Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/13639
DOI URL: http://dx.doi.org/10.21474/IJAR01/13639

RESEARCH ARTICLE

Enhancing Commitment to Physics using Locally Sourced Instructional Materials

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Manuscript Info

Manuscript History
Received: 31 August 2021
Final Accepted: 30 September 2021
Published: October 2021

Key words: -
Locally Sourced Materials, Physics, Commitment, Secondary School, Students

Abstract

Physics is an integral part of the science curriculum in the educational landscape of Nigeria. The subject has attracted extensive research attention primarily due to its relevance and growing concern about the accompanying poor performance. Numerous literatures abound that suggest varying approaches to increasing student's interest, motivation, and performance in the subject. However, effort geared towards improving student's commitment to the subject is scarcely documented. The present study was aimed to determine whether there would be a difference in commitment to physics between students taught with locally sourced materials and those taught with the conventional learning materials in a convenience sample of 201 senior secondary school students. The students were pooled from the Kogi state secondary education system. A quasi-experimental pre-test and post-test research design were adopted. The result found a statistically significant difference between the research conditions. Thus, the study concludes that the locally sourced instructional materials are an indispensable teaching approach that might increase students' commitment to physics. The practical implication of the study is discussed.

Introduction:-

Today's global education plan is to raise individuals with modern-day skills regarded as a general necessity (Ince, 2018). The direction of modern-day education across the universereflects the importance of fundamental skills that include reasoning, creativity, and problem-solving(Bao & Koenig, 2019; Ludwig et al., 2017; Qablan et al., 2019). The field of science has been demonstrated to be an essential component of the national development of any country, including Nigeria(Ankeli, 2019; Clement et al., 2017; Okwuoyibo, 2012; Olufunke, 2012). Hence, remarkable attention is being given to the concept of STEM education across the world(Carlisle & Weaver, 2018; Gao et al., 2020).The trending Science, Technology, Engineering, and Mathematics (STEM) education has become the basis for various educational reforms in many countries' secondary and tertiary education levels (Liu et al., 2020). Science-based education is primarily intended to improve the socio-economic potentials of every society, including quality of life, thus making science an essential aspect of a better world.

The national policy on education and school curricula of the Nigerian educational system considers knowledge of science as essential to the growth and development of the learners(Adolphus, 2019; Jacob, 2013; Ogunjuyigbe et al., 2006; Sambo et al., 2014).Thus, this recognition is critical for the country to achieve the STEM objective enshrined in the 2030 agenda. Research has classified science as the basis for the advances in modern-day society(Aderonmu

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& Obafemi, 2015; Fuwape et al., 2019; Kola, 2013; Odu, 2020). Thus, the progress of any culture is based on its technological status.

The concept of physics as a branch of science education focuses on the interaction relating to energy and matter(Faridi et al., 2021; Daramola & Omosewo, 2012). It is recognized as part of the primary science subjects in Nigeria's education system(Ojediran, 2016; Onah & Ugwu, 2010; Segun Mobolaji et al., 2017; Mbamara & Eya, 2015). The subject's essence is to familiarize the young learners with the fundamental knowledge of the physics concepts for practical inclusion in society and acquire essential scientific skills and attitudes towards the technological demands of the world(Abuh & Attah, 2021). Research has noted that the fundamental physics concepts are imperative in improving the technological status of countries(Agbele et al., 2020; Adeyemo, 2010). Moreover, learning physics allows the learner to efficiently solve a technical problem(Santyasa et al., 2020). Extensive literature linked physics with increased scientific innovations(Bortfeld & Jeraj, 2011; Bunyamin et al., 2020; Chu, 2020; Moraga-Calderón et al., 2020; Ukoh & Onifade, 2020). Consequently, the teaching and learning of the subject have been fraught with challenges ranging from pedagogical concerns to instructional strategies.

