

# The Impact of Mathematical Terminologies on the Understanding of Mathematics in Senior Secondary Schools in Yobe State

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**Abstract:** The study examined the impact of mathematical terminologies on students understanding of mathematics in senior secondary schools in Yobe State. A descriptive survey design was adopted for the study. The target population comprising all teachers of mathematics in the selected schools and some randomly selected students within the schools. The research questions were answered using descriptive statistics (mean and standard deviation). The population of the study was 3,522 participants comprising 48 principals and 3,474 Teachers of senior secondary schools within the three education zones of Yobe State. Based on the result there is a barrier between the students and the teachers in terms of the application of mathematical terminologies. Also the result shows that setting examination, question using mathematical terminologies is not a problem and not be the cause of mass failure in schools the study encourages teachers to increase the use of mathematical terms in setting examination questions. Another result shows that majority of the terminologies used are subtraction, multiplication and addition, complicating terminologies such as COSINE, TANGENT and SINE are commonly avoided and this is an indication that even the teachers are not well equipped with the knowledge of the terms making application vague. The result of the analysis contradicts the well-known beliefs that, the teachers are not giving much attention to the concepts of terminology in teaching and learning mathematics. The result from attempt to improve the use of the terms in schools shows that there is a need to organize workshop and conferences for teachers in order to equip them with the use of mathematical terminologies in teaching and learning process. Make a subject called mathematical terminologies at lower level of education and introduce to all schools, there should be special teachers for training students on the use of mathematical terminologies.

## I. INTRODUCTION

Education is a key aspect of life and a necessary for critical reasoning ability, it has an integral role in determining the quality of life, research has shown that quality education defines human moral and social values, and it has come to stay as an instrument for economic growth and productivity (Salleh et al., 2016). A society with an acceptable level of development attends its height by using education as a tool. Interestingly education has brought science and technology to stay which becomes the catapult of growth and development in Nigeria and the world at large. Imagine life without science and technology and look at what we have today. It's worth respecting that the bedrock of

science and technology is mathematics. Mathematics has cut across all science fields including medicine, biotechnology, anatomy, nursing, engineering, computer and many more. It has become the heart of many reputable careers and successful lives for societal development (Nkonde et al., 2018). Mathematics is about solution finding or problem solving it's a system of rigorous practices that brings out the virtue of critical thinking and results in logical reasoning and problem solving skills. Therefore it is necessary to step up efforts that will boost the understanding mathematical concepts in the 21<sup>st</sup> century. In Nigeria mathematics has become a pre-requisite requirement for entry into higher institution of learning because of the value added to it. In 2019 during the national mathematics conference it was agreed that lets all institution regardless of region be giving equal educational opportunities and mathematics as a standard and most be included in the curriculum at all levels (Lin et al., 2018).

Mathematics is a language on its own. There are peculiar terminologies use to describe a process. According to Mbugua (2012) mathematical terminology is a system of communication which involves its own mathematical symbols and equations.

Mathematical language involves not only words, equations and texts but it has symbols, charts and diagrams; with standard instructions building the connections between the elements of mathematical language. Lin et al., (2018). Stated that the most of the types of knowledge use in many fields has its own peculiar terminology, the understanding of terminology itself is the basic foundation necessary to establish mathematical knowledge and process. Mathematical terminology is the basic weapon on the power of mathematics. It has a very important role in teaching and learning of mathematics including the entire process of education. So, it is necessary to study the influence of mathematical terminology on students' achievements at the high school level.

Lee (2006) asserted that, mathematics is a language of its own too and each language has its own terminology and the way it is pronounced and used. If that is the case teaching and learning mathematical language is a pre-requisite requirement for the learning of the mathematics entirely. Mathematics has its unique mathematical terminology. Looking at the nature of

mass failure in mathematics within the country in the last decade (Bwalya, 2019) it is necessary to look inward as why? The record of the academic performance of Yobe State students in Mathematics is terrifying and alarming, with 75% failure in Mathematics for the past two decades is an indication that there is a strong problem in the area. The only tangible answer to this is that there is poor understanding of the basic concept of the subject. There different types of difficulties that students face when learning mathematics the use of the mathematical terminology itself is a hinge, the complexity of the terms and relating it with the symbol make the entire process a hinge (Jalil et al., 2020) and this can negatively impact their language development. Pupils most learn and use the terminology of mathematics to understand the many barriers that it presents students. Mbugua, (2012) state that Mathematical terminology is a system of organized communication which has its own set of terms, symbols and or structures. Therefore, looking at the concept of terminology in solving the challenges of mass failure in Nigeria, steps has to be taking in the right direction.

