

The Revealing Aftermath of Mathematical Terms' Simplification on Pedagogy and Performance in Public Secondary Schools in Ekiti State

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Abstract:

The study investigated the aftermath of mathematical terms' simplification on pedagogy and performance which is quite revealing as an academic discovery and rewarding as pedagogical strategy. The research sought to observe the extent to which the simplification of Mathematical terms could facilitate comprehension, enhance better performance and facelift mathematical pedagogy. This becomes necessary because of the different meanings students attach to some mathematical terms which invariably result in wrong answers. The researcher identified some mathematical terms that were taught in the experimental group in a simpler term while the teaching in the control group was done conventionally. The study compared the performance of students in the experimental group with the performance of students in the control group to determine the effect of treatment on students' performance in Mathematics. The study adopted the quasi-experimental research design of the pre-test, post-test control group design. The population comprised all Junior Secondary School Class II students in public secondary schools in Ado, Ekiti State. The sample consisted of 400 Junior Secondary School students selected from two public secondary schools in Ado Ekiti using multi-stage sampling technique. The experimental group was exposed to Mathematical terminologies simplification strategy. The control group was taught conventionally. Two null hypotheses were generated. The

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instrument used to collect data was Mathematics Performance Test (MPT). The instrument was subjected to intensive screening by experts for validation. Hypotheses were tested at 0.05 level of significance. t-test was used to analyse hypotheses. The results of the study showed that there was significant difference between the pre-test and post-test mean scores of the students in the experimental group, while the pre-test and post-test mean scores of the control group showed less difference. It was found that there was significant difference in the post-test of the experimental and control groups. The results showed that simplification of mathematical terminologies could improve students' performance in Mathematics. Based on the findings of the study, it was recommended that Mathematics teachers should simplify Mathematical terms to the level that students will have the understanding of what is expected of them. Teachers of Mathematics should set questions with simple words that the students of a particular level will be able to interpret. The writers of the recommended Mathematics texts should be instructed by the Ministry of Education to create space for and interpret difficult words on every topic.

Keywords: Mathematical Language, simplification, comprehension, facilitation, performance,

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Introduction

An information or idea becomes relevant if the receiver is able to interpret what is being coded across. Each subject in the school curriculum has specific terminologies that convey meanings that are peculiar to the field, of which Mathematics is one. When these words are well understood by the learner, it makes him happy and increases his chance of better performance in such a subject. The interest and the willingness of such a student towards the subject will be boosted. Child-centered methods have been discovered to be appropriate for the learning of Mathematics, (Pugalee & Johnson, 2013; Chan & Idris, 2017; Millis, 2012). Mathematics is not only a key subject in Nigeria as a nation. It is also a core subject in some other countries such as Kenya, Ghana, and Egypt.

The place of Mathematics in the scientific and technological development cannot be winkled at. Scientific ideas and findings are communicated into the world of works using Mathematical terminologies. It is the bedrock of technological advancement of a nation. Alan (2012) explained how the coefficients of an equation were loaded into the counter drum to form addition and subtraction in the counter; this forms the process by which a number of identical operations were performed in parallel which is called vector operation that explains a specific impact of Mathematics in the field of engineering. Mathematics has its tentacles spread into all other disciplines. This has been established by many scholars from diverse field of studies, Mathematics is a tool in Astronomy, Navigation, e-commerce, Agriculture, Geography, Economics, even languages. All these are the sources of economy of any nation. So, for a country to be buoyant economically, Mathematics must not be undermined (Kolade, 2012). Mathematics is a subject that some people believe is abstract in nature because of its language that is full of complex terms or vocabularies. Such terms include; product, quotient, factor, sum, difference, coefficient, volume, vertex, dividend, and polygon for the lower classes. These words seem to sound or look strange because they are not used in general as some other words. If there could be means of simplifying such terms to the level of a learner, it may lift the maths-phobia in him and pave way for his free course in the subject. Many of these terms are from English Language which is our second language. Since it is not our original or mother tongue, there could be difficulty in comprehending the exert meaning of a particular word especially for a child that has not been so deep in the use of such terms.

