

IMPACT OF IMPROVISED INSTRUCTIONAL MATERIALS ON STUDENTS' ACADEMIC PERFORMANCE IN PHYSICS AMONG SENIOR SECONDARY SCHOOLS IN SAMARU METROPOLIS, ZARIA, KADUNA STATE, NIGERIA

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Abstract

This study investigated the impact of improvised instructional materials on students' academic performance in physics among senior secondary schools in Samaru Metropolis, Zaria, Kaduna State, Nigeria. The study adopted a quasi-experimental research design involving pre-test and post-test for experimental and control groups. A sample of 100 SS1 physics students was selected from two secondary schools, comprising 55 students in the experimental group and 45 students in the control group. Data were collected using a Physics Achievement Test (PAT) and Teachers' Questionnaire (TQ) with reliability coefficient of 0.80. Data was analyzed using mean, standard deviation, and independent sample t-test to answer the research questions and test the hypothesis, respectively. Findings revealed that most schools lacked improvised instructional materials, while students taught using improvised materials performed significantly better than those taught using conventional methods. The study revealed that improvised instructional materials significantly improved students' achievement in physics and promoted better understanding of abstract concepts in resource constrained secondary schools. The findings underscore the pedagogical value of locally improvised materials as viable alternatives for enhancing effective physics instruction.

Keywords: Improvised Instructional Materials, Physics Education, Academic Performance, Secondary Schools.

Introduction

Science education plays a crucial role in national development, technological advancement, and economic growth. Among science subjects taught in Nigerian secondary schools, physics occupies an important position because it provides foundational knowledge for engineering, technology, and other scientific disciplines. However, students' performance in physics has remained consistently low in many secondary schools across Nigeria (Adeniyi, 2018). Physics as one of the science subjects that students often find very difficult and students always have low performance or achievement in the subject. One of the major reasons for the poor performance might not be separated from the abstract nature of the subject as observed by Adeyemo (2010). The teaching of physics in school has not been encouraging due to this abstract nature of the subject that is why the use of instructional materials is needed to facilitate

students learning of physics. Physics concepts cannot be fully achieved without the use of instructional materials.

Poor performance in physics has been attributed to several factors including inadequate instructional materials, ineffective teaching methods, lack of laboratory facilities, and the abstract nature of many physics' concepts (Adeyemo, 2010). When physics is taught mainly through theoretical explanations without practical demonstrations, students often develop misconceptions and lose interest in the subject.

Instructional materials play an important role in facilitating effective teaching and learning. They help translate abstract scientific concepts into concrete experiences, thereby improving students' understanding and retention of knowledge. However, many Nigerian secondary schools lack adequate laboratory equipment and teaching aids needed for effective science instruction. Improvisation therefore becomes necessary. Improvisation refers to the process of producing substitute teaching materials from locally available resources when standard equipment is not available (Tukur, 2020). Improvised instructional materials help teachers demonstrate scientific principles practically even in the absence of sophisticated laboratory equipment. An instructional material helps teachers to meet individual difference of the learners in the class using aids that appeals to different sense (Morohunfolu, 2021). Instructional materials are used to supplement verbal explanation of concepts or any description so that the lesson could be real to students. These instructional materials are categorized into audio, visual and audio and visual. These are materials that when teacher used then can appeal to students both sight and hearing. These can be electronically operated materials like televisions, radio, slide motion, computer and non-electronic one such as chalk board, burner, models etc. The absence of these materials in teaching of physics could make the class very uninteresting to students and discourage learning thereby led to low or poor performance.

