

Teachers' Improvisation of Instructional Materials and Mathematics Learning Gains among Students in Kwara State: Counselling Implications

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ABSTRACT

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The purpose of this study was to investigate the assessment of teachers' improvisation and utilisation of instructional materials as determinants of mathematics learning gains among secondary school students in Kwara State: Counselling Implications. Descriptive research design of ex-post-facto type was used in the study. Three hundred and seventy two respondents were selected randomly from 10 Local Government Area in Kwara State, Nigeria. The respondents were measured with validated scale and the data obtained was analyzed using the Pearson Product Moment Correlation (PPMC) and Multiple regression statistical analysis. Three research questions were raised and answered in the study. The result showed that mathematics learning gains among secondary school students is significantly correlated with teachers' improvisation of instructional materials ($r = .863$; $p < .05$) and teachers' utilisation of instructional materials ($r = .783$; $p < .05$), the independent variables when pulled together have significant effect on mathematics learning gains (R (adjusted) $= .837$ & R^2 (adjusted) $= .745$) with 74.5% variance accounted for mathematics learning gains and each of the independent variables made a significant contribution to the prediction of mathematics learning gains. In view of these findings, the study recommended that relevant professional bodies like Mathematics Association of Nigeria (MAN) and Counselling Association of Nigeria (CASSON) should organize seminar or workshops during annual conferences to train teachers about the techniques that will be used to bring a total change in teaching mathematics contents.



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A. INTRODUCTION

Mathematics is one of the compulsory subjects that students must offer in the school system not minding whether such students intend to be a professional in science, commercial, arts or social science. In secondary school curriculum according to National Policy on Education (Varughese, 2017), mathematics is one of the core subjects that for the students to further their studies in institutions of higher learning especially in University, students are expected to have credit in it. However, mathematics is one of the subjects that is taken very seriously in the school system, irrespective of country or level of education. It has been described as a model of thinking which encourages learners to reflect and reason logically about a problem and communicate ideas, making it the central intellectual discipline and a vital tool in science, commerce and technology.

Mathematics learning gains (MLGs) is the outcomes and performance of students in the mathematics tests and examinations he/she has been exposed to. MLGs is a concept that has always been used synonymously with some concepts such as mathematics learning outcomes, mathematics academic achievement, mathematics academic performance and mathematics academic success among others (Mayanchi et al., 2019). MLGs is a key factor in education system as it serves a number of very important purposes and important for the students' families, as well as for the future of society, which is heavily dependent upon a well-educated citizenry.

From available statistics, Uwadie noted that it was only 48.88% of candidates who sat for November/December 2013 West African Senior School Certificate Examination (WASSCE) that has credit while the rest of 51.12% of the candidates failed in mathematics (Law et al., 2013). The 2014 May/June SSCE results also recorded mass failure by students across the country. Out of 242,162 students who sat for the examination only 23,042 representing 9.52% obtaining distinction, 15,752 representing 6.50% got credit while 101,321 representing 41.8% got pass. And 94,162 representing 38.9% failed while 7,886 representing 3.26% were involved in malpractice. By implication, only 16.02% (distinction and credit percentage) is qualified for admission into universities and polytechnics. It is on this basis that the present study concentrates on teachers' improvisation and utilisation of instructional materials: implications for MLGs among secondary school students.

Instructional materials are didactic materials which are supposed to make learning and teaching possible. According to Abdullahi (Aladejana, 2007), instructional materials are tools locally made or imported that could made tremendous enhancement of lesson impact if intelligently used. Isola referred to them as objects or devices, which help the teacher to make a lesson much clearer to the learner (Idongesit N. & Thelma U., 2019). Instructional materials are also described as concrete or physical objects which provide sound, visual or both to the sense organs during teaching (Kerkhoff & Makubuya, 2021). Instructional materials are in various classes, such as audio or aural, visual or audiovisual. Thus, audio instructional materials refer to those devices that make use of the sense of hearing only, like radio, audio tape recording, and television. Visual instructional materials on the other hand, are those devices that appeal to the sense of sight only such as the chalkboard, chart, slide, and filmstrip. An audio-visual instructional material however, is a combination of devices which appeal to the sense of both hearing and seeing such as television, motion picture and the computer.

The influence of instructional materials in promoting students' academic performance and teaching and learning in mathematics is indisputable. The teaching of mathematics in Nigerian secondary schools needs to be properly handled. As a result of immense contributes of mathematics to the national economic development, hence, the need to be taught thoroughly if it is to meet the educational and economic development cannot be overemphasis (Fang & Lee, 2021). There have been several studies on instructional materials and academic achievement of students. For instance, Isola (Voronina et al., 2017) correlated instructional materials usage with academic achievements of students in 10 subjects in West Africa School Certificate Examinations (WASCE) in Kwara State. In the same manner, Odukwe (Okori & Jerry, 2017) found that the use instructional materials are related to students' achievements in each of the selected subjects.

