EFFECT OF IMPROVISED INSTRUCTIONAL MATERIALS ON PERFORMANCE OF SENIOR SECONDARY SCHOOL PHYSICS STUDENTS ON PROPERTIES OF WAVES IN SULEJA METROPOLIS OF NIGER STATE

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Abstract

The paper was an investigation conducted on the "Effects of Improvised Instructional Materials on Performance of Secondary School Physics Students on Properties of Waves in Suleja Metropolis". The research design employed was the quasi experimental research design. The sample size for the study was 120 students from four secondary schools randomly selected from a population of 20 secondary schools offering physics in Suleja metropolis. One objective, one research question and one null hypothesis guided this research study. A physics achievement test (PAT) drawn from past question papers of West African Examination Council (WAEC), National Examinational Council of Nigeria (NECO) and Unified Tertiary Matriculation Examination (UTME) was used to generate data for the study. The instrument was validated by experts in

science education and a reliability coefficient of 0.79 was obtained after a trial testing of the instrument in a school different from the school where the experiment was conducted. The statistical tools used for the study were mean and standard deviation to answer the research question and t-test to test the hypothesis. The result obtained indicated that the use of improvised instructional materials improved the learning and performance of students in physics, a p-value of 0.03 was obtained. It was, therefore, concluded that improvised instructional materials were effective in enhancing learning of physics. Based on the findings of the study, it was recommended that all sectors, government, philanthropist, schools' administration should embrace and encourage the improvisation of instructional materials and their used in physics.

Keywords: *improvisation, student academic performance, waves.*

Introduction

The federal government of Nigeria is actively involved in providing quality education to the citizens of the country. This of course is in realization that no country can develop in any dimension unless quality education is provided to her citizens. As such, the federal government assumed the responsibility for improving the standard at all levels of education by encouraging the use of quality educational techniques such as the use of improvised material, computer assisted instruction. and the use of cloud based technology and so on. Improvisation in sciences dates back to the genesis of experimental sciences when the earliest pioneering scientists had originated both their ideas and the methods needed to empirically demonstrate and authenticate their validity (Soyibo, 2000). Improvisation in science technology and mathematics education is the preparation and use of materials and equipment obtainable from the local environment for the enhancement of the effectiveness of teaching and learning science and technology and mathematics (Soyibo, 2000). According to Igwe (2003), improvisation is the making or inventing of a piece of science teaching equipment in emergency. It is an essential part of laboratory management for the purpose of maximizing the use of the available resources. Improvisation of instructional materials simply means making or constructing of substitute instructional materials from available materials when the real equipment is not available (NERDC 1987). Ango (2000) went further to

explain that improvisation rightly conceived means substituting something in place of another to serve a unique function, altering the shape, size or the look of a thing to serve a function other than that originally used for or intended for. The literature reviewed during this study shows that improvised materials improve the teaching and learning of science subjects and that necessitated the researcher to improvise and apply it in teaching of physics. Physics is a science subject which is activity oriented and the suggested method for teaching is guided discovery method which is resource based. This suggests that the mastery of physics concept cannot be fully achieved without the use of instructional learning material. The teaching of Physics without learning material will certainly result in poor performance. Professionally qualified science teacher no matter how well trained might not be able to practice effectively, if the school setting lacks the equipment and materials necessary for the teacher to translate his/her competence into reality(Frenzer,1992).

Bassey (2002) opined that science is resource intensive. Furthermore, in a period of economic recession, it will be very difficult to adequately find some of the electronic gadgets and equipment for physics in schools. A situation that is further compounded by the galloping inflation in the country and often un-relatedness of some of the imported sophisticated materials and equipment to the reading and learning of physics. Hence, the need to produce materials locally. Researchers reported that, there were inadequate resources for the teaching of science subjects in secondary schools in Nigeria.

They further stated that where there were still resources at all, they were not usually in good conditions, while the few that were in good conditions were not enough to go round those who needed them(Ogunleye, 2000; Okonkwo, 2000; Mkpanang, 2005 & Obioha, 2006). Hence, there is need for improvisation.

Orasanya (2008), Adebimpe (1997) and Aguisiobo (1998) noted that improvisation demands adventure, creativity, curiosity and perseverance on the part of the teacher. The author added that such skills are only realizable through well planned training programme on improvisation. There have been several studies on instructional materials and academic achievements for instance; Isola (2010) conducted a research on the effects of instructional resources on

students' performance in West Africa School Certificate Examination (WASCE) in Kwara state. The researcher correlated material resources with academic achievement of students in ten subjects. Data were collected from the subject teachers in relation to the resources employed in teaching. The achievements of student in WASCE for the past five years were related to the resources available for teaching each of the subjects. The researcher concluded that material resources have a significant effect on students' achievement in each of the subjects. The gains of using improvised materials in teaching and learning include the following among others:

Effect of Instructional Materials on Learning

- Helps learner to remember for longer time.
- Helps learner to read pictures and models with skill.
- It stimulates interest in learning.
- Sharpens perception and ability of learners.
- Add enjoyment to learning.
- Permit learner to learn through personal experiences.
- Provides multi-sensory avenue for learning.
- Help learners to have critical approach to what they are learning.

