Effect Of School Librarians’ Involvement On Pupils’ Production Of Learning Materials In Mathematics

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ABSTRACT
This study investigated the effect of school librarians’ involvement on pupils’ production of learning materials in mathematics. The study adopted a quasi-experimental nonequivalent control group design. The sample of the study comprised of one hundred and twenty (120) primary five pupils drawn by simple random sampling techniques from four primary schools in Oji-River Local Government Education Authority of Enugu State. The four schools were assigned to experimental and controls groups respectively. Six research questions and six null hypotheses guided the study. The null hypotheses were tested at 0.05 level of significant. The instrument used for data collection was researchers -made Mathematics Achievement Test basically on geometry aspect of Mathematics. The instrument was validated by five experts. Achievement Test was trial-tested to determine its internal consistency using the K-R0 (Kuder Richardson) procedure and this yielded a reliability estimate of 0.80. Estimate of temporal stability for Mathematics and Achievement Test was also determined using Pearson Product Moment Correlation and the coefficient of 0.79 was obtained. Mean, Standard Deviation and Analysis of Covariance (ANCOVA) were used for the analysis. Major findings of the study indicated that involving school librarians on pupils’ production of learning materials significantly enhanced their achievement in Mathematics.

Keywords: Learning materials, Mathematics, Pupils’ achievement, School librarians

Introduction
Over the years, the role of school librarians in the overall success of pupils cannot be overemphasized. Moreover, school librarians have significantly contributed immensely towards the progress primary education. In recognition of the role school librarians on primary education,
the Federal Republic of Nigeria in her National Policy on Education (FRN, 2013) states that the objectives of primary education include: inculcate permanent literacy, numeracy and ability to communicate effectively; lay a sound basis for scientific, critical and reflective thinking; promote patriotism, fairness, understanding and national unity; instill social, moral norms and values in the child; develop in the child the ability to adapt to the changing environment and provide opportunities for the child to develop the manipulative skills that will enable the child function effectively in the society within the limits of the child’s capacity, participation in and conservation to the life of the society. Also, to mould the character and develops sound attitude and morals in the child, develop in the child the ability to adapt to the child’s changing environment. The goal also stated that the child be given opportunities for developing manipulative skills that will enable the child function effectively in the society within the limits of the child’s capacity. In order to achieve these objectives, librarians should be involved in the production of learning materials.

Furthermore, Nigeria prescribed that the curriculum of this level of education will include Mathematics in order to help achieve the educational goals of the nation. Mathematics is a science subject that deals with numbers. Mathematics according to Obodo (2009) is a study of national phenomena and also an unending activity without limitation. This implies that the child’s conspicuous progress and advancement made in science and technology are dependent on Mathematics. Brooks (2010) defined Mathematics as an activity concerned with logical thinking, spotting patterns, posing, premises and investigating their implications and consequences. Mathematics is concerned with numeracy or arithmetic. Mathematics is the ability to reason and apply simple numerical concepts. It also involves the study of the properties of numbers and shapes, the relationship between numbers, indicative and deductive thinking and the formation of generalization (Usman, 2009). Further, Usman stated that Mathematics is a creation of human mind and becomes primarily a way of thinking thus facilitating problem solving. Operationally, Mathematics is made up of sub-divisions which include: arithmetic, algebra, geometry, trigonometry and measurement.

The increasing importance and contribution of Mathematics to modern culture of science and technology has been very well established (Obodo, 2009). Mathematics is the bedrock of primary education because it is concerned with activities such as logic, spotting patterns, posing premises and investigating their implications to the study. Indeed without Mathematics, there is no science; without science there is no modern technology; and without modern technology there is no modern society, (Okoro, 2000). Harbour-Peters (2002:29) agreeing with this view simply said, “Mathematical and scientific concepts are basic to technological advancement while applications of technological products have greatly facilitated studies in Mathematics and sciences”. Further, Harbour-Peters noted that there could be no real development technologically without a corresponding development in Mathematics both as conceived and practiced. Mathematics is the key to science based courses. Usman (2009) affirmed that success in the subject enhances the quality of certificates. A credit pass in Mathematics is prerequisite for securing admission into almost all science based courses at the tertiary level of education. This position necessitated the endorsement of Mathematics as one of the core subjects in both primary and secondary schools. In other words, Mathematics is a compulsory subject at primary and secondary levels of education (Ibraheem & Ogunusi, 2011).
However, despite the fact that every individual needs mathematical knowledge to function effectively and efficiently in today’s world, it has been reported that many pupils at the primary school level are not doing well in Mathematics (Harbour–Peters, 2000). Likewise, Iji (2010) pointed out that there is poor achievement of pupils in simple arithmetic due to lack of learning materials. Iji further stated that many pupils at the primary school levels perform poorly in Mathematics. Amazigo (2010) found out in a research that pupils rarely score 50% in Mathematics class test. In addition, the First School Leaving Certificate Examination Chief Examiner’s reports have continued to show that the achievement of the majority of pupils in primary school Mathematics is below expectation. One aspect of Mathematics that is challenging to learners is geometry.