Instructional materials are very important because what students hear can be easily forgotten but what they see cannot be easily forgotten and last longer in their memory. Instruction materials use in teaching and learning process for more effective and facilitate learning Abasi (2019). Without instructional materials effective and facilitate learning cannot be achieved, therefore improvisation becomes necessary. Improvisation is the act of using the local available material in the absence of the factory manufactured ones. Learner participation in improvisation of instructional materials makes them more expose to creativity, innovation and curiosity, all of which are fundamental to teaching and learning of science (Ayuba, 2015). Improvisation in science teaching is an important issue in science education which has attracted a lot of contribution from science education (Fatubarin, 2017). The use of improvised materials can enhance students' participation in learning activities, stimulate curiosity, and promote meaningful learning experiences. Studies have shown that practical activities using improvised materials help students develop scientific skills such as observation, measurement, and experimentation (Ayuba, 2015). Some of the improvised materials used are magnet from old

radio and nails, where the nails are magnetized on the magnetic bar making the nails just as a real magnet. The magnetized nails are used to explain the attractive properties of magnet and also the repulsion properties of the magnet. The use of iron filings and a bar magnet serve as an effective improvised instructional material for demonstrating magnetic fields in the classroom. a bar magnet (or a magnet obtained from a discarded speaker) is placed beneath a sheet of plain paper or cardboard, while iron filing sourced from a local mechanic workshop (welder workshop) are evenly sprinkled on top of the surface. When the paper is gently tapped, the iron filings align themselves in distinct curved patterns around the magnet. This arrangement enables students to clearly observe the presence and pattern of magnetic field lines. Through this demonstration, learners are able to understand key concepts such as the direction of the magnetic field, which flows from the North pole to the South pole, as well as the variation in field strength, indicated by the higher concentration of filings at the poles.

Despite the recognized importance of improvised materials in science education, many schools still do not utilize them effectively. Therefore, the principle of improvisation in physics aims at revealing the way or manner improvised materials are integrated and applied into teaching of physics (Adamu, 2003). Improvised materials are materials that used or that substitute the real material unavailable using localizes or available materials. The use of improvised materials should be encouraged to teacher and school management because improvised materials can significantly improve students' interest in the academic excellence by improving their cognitive level, exploring the full potential of the students and improve teaching and learning of physics. Improvised materials make teaching and learning process easier and improve knowledge, performance skill acquisition, and self-actualization and improve confidence because the concept has been well explained practically and theoretically (Fadeiye, 2015). Some advantage of improvisation according to Ofoefuma and Eye (2019) are; improvisation helps to bridge the gap between theoretical knowledge and practicability. It enables the learner and teacher make proper use of their environment this is because in improvisation we meanly make use of the available materials in the environment. Improvisation becomes imperative in situation where there are scarce of resources and facilities. According to STAN 54th anniversary conference proceeding (2013), some of the influence that improvised materials would have on physics teaching and learning process are as follows; improvised materials provide a cognitive bridge between abstraction and reality to students. Improvisation saves cost in addition the teacher and the students make positive effort toward effective instruction

Improvisation helps students to understand the practical aspect of physics rather than the theory. Without a gainsaying, experimental work in physics always create a lasting picture in the memory of the students and discourage memorization of laws and theories (Adeyemo, 2017). This study therefore investigated the impact of improvised instructional materials on students' performance in physics among senior secondary schools in Samaru metropolis, Zaria.

Statement of the problem

One of the major challenges facing education in Nigeria today is the persistent poor performance of students in science subjects, particularly physics. Reports from West African Examinations Council and National Examinations Council have consistently indicated unsatisfactory performance of secondary school students in physics over the years. This trend has generated concern among educators and other stakeholders in science education in Nigeria (WAEC, 2012; Adeyemo, 2010). Poor academic performance in physics has been attributed to several factors, including inadequate learning environments, shortage of instructional materials, insufficient laboratory facilities, and ineffective teaching methods, students' poor attitudes toward the subject, and limited practical skills acquisition Uguche and Yahaya (2026). The government, parents, and students blame one another for poor performance in science education physics in specific. The parents are blame for lack of commitment to their children education (that is lack of not doing home-work and checking what their children did in class) this can occur as a result when the parents are not educated or their area of specialization is quite different from that of their children. The teachers are blame for lack of commitment to their duties as teacher and as role model to the students. Teachers have identified inadequate government provision of instructional materials as one of the factors limiting effective teaching and learning in secondary schools (Achimugu, 2017).

