



Production of Locally Made Meter Bridge and Students' Achievement in Physics in Mkpato Enin, Akwa Ibom State, Nigeria

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Abstract

The study investigates the impact of the production of locally made Meter Bridge and students' achievement in physics in Mkpato Enin, Akwa Ibom State, Nigeria. Three research questions and three hypotheses were formulated to guide the study. Quasi quasi-experimental research design was adopted using pretest, posttest, non-randomized intact classes. The population for the study comprised all the Senior Secondary Two (SS2) Physics students for the year 2024/2025 session in the 16 public Secondary Schools in Mkpato Enin. A sample size of 50 SSII students drawn from four schools in their intact classes through a stratified sampling technique was used for the study. Physics Practical Test (PPT) was used as an instrument for data collection. The instrument was duly validated and subjected to reliability analysis using Cronbach's alpha statistics. The result showed a reliability coefficient of 0.79 and was deemed appropriate for the main study. Descriptive statistics of mean and standard deviation were used in answering the research questions, while analysis of covariance was used in testing the hypotheses at 0.05 alpha level. From the results of the analyses carried out, the findings showed that those taught using locally produced and standard laboratory Meter Bridge demonstrated significant improvements in their physics achievement scores from pre-test to post-test, with the standard laboratory Meter Bridge group showing a slightly higher mean gain compared to the improvised Meter Bridge group. Urban students performed better than rural students in terms of achievement in the concept of electricity in Physics. There is an interaction between instructional materials and location on students' academic achievement in Physics. Based on the findings, it was recommended, among others, that teachers should receive training and support on how to effectively use locally produced instructional materials and standard laboratory Meter Bridge to improve student achievement in Physics.

Keywords: Production, Meter Bridge, Achievement, Physics

Introduction

The laboratory is one of the most important places in the study of Physics. It is the engine room for the study of Physics. Physics is a practical subject; therefore its teaching must be carried out in the laboratory where practicals can be conducted. The teaching of Physics is to be carried out in the Physics laboratory according to the Federal Ministry of Education (FME, 2018). The use of laboratory environment to teach science subject is an essential factor if learners have to move from the world of theory to practical (Itghise & Babayemi, 2018). Hence there is need to have a thorough knowledge of development of laboratory instruments which is part of Physics in technology (FME, 2023). Any study of Physics done outside the laboratory is a deviation from the proper teaching of Physics. The materials for Physics teaching are stored in the laboratory (Utibe, 2015).

Physics is divided into three basic sections in the external and final Senior Secondary Certificate examinations (SSCEs). The sections are: objective, theory and practical examinations. The practical examination is the area where most of the students are very scared. The students are scared for reasons ranging from lack of equipment in the laboratory, poor practical sessions occasioned by attitudes of teachers and students and the fear of damaging the few available equipment by either the teacher or the students. It is true that teachers cannot give what they do not have (FME, 2006). Itghise (2016) posits that the use of educational technology laboratory equipment in teaching encourages students centered technology driven instructional delivery and development of creative skills in learners that lead to self-reliance.

The level of development and growth of any nation is dependent upon the technological growth of the nation. Physics is one particular subject that is also a requirement for all science and engineering courses in the polytechnics and universities (FME, 2018). This growth is related to the applications of science and technology. Physics in technology is an aspect of Physics curriculum that provides an opportunity for the construction, operation of workable devices, acquaintance with laboratory equipment and development of skills (Utibe & Onwioduokit, 2019). However, the term local production as used in this study, involves the application of theoretical concepts in Physics to develop local instruments in the laboratory, such as the Meter Bridge in this study. The Meter Bridge in the topic of this study is an example of indicating/measuring instrument. Indicating instruments are those instruments which indicate the value of the quantity that is being measured at the time at which it is measured. Such instrument according to Utibe et al. (2019), consist essentially of a pointer which moves over a calibrated scale and which is attached to a moving system pivoted in jewelled bearings. Examples of these measuring instruments are Ammeter, voltmeter, wattmeter, galvanometer and Meter Bridge; which measure current, voltage, power, smaller values of currents and resistances respectively.