Geometry is the study of art and design, construction and measurement. It is the oldest branch of Mathematics (Okoro, 2009). Geometry is defined as a science of the properties and relation to lines, figures, surface, solids and angles (Timky, 2010). It is used for describing and measuring figures. Geometry is a process of visual representation of concepts and processes from other areas in Mathematics and other sciences such as diagrams. It is an ideal example for teaching deductive reasoning and a tool in application of both traditional and innovative techniques. In the context of this study, geometry aspect of Mathematics will be dealt with because pupils’ found this aspect of Mathematics very difficult to understand. Timky pointed out that a basic knowledge of geometric concept their attributes and relation is fundamental for children to interact effectively with their environment. Therefore, teachers of Mathematics should possess adequate knowledge of geometry aspect of Mathematics in order to increase Mathematics achievement especially at the primary school level.

The alarming poor state of Mathematics education in Nigerian primary schools needs to be documented. Ogum (2006) stated that the deplorable state of primary educational system especially in Mathematic will continue to be a major deterrent, not only to the nation but also to the realization of the economic goals of vision 2030 if not urgently arrested. Betiku (2012) expressed that despite the relative importance of Mathematics it is very disappointing to note that pupils’ achievement in the subject at both internal and external examinations has remained consistently poor. IN Oji-River Education Authority in particular, most pupils are not involved in the production of learning materials during teaching and often perform poorly on Mathematics Ale. (2009) Amazigo, (2010); and Agwagah, (2011). Brousand and Ndukwe reports lend credence to the fact that pupils’ performance in verbal, written and mathematical domains has declined so considerably that other alternatives to improving academic achievement among pupils have been sought with no significant improvement. This indicates a very high achievement gap across schools which must be bridged if pupils are to advance and excel in their academics. The low outcome is an indication of low retention of what is taught and subsequently, poor achievement (Ekpo, 2010). Based on this background, the purpose of this study was to determine the effect of school librarians’ involvement on pupils’ production of learning materials in mathematics; while the hypothesis that there is no significant difference in the mean Mathematics achievement scores of pupils exposed to learning materials production with librarians’ involvement and those exposed to learning materials production without librarians’ involvement was tested at 0.05 level of significance.
Method

Design of the Study
The quasi-experimental research design was adopted for the study. The study was carried out in all public primary schools in Oji-River Local Government Education Area of Enugu State. It has both urban and rural areas, with the sample size of the study comprised 120 primary five pupils, (50 males and 70 females) drawn from four public primary schools in the Oji-River Local Government Education Authority of Enugu State.

Instrument for Data Collection
One instrument was developed and used for the study. The instrument was the researchers constructed Mathematics Achievement Test basically on Geometry. The instrument was developed by the researchers with the help of some qualified Mathematics teachers in primary schools and other experts in science education. Geometry aspect of Mathematics was chosen because it is a topic area in which pupils have been observed to have poor outcomes. Twenty multiple-choice test items based on the topics selected for the study was used. The objectives test covered the following topics; Basic Properties of Plane Shapes, Area of Plane Shapes, Measurements, Cutting, and Folding of Plane Shapes as contained in the primary five mathematics curriculum. To develop the instrument, a test blue print was designed and used in guiding the construction of the test. The 20 multiple-choice questions tested pupil’s ability on knowledge (KWL), Comprehension, (COM), Application (APP), Analysis (ANL), Synthesis (SYN and Evaluation (EVA). Also, the questions took into cognizance the children’s intellectual ability, age and language. Each question was scored five marks.

The face and content validity were established for the Mathematics Achievement and Retention Test basically on Geometry. To ensure the face validity of the instrument the test blue print for Mathematics Achievement and Retention Test were presented to five experts, one in Childhood Education, one in Arts Education (Educational Technology), one in Measurement and Evaluation, one in Psychology and one in Mathematics Education all from Faculty of Education, University of Nigeria, Nsukka.

