning of science.

Instructional materials used in teaching science help to enrich learning; while the lack of these materials in classrooms makes teaching and learning less interactive. Most secondary schools lack many of the instructional materials for teaching and learning of Chemistry. The inadequacy of these materials has been a serious concern to science teachers in schools (Aina, 2013). In developing countries, there was a high

expectation from teachers mostly by the parents, even though there were scarce and limited resources to achieve educational goals (Lingam and Lingam, 2013). However, some teaching aids can be improvised in place of the standardized ones to bring about similar learning result as the standardized teaching aids. Improvisation of teaching aid is an attempt geared towards finding substitute or alternative to conventional science materials. Due to the present state of our nation's economy, teachers, students, school authorities, and communities should engage in improvising teaching aids. Abdullahi, (2015) stated that scientific materials used in teaching enable the students to become actively involved intellectually, perceptually and physically in the learning process. However, for an improvised teaching aid to be valid, the material should provide the desired results expected, improve the lesson effectiveness and reduce to a minimum the risks associated with the usage of the equipment. Educational materials in teaching according to Ifedayo, (2015) helps to increase learners motivation, recall earlier learning, and activate learner's response give speedy feedback and encourage the appropriate practice. Stephen (2004) suggested that the mastery of Chemistry concepts cannot be fully achieved without the use of learning instructional materials in teaching. The influence of gender on achievement and learning is still a controversial among science researchers. Therefore, more investigation has become necessary. It is important therefore, to determine whether male and female students will benefit equally with the use of improvised teaching aids in the teaching of Chemistry. Hence, the present work seeks the effect of improvised teaching aids of gender in order to make a significant contribution to world concern on gender issues. These views need to be established/confirmed through research, hence the need to determine the impact of improvised teaching aid for teaching separation techniques and influences on student's achievement in Chemistry in Misau Local Government Area of Bauchi state,

Research Questions

The following research questions guide the conduct of the study:

1. What are the mean achievement scores of students taught Chemistry with improvised teaching aids?
2. Is there any differential effect of improvised teaching aids on male and female students' achievement in Chemistry?

Hypotheses

The study was guided by the folioing hypotheses, which were tested at 5% (P<**0.**05**)** level of significance.

HO_1: There is no significant difference between the mean achievement scores of students taught Chemistry with improvised teaching aids and those taught using the conventional methods.

HO_2: There is no significant difference between the mean achievement scores of male and female students taught with improvised teaching aids?

Method

The design of the study was a quasi-experimental research in which intact classes were used for the study. The area of the study was Misau Local Government Area of Bauchi State. The choice of this area was because students in the area performed very poor in Chemistry as reflected in the results of the Senior Secondary School Certificate Examination (SSSCE) of the students in the area for many years. Population of the Study compressed all the Science Students in the four (4) Public Secondary Schools selected out of the Nine (9) secondary schools situated within the Local Government Area, formed the population of the study. The Sample Size for this study consisted of One Hundred and Seventy Three (173) SS I Chemistry Students which formed intact class from the four (4) secondary schools which were randomly selected out of the Nine (9) secondary schools located within the Local Government Area.

The instrument used for data collection was Chemistry Achievement Test (CAT). It was a 30 items essay test that was answered by both experimental and control groups. The test lasted for an hour, and it was conducted under strict examination conditions for both groups. The test blue print was formulated in order to construct the test which was based on the concepts of separation of mixtures taught during the class session. The instrument was validated by three subject experts from Science Education Department, and Chemistry Department in Modibbo Adama University of Technology, Yola, Nigeria carried out both the face and content validity of the instrument. Th**e** reliability of CAT was established by administrating it to a sample of SS 1 students of a school different from the schools used in the study. The result from this trial test was analyzed using standardized Cronbach's Alpha and it gave the reliability coefficient of 0.89.

The lesson plans for both the experimental and the control groups were produced which were based on the concepts taught during the period of the experiment on the separation techniques. The administration of the instrument was as follows:

The regular Chemistry teachers were trained on how to teach both groups using the lesson notes. The regular class teachers did the teaching and conducted the test after the teaching. The test instrument was given to

the students before the experiment and after the experiment. The data collected for the study were analyzed by using means and standard deviations for research questions and t-test statistics for the null hypotheses tested at 0.05 level of` significance. Any hypothesis that is greater than 5% or p = > 0.05 will be rejected and any hypothesis that is less than 5% i.e p = < 0.05% will be retained.

Table 1: Specification for CAT.