Some educators have looked into this problem of difficulty in the interpretation of some terms in Mathematics, for instance, Kolawole (2013) attributed the problem of inability of the learners to perform well in mathematics to the failure of some teachers to interpret well the terminologies involved in each concept to students in a way that they will have the real meaning of each term. Benson and Miheso (2015) in their work titled "Effect of Mathematical Vocabulary Instruction on Students' Performance in Mathematics in Secondary Schools of Murang'a country, Kenya" were able to use Fryer Model strategy with technology to teach learners in the way that difficult words in Mathematics were simplified to the level of the learners and this affected the students' performance positively. Also Oginni & Owolabi (2013), in their work titled "Effect of Mother Tongue and Mathematical Language on Primary School Pupils Performance in Mathematics", concluded that the use of Mother tongue in the teaching of Mathematics in primary schools would make some mathematical terminologies that are difficult for pupils to understand in the second language easy to understand.

Akinwamide (2016) was able to highlight the effects of misunderstood words. He explained that misunderstood word can lead to confusion, anger, becoming depressed, taking decision to hate the subject and hate the teacher teaching the subject, diverts attention to another irrelevant thing(s). The negative effect of lack of proper meaning of some terms used in the teaching of mathematics had made some students developed hatred towards the subject. This may eventually hinder some of them from entering into the field of sciences in the future. The aftermath will be the deficiency of the whole nation in virtually all the aspects of human endeavor. The negative effect of mathematical terms on students' performance could be view as been injurious to the mathematics teachers' feelings and expectations. Much efforts with low product as some of the mathematics teachers are experiencing could be a discouraging factor that may lead to negative attitude by the teachers towards the teaching of mathematics.

Theoretical Frame Work

This research has its base on the theory of Kolawole's Problem-Solving method (KPS) (2013). This theory premised on the fact that a mathematics teacher must be able to adequately identify relevant keywords, terms and terminologies in a topic, putting into consideration the educational level of the students if there will be effectiveness in the teaching of mathematics. Kolawole believes that when learners have the ground knowledge of the related terms before involving in computation and manipulation processes, it will help them in relating such concept to real life situations. This theory is in connection with this work, as the teacher identifies the terms that may be difficult for the students to understand, he interprets and explains in a simple form that learners will be able to comprehend. This could invariably improve the performance of the learners and encourage teachers to do better.

Statement of the problem

The report from WAEC statistical data and the observation of the researcher as a Mathematics teacher showed that students' performance in Mathematics is not encouraging. Among many reasons that could be attributed to this is the problem of inability of the leaners to interpret questions appropriately. The researcher's personal observation showed that Mathematical terms used by some Mathematics teachers in setting questions are too logical and difficult to interpret by the students especially in lower levels. This might not only reduce the performance of such a learner but also open door for depression and discouragement. For these reasons, the study examined the revealing aftermath of mathematical terms'simplification on pedagogy and performance.

Purpose of the Study

This study mainly investigated the simplification of Mathematical language for comprehension and facilitation of better performance.

The specific aim of the study was to investigate the effect that simplification of mathematical terminologies will have on the performance of students in Mathematics at the lower levels of secondary school. The study compared the performance of students in experimental with the performance of students in the control group.

Research Hypotheses

1. There would be no significant difference in the performance mean scores of students in the Experimental and Control groups before treatment
2. There would be no significant difference in the performance scores of students in the experimental and control groups after treatment.

RESEARCH METHOD

Research Design

This study adopted quasi-experimental of pre-test, post-test, control group design. The design employed examined the effect of the independent variable on the dependent variable. The performances of students that were used for the study were established by pre-tests that were conducted on both the experimental and the control groups to ascertain homogeneity. Post-tests after the treatment were used to measure improvement on performances in the two groups. This was represented diagrammatically thus:

O₁ X O₂ (Experimental group)

O₃ C O₄ (Control group)

O₁ is first observation for experimental group.

O₃ is the first observation for control group.

X is the treatment for experimental group.

O₂ is the second observation for experimental group.

O₄ is the second observation for control group.

Population

The population for this study consisted of all the 3,125 students in the Junior Secondary Class II students in the fourteen public secondary schools in Ado Local Government Area in Ekiti State of Nigeria as at the time of this research.

Sample and Sampling Techniques

The sample for the study consisted of 400 Junior Secondary class II (JSSII) students that were selected using multistage random sampling techniques.

Research Instrument

The instrument used was developed by the researcher, named Mathematics Performance Test (MPT). MPT is the test item to determine the selected students' performance in Mathematics before and after treatment. It consisted of two sections. First section consisted of the students' bio-data, while the second part consisted of the test items. Mathematics Performance Test (MPT) contains twenty selected questions from the recommended texts that contain some terminologies which might be difficult for the students to interpret.

Validity of the Instrument

The instrument used for pre-test and post-test was subjected to intensive screening by a consortium of experts: Two seasoned Mathematics teachers that set and mark Junior WAEC

& NECO examinations and an expert in the field of Tests and Measurement. The Content and face validity were accessed.