The main focus of this study is to construct a local laboratory Meter Bridge that will be functional. To achieve this aim requires a consideration and understanding of the combined principles of operation of the Wheatstone bridge and potentiometer. In the simplest definition, a Meter Bridge is a simple type of potentiometer which may be used in school science laboratories to demonstrate the principle of resistance measurement by potentiometric methods (Farinde et al., 2018). Constructing a Meter Bridge involves the selection of various components and the assembling of the components into the workable equipment. These components include the connecting wire, meter bridge rule, jockey, cell and key.

A visit to the laboratory of any secondary school in Akwa Ibom State will reveal a shocking dearth of equipment. The reason for lack of equipment is either that the Government does not supply it or that the school authorities are not able to maintain laboratory equipment supplied to them. Another reason for the emptiness of the schools laboratories is that the teachers, students and the school system are not employing the local technology (Utibe et al., 2017). A survey by the researchers reveal that the teachers, students and the school system give several reasons for the emptiness of

schools laboratory ranging from lack of equipment, trained technicians and interest. Considering the importance of the laboratory in Physics teaching, the laboratory should not only be well equipped with laboratory equipment but should also be equipped with spare parts for any equipment, trained technicians and teachers with the knowledge of production of Physics equipment.

Physics is an important science subject taught at the senior secondary school level in Nigeria. The general objectives of Physics at the secondary school are to: Provide basic literacy in Physics for functional living in the society; Acquire basic concepts and principles of Physics as a preparation for further studies; Acquire essential scientific skills and attitudes as a preparation for technological application of Physics; and Stimulate and enhance creativity. The Physics curriculum used in this study is structured into six themes, which have related concepts and topics. They are: Interaction of matter, space and time, Conservation principles, Waves: Motion without material transfer, Fields at rest and in motion, Energy quantization and duality of matter and Physics in technology (FME, 2023). Themes four and six are useful in this study as it relates to the concepts of electricity, Meter Bridge, technical skills in Physics. The importance of Physics as a requirement for scientific and technological development of any nation cannot be overemphasized. The technological potentials, societal comforts, production and development of Nigeria depend on the quality of the Physics education provided (Utibe & Agah, 2015).

Despite the application of the knowledge of Physics in solving societal problems, the performance of candidates in Physics examinations conducted by WAEC is usually not encouraging as reported in the WAEC Chief Examiners Reports, CERs, 2021 – 2025. There had been a consistent poor performance in Physics over the years. For example, the failure rate in Physics in 2021 was 44.7%, 2022 was 46.43%, 2023 was 49.1%, 2024 was 43.89% and 2025 49.3% respectively. It is believe that this study would help in improving students' performance in Physics in the public examinations.

Furthermore, WAEC CERs for June 2021 - 2025 points to a display of poor understanding and difficulty in electricity practical questions in the Senior School Certificate Examinations. Science educators have equally expressed concern at the failure of many students to have practical/technical knowledge of most of the equipment they used (Utibe & Onwioduokit, 2019; Utibe & Olah, 2024).

The area in which a school is located can affect students' technical skills, production and

academic achievement. Oyeromi et al. (2018) observed that schools located in rural areas are usually faced with problems like shortage of skilled teachers, low population density and subsistence mode of life, whereas urban areas are those with high population density, technically minded and skilled teachers. The disparity between the quality of teachers in urban and rural schools are reflected in students' technical skills and performance in the school subjects. School location is used to describe the geographical position of a school, in relation to other areas in the physical environment (rural or urban), where the school is sited. Utibe & Agwagah (2015), Abamba (2021) and Ikechuku & Abamba (2021) posit that education in rural areas is usually full of difficulties and teachers do not like being posted to rural area. Parents in rural area may prevent their children from going to school regularly because of the children's involvement in farming activities.

This study is anchored within the constructivist theory of learning. The constructivist learning theory holds that "learning is a constructive process in which the learner builds an internal representation of knowledge, the ability to produce a Meter Bridge locally". It is a theory of learning that derives from a philosophical position that individuals construct their own new understandings based on an interaction between what they already know and believe, against the ideas and knowledge that they meet (Piaget, 1972).