Content	Knowledge	Comprehension	Application	Analysis	Synthesis	Activity	**Total**
4	5	3	5	4	5	4	30

The results of the study were presented in tables. The analysis of the data collected from the study was presented in tables according to the research questions and the hypotheses.

Research Question 1: What are the mean achievement scores of students taught Chemistry with improvised teaching aids?

Table 2: Means and Standard Deviation Scores of Students

Group	**Mean (*x*)**	**Standard Deviation (SD)**
Experimental	25.06	4.32
Control	16.21	2.78
Difference in mean	9.85	

The table 2 above shows that the experimental group has a mean of25.06 and standard deviation of 4.32 while the control group has a mean of 16.21and a standard deviation of 2.78. The difference in mean is 9.85.

Research Question 2: Is there any differential effect of improvised teaching aids on male and female students' achievement in Chemistry?

Table 3: Means and Standard Deviation scores of male and female students' taught using improvised teaching aids**.**

Gender	**Mean (x)**	**Standard Deviation (SD)**
Male	19.65	3.24
Female	15.41	4.77
Difference in mean	4.24	

The table 3 above shows that the males have a mean of 19.65 and standard deviation of 3.24, while the female shave a mean of 15.41 and a standard deviation of 4.77. The difference in mean is 4.24.

Hypotheses 1:

HO_1: There is no significant difference between the mean achievement scores of students taught chemistry with improvised teaching aid and those taught using the conventional methods

Table 4: T-table for difference in mean of the experimental and controlled groups

Group	Mean	t-calculation	t-critical	Decision
Experimental	25.60	4.91	3.353	Rejected
Control	16.21			Ho

This t-table shows that t-calculated (t-cal) is 4.91 and that t- critical (t-crit) is 3.353. Since t calculated (t-cal) is greater than t-critical (t-crit), Ho is rejected and so, the researchers conclude that there is a significant difference in the mean achievement scores of the students taught Chemistry with improvised teaching aids and those taught with the use of the conventional method.

Hypothesis 2:

HO_2: There is no significant difference in the mean achievement scores of male and female student's in the Chemistry achievement test.

Table 5: t-table for difference in the mean achievement scores of male and female students taught Chemistry using improvised teaching aids.

Group	Mean (x)	t-cal	t-crit	Decision
Males	19.65	6.02	3.373	Rejected
Female	15.41			

This t-table shows that t-calculated (t-cal) is 6.02 and that t-critical (t-crit) is 3.373. Since t-cal is less than t-crit, Ho is accepted and so, the conclusion is that there is significant difference in the mean achievement scores of male and female student's in the Chemistry achievement test.

II. Discussion of the findings

The results of the tables show that students taught using improvised teaching aids got a higher mean scores than those taught with the conventional method. It then means that students in the experimental group achieved more than those in the control group. This is confirmed by the test of hypothesis which revealed that there is significant difference in the mean achievement scores of students taught using improvised teaching aids and those taught with the conventional method (table 1). This study found that students in the experimental group performed better than students in the control group in their achievement mean scores. The study corroborates the findings of Aina, (2013) and Abdullahi (2015) which found that teaching aids are indispensable to the effective teaching and learning activities and successful instructional delivery in schools. Hence, improvised teaching aids are necessary to enable students acquire better knowledge and skills, This is in agreement with the work of Ifedayo, (2015) and Stephen (2004) which indicated that, improvised teaching aids used in teaching and learning promote better understanding of the concepts.

Table 3 shows that male students had a higher mean score than the female students. The t-test on table 5, point out that there is significant difference in the achievement mean scores of male and female students in the study. This shows that improvised teaching aid is gender insightful. This aggresses with the findings of Chen and Howard (2010) which revealed that males experienced better change in learning and attitudes.

III. Conclusion

The study concluded that the importance of improvised teaching aids in the development of learners' intellectual abilities and attainment of teaching/learning objectives cannot be over-emphasized. The students taught with improvised teaching aids have excellent achievement scores compared with those taught without any material. It was also noted in the study that there is no significant interaction effect of treatment and gender on students' achievement in Chemistry.

IV. Recommendations

Based on the findings, the following recommendations were made:

1. Chemistry teachers should accept the use of improvised instructional materials as a method in teaching Chemistry since it is found to be effective.
2. Students should be encouraged with the help of the teacher to assembly locally made material resources that would be used in the teaching of Chemistry.
3. Government at all tiers should assist in the supply of those materials that could not be locally produced. This will help to reduce the abstract nature of the subject.
4. Regular workshops should be organized for serving teachers to broaden their knowledge on improvisation.

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