Improvisation of instructional materials refers to teachers' ability to generate appropriate instructional materials for the teaching of mathematical concepts that could made tremendous enhancement of lesson impact of students. Balogun (Alphonsus & Bola, 2013) identified two main constraints militating against the successful improvisation of mathematics instructional materials which are technical and human factors respectively. While the technical factors relate to the question of degree of accuracy and precision that is possible with the improvised equipment, the human factor relates to the teachers' skills in developing the resources while providing the appropriate learning experience to the learners. Also, Ogunleye (Shikha Kapur, 2015) reported lack of adequate professional training as a major problem militating against the effective use of local resources for Science teaching. Isola (Muraina, 2015) then stressed the need for a definite well planned training programme of improvisation for teachers. He suggested regular meaningful workshop on improvisation technique for science teachers to improve and up-to-date their competence.

Despite the effort of scholars and researchers in finding lastly solution to the problems of low learning gains among students in the school, little studies have concentrated on the teachers' improvisation of instructional materials especially in mathematics. Also, studies related to the use of instructional materials was majorly on other subjects and were studied mostly outside Nigeria and the need to examine teachers' improvisation of instructional materials on mathematics learning gains make this present study a peculiar one. Also, most studies conducted on learning gains in mathematics used only aspect of mathematics such as Algebra, Calculus, Simultaneous Equation, Trigonometry and word problem among others. In order to fill the gaps in the previous study and add more to the existing literatures, the present study intends to examine the teachers' improvisation and utilisation of instructional materials: implications for MLGs among secondary school students in Kwara State, Nigeria.

B. METHODS

The research design for this study was a descriptive survey research design of *ex-post-facto type*. This approach does not involve the manipulation of variables in the study. It is therefore, after the fact study. It neither add to nor deduct from the existing fact. The population for this study covered all secondary school students and mathematics teachers in 16 Local Government Area of Kwara State, Nigeria. Simple random sampling technique was used in this study. Ten (10) Local Government Areas were randomly selected in Kwara State. In each randomly selected LGA, 10 public secondary schools were randomly selected. Also, in each randomly selected secondary school, 4 secondary school mathematics teachers and 4 students were selected through balloting. On the whole, total numbers of participants selected were 400 students and 400 mathematics teachers.

Mathematics learning gains (achievement) test developed by Muraina (Prabakaran & Saravanakumar, 2020) was used to measure the students' mathematics learning gains. The test made up of multiple-choice of 25 item test with four options A-D. For scoring, each correct answer attracts 4 marks, making the total obtainable marks to be 100. The internal consistency of the test using Kruder-Richardson formula (KR) yielded a coefficient of 0.79; and also a reliability coefficient of 0.82. Teachers' improvisation of instructional materials scale developed by Balogun (Olibie et al., 2014) was used to measure the teachers'

improvisation of instructional materials. The scale has 10 items based on 5-points which are Strongly Disagree, Disagree, Undecided, Agree and Strongly Agree. The scale according to the Author had internal consistency of 0.70 and reliability indices of 0.81. The instrument was however re-validated and Cronbach alpha value of .83 was obtained after administering the instruments in a pilot study to a selected sample of twenty (20) secondary school teachers who are not part of the samples for this study at Ibadan, Oyo State, Nigeria.

Utilisation of instructional materials scale designed by Isola (Olibie et al., 2015) was used to measure the teachers' utilisation of instructional materials. The scale comprises of ten (10) adapted items which were all drawn on 5-point scale ranging from 'Strongly Agree' to 'Strongly Disagree'. Participants were supposed to tick the option that best described their utilisation of instructional materials. The scale has a reliability coefficient of 0.78. The instrument was however re-validated and Cronbach alpha value of .81 was obtained after administering the instruments in a pilot study to a selected sample of twenty (20) secondary school teachers who are not part of the samples for this study at Ibadan, Oyo State, Nigeria. The instrument was administered to the respondents on the day approved by the school authorities for the exercise. The researcher was assisted by trained research assistants in the administration and collection of the questionnaire. In each of the selected school, the administration and collection of instruments were done on the same day. On the whole, data collection lasted for 10 weeks. Out of 400 questionnaires administered only 372 were retrieved and used for data analysis. The data collected from the study was analyzed, using Pearson Product Moment Correlation (PPMC) and multiple regression statistical method at 0.05 level of significance.

C. RESULTS AND DISCUSSION

Research Question One: What is the relationship among teachers' improvisation and utilisation of instructional materials and mathematics learning gains among secondary school students?

Table1. Descriptive statistics and Inter-correlations among the variables

Variables	N	Mean	SD	1	2	3
Mathematics Learning Gains	372	29.40	13.69	1.00		
Instructional Materials Improvisation	372	25.00	9.06	.863**	1.00	
Instructional Materials Utilisation	372	28.35	7.92	.783**	.813	1.00

Correlation is significant at the 0.05 level (2-tailed)

Table 1 contains descriptive statistics and inter-correlations among the study variables. As shown in the table 1, mathematics learning gains among secondary school students is significantly correlated with teachers' improvisation of instructional materials ($r = .863$; $p < .05$) and teachers' utilisation of instructional materials ($r = .783$; $p < .05$). There were also significant correlations among the independent variables. The result of the first research question showed that mathematics learning gains among secondary school students was significantly correlated with teachers' improvisation and utilisation of instructional materials. In consistent with this finding, Isola who found correlation in the instructional materials usage with academic achievements of students in ten subjects in West Africa School Certificate Examinations (WASCE) in Kwara State (Suarez, 2011). In the same manner, Odukwe (Aborisade & Fajobi, 2020) found that the use instructional materials are related to

students' achievements in each of the selected subjects. The influence of instructional materials in promoting students' academic performance and teaching and learning in mathematics is indisputable. The teaching of mathematics in Nigerian secondary schools needs to be properly handled. As a result of immense contributes of mathematics to the national economic development, hence, the need to be taught thoroughly if it is to meet the educational and economic development cannot be overemphasis (Akinwande & Okunola, 2015).