Numerous studies have underscored students' low achievement in physics, especially at the secondary level(Coffie et al., 2020; Ebong, 2021; Falode & Ajala, 2014; Folashade & Akinbobola, 2009; Madu & Udoh, 2016; Onah & Ugwu, 2010). Over the years, researchers have linked the reported poor performance in physics to numerous variables, including teacher's knowledge, learning styles, study setting, instructional materials and method, personality variables, peer and parental influence, and certain demographic variables(Erdemir, 2009). Perhaps, most authors identified the use of locally sourced materials as a practical approach to enhancing learning, especially at the secondary level(Akano, 2018; Ugwu et al., 2019).

The concept of sourcing learning material within the learning environment, widely recognized as improvisation, denotes a low-cost process of broadening the scope of learning by integrating relevant material from sources apart from the conventional forms. The approach is essential in an attempt towards finding suitable substitutes or alternatives to traditional science materials. Improvisation of instructional materials entails sourcing learning material within the learning locality. Extensive studies have applauded the adoption of the strategy in the educational landscape of Nigeria. For example, Akano (2018)investigated the effects of teachers' adoption of improvised materials on learners' academic performance in physics among senior secondary school students in Kontagora, Niger State. The study employed a quasi-experimental research design, and the result showed that students taught with the improvised materials outperformed those taught without it.

Similarly, Obodo et al. (2020)examined the effects of improvised teaching materials on the academic performance of junior secondary school students in Basic Science in Enugu state, Nigeria using the quasi-experimental research design. The researchers found a significant positive difference in the students' performance, especially those exposed to the improvised teaching-learning material and those taught with the conventional materials. Also, (Jacob 2013)investigated the availability, uses, and improvisation of instructional materials and the implications in physics classrooms in secondary schools. The result of the study revealed inadequate instructional materials, poor utilization of the available materials, and instructor's adoption of local materials to improvise physics teaching.

Consequently, (Akani 2016)noted that teachers are not utilizing effectively the available instructional materials in their teaching. Thus, it might result in student's low performance. The current study assumes that locally sourced instructional material remains a veritable tool in teaching and learning physics at the secondary level of education in Nigeria. (Nbina, 2012)contend that improvising learning materials ensure that science concept are comprehensible to learners. Oguche and Usman (2019)concluded that improvising instructional materials increases students' achievement and interest. However, research looking at the relationship between the use of locally sourced materials and student's commitment remains scarce in the literature, hence the justification for the study.

Commitment in this study entails student's dedication and engagement in physics activities. Commitment is an essential component of learning and can improve school achievement (Korpershoek, 2016). Perhaps, research has shown that student's commitment to a subject is positively related to performance(Felfe et al., 2014). Thus, the primary purpose of the current study is to answer the question: Would there be a significant difference in commitment to physics between students taught with locally sourced instructional material and those taught with conventional materials?

Method:-

This study includes a convenience sample of 201 senior secondary school students under the ages of 12 and 16 at baseline who were enrolled in the science classes during the study period. The study sample was chosen because the study's objective is centered on a science subject (physics). To be included in this study, the student needs to be in ss2 or ss3, respectively. Ss1 students were excluded from the study because they had less exposure to physics at the time. Those who met the inclusion criteria were assigned to two conditions, with group A as the experimental condition and group B assumed the control condition.

Procedure:-

The study was conducted in different locations in Kogi State, Nigeria. Authorization was duly obtained from authorities of public and private secondary schools within the study parameter. Nevertheless, physics teachers were trained as research assistants in each of the schools. The training was conducted to inform the teachers of the study's purpose and make them conversant with the study procedures. The study was conducted in the third term of the 2020/2021 academic session. Before commencing the experiment, the students were subjected to a pre-test study to determine their overall commitment to physics. In this case, a questionnaire was distributed to all the students to fill at the spot. The primary research resumed with the experimental conditions been taught basic physics principles with the locally sourced materials. In contrast, the control conditions were taught the same lesson using the conventional materials. Finally, the post-test study was conducted similarly to the pre-test except that the questions were reshuffled. The data from the pre-test and post-test were subjected to data analysis.

