TEXTBOOK UTILIZATION AND CLASS PARTICIPATION AS PREDICTORS OF PUPILS' ACADEMIC ACHIEVEMENT IN MATHEMATICS

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Abstract

The study investigated textbook utilization and class participation as predictors of academic achievement in mathematics in Ilorin West Local Government Area of Kwara State. Survey research design was adopted for this study. 480 primary six pupils were randomly selected. Three (3) research instruments were used for data gathering- Questionnaire on Pupils' Utilization of Mathematics Textbooks (QPUMT), Observation Scale Measuring Pupils' Participation in Mathematics Class (OSMPPMC) and Mathematic Achievement Test (MAT). Both QPUMT (α =0.84) and OSMPPMC (α =0.87) were validated and tested for reliability with Cronbach's Alpha while MAT(K-R 20 =0.72) was equally validated and tested for reliability with the use of Kuder-Richardson Formular 20(KR20). Analysis of data was carried out using multiple linear regression. The findings showed that there was positive relationship among textbook utilization (r = .597), class participation (r = .607) and pupils' academic achievement. The predictor variables were significant in their composite contribution to the prediction of academic achievement in mathematics ($F_{(2,477)} = 267.963$; R = .727, R^2 =.529, Adj. R^2 = .527). About 53 % of the variation in pupils' academic achievement in mathematics was accounted for by the predictor variables. Also, the predictor variables were significant in their relative contribution to the prediction of academic achievement in mathematics. Class participation of the pupils had the highest predictive rate of academic achievement in Mathematics. Based on the findings, it was recommended that teachers should use teaching strategies or methods that will foster active participation of pupils in Mathematics class.It was also recommended that pupils should make use of the recommended Mathematics textbooks.

Key words: Textbook utilization, Class participation, Academic achievement

Introduction

Mathematics education is to a nation what protein is to a young human organism. As a vital tool for the understanding and application of science and technology, mathematics is seen by society as the foundation of scientific and technological knowledge that is vital to the social- economic development of the nation. Mathematics occupies a pivotal position in Science and Technology and is needed by everybody and in every aspect of human endeavor. Because of this, Mathematics is a compulsory subject at both primary and secondary levels in Nigeria. Mathematics is also used as a basic entry

requirement into any of the prestigious courses such as medicine, architecture and engineering among other degree programmes. Despite the important role Mathematics plays in society, there has been poor performance in the subject at national examinations.

A close examination of mathematic unfolded that the subject has been identified as the most disliked subject in school, with pupils' performance worsening from year to year at all levels of education (Brown, Brown and Bibby, 2008). Research findings in Nigeria have shown that the performance of pupils in primary mathematics is below average and that the problem solving skills of the pupils is poor. In a report prepared by Nigeria Education Sector Analysis (ESA, 2004), the national percentage of mean scores of primary four and six pupils in numeracy are put at 33.7 and 35.7 respectively.

Similarly, the National Assessment of the Universal Basic Education Programme presented the performance of primary six pupils across the nation in 2009. The results revealed that only three states out of the thirty-six states and the Federal Capital Territory had average scores that is up to average- Bayelsa State (Mean= 55.96%), Jigawa State (58.26%) and Osun State (Mean= 54%). Fifteen states have mean scores that are not up to pass mark. Their scores range from 23.35% for Kano State to 29.23% for Ondo State. The national mean score is 42.87% which was below average (NAUBEP, 2009).

Considering the status and the importance of mathematics in various spheres of our national life, this poor learning situation associated with it should not be allowed to continue. This raises a serious concern. If the trend is unchecked, it will undermine national development. Today, technology is the mainstay of any societal development and mathematics has been recognized as the bedrock of technology and sciences (Adeyemo and Adetona, 2007; Awofala, 2008; Rasheed, 2008). In fact, we are at an age where no human endeavour could survive or develop without the application of mathematics and/or technology since almost all kinds of job have been computerized. Apart from this, the subject develops the computational skills of the pupils, skills for solving the day-to day problems that require mathematical knowledge. It forms the basis for further education in almost all fields of study in all higher institutions (Tella, 2009).

Today, mathematical methods are applied in most areas of human endeavour and as such mathematics learning plays a fundamental role in economic development of a country. In her match towards scientific and technological advancement, Nigeria needs good performance in mathematics for students at all levels of education. Therefore, all hands must be on deck to ensure improvement in the academic achievement of pupils in mathematics at primary school level where solid foundation for further studies could be laid. This is why a study of this nature is important and necessary.