The result of this study is beneficial to the students, teachers, curriculum planners, government, textbook writers and researchers. This study will help Physics teachers to encourage students to acquire entrepreneurial skills and learn how to produce a Meter Bridge in Physics for improved students' understanding and achievement. The study will assist in producing more practically oriented and competent students for courses in science and technology in the tertiary institutions of learning, which in turn will boost national growth and development.

This study covered Senior Secondary two (SS2) Physics students in public secondary schools in Mkpato Enin Local Government Area of Akwa Ibom State for 2024/25 academic session, taking into consideration the school location of the students. This study was also limited to the concept of electricity with the production of Meter Bridge in Physics (Measurement of resistances using Meter Bridge).

A review of Utibe's (2009) study on the analysis of the performances of students in Physics in Rural and Urban Schools in WASSCE, using the results of 720 students and t-test statistics, shows that there exists a significant difference between the performances of students from Urban and Rural

Secondary Schools in favour of rural schools. No significant influence of gender on the performances of male urban and female rural students. This study relates to the present study in the area of the school location and subject used in the study. It is one of the bases for understanding the influence of school location on students' performance. Also, Soliu (2017) investigated the influence of school location and school type on senior school achievement in Physics in Ilorin, Kwara State. The study specifically examined the influence of school location and school type on students' academic achievement in WASSCE Physics examinations from 2010- 2014. This study reveals statistical significant difference in the achievement of senior school students in WASSCE Physics based on school location from 2010-2014 in favour of rural schools among others. This study relates to the present study in the area of the school location used in the study.

Ndihokubwayo et al. (2018) investigated the extent to which the production and use of improvised experiment materials contribute to students' achievement in Physics. Using multivariate analysis of variance, it was found that there was no statistically significant difference between teaching using improvised materials. On the other hand, Obikezie et al. (2023) investigated the comparative effect of teaching with improvised instructional materials and standard instructional materials on secondary school students' academic retention in Chemistry. The findings of the study revealed that there was higher knowledge retention when Chemistry students were taught using improvised instructional material than those taught with standard instructional material. This study relates to the present study in the area of instructional materials (locally made) and in the design of the study. Thus, this study focused on enhancing the achievement and skill development of students in the production of Meter Bridge in Physics in Mkpato Enin local government area, Akwa Ibom State.

Statement of the Problem

As practicing Physics teachers, the researchers have observed that there is consistent poor performance of students in electricity concepts, which contributes to the general performance in Physics. Furthermore, students graduate from school without acquiring skills in Physics to produce any laboratory equipment, in spite of the time they spent in the laboratory learning Physics as directed by the Senior Secondary Physics curriculum. Another glaring issue is that of poor technical skills in Physics, despite the importance of Physics to man and society. The level of performance of students in WASSCE

2021 – 2025 is below average (WAEC, 2025). It is based on these observations that the researchers were motivated to carry out this study on the production of locally made Meter Bridge and students' achievement in Physics in Mkpato Enin, Akwa Ibom State, Nigeria.

Purpose of the Study

The purpose of this study is to investigate the production of locally made Meter Bridge and students' achievement in Physics in Mkpato Enin, Akwa Ibom State, Nigeria. The study is designed to achieve the following specific objectives:

1. Compare the mean achievement scores of students taught using the locally produced and standard Meter Bridge as an instructional material in Physics.
2. Compare the mean achievement scores of urban and rural students in the concept of electricity in Physics.
3. Find the interactive effect of instructional materials and location on students' academic achievement in Physics.

Research Questions

In order to guide the researcher in the study, the following research questions were formulated:

1. What is the difference in the mean achievement scores of students taught using the locally produced and standard Meter Bridge as an instructional material in Physics?
2. What is the difference in the mean achievement scores of urban and rural students in the concept of electricity in Physics?
3. What is the interaction between instructional materials and location on students' academic achievement in Physics?

Hypotheses

To guide the researcher in the conduct of the study, the following null hypotheses were tested at 0.05 level of significance:

1. There is no significance difference in the mean achievement scores of students taught using locally produced and standard Meter Bridge as an instructional material in Physics.
2. There is no significant difference in the mean achievement scores of urban and rural students in the concept of electricity in Physics.
3. There is no significant interaction between instructional materials and location on students' academic achievement in Physics.