Result:-

Table 1 below shows that the obtained mean from the pre-test study for experimental conditions is 54.28 while the mean from the control conditions is 52.11 resulting in a mean difference of 2.17 for the pre-test investigation. Perhaps, the outcome indicates no significant difference in the respondent's mean scores on their level of commitment in physics. However, the mean score for the experimental condition in the post-test study reveals a mean of 62.18 and 56.21 for the control condition. A mean difference of 5.97 was recorded. However, the mean score gained for the two conditions was 7.09 and 4.01, respectively. Thus, the result revealed an increased commitment to physics by the experimental conditions than the control condition.

Table 1:- The table shows the mean and standard deviation scores of students taught physics with locally sourced materials and those taught with conventional materials.

	Pre-test			Post test		
Group	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Gain
Experimental	106	54.28	13.54	62.18	15.67	7.09
Control 95	52.11	13.29	56.21 15.38	4.01		
MD	2.17		5.97			

To answer the research question on whether there would be a significant difference in commitment to physics between students taught with locally sourced instructional material and those taught with the conventional materials. The result of a t-test model revealed a statistically significant difference between the experimental and control conditions on a commitment to physics MD = 5.97, t (199) = 6.256, p = .000, as shown in Table 2 below.

Table 2:- Table showing the t-test comparison of the differences in student's engagement in physics.

Source of variation	N	Mean	SD	df	t	Sig
Experimental	106	62.18	15.67			
Control	95	56.21	15.38	199	6.25	000

Discussion:-

This study was conducted to determine whether there would be a significant difference in students' commitment to physics between students exposed to teaching with locally sourced instructional materials and those taught with conventional instructional materials. The pre-test and post-test examinations result indicate a significant variation in commitment to physics, especially in the experimental condition due to the improvised materials. More so, the result of the independent t-test was conducted to answer the research question on whether a significant difference would be observed relating to commitment in physics between students taught with locally sourced instructional material and

those acquainted with the conventional materials. The result established a significant difference between the experimental conditions and the control conditions on commitment in physics. Thus, this current revelation entails employing locally sourced instructional materials in the physics classroom to increase secondary school students' commitment to physics. Indeed, research has shown a link between academic commitment and achievement (Rezaei Gazki et al., 2019).

Consequently, (Human-Vogel & Rabe, 2015)indicated that meaningful commitment is predicted by satisfaction and quality of alternatives, which means that the quality of the improvised material is critical in attracting student's affective commitment to physics. Moreover, the study results support similar findings (Akano, 2018; Jacob, 2013; Obodo et al., 2020; Offor, 2021), which find improvised learning materials to enhance learning among secondary school students. The likely explanation for this outcome could be linked to the monotonous dimension of the conventional learning materials. Perhaps, the youngsters are keener to embrace quality learning alternative, especially when it is adapted from a familiar context. Therefore, the locally sourced instructional materials present a pathway to committing the youngsters positively in the physics classroom for effective teaching and learning of the subject in Nigeria's secondary education landscape.

The implication of the study

The research findings have implications for the school authorities, instructors, students, and parents in that knowledge of contributory variables in physics commitment provides an option to limiting the level of failure associated with the subject. Perhaps, the finding implicates the improvisation approach as an effective strategy to enhance students' commitment to physics studies. More so, it implies an increased emphasis on the importance of improving the quality of improvised materials.

Conclusion:-

The present research aimed to investigate whether locally sourced instructional methods would enhance students' commitment to physics in secondary school. The research established a positive difference between the two conditions on commitment in physics in the post-test study. Thus, the study concludes that the locally sourced instructional methods are an essential low-cost teaching method that could improve secondary school students' physics classroom commitment. Therefore, the study contributes to the physics literature by supporting previous researches that promote the integration of locally sourced instructional methods in the classroom in Nigeria. Nonetheless, the sample size used in the study may pose a significant challenge for generalizing this result. Future researchers should include more representative samples and explore other moderating variables to broaden our understanding of this outcome. However, the study recommends the full integration of locally sourced instructional methods in the classroom and consistent training of instructors in this direction.

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