The researchers trial tested the instrument by administering the items on 20 primary five pupils who were drawn from Enugu Road Primary School, Nsukka. Thereafter, the scores of the pupils from first and second administration of the instruments were correlated using Pearson Product Moment Correlation Coefficient (r) and this yield value of 0.79.

Development of Instructional Programmes
The researchers prepared two sets of lesson plans. One set for the experimental group using learning material with librarians’ involvement and the other set for the control group using learning materials production without librarians’ involvement. For each lesson topic, a lesson plan was prepared by the researchers with the help of experts in Library and Information Science, Science Education and Mathematics. Each lesson plan was designed for use in teaching for 40 minutes per period. The samples of the lesson plans for both experimental and control groups are attached.

The researchers organized one week briefing for the regular class teachers as research assistants of the individual schools and the class of the study. These helped the researchers to
control any error which may arise as a result of teacher difference. The researchers conducted separate briefing for the teachers in experimental groups and the additional lecture method respectively. The researchers introduced and explained each of these methods to the four class teachers. The two approaches are identical in terms of content instructional objectives and mode of evaluation. The only difference is the instructional method the individual teachers used. The researchers briefed the teachers separately. The researchers discussed the procedure approach for the teacher using learner participation in production of learning materials. The researchers had first of all presented an overview of each day lesson tasks on the topic to be covered.

In the control group no actual lesson was taught by the teacher with emphasis on particular method of teaching. The control groups were taught the same concept using traditional lecture method. All topics were treated in details and the researchers laid more emphasis on the method to be used. The briefing helped the researchers to detect individual problems of the teachers that might introduce error in the study. The regular class teachers conducted the teaching in there different classes while the researchers went regularly to supervise the teaching to ensure that the teachers did not deviate from the normal procedure.

**Experimental Procedure**

Before the commencement of the briefing, the researchers sought the cooperation of the head teachers, and school librarians of the school involved to enable the researchers build in her research programme into the school schedule without disrupting the school activities. The researchers did this by explaining the purpose of the study and the benefit that could be derived if properly conducted. This helped the researchers to obtain their cooperation throughout the study. The conduct of the study was taken during the normal school lesson periods, following the normal timetable of the school in each school used for the study. The regular school (Mathematics) teachers of the sampled classes were briefed thoroughly on how to administer the instrument.

Four regular primary school teachers in the selected schools served as research assistants in the study and they were briefed for two days by the researchers on how to teach using the lesson plans. Each teacher was given the validated lesson plan to enable get used to it and to avoid teacher bias. The researchers prepared a time table for monitoring the teachers teaching in their respective schools during the experiment.

On the first day of the experiment before the treatment commenced, the Mathematics Achievement and Retention Test basically on geometry were administered to children of both schools as pre-test. The treatment lasted for six weeks. At the end of the treatment, post-test and post-retention for Mathematics Achievement and Retention Test basically on geometry were administered to the children. Test items for the both post-test were the same with the pre-test. Data for the pre-test, post-test and post retention were recorded separately for each of the pupils in the experimental groups and were used for analysis according to the demands of the research questions and hypothesis.

Thereafter, experimental groups were taught using learners’ participation in production of learning materials while the control groups were taught using lecture method. The scripts were marked and scored using the marking scheme. The scoring was based on 100 percent.

**Method of Data Analysis**
Data collected for the study were analyzed as follows: mean and standard deviation were used to answer all the research questions. The hypothesis was tested using analysis of covariance (ANCOVA) at 0.05 level of significance. Analysis of covariance (ANCOVA) was used in order to take care of the errors of initial difference in the ability level among the research subject. The pre-test scores were used as covariates for achievement.

Results

Table 1: Mean and standard deviation of Mathematics achievement scores of pupils experimental and control groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Experimental</td>
<td>60</td>
<td>41.65</td>
</tr>
<tr>
<td>Control</td>
<td>60</td>
<td>42.13</td>
</tr>
</tbody>
</table>

Table 1 shows that the pupils exposed to learning materials production with librarians’ involvement had mean achievement score of 62.55 with a standard deviation of 9.50 at the post-test against their pre-test mean achievement score of 41.65 with standard deviation of 6.26 while those who participated in the production of learning materials without librarians’ involvement had mean achievement score of 54.58 with a standard deviation of 4.38 at the post-test against their pre-test mean achievement score of 42.13 with standard deviation of 5.56. Mean gain scores of 20.90 and 12.45 for the two groups respectively imply that the pupil who participated in production of learning materials with librarians’ involvement had a higher post-test mean achievement score than their counterpart. However, the post-test standard deviations of 9.50 and 4.38 for the two groups respectively imply that the pupils in the experimental group varied much in their individual achievement scores than the pupils in the control group.