Methods

This study adopts a quasi-experimental research design using pretest and posttest non randomized design from intact classes. Students were randomly selected from two schools to form the experimental groups. This design, according to (Nworgu, 2015) is a type of design that contains different levels of factors and can be used in an investigation to establish the combined effects of two or more independent variables.

This study was conducted in Mkpato Enin Local Government Area. Mkpato Enin is located in the South-South region of Nigeria and is a town and a Local Government Area (LGA) in Akwa Ibom State. The people are traditionally Ibibio speakers and because of its proximity to the Atlantic Ocean, the people of Mkpato Enin are predominantly fishermen. Mkpato Enin is located near large offshore oil and gas drilling operation areas. This area has 16 public secondary schools spread across the urban and rural settlements. Mkpato Enin has two tertiary institutions, Edar polytechnic and Akwa Ibom State University (Mkpato Enin LGA, 2024). The reason for selecting this area for the study is that the population needed for the study can be found in this area.

The population for the study was 512 Senior Secondary two (SS2) Physics students for the year 2024/2025 session in Mkpato Enin Local Government Area of Akwa Ibom State (Mkpato Enin LEC, 2024). A total of 50 students from four intact classes of SS2 constitute the sample for the study. Stratified random sampling technique was used to select the schools using the location of schools in the local government as strata. After stratifying the schools along location, two schools were randomly selected from each location and assigned as urban and rural schools and these schools were taught how to produce Meter Bridge locally using demonstration teaching methods. All Physics students in the two selected schools were used in the study (intact classes).

One instrument and one treatment package were used to gather data for the study. This instrument was adopted from the WASSCE Physics practical examination for school certificate candidates. The researcher also adopts the WASSCE Physics practical marking guide. The test is marked on a total of 25 marks maximum and zero-mark minimum, if students' performance merits it.

The instrument and lesson package were subjected to face validation by two Physics lecturers and one lecturer of Research, Measurement and Evaluation, all of Akwa Ibom State University. The validity verdicts from the three evaluators, who assessed the appropriateness of the items in the

instruments and the suitability of the contents of the lesson packages used for the teaching of the students on the production of local Meter Bridge and measurement of electrical resistance practical test, helped to produce the final copy of the test and lesson package. The corrections from the validators were incorporated in the topics, the purpose of the study, research questions and hypotheses, general notes in the marking guide and the equation of slope.

In order to determine to reliability of the instrument, it was administered a group of 30 Physics students who were not part of the main subjects for the study but who were found to be equivalent in all respects to the subjects in the study. The estimate of temporal stability of the Physics Achievement test (PAT) was determined using the Pearson product-moment correlation coefficient, and the value of 0.79 was obtained. With this value, the instrument was considered reliable and it adopted for use in the study.

The following procedures were followed during the training and administration of the instrument: The researcher informs the Director of schools, Mkpato Enin Local Education Committee (LEC) for use of the two selected schools in the LEC for the conduct of the study. The researcher meets with the Principals of the selected schools for proper arrangement for use of the Physics students, Physics teachers, technicians and relevant facilities in the school Physics laboratory for the conduct of the

study, having briefed the Principal of the purpose of the study and the benefit of the study to the students and the school. Two professional Physics teachers and two technicians (one each from the selected schools) were selected and briefed using the lesson package and the test. These teachers and laboratory technicians were used as research assistants in the study. In order to predict the effects of the treatments (test instrument) pretest was administered to the students (intact classes) at the beginning of the study, and the results were used to test a possible effect of the treatment and as covariates in subsequent analysis. The actual teaching and training of the students on the concepts of production of local Meter Bridge and resistance practical test with standard and locally made meter bridge was done by the Physics teachers and laboratory technicians under the supervision of the researchers in each of the schools using the lesson package developed by the researchers for two weeks. Two days of review were allowed for the participants, after which the posttests: Measurement of electrical resistance practical test with standard and locally made Meter Bridge was administered to the students. The data collected in the course of the study was analyzed using descriptive statistics and Analysis of Covariance (ANCOVA), using pretest scores as covariates. All hypotheses were tested at 0.05 alpha level of significance.

