



RESEARCH ARTICLE

Improving Mathematical Skills among Rural Students in Kogi State Using Improvisation Technique

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Abstract

Mathematics remains an essential part of the education system in the educational landscape of Nigeria. It is a compulsory subject at all levels of education and a prerequisite for academic transition. Thus, proficiency in the basic concepts of mathematics is essential for educational progression and better adjustment in contemporary society. However, the subject has been fraught with challenges ranging from learner characteristics to instructional strategies. Intimations point to the prevalence of poor mathematical skills among rural students in the Kogi state of Nigeria. The present study aimed to test the effect of improvising instructional materials on improving math-related skills among students in the state's rural communities. The population of the study included primary school students. One hundred and eighty-six primary 5 and 6 students constituted the study samples. A quasi-experimental design was used. The result established a statistically significant difference between the experimental and control group on math skills. The study concludes that improvisation of mathematics instructional materials is a widely researched approach that could enhance the mathematics skills of primary school students in rural communities. The findings and recommendations are discussed.

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Introduction:-

Over the years, mathematics has assumed an essential subject in every level of the educational system of every society. It is viewed as a pathway to the concepts of shapes, quantity, size, and order used to describe a diverse phenomenon. The subject is an essential part of early learning in that it prepares the early learners for the challenge of reasoning and problem-solving. Mathematics is a ubiquitous part of every culture and assumes a significant position in our everyday lives. Perhaps, it encroaches into all aspects of human endeavors and contributes significantly to studying other science disciplines (Usman, 2002). Mathematics has proved to be the foundation of the education system of any nation regarding scientific development (Etuk & Bello, 2016; Festus, 2014; Josiah & Adejoke, 2014; Musa & Dauda, 2014). Perhaps, it is essential in the Sustainable Development Goals plan (Lafuente-Lechuga et al., 2020) and the development of the society (The Education Committee, 2021). Acquiring mathematical skills has been implicated as a prerequisite in achieving competency in the world of work. Thus, it is an essential component of science and technology (Li & Schoenfeld, 2019) and an indispensable tool in modern-day society. Hence, mathematical knowledge provides the pathway to successful future career opportunities (Hemmings et al., 2011). More so, proficiency in mathematics is a significant advantage in the contemporary business world (Maloney et al., 2013). It provides the learners with the skills to describe, analyze and manipulate variables.

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Extensive literature has highlighted the relevance of mathematics (see., Akinoso, 2018; Andrews, 2007; Charles-Ogan, 2015; Kachapova, 2014; Kusmaryono, 2014; Lai et al., 2011; Obadara, 2012).

Mathematics is a compulsory subject in Nigeria's educational system (Adebule & Ayoola, 2015; Ugodulunwa & Okolo, 2015) and an important school curriculum (Aguele & Usman, 2007). The relevance of mathematics is reflected in its requisite as a criterion for transition into post-primary and secondary education in Nigerian education (Anibueze, 2017). Mathematics is considered crucial in science, technology, and industrial setting. The aim of mathematics in the primary level curriculum is to equip the youngsters with logical reasoning abilities and higher education preparation. It is designed to prepare the learners with suitable scientific attitudes, abilities, and competencies to apply scientific knowledge in future challenges (Okori & Jerry, 2017). The mathematics syllabus for primary school students is designed to inculcate mathematical literacy (Ekwueme et al., 2013). Unfortunately, teaching and learning mathematics remains a considerable concern for educators at the primary level (Adedeji, 2018).

George and Amadi (2016) contend that mathematics is captured in abstract concepts. Accordingly, Usman (2002) noted that the subject cuts across every aspect of human activities and is crucial in every academic field. Ziegler and Loos (2017) described math as a science that explores hypothetical structures created by logical meanings. Similarly, research highlights the importance of math in accomplishing the technological goal in any nation (Ezeugo & Agwagah, 2000). Additionally, literature has emphasized the vital role of mathematics in academia and its implication in human and national growth and development (Uwaezuoke, 2013; Roohi, 2012). However, several authors have implicated innovations, experiences, and creativities as hindering mathematical objectives (Pound & Lee, 2020; Back, 2014).

The primary school level provides the step for acquiring the basic meaning of mathematics and its application in everyday life (Uwaezuoke & Charles-Ogan, 2016). However, the subject has been fraught with challenges. Ajagun (2000) asserted that the causes of low achievement in math had remained an issue of concern to all stakeholders. Over the years, math performance at the primary level has underscored the teacher's method and competence. Accordingly, research has implicated instructional materials and techniques in students' low achievement in math (Eniyeju & Azuka, 2010; Sule, 2009; Anene & Okpala, 2012; Adaramola, 2012; Ekwue & Umukoro, 2009). Additionally, others have attributed the poor math outcome in National examinations to teacher's inability to employ appropriate instructional strategies (Adebayo, 2010; Ali, 2010; Nwankwo, 2012).

Mathematical skills denote proficiency in basic math concepts such as numbers, sizes, or other measurements. Perhaps, basic concepts including addition, subtraction, multiplication, and division provide the basis for learning and proficiency in more advanced math-related tasks. Mathematical skills include numerical information and manipulation, essential for productive functioning in our progressively complex, technological society. However, mathematics learning requires some technicality level, meaning that continuing with the conventional mathematics approach might dampen the acquisition of math-related skills among rural students. Thus, implementing a system that is environment-specific compliance could improve mathematical skills. Improvisation of instructional materials entails the ability of teachers to create suitable learning material from the school context (George & Amadi, 2016). This is important in rural communities with limited learning resources (Okori & Jerry, 2017). Hence, improvisation symbolizes replacing the conventional learning materials with relevant material capable of improving motivation and learning.