Usually, the way Mathematics is represented in the classroom and perceived by students is a communication using peculiar terms, structure and symbols; in spite of teachers believe they are presenting it in authentic and context dependent ways in best of pedagogy which tend to alienate many students from Mathematics (Barton, 2000; Furinghetti and Pekkonen, 2002).

*Purposes*

The purpose of the study is to investigate the impact of understanding mathematical terminologies in senior secondary school

The specific objectives are as follows:

1. To investing, ate the current status of understanding of mathematical terminologies among student, s
2. To investigate the rate of usage of mathematical terminologies in the schools by teachers.
3. To identify, best possible approaches to the usage of mathematical terms
4. To give suggestions for improving the understanding of terminologies in students' learning mathematics.

*Research Questions*

The following were the research questions:

1. What is the student and teachers' attitude towards the teaching of mathematical terminology?
2. What different terminologies do teachers of mathematics use in the classroom?
3. How do teachers of mathematics support pupils' learning of mathematical terminology?
4. How can we improve the use of mathematical terminologies in school

*Scope of the Study*

The following points indicate the scope of the study.

1. This study was carried out within Yobe State Nigeria.
2. Participants in the study were teachers and students at some selected senior secondary schools in Yobe State.
3. The study was limited to understanding the impact of mathematical terminologies in understanding mathematics as a subject.

**II. METHODOLOGY**

A descriptive survey design was adopted for the study. The area of the study was Yobe State. The target population comprising all teachers of mathematics in the selected schools and some randomly selected students within the schools. The research questions were answered using descriptive statistics (mean and standard deviation).

*Research Design*

A descriptive survey research design was used in the study which seeks to determine whether, and to what extent does the student and teachers give value to mathematical terminologies and the way forward.

*Method of Data Collection*

Data were collected using quantitative method where a structured questionnaire was prepared and distributed randomly across all the student in the school. All participants were teachers and students of some selected senior secondary schools in Yobe State Nigeria. Schools were selected by using stratified random sampling method. Three high schools were selected from a township in each Zone. Therefore, Nine (9) Secondary schools were included.

Table 1. List of educational institutions selected for the study

S/N	Name of Education Institution	Educational Zone
1	Government Secondary School Geidam	Zone A
2	Government Science and Technical College Ngelzarma	Zone A
3	Government girls Secondary school Damaturu	Zone A
4	Senior Science Secondary School Potiskum	Zone B
5	Government Science and Technical College Damagum	Zone B
6	Government girls Secondary school Gadaka	Zone B
7	Heritage Academy Gashua	Zone C
8	Government Secondary School Jakusko	Zone C
9	Government Science Secondary School Nguru	Zone C

*Validation of the evaluation Instrument*

The instrument for data collection were validated by experts from three different region k

- a) Department of mathematics University of Maiduguri, Maiduguri Borno State.

- b) Department of Education Psychology Umar Suleiman College of Education Gashua Yobe State, Nigeria and
- c) Department of Measurement and Evaluation University of Jos, Jos Plateau state Nigeria.

*Population of the Study*

The population of the study was 3,522 participants comprising 48 principals and 3,474 Teachers of senior secondary schools within the three education zones of Yobe State. (Directorate for planning, research and statistics, Yobe State Teaching Service Board Damaturu, 2019).

*Sample and Sampling Techniques*

The population of the study was 3,522 participants comprising 48 principals and 3,474 Teachers of senior secondary schools within the three education zones of Yobe State; the sample size was computed using Taro Yamane’s method. The researcher used stratified random sampling technique to draw the sample needed for the study in three education zones in the state (Zone A, B and C). The three education zones in the study area were used as strata. Hence, simple random sampling by lucky dip method was employed to select 9 participating schools for the study. Odekunle (2013) stated that sampling is very necessary when there is infinitely large number to be managed within the time and financial constraint.