Results

Table 1: Mean achievement score difference of students taught using the locally produced and standard meter bridge

Instructional Materials	N	Pretest		Posttest		Mean Gain	Mean Difference
		Mean (\bar{x})	SD	Mean (\bar{x})	SD		
Local	24	7.67	1.12	19.17	1.37	11.50	0.29
Standardized	26	7.84	1.15	19.63	1.62	11.79	

Table 1 reveals the pre-test mean and standard deviation scores (\bar{x} =7.76, SD=1.12) of the group of students taught using locally produced Meter Bridge and post-test mean and standard deviation scores (\bar{x} =19.17, SD=1.37) of the same group with mean gain of 11.50. Also, the pre-test mean and standard deviation scores (\bar{x} =7.84, SD=1.15) of the group of students taught using standard Meter Bridge and a post-test mean and standard deviation scores (\bar{x} =19.63, SD=1.62) of the same group with mean

gain of 11.79. The standard deviation scores in both groups reveal that students' achievement did not differ widely based on either of the instructional material used. Also, the mean of the two groups shows that students' mean achievement score increased under the use of both locally produced and standard laboratory instructional materials. More so, the difference for the mean gains in both groups was 0.29, in favour of the standard meter bridge group.

Table 2: Mean achievement score difference of urban and rural students in the concept of electricity in Physics

School Location	N	Pretest Mean (\bar{x})	SD	Posttest Mean (\bar{x})	SD	Mean Gain	Mean Difference
Urban	24	7.72	0.96	19.78	1.41	12.06	0.76
Rural	26	7.81	1.28	19.11	1.56	11.30	

Table 2 reveals the pre-test mean and standard deviation scores ($\bar{x}=7.72$, $SD=0.96$) of the urban students in the concept of electricity in Physics and post-test mean and standard deviation scores ($\bar{x}=19.78$, $SD=1.41$) of the same group with mean gain of 12.06. Also, the pre-test mean and standard deviation scores ($\bar{x}=7.81$, $SD=1.28$) of the rural students in the concept of electricity in Physics and a post-test mean and standard deviation scores

($\bar{x}=19.11$, $SD=1.56$) of the same group with mean gain of 11.30. The standard deviation scores in both groups reveal that students' achievement did not differ widely based on their school location. Also, the mean of the two groups shows that students' mean achievement score increased for both school location groups after the instruction. More so, the difference for the mean gains in both groups was 0.76 in favour of urban school students.

Table 3: Mean interaction between instructional materials and school location on students' academic achievement in Physics

Instructional Materials		N	Pretest Mean (\bar{x})	SD	Posttest Mean (\bar{x})	SD	Mean Gain	Mean Difference
Local	Urban	12	7.71	0.91	19.36	1.34	11.65	0.28
	Rural	12	7.63	1.31	19.00	1.41	11.37	
Standard	Urban	12	7.72	1.28	20.11	1.41	12.39	1.14
	Rural	14	7.95	1.15	19.20	1.70	11.25	

Table 3 reveals the pre-test mean and standard deviation scores ($\bar{x}=7.71$, $SD=0.91$) of the urban students who were taught using locally produced materials and posttest mean and standard deviation scores ($\bar{x}=19.36$, $SD=1.34$) of the same group with mean gain of 11.65; the pre-test mean and standard deviation scores ($\bar{x}=7.63$, $SD=1.31$) of the rural students who were taught using locally produced materials and posttest mean and standard deviation scores ($\bar{x}=19.00$, $SD=1.41$) of the same group with mean gain of 11.37. Also, for students in the standard group, the pre-test mean and standard deviation scores ($\bar{x}=7.72$, $SD=1.28$) of the urban students and a posttest mean and standard deviation scores

($\bar{x}=20.11$, $SD=1.41$) of the same group with mean gain of 12.39; the pre-test mean and standard deviation scores ($\bar{x}=7.95$, $SD=1.15$) of the rural students and posttest mean and standard deviation scores ($\bar{x}=19.20$, $SD=1.70$) of the same group with mean gain of 11.25. The standard deviation scores in all the groups reveal that students' achievement in Physics did not differ widely based on their school location. Also, the mean of the all the groups shows that students' mean achievement score increased for all school location groups after the instruction. More so, the difference for the mean achievement scores 0.28 and 1.14 for the students taught with locally made materials and those taught using.