Influence of Instructional Materials on Learning Habits

- It influences attitude.
- Can help change behaviour.
- Leads to experimentation and innovation.
- Promotes emotional feelings towards what is being learned.
- Promote better understanding.
- Helps to teach habit.

Effects of Instructional Materials on Teachers

- Help teachers to reach slow learners.
- Teachers can learn from instructional materials.
- Permit teachers to reach more learners.
- Help teachers to become more skillful.
- Help teachers to have better control of the class.
- Help teachers to organize their work/teaching better.

Teaching materials help focus the learner's attention on the lesson and so shift educational activities from the teacher to the learner. These foster understanding and help learners remember what they have learned. It also helps in development of skills and attitude in learners. The poor performance of students in physics at the final Senior Secondary School Certificate Examination (SSCE); research revealed that in 2005, the percentage of students that passed physics was 41.5%, from records obtained; there has been a decline in the level of performance of students in physics, especially in external examinations such as West Africa Examination Council (WAEC), National Examinational Council (NECO) and the Unified Tertiary Matriculation Examination (UTME).

Table 1.0 Percentage Score of WAEC Result in Physics for 2005-2009

Year	Total Entry	Percentage Pass Physics
2005	344,411	41.50
2006	345,225	43.84
2007	427,390	58.05
2008	424,693	48.26
2009	429,174	43.56

Source: WAEC Office Yaba, Lagos.

For instance, as shown in the table above percentage score of WAEC result in physics for 2005 – 2009 are as follows, in the year 2005, the students that enrolled for physics were 344,411 and only 41.5 percent passed physics; in the year 2006, the students that enrolled for physics were 345,225 and only 43.84 percent passed physics; in the year 2007, the students that enrolled for physics were 427,390 and only 58.05 percent passed physics ; in the year 2008 , the students that enrolled for physics were 424,693 and only 48.26 percent passed physics and in the year 2009, the students that enrolled for physics were 429,174 and only 43.56 percent passed physics (Source: WAEC Office Yaba, Lagos). From this source, it is clear that the students' performance in physics dropped seriously from 2007 – 2009, and the overall performance is not encouraging, if not 2007 that had a performance percentage above 50%, all other years reviewed showed a performance percentage below 50.

This is very poor for a nation like Nigeria that is tending towards self-dependent in technological development. More so, research has shown that there are no improvised instructional materials on the area under study. In schools where such materials are available, they are only in chart forms or diagrams, no concrete models. The researcher used concrete improvised instructional materials to bridge the gap between charts and diagrams. Based on the foregoing the researcher sought to investigate the effects of improvised instructional materials on performance of senior secondary school physics students on properties of waves in Suleja metropolis of Niger state.

Methodology

The research design adopted was the quasi experimental research design in which the pretest – post-test control group design was used. The two groups were drawn from a homogenous or the same population. The population for the study comprised of all the twenty senior secondary schools offering physics in Suleja metropolis. The researchers targeted the senior secondary two (SSII) students.

A three stage sampling technique was employed in selecting the sample. A purposive sampling technique was first employed to select the four sampled senior secondary schools because the schools offer physics and are close to the researchers' reach in this session. Secondly, a simple random sampling technique was used to assign the four schools selected to experimental group and control group respectively. Finally, an intact class each of 30 (thirty) students were randomly selected from each of the sampled school, making a total of 120 (one hundred and twenty) students in all.

Physics achievement test (PAT) was developed from past West Africa Examination Council (WAEC), National Examination Council (NECO) and Unified Tertiary Matriculation Examination (UTME), examination question papers which covered the topic treated from (1988 – 2011). The improvised instructional material was designed and constructed by the researchers using metallic materials which are readily available and affordable as well. Although the items used were drawn from internationally and nationally validated question papers. The items were still subjected to expert validation by physics professionals from Federal University of Technology, Minna. The

reliability coefficient of the instrument was 0.79. The researchers used the research assistant to administer the questions to ensure fairness and objectivity and to reduce teacher's variableness.

Physics achievement test (PAT) was used to obtain pretest and post-test data for the research study. The experimental and control groups were pretested before the administration of the treatment. The result was collected and analyzed to determine their entry behaviour. The second test which was post-test was administered to the two groups after the treatment. The mean score and standard deviation was used to answer research question while ANCOVA statistical analysis was used to test the hypothesis using the 13.0 version of Statistical Package for Social Sciences (SPSS). The hypothesis was tested at 0.05 alpha of significant level of probability.