Research Question Two: What is the joint contribution of teachers' improvisation and utilisation of instructional materials to the prediction of mathematics learning gains among secondary school students?

Table 2. Multiple Regression Analysis on Mathematics Learning Gains Data

Multiple R(adjusted)=.837				
Multiple R ² (adjusted)=.745				
Standard error of estimate= 3.83				
Analysis of variance				
	Sum of square (SS)	DF	Mean square	F
Regression	3252.76	2	1626.38	121.46
Residual	4941.03	369	13.39	
Total	8193.79	371		

From Table 2, it showed that the independent variables when pulled together have significant effect on mathematics learning gains among secondary school students. The value of R (adjusted) =.837 and R² (adjusted) =.745. The analysis of variance performed on the multiple regressions yielded an F- ratio value of 121.46 and was found to be significant at 0.05 levels. The variance accounted for 74.5% for the prediction. The result of the second research question showed that independent variables when pulled together have significant effect on mathematics learning gains among secondary school students with 74.5% variance of independent variables contributed to the prediction of mathematics learning gains. In correlation with this study, Ogunleye (Jonah et al., 2021) who found that lack of adequate professional training as a major problem militating against the effective use of local resources for Science teaching. Isola (Joseph & John, 2015) then stressed the need for a definite well planned training programme of improvisation for teachers. He suggested regular meaningful workshop on improvisation technique for science teachers to improve and up-to-date their competence.

Research Question Three: What is the relative contribution of teachers' improvisation and utilisation of instructional materials to the prediction of mathematics learning gains among secondary school students?

Table 3. Relative Contribution of Independent Variables to the Prediction

Model	Unstandardized coefficients		Standardized coefficients		t	p
	B	Standard error	Beta			
Constant	63.406	13.314			4.662	p<0.05
Instructional Improvisation	Materials	1.093	.293	.727	3.655	p<0.05
Instructional Utilisation	Materials	.613	.343	.359	1.801	p<0.05

From Table 3 it showed that each of the independent variables made a significant contribution to the prediction of mathematics learning gains among secondary school students. In term of magnitude of contribution, teachers' improvisation of instructional materials made the most significant contribution (Beta= .727; t= 3.655; p<0.05) to the prediction follow by teachers' utilisation of instructional materials (Beta= .359; t= 1.801; p<0.05). The result of the third research question showed that, each of the independent variables (teachers' improvisation and utilisation of instructional materials) made a significant contribution to the prediction of mathematics learning gains among secondary school students. In term of magnitude of contribution, teachers' improvisation of instructional materials made the most significant contribution to the prediction follow by teachers' utilisation of instructional materials. In line with this finding, Balogun (Ibrahim Wushishi & usman, 2013) who found that two main constraints militating against the successful improvisation of mathematics instructional materials which are technical and human factors respectively. While the technical factors relate to the question of degree of accuracy and precision that is possible with the improvised equipment, the human factor relates to the teachers' skills in developing the resources while providing the appropriate learning experience to the learners.

D. CONCLUSION AND SUGGESTIONS

This research work has been able to examine teachers' improvisation and utilisation of instructional materials as correlates of mathematics learning gains, and the result showed a positive correlation between teachers' utilisation of instructional materials and improvisation of instructional materials having significant correlation with mathematics learning gains. It is therefore concluded that both the parents, teachers, students and even the government should as a matter of urgency should rise to put programmes in place to get teachers more involved in educational life of their wards by providing and using appropriate instructional materials in the teaching of students; tackle the menace of poor teachers' utilisation of instructional materials which is about to rampage the educational system.

Having gone through the study the following recommendations are therefore highlighted for consideration by counselling psychologists, educational managers, teachers, parents/guardians, curriculum planners, NGOs and the government as follows: (1) Teachers should be trained on the need for the improvisation and utilisation of instructional materials in the teaching of mathematics to the students; (2) School activities should be painted in a way that seems interesting and appealing, so that students become more engaged in the school activities. This is especially fundamental for enhanced educational achievement of

students in mathematics; (3) Government should employ qualified counselling psychologist to schools to help facilitate adequate counseling processes in order to abolish low mathematics learning gains in the school system; and (4) Relevant professional bodies like mathematics Association of Nigeria (MAN) and Counselling Association of Nigeria (CASSON) should organize seminar or workshops during annual conferences to train teachers about the techniques that will be used to bring a total change in teaching mathematics contents in order to reduce if not remove poor mathematics learning gains.

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