Table 4: Significance of difference in the mean achievement scores of students taught using the improvised and standard meter bridge as an instructional material

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	24.42 ^a	8	3.052	1.38	0.22	0.16
Intercept	538.49	1	538.49	243.99	0.00	0.81
PreScore	0.28	1	0.28	0.13	0.72	0.00
Instructional Materials	3.00	1	3.00	1.36	0.25	0.02
Location	8.18	1	8.18	3.71	0.06	0.06
Instructional Materials * Location	1.00	1	1.00	0.45	0.50	0.01
Error	130.22	41	2.21			

Total	25817.00	50
Corrected Total	154.63	49

R Squared = 0.158 (Adjusted R Squared = 0.44)

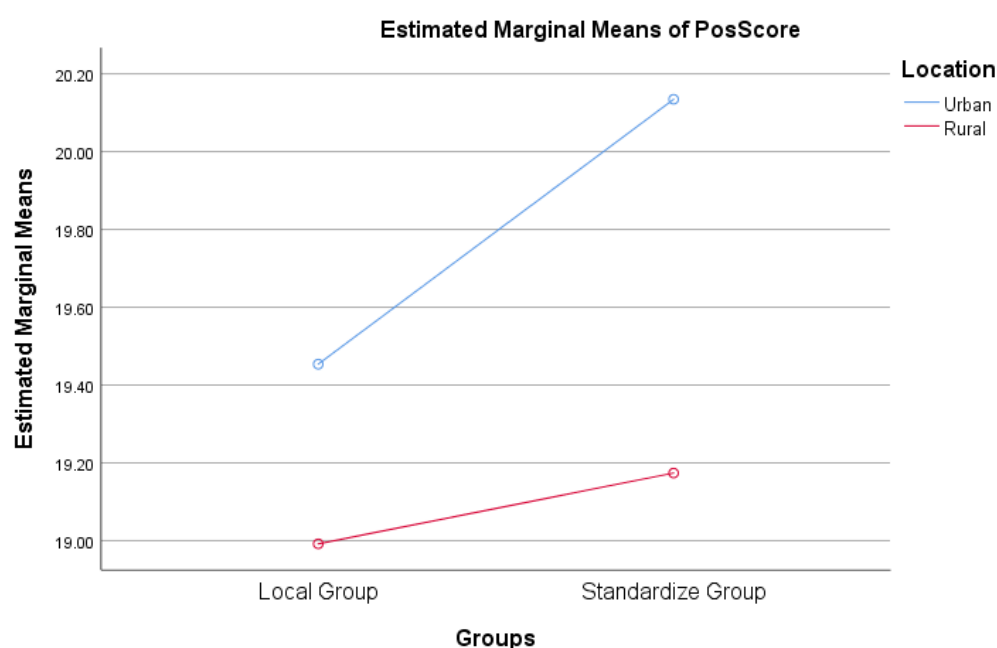
Dependent Variable: Postest

Table 4 shows the significance of difference in the mean achievement scores of students taught using the locally made and standard Meter Bridge as an instructional material in Physics. With an F-ratio of 1.34, and p-value of 0.25 which is greater than the 0.05 level of significance, the null hypothesis one which states that there is no significant difference in the mean achievement scores of students taught using the locally made and standard Meter Bridge as an instructional material in Physics was not found to be significant. Therefore, the null hypothesis one is not rejected. Hence, there is no significant difference between the mean achievement scores of students taught using the locally made and standard Meter Bridge as an instructional material in Physics. The effect size of 0.02 indicates that 2% change in students' achievement in Physics can be attributed to the use of either locally made or standard Meter Bridge as an instructional material.