III. METHOD OF DATA ANALYSIS

The four research questions were answered using descriptive statistic (mean and standard deviation).

Table II: What is the teachers’ attitude towards the use of mathematical terminologies during teaching and learning?

Item	Statement strategy	Mean	S.D	Remark
1	My mathematics teachers uses mathematical terms more than symbol	3.61	1.21	Accept
2	The types of questions in my mathematics examination involves more terminologies than symbol	3.83	1.86	Accept
3	My teachers understood the application of the terms to ease our understanding of mathematics	2.87	1.64	Reject
4	Mathematical terminologies are vague and confusing	3.59	1.92	Accept
5	There is no need of setting questions using mathematical terms	3.46	1.43	Reject

Source: Field Work

The results show that, it is clear that the use of these mathematical terminologies is a common practice in all the schools as teachers used many of the terms, symbol and structures to portray a mathematical expression. However, there seems to be a barrier between the students and the teachers in terms of the application of the terms. Knowing the terms is not the problem but using it in the right expression is what matters most. The result also shows that setting examination using mathematical terminologies is not a

problem and may not be the cause of mass failure in schools, as the use of the terms in examination add value to the terms and make students strive towards understanding of the concepts of terminologies in learning mathematics.

Table III: What different terminologies do teachers of mathematics use in the classroom?

Item	Statement strategy	Mean	S.D	Remark
6	Both teachers and students commonly use the term addition rather than writing the symbol (+)	2.76	1.32	Reject
7	Subtraction (-) is the commonly used term when there is need for reduction of figures	3.98	1.70	Accept
8	Multiplication (x) is the common term for replication	3.32	1.73	Accept
9	The most confusing mathematic term is root	2.96	1.65	Reject
10	Highly used terms by my teachers are COSX, SINX, ROOT	3.50	1.23	Reject

Source: Field Work

From the table above, it is obvious that majority of the terminologies used are minus, multiplication and addition, complicating terminologies such as COSINE and SINE are commonly avoided. And this is highly alarming because is an indication that even the teachers are not well equipped with the knowledge of the terms which make application difficult. According to Alkilany, (2017) when teachers are not fully acquainted with the basic concepts of mathematical terminologies teaching and learning tends be unproductive.

Table IV: How do teachers of mathematics support pupils’ learning of mathematical terminology

Item	Statement strategy	Mean	S.D	Remark
11	My mathematics teacher uses mathematics terminologies even in his speech.	3.48	1.65	Reject
12	My teachers first teaches us terminologies before the real topic	3.41	1.34	Reject
13	My teachers encourages us to learn terminologies by buying related books	3.52	1.56	Accept
14	Knowing the terms is 50% answering the question was my teachers motto	3.49	1.76	Reject
15	The value of terminologies in mathematics is under appreciated by the teachers	3.56	1.65	Accept

Source: Field Work

The result of the analysis contradicts the well-known beliefs that, the teachers are not giving much attention to the concepts of terminology in teaching and learning mathematics. A mathematics teacher is known with terminologies only applicable to his terms but from the result of the research most of the teachers doesn’t show fluency in terms of mathematical terms making it difficult to differentiate them with social studies teachers and others. However, majority of the teachers encourages their students to buy books that will ease their understanding of the subjects which by implication is not

enough. According to Pinto et al., 2012. Learning mathematics depends on how well the teacher uses mathematical terminologies to solve problem, it involves the acts of learning by doing, active rather than passive. Buying books by the students of the 21<sup>st</sup> century is an act of procrastination if the teacher cannot guide pupils on application. The result also shows that, the students themselves doesn't show hunger in understanding the concept of mathematical terminologies which is a big challenge in Nigerian education system.

Table V: How do we improve the use of mathematical terminologies in teaching and learning mathematics?