Prior studies have suggested that urban school students had better achievement than rural students (Umar & Samuel, 2018). Various reports have supported this claim. For instance, extensive literature suggests that students from urban centers perform better in learning than their rural counterparts (Owoeye & Yara, 2011; Ramos et al., 2016; Ijenkeli et al., 2012; Chianson, 2012). Perhaps, this assertion has been attributed to factors such as the infrastructural deficit, pedagogical incompetence, and student's learning style. Accordingly, an observation of the math skills among students in the rural communities of Kogi state reveals that most students lack the basic knowledge of the subject. Given this revelation, the present study intends to examine the effect of material improvisation in improving mathematical skills among rural students in Kogi state, Nigeria. Specifically, the study's primary objective is to answer the question: would students in rural communities differ in mathematical skills when improvised learning materials are employed?

Method:-

The present study applied a quasi-experimental design with a pre-test, post-test control group. The population of the study comprised primary school students in the Kogi state of Nigeria. A total of one hundred and eighty-six (186) primary 5 and 6 students were randomly selected from different public primary schools in the rural communities of the states as the study samples. The study was conducted in the final term of the 2020/2021 academic session. Mathematics teachers in the selected primary schools were trained for the study. Thus, they were made conversant of the study procedures and guidelines. With the assistance of the school teachers, the samples were allotted into groups (experimental and control) group. Perhaps, before the main study, the samples were subjected to pre-tested research to determine their mathematical skills. After that, the primary research commenced with the experimental group being exposed to math learning with an improvised instructional approach while the control group was taught conventionally. The samples were later tested with a developed Mathematical Skills Test (MST) to assess their mathematical skills following the experimentation.

Result:-

The outcome of the pre-test and post-test analysis is presented in Table 1 below. The result shows that the recorded mean from the pre-test study for the experimental group is 53.34 while the mean from the control group is 52.69 resulting in a mean difference of 0.65 for the pre-test examination. Perhaps, the result indicates no significant difference in the respondent's mean scores on their level of mathematical skills. However, the mean score for the experimental group in the post-test study reveals a mean of 61.09 and 53.02 for the control group. A mean difference of 8.07 was recorded. However, the mean score gained for the two conditions is 7.75 and 0.33, respectively. Thus, the result revealed an increased mathematical skill by the experimental conditions than the control condition.

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

Group	N	Pre-test		Post test		Mean Gain
		Mean	Standard Deviation	Mean	Standard Deviation	
Experimental	90	53.34	13.46	61.09	14.07	7.75
Control	96	52.69	13.97	53.02	14.37	0.33
MD		0.65	8.07			

To answer the research question on whether there would be a significant difference in mathematical skills between students taught with improvised 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 groups on mathematical skills MD = 8.07, $t(184) = 5.262$, $p = .000$, as shown in Table 2 below.

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

Source of variation	N	Mean	SD	df	t	Sig
Experimental	90	61.09	14.07			
Control	96	53.02	14.37	184	5.262	.000

Discussion:-

The study aimed to investigate the effect of improvisation of learning materials on mathematical skills among students in rural settings. The above tables revealed that improvising instructional material for mathematics teaching increases students' mathematical skills. Thus, the result confirmed our expectation that there would be a significant difference between students taught with improvised learning materials and those acquainted with the conventional method. The tables above revealed that the experimental group differed from the control group, with a mean difference of 8.07 in the post-test. This means that at the pre-test level, the students almost have the same level of mathematical skills. However, when exposed to teaching using improvised materials, the students in the experimental group acquired increased mathematical skills. One reasonable explanation for this outcome is that students in rural settings are more adaptive to the contextual phenomenon. In other words, the conventional mathematical teaching materials might seem foreign, thus, perceive as complex. Indeed, similar studies have associated improvisation of learning materials with a positive learning outcome, especially in early education levels (Akano, 2018; Jacob, 2013; Obodo et al., 2020; Offor, 2021). Perhaps, the youngsters are keener to embrace quality learning alternative, especially when it is adapted from a familiar context. Therefore, improvisation of instructional

materials could provide a pathway to enhancing rural student's mathematical skills. In a related development, researchers have implicated the improvisation of materials in mathematical achievement (see., Miciano, 2005; Anibueze, 2017). Thus, improvisation of learning material reflects a positive approach to acquiring skills in mathematics and other subjects. For instance, Aina (2014) observed that students enjoy learning more when improvised material teaches physics. The present finding supports the existing literature advocating for the complete improvisation of learning material in rural schools.

Conclusion:-

The study aimed to investigate the improvisation of learning material as a learning approach that could improve the mathematical skills of rural students in Kogi state. Thus, the study established a significant difference between the experimental and the control group on the mathematical skills. It was concluded that improvising instructional materials is an indispensable teaching approach that could improve rural students' mathematical skills. The study implies that if teachers repeatedly employ this method in the mathematics classroom, especially in rural communities, the students might have more opportunities to express their capabilities due to their familiarity with the materials. The technique reflects a contextual learning approach that allows the unskilled mathematical student to recognize and adapt to the basic mathematical concepts quickly. Thereby, this method could improve the overall mathematical skills of the youngsters. Consequently, the sample size of the present study reflects a study limitation that could affect the generalization of the result. However, the study broadened our understanding of the possibility of improving rural student's mathematical skills. Therefore, the study recommends a consistent improvisation of mathematical materials and robust coaching of teachers in rural communities on improvisation.

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