Table 4 shows the significance of difference in the mean achievement scores of urban and rural students in the concept of electricity in Physics. With an F-ratio of 3.71, and p-value of 0.06 which is greater than the 0.05 level of significance, the null hypothesis three which states that there is no significant difference in the mean achievement scores

of urban and rural students in the concept of electricity in Physics was not found to be significant. Therefore, the null hypothesis two is not rejected. Hence, there is no significant difference between the mean achievement scores of urban and rural students in the concept of electricity in Physics. The effect size of 0.06 indicates that 6% change in students' achievement in the concept of electricity in Physics can be attributed to school location (urban and rural).

Table 4 shows the significance of interaction between instructional materials and school location on students' academic achievement in Physics. With an F-ratio of 0.45, and p-value of 0.50 which is greater than the 0.05 level of significance, the null hypothesis five which states that there is no significant interaction between instructional materials and school location on students' academic achievement in Physics was not found to be significant. Therefore, the null hypothesis three is not rejected. Hence, there is no significant interaction between instructional materials and school location on students' academic achievement in Physics. The effect size of 0.01 indicates that 1% change in students' academic achievement in Physics can be attributed to the interaction between the instructional materials and school location (see Figure 1).



Covariates appearing in the model are evaluated at the following values: PreScore = 7.7647

Figure 1: Interaction between instructional materials and school location on students' achievement in Physics

Discussion of the Findings

Data in Table 4 revealed that there is no significant difference between the mean achievement scores of students taught using the locally produced and standard laboratory Meter Bridge as an instructional material in Physics. The achievements of students when taught the concept of electricity using locally produced and standard laboratory Meter Bridge as instructional materials in Physics were compared. The outcome of the comparison indicated that the use of locally produced and standard laboratory Meter Bridge in teaching the concept of electricity significantly enhanced students' achievement in Physics. This result could be attributed to the fact that both the students who were exposed to locally produced and standard laboratory Meter Bridge in teaching the concept of electricity can achieve equally in Physics. The result of this finding is in line with Ndiokubwayo et al. (2018), whose study investigated the extent to which the making and use of improvised instructional materials contribute to students' achievement in Physics, and all students were able to make use of instructional materials. Also, Obikezie et al. (2023) in another study found out that the use of instructional materials contributes to students' achievement.

Findings from Table 4 revealed that there is no significant difference between the mean achievement scores of urban and rural students in the concept of electricity in Physics. The achievements of urban and rural students when taught the concept of electricity using locally made and standard laboratory Meter Bridge as instructional materials in Physics were compared. The outcome of the comparison indicated that the use of locally made and standard laboratory Meter Bridge in teaching the concept of electricity significantly enhanced both urban and rural students' achievement in Physics. This result could be attributed to the fact that both the urban and rural students that were exposed to locally made and standard laboratory Meter Bridge in teaching the concept of electricity can achieve equally in Physics. The result of this finding contradicts that of Soliu (2017), whose study examined the influence of school location and school type on senior school achievement in Physics in Ilorin, Kwara State, Department of Science Education, University of Ilorin, Nigeria.

Findings from Table 4 revealed that there is no significant interaction between instructional materials and school location on students' achievement in the concept of electricity in Physics. Thus, the use of instructional materials in teaching the concept of electricity in physics was not influenced by school location, hence the result obtained. This

result could be attributed to the fact that schools, whether located in urban or rural settlements, do not ascertain the standard and quality of teaching provided for the students. Rather, the contents of teaching experiences provided for the students to a greater extent determine the output of what students learn and acquire. The use of these instructional materials, whether in urban or rural schools, provided the students with similar opportunities to engage in practical learning using hands-on materials, thereby enhancing their academic achievement. The result of this finding is in line with Ndiokubwayo et al. (2018) who investigated the extent to which the production and use of improvised experiment materials contribute to students' achievement in Physics.

Conclusion

Based on the findings of the study, the researcher hereby concluded that students' exposure to different instructional materials in teaching the concept of electricity in Physics was found to be most effective in facilitating students' achievement without bias to gender and school location. Based on the findings and the conclusions reached, the following recommendations were made: Physics teachers should receive training and support on how to effectively use locally produced instructional materials and standard laboratory Meter Bridge to improve student achievement in Physics. Physics teachers should effectively utilize different instructional materials in teaching the concept of electricity specifically and in the general teaching of Physics concepts as it has proven to enhance students' achievement.

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