Objective of the Study

The objective of the study is to determine the effect of improvised instructional materials on senior secondary school physics students' performance when taught wave properties in Suleja metropolis.

Research Question

What is the mean performance score of the experimental and the control group when taught wave properties in Suleja metropolis?

Research Hypothesis

H_0 – There is no significant difference in the mean performance scores of students taught physics with improvised instructional materials and those students taught without improvised instructional materials.

Results and Discussion

Table 1: Mean and Standard Deviation of Physics Students Exposed to Improvised Instructional Material and those Exposed to Lecture Method

		Pre-test		Posttest			
Groups	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**Gain**
Experimental	60	47.12	6.85	6 94.24	3.108		
Control	60	46.22	6,327	82.44	3.914		

Table1. Showed that the mean score of the experimental group before treatment was 47.12 and that of the control group was 46.22 with only a marginal difference of 0.90 which was not significant.

Based on the above, it could be deduced that the experimental and the control group were equivalent in terms of entering knowledge of the subject physics before the treatment and therefore the group was considered okay for the study. The post-test result showed that the mean score of experimental group after treatment was 94.24 and that of the control group was 82 .44.The mean gain is 11.80 in favour of the experimental group.

Table 2.0: ANCOVA Result of Physics Students Scores of Experimental and Control Groups Exposed to Improvised Instructional Material and those Exposed to Lecture Method

Source	Sum of Squares	df	Mean Squares	F-value	P-value
Corrected Model	101846.000	2	50923.000	145.30	.000
Intercept	2793.311	1	2793.311	796.75	.000
Pretest (covariate)	2.082	1	2.082	0.59	.442
Treatment	1333.455	1	1333.455	380.35	.030
Error	581.976	117	3.506		
Total	930248.000	120			
Corrected Total	102427.979	119	io;		

Significant at ⩾0.05 probability level

The result in table 2.0 showed the result of experimental and control group. The p-value was significant at 0.05 level of significance (F-value = 380.35, $p < 0.05$=.03). Therefore, the hypothesis which states that, there is no significant difference in the mean performance scores of students taught physics with improvised instructional materials and those taught without improvised materials is hereby rejected.

Students found it difficult to pass physics in the Senior Secondary Certificate Examination (SSCE) because the teaching of physics have been rendered abstract due to the fact that teachers no longer exploit the natural environment and they no longer apply innovative ideas to teach

the subject(Ugwu,2000). These facts have been supported by the findings of IGS (2000), who noted that science teachings and learning could only be meaningful and effective if backed up by the necessary resources to enrich instruction.

The result in Table 2.0 revealed that the students taught physics properties of waves with improvised instructional materials performed better than those taught without instructional materials. This showed that the use of improvised instructional materials contributed positively to the learning achievement of students in physics. The result is in agreement with the previous findings of Ango (1990) and Ngoka (1992) as well as the findings of Dawodu (2007), Ayodele (2001). Cirfat, Zumyil and Tongjura (2006) who noted that there was a significant difference in the performance of students exposed to a particular treatment. It is also supported by findings of Nsofor (2004) who noted that students learnt more from science lesson when they were taught with learning or teaching materials. The result is contrary to the findings of Delialogle and Yoldrin (2008), Serger and Verhoven, Nwa. Chukwu et al (2006) among others who noted that there was no significance difference between the performance of the experimental group and control group when diagrams, instrumental models and styles were administered on different groups of students.

This research work also revealed that students taught with improvised instructional materials participated more actively than those taught without instructional materials as revealed from the p-value score of .030 which was significant. This is supported by the findings of Pine and West (1986) and Nwachukwu et al (2007), Alazi (1990) and Azubuike (1999), Wasaagu (2000), Olumotumi and Fenso (2000), Adeniyi (2001), Nsofor (2004), who all noted that using teaching materials helped students to show more interest in teaching and learning. They also noted that facilities motivated the student and also help them to recall easily.

Conclusion

In conclusion, the researchers discovered and concluded that improvised instructional materials would enhance, stimulate and motivate the teaching of physics in schools and colleges. Based on the findings of the researchers, the following conclusions were drawn;

- Improvised instructional materials are effective in enhancing learning.
- Improvised instructional materials motivate and stimulate learning.
- Improvised instructional materials help to improve teaching skills.

Recommendations

Based on the findings available as a result of this study, the following recommendations are made;

1. The physics teachers should always endeavor to improvise instructional materials for effective teaching and learning.
2. Government, philanthropists, non-governmental organizations should come to the aid of the schools and colleges that offer physics by providing befitting laboratories for improvised instructional materials.
3. Government and school administration should make funds available to teachers to encourage improvisation of instructional materials.
4. Physics teachers should be encouraged to attend conferences, seminars and workshops to improve their competence in the use of improvised materials for teaching physics.
5. Physics teachers and laboratory attendants should be trained and retrained on how to produce improvised instructional materials.

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