Textbook utilisation has to do with the extent to which pupils' make use of recommended texts within and outside the Mathematics classroom. Rezat (2010) reported that adequate textbook utilisation enhances academic achievement in Mathematics. However, Nwangawu (2008) reported that there is no significant relationship between students' text utilisation and academic achievement in Biology. Ademola (2005), Olajimbiti (2005) and Ogunyinka (2011) investigated the extent to which students utilise library texts and found that students do not read prescribed texts but rely on study notes on the texts. Oduwole (2011) investigated text utilisation as a predictor of students' academic achievement in English Language and found a positive relationship between textbook utilisation and academic achievement. However, these cited studies do not investigate textbook utilisation as a predictor of academic achievement in Mathematics. However, Clark and Graves (2008) emphasized that there is no significant positive relationship between utilisation of Literature in English textbooks and student achievement. Adegbile (2013) found that textbook utilisation has a significant relationship with students' learning outcomes in Literature in English, but the research was based on Literature in English students from Ondo State alone.

The cited studies on textbook utilisation have not come out with conclusive findings on the extent to which textbook utilisation influences students' achievement in academic subjects, and most of these studies have been carried out in subjects other than Mathematics. Hence, there is need to investigate into the relationship between textbook utilization and academic achievement in Mathematics, particularly at primary level of education.

The involvement of pupils in the teaching and learning processes has been described as class participation, which is one of the variables of interest in this study. It has been noted by Green (2008) that learners who raise their hands and respond to the teacher's questions do better than others who do not overtly participate in classroom activities. This means that class participation could be well organised to help learners interact more with learning materials to enhance assimilation of facts presented in a subject. Ezenandu, (2011) revealed that students' class participation positively influences their learning outcome. Ogunsola (2008) asserted that students who are allowed to express and exchange their opinions in class through interaction with the teacher and other learners, showed improvement in academic achievement and attitude to the subject. In the words of Amokeodo (2012), class participation has influence on students' academic achievement in Literature in English. Onwunde (2005) unfolded that students' class participation can help teachers to determine students' learning interests, develop students' oral skills and their feeling of confidence.

Javaria (2008), Ogaboh, Ikoh and Ashibi (2010) and Olaoluwa (2012) discovered that class participation positively influences students' success in academic. This adds colour to the research findings of Orji (2004) who found a significant positive relationship between students' class participation and their learning outcomes in chemistry. Okusaga (2004) subscribed to the fact that patterns of interaction in classroom determine students' outcome in English Language. However, the cited studies on class participation are more on other school subjects than Mathematics. Again, the available studies covered geographical areas other than Ilorin West Local Government Area of Kwara State. Hence, this justified why this study was conducted.

Research Questions

1. What relationship exists between the predictor variables (textbook utilization and class participation) and the criterion variable (pupils' achievement in mathematics)?
2. What is the composite contribution of the predictor variables (textbook utilization and class participation) to the prediction of criterion variable (pupils' achievement in mathematics)?
3. What are the relative contributions of each of the predictor variables (textbook utilization and class participation) to the prediction of the criterion variable (achievement in mathematics)?

Methodology

The study adopted a correlational survey research design. The study sampled 480 pupils from 12 primary schools which were randomly selected from 241 duly registered schools in Ilorin West Local Government Area of Kwara State. 40 pupils were selected from each of the schools. Three research instruments- Questionnaire on Pupils' Utilization of Mathematics Textbooks (QPUMT), Observation Scale Measuring Pupils' Participation in Mathematics Class (OSMPPMC) and Mathematic Achievement Test (MAT), were used for data gathering. QPUMT was divided into two parts. The first part was aimed at obtaining information on pupils' demographic data, while the second part addressed pupils' level of textbook utilization in Mathematics. It consisted 16 items placed on a three-point Likert-scale of Agree (A), Don't Agree (DA) and Disagree (D). QPUMT was validated by lecturers in Department of Teacher Education who ensured that the content and face validity of the instrument was examined. A trial test of the instrument was carried out and data generated were analysed using

Cronbach alpha and the reliability co-efficient stood at 0.84. The observation scale measuring pupils' participation was designed by the researcher to collect information on how pupils participated in mathematics Classes. OSMPPMC was adapted from Amokeodo (2012). The pupils were observed and rated with three likert-point scale, using certain criteria which focused on what the pupils demonstrate. The instrument was divided into two sections – A and B. Section A was designed to get personal information like name of school, teacher in charge of the class, Pupil's gender, subject, topic, and the date of observation from respondents. Section B comprised of six (6) criteria which was rated at three-likert point scales of 'Quite often', 'Sometimes' and 'Almost Never'.

Each of the six (6) criteria embraced different aspects of classroom participation. The criteria were incorporated to rate pupils who are active participants and those who were passive participants in mathematics classes. The criteria on the observation scale measured the extent to which pupils ask questions calling for factual information, explanation and clarification. The criteria also included the extent to which they give opinion, constructive criticism as well as their response to teacher's questions. Pupils were rated on each of the criteria. The researcher gave the instrument to lecturers in the Faculty of Education, University of Ibadan, who helped to establish its content and face validity. The lecturers made their observation known and offered useful suggestions for improvement. The instrument was trial-tested on 35 primary six pupils in Ilorin, Kwara State, who were not part of the participants of the study. Cronbach Alpha was used to establish the reliability of the instrument and the coefficient of the items was established at 0.87.