Table 2: Analysis of covariance of the effect of with librarians’ involvement on pupils’ production of learning materials on their achievement in Mathematics

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2157.959a</td>
<td>4</td>
<td>539.490</td>
<td>9.988</td>
<td>.000</td>
<td>.258</td>
</tr>
<tr>
<td>Intercept</td>
<td>4606.193</td>
<td>1</td>
<td>4606.193</td>
<td>85.279</td>
<td>.000</td>
<td>.426</td>
</tr>
<tr>
<td>Pre-test</td>
<td>16.246</td>
<td>1</td>
<td>16.246</td>
<td>.301</td>
<td>.584</td>
<td>.003</td>
</tr>
<tr>
<td>Treatment</td>
<td>1692.577</td>
<td>1</td>
<td>1692.577</td>
<td>31.336</td>
<td>.000</td>
<td>.214</td>
</tr>
<tr>
<td>Gender</td>
<td>29.368</td>
<td>1</td>
<td>29.368</td>
<td>.544</td>
<td>.462</td>
<td>.005</td>
</tr>
<tr>
<td>Treatment * Gender</td>
<td>193.642</td>
<td>1</td>
<td>193.642</td>
<td>3.585</td>
<td>.061</td>
<td>.030</td>
</tr>
<tr>
<td>Error</td>
<td>6211.508</td>
<td>115</td>
<td>54.013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>419976.000</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>8369.467</td>
<td>119</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .258 (Adjusted R Squared = .232)
Table 2 shows that the probability associated with the calculated value of $F (31.336)$ for the effect of pupils’ participation in the production of learning materials on their achievement in Mathematics is 0.000. Since the probability value of 0.000 is less than the 0.05 level of significance that is ($p < 0.05$), the null hypothesis was rejected meaning that there is a significant difference in the mean Mathematics achievement scores of pupils exposed to learning materials production with librarians’ involvement and those exposed to learning materials production without librarians’ involvement was tested at 0.05 level of significance. The partial Eta Square value (effect size) of 0.214 shows that pupils’ participation in the production of learning materials had low effect on the pupils’ achievement in Mathematics.

**Discussion of the Findings**

Finding of the study revealed that the pupils exposed to learning materials production with librarians’ involvement differ from those exposed to learning materials production without librarians’ involvement. Pupils who were taught Mathematics using learners’ participation in the production of learning materials with librarians’ involvement achieved significantly higher than those not exposed. Findings also showed that there is a significant difference in the mean Mathematics achievement scores of pupils exposed to learning materials production with librarians’ involvement and those exposed to learning materials production without librarians’ involvement. The studies conducted by Olagunju (2008), Ogar (2007) and Peters(2012) provided credence for the present study. The studies showed that there is a significant difference in the Mathematics achievement of pupils who participated using learners’ participation in the than their counterparts.

The findings of this study agreed with the findings of Ogar who found that students taught with instructional materials achieved better than the group taught without. The findings also, agreed with the findings of Olagunju who found that students’ participation in learning materials production enhanced students’ achievement in geometry. The findings of this study equally corroborated the findings of Jones (2010) who noted that exposing pupils to the use of learning material production leads to superior achievement of those not exposed to the method. The findings of this study suggest that learning material production help pupils to actively be in-charge of the learning process and to monitor the progress in the learning exercise. As pupils are deeply involved in active learning, they are able to learn the processes involved in solving Mathematical problems. Also, the findings agreed with the findings of Usman and Obidoa (2011) who found that learning materials production and innovative teaching methods enhance the implementation of Mathematics curriculum. The findings are unsupported of the finding of Peters (2012) who found that production of learning materials during teaching promotes pupil’s development of cognitive skills. In similar vein, the findings equally corroborated the findings of Stephen (2013) who found that the use of picture books during teaching increases learners’ participation in science. The studies which are all supported by the findings of the present study are indications that pupils’ participation in the production of learning materials promotes achievement. This finding could be largely due to the fact that pupils learn by doing not by mere listening or observing. When pupils participate in the production of learning materials they will use during teaching and learning, it makes learning an exciting and enjoyable venture not a boring exercise and thereby enhances achievement.
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