The poor academic achievement of students in physics has attributed to many factors which are lack of availability of enough instructional material, over population and skills needed for effective teaching, poor provision of conducive environment for teaching and learning which tend to result to low teachers and students' motivation and lack of teacher's commitment to their duties. It is observed that most students complain of being taught the theoretical aspect of physics rather than both practical and theory aspect of physics making students to lose motivation. Educationally what student hear can easily be forgotten but what they see and hear cannot be easily forgotten and its last longer in their memory. The researcher deemed it necessary to look specifically into the impact of improvised material on students' performance in physics among secondary school students in Samaru metropolis, Zaria, Kaduna state.

Objectives of the Study

The objectives of the study are to find out;

1. The availability of improvised instructional materials in Zaria metropolis to enhance students' performance of physics students.
2. The impact of improvised instructional materials on students' performance in physics among secondary school students in Zaria metropolis, Kaduna State.

Research Questions

The study addressed the following research questions:

1. How available are improvised instructional materials in secondary schools in Samaru metropolis, Zaria, Kaduna state?

2. What is the impact of improvised instructional materials on students' academic performance in physics in Samaru metropolis, Zaria, Kaduna state?

Hypothesis

H₀: There is no significant difference between the academic performance of students taught using improvised materials and those taught without improvised materials.

Methodology

The study employed a quasi-experimental research design involving a pre-test and post-test for both experimental group and control group. The population comprises all senior secondary school physics students in Samaru metropolis, Zaria, Kaduna State. According to the Kaduna State Annual School Census (2019), there were 17,596 students across six secondary schools in the area. A sample of 100 students was selected using random sampling. The sample consisted of Experimental group 55 students and Control group 45 students. Two schools were selected for the study, with one serving as the experimental group and the other as the control group. The instruments used for data collection are Physics Achievement Test (PAT) and Teachers' Questionnaire (TQ). The Physics Achievement Test (PAT) contain 20-item multiple-choice test designed to measure students' understanding of physics concepts and a structured questionnaire used to determine the availability of improvised materials in schools. The research instruments were validated by the project supervisor and experts in science education. Reliability was determined using a test-retest method which yielded a reliability coefficient of 0.80, indicating that the instrument was reliable. Data collection followed a Pre-test: Administered to both experimental and control groups. The Treatment, the experimental group was taught using improvised materials, while the control group was taught using conventional teaching methods. The Post-test: Conducted after the instructional period. Descriptive statistics such as mean and standard deviation were used to answer research questions, while independent sample t-test was used to test the hypothesis at 0.05 significance level.

Results

Research question: What is the impact of improvised instructional materials on students' academic performance in physics in Samaru metropolis, Zaria, Kaduna state?

Group	N	Mean	Standard Deviation
Experimental	55	59.00	14.68
Control	45	44.55	9.67

Mean difference of 14.45.

The experimental group recorded a mean score of 59.00, while the control group recorded 44.55,

Hypothesis Testing: There is no significant difference between the academic performance of students taught using improvised materials and those taught without improvised materials.

Group	N	Mean	SD	df	t-cal	P-value
Experimental	55	59.00	14.68	98	5.90	0.00
Control	45	44.55	9.67			

Since $p = 0.00 < 0.05$, the null hypothesis was rejected.

This indicates that there is a significant difference between students taught using improvised materials and those taught without improvised materials.

Discussion of Findings

The findings of this study revealed that the majority of schools in Samaru metropolis lack improvised instructional materials for teaching physics. This finding agrees with Ogunleye (2020) who reported that inadequate instructional materials remain a major challenge in science education in Nigeria. The study also revealed that students taught using improvised instructional materials performed significantly better than those taught using conventional methods. This supports earlier studies by Amina (2017) and Tobi (2015), who found that the use of improvised materials improves students' understanding and academic achievement in science subjects. Improvised materials help bridge the gap between theoretical knowledge and practical experience, thereby making abstract physics concepts easier to understand.

Conclusion

The study concluded that improvised instructional materials significantly improve students' academic performance in physics. Despite their benefits, many schools still lack such materials in their laboratories. Encouraging teachers to develop and utilize improvised materials can greatly enhance the teaching and learning of physics in secondary schools.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. School management should support teachers in producing and using improvised instructional materials for physics teaching.
2. Government and educational authorities should provide training workshops on improvisation of teaching materials.

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