The observation and rating of the class participation of the pupils was conducted thrice. The three observations of pupils in mathematics classes, in each of the schools were conducted during mathematics class. The researcher and the research assistants observed the three live lessons on mathematics in each school and used the classroom participation scale to rate the involvement of pupils in classroom.

MAT was a twenty-item test developed by the researchers. The items in MAT were validated and their internal consistency, using Kuder-Richardson Formular 20 (KR20), was estimated to be 0.72. Data analysis was carried out using standardized multiple linear regression.

Results

Research Question One

What relationship exists between the predictor variables (textbook utilization and class participation) and the criterion variable (pupils' achievement in mathematics

Table 1: Relationship between textbook utilization and class participation, and pupils' academic achievement in mathematics.

Variables	Pupils' Academic Achievement in Mathematics	Textbook utilization	Class participation
Pupils' Academic Achievement in Mathematics	1	.597*	.607*
Textbook utilization	.597	1	.370
Class participation	.607	.370	1
Mean	56.8313	12.5125	29.1104
S.D	14.63925	2.11364	6.01722

In table 1, it is shown that there was positive relationship between textbook utilization (r = .597), class participation (r = .607) and pupils' academic achievement in mathematics.

Research Question Two

What is the composite contribution of the predictor variables (textbook utilization and class participation) to the prediction of criterion variable (pupils' achievement in mathematics)?

Table 2: Composite contribution of each of the predictor variables to the prediction of pupils' academic achievement in Mathematics.

Df	Model	Sum of Square	Mean Square	F	Sig.
2	Regression	54312.546	27156.273	267.963	.000
477	Residual	48340.785	101.343		
479	Total	102653.331			
R = .727 R^2 = .529* Adj. R^2 = .527*					

It is shown in table 2 that textbook utilization and class participation were significant in their composite contribution to the prediction of academic achievement in mathematics ($F_{(2,477)} = 267.963$; R = .727, R^2 = .529, Adj. R^2 = .527). About 53% of the variation in pupils' academic achievement in mathematics was accounted for by the predictor variables.

Research Question Three

What are the relative contributions of each of the predictor variables (textbook utilization and class participation) to the prediction of the criterion variable (achievement in mathematics)?

Table 3: Relative contribution of each of the predictor variables to the prediction of pupils' academic achievement in Mathematics

Model	Unstandardized Coefficient		Standardized Coefficient	T	Sig.	Ranking
	B	Std. Error	B			
(Constant)	-12.242	3.057		-4.005	.000	
Textbook Utilization	2.988	.234	.431	12.757	.000	2
Class Participation	1.088	.082	.447	13.228	.000	1

In table 3, the result showed the relative contribution of each of the predictor variables to the prediction of pupils' academic achievement: Textbook utilization (β = .431, P < .05) and class participation (β = .447, P < .05). This indicated that the predictors' variables were significant in their relative contribution to the prediction of criterion variable.

Discussion of Findings

The result of the study shows a significant positive relationship between textbook utilization and academic achievement in Mathematics. The finding concurs with the findings of Ademola (2005), Olajimbiti (2005) and Ogunyinka (2011) who reported a positive relationship between textbook utilization and academic achievement. Adegbile (2013) also reported a significant relationship between

textbook utilization and student learning outcomes. However, it contradicts that of Clark and Graves (2008) who reported that there is no significant relationship between textbook utilization and success in academics. It also contradicts that of Nwangawu (2008) who reported that there was no significant relationship between students' textbook utilization and academic achievement in Biology. Similarly, Oyedele (2007) and Odetokun (2008) found no significant relationship between textbook utilization and learning outcomes.

The findings of the study also unfolded that there was significant positive relationship between pupils' class participation and their academic achievement in Mathematics. The result of this study corroborated the findings of researches such as Onwunde (2005), Fakeye (2010), Ogunsola (2008) and Amokeodo (2012) who reported a significant positive relationship between students' class participation and their academic achievement. The finding also coincided with that of Javaria (2008), Ogaboh, Ikoh and Ashibi (2010) who reported that class participation was a good predictor of academic achievement. Ugbodovon (2003), Ogar (2005) and Okusuga (2004) all agreed that the pattern of interaction in classroom determine students' learning outcome

Conclusion and Recommendations

Based on the findings of the study, it can be concluded that textbook utilization and class participation are capable of predicting academic achievement in mathematics. In the light of this conclusion, the following recommendations were made:

- Pupils should be made adequately engaged with the recommended Mathematics textbooks and not just teachers' notes or commentaries on the texts that will not give the pupils a firsthand knowledge of what is in the recommended textbooks.
- Lessons should not be teacher-dominated, but pupils should be made to participate in the teaching-learning process in order to make learning easier and more permanent. To this end, teachers should use teaching strategies that will foster active participation ofpupils in Mathematics class.

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