Administration of the Instrument

The Mathematics teachers of the selected students in the selected schools acted as research assistance. Instrument was administered as pre-test after which the teachers taught the students for four weeks on the selected topics. The teacher in the experimental group taught the students with the simplification of difficult terms. The teacher in the experimental group expressed difficult terms in simple sentences while teaching, the control group was taught conventionally. The same questions were administered again as post-test. Data collected were analysed using mean and standard deviation.

Table 1 shows simplification of mathematical terms

<i>General Term</i>	<i>Conventional group</i>	<i>Experimental group (simplification method)</i>
Find the sum of 2 and 3	Find the sum of 2 and 3	What is the answer, if 2 is added to 3?
What is the product of 2 and 3?	What is the product of 2 and 3?	What is the answer, if you multiplied 2 by 3?
What is the quotient of 10 by 2?	What is the quotient of 10 by 2?	What is the answer, if we divide 10 by 2?
The positive difference of 5 and 3 is what?	The positive difference of 5 and 3 is what?	What is the answer, if we take away 3 from 5?
What are the factors of 6?	What are the factors of 6?	What are the numbers that can divide 6 without remainder?
Write three multiples of 2.	Write three multiples of 2.	Write three numbers that 2 will divide without remainder.
A Prime number	A Prime number	A number that only 1 and itself will divide without remainder.
Ascending	Ascending	From smallest to the highest

Descending	Descending	From highest to the smallest
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Results and Discussion

All hypotheses generated were tested with t-test and decision was taken at 0.05 level of significance.

Hypothesis 1: There would be no significant difference in the performance mean scores of students in the Experimental and Control groups before treatment.

Table 2: The t-test Analysis of pre-test Scores of Experimental and Control Groups on Simplification of Terminologies in Mathematics

Groups	N	X	SD	Df	t _{cal}	t _{tab}
Experimental	200	9.06	2.11	398	0.27	1.96
Control	200	9.10	2.14			

$P > 0.05$

Table 2 above shows that $t_{cal}(0.27)$ was less than the $t_{tab}(1.96)$ at 0.05 level of significance. The mean score of the experimental group bears no difference with the mean score of the control group. Hence the null hypothesis is not rejected. That is, there is no significant difference in the performance mean scores of students in the Experimental and Control groups before treatment. This established the homogeneity of the groups.

Hypothesis 2:

There would be no significant difference in the performance mean scores of students in the experimental and control groups after treatment.

Table 3: The t-test Analysis of post-test Scores of Experimental and Control Groups on Simplification of Terminologies in Mathematics

Groups	N	X	SD	Df	t _{cal}	t _{tab}
Experimental	200	12.43	3.11	398	17.28	1.96
Control	200	9.50	2.64			

$P < 0.05$

Table 3 above showed that $t_{cal}(17.28)$ was greater than the $t_{tab}(1.96)$ at 0.05 level of significance. There is significant difference between the post-test mean scores of the experimental and the control groups, hence the null hypothesis was rejected. The mean score (12.43) of the experimental group is greater than the mean score (9.50) of the control group.

This implied that the experimental group has better performance than the control group. This could be as a result of the treatment administered to the experimental group.

Discussion

This study examined simplification of Mathematical language for comprehension. The findings of this study showed that performance of the students towards Mathematics was improved upon their exposure to treatment. The study showed that there was no significant difference in the pre-test performance scores of the students in the experimental and the Control groups before treatment. This established the homogeneity of the groups at the beginning of the research. The findings showed that there is significant difference in the post-test performance scores of the students in experimental and control groups. This established the effect of simplification of Mathematical terminologies and how it enhances students' performance in Mathematics. This is in agreement with the findings of Popoola (2013), that there was significant positive change in the performance of students in Mathematics as a result of the method used by the teachers. Also, Kolawole (2013) and Popoola (2013) were of the opinion that when Mathematics teachers select appropriate strategies, it would bring about positive change in the performance of the learners in Mathematics.

Based on the findings of this study, it was concluded that simplification of terminologies has positive effect on students' performance in Mathematics. Students are able to solve tasks with ease.

Recommendations

Based on the findings of this study, it was recommended that:

- Mathematics teachers should simplify Mathematical terminologies to the level that students will have the understanding of the each concept.
- Teachers of Mathematics should set questions with simple words that the students at a particular level will be able to interpret.
- The writers of the recommended Mathematics texts should be instructed by the Ministry of Education to create space for and interpret difficult words in every topic.

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