Item	Statement strategy	Mean	S.D	Remark
16	Organize workshop and conference for teachers and equipped them with the use of mathematical terminologies in teaching	3.67	1.93	Accept
17	Make it necessary to use mathematical terminological during communication by mathematics teachers	2.98	1.56	Reject
18	Make a subject called mathematical terminologies at lower level of education and introduce to all schools.	3.45	1.54	Accept
19	Teachers should revise the concept of mathematical terms every lecture and use at least 10minutes to teach the concept before starting the main lecture.	3.61	1.63	Accept
20	There should be special teachers for training students on the use of mathematical terminologies.	3.98	1.75	Accept

Source: Field Work

From the table above, the result shows that there is a need to organize workshop and conferences for teachers

in order to equip them with the use of mathematical terminologies in teaching and learning process. In the same vein the respondents both staff and students do not agree that mathematics teachers most use mathematical terminologies during communication after all there only few terms that can be articulated into their daily communication. Gladys et al., (2019) state that mathematics teachers are also like normal convention classroom teachers as they do not have a separate language for communication however, there are some few terminologies observable in their speech that are mathematically originated

Make a subject called mathematical terminologies at lower level of education and introduce to all schools. Teachers should revise the concept of mathematical terms every lecture and use at least 10minutes to teach the concept before starting the main lecture. There should be special teachers for training students on the use of mathematical terminologies. This idea is in agreement with the result presented by Chinyama, N. (2020) which impasses the importance of teaching mathematical terminologies separately before the ideal teaching setting.

Table VI: Teachers perspectives on mathematical terminologies in teaching and learning mathematics?

Item	Statement strategy	Mean	S.D	Remark
21	Mathematical terminologies are difficult words compares to everyday language	3.67	1.93	Accept
22	Mathematics teachers have positive attitude towards the teaching of mathematical terminology	2.98	1.56	Reject
23	Time period allocated is not enough for the teacher to introduce his topic by revising some key terminologies to be used.	3.45	1.54	Accept
24	Is it right to substitute mathematical terminologies with what was believed to be easier words for the concept	3.61	1.63	Accept
25	Is there appropriate monitoring and evaluation of mathematics teachers to confirm their effectiveness in classroom teaching?	2.98	1.75	Reject

#### IV. DISCUSSION

In the 21<sup>st</sup> century also called the information age, science and technology has taking the toil for the revolution of the earth. The earth is a global village which is undergoing great transformation as people keeps understanding concepts and research is paving the way forward Mathematics is an instrument for transformation and a tool of the information era. Today it is easier to say Mathematics is the bedrock science and technology and in the same vein science and technology the bedrock of the world growth and development.

Knowledge of mathematics is very important for any vocation, mathematical terminology is a necessary instrument for understanding mathematical knowledge hence education. Mathematical terminologies can be divided into three vital portions, this include mathematical terms, mathematical symbols, and mathematical structures all are significant aspect of understanding the concept of mathematics.

The finding presented in this study described the impact of understanding mathematical terminologies in the teaching and learning of mathematics as a tool for growth and development. The response from mathematics teachers' and that of the students indicated that mathematical terminologies are difficult words compares to everyday language and to a greater height agreed with the fact that putting more attention on mathematical terminologies when teaching mathematics is a very vital strategy to evaluate the outcome of an effective teaching and learning. These responses were consistent with the work of Benavides et al., (2020) who state that putting more attention on mathematical terminologies during teaching and learning would ease the stress of understanding mathematical words and eradication fear in the subject mathematics. This means that the mathematics teachers have positive attitude towards the teaching of mathematical terminology but the time period allocated is not enough for the teacher to introduce his topic by highlighting some key terminologies to be used.

In addition, mathematics teachers in the study indicated interest that if there is a way of substituting some

mathematical terminologies with what is believed to be easier terms for the concept and to some level agreed that the teacher can provide list of terminologies on the board and their meaning before the commencement of the teaching and learning process. This observation is in agreement with the work of Huai et al., (2020) which state that a list of definitions of mathematical terminologies can help pupils to better understand mathematical words properly before the commencement of the real mathematics teaching and learning process. However, the teachers also indicates that the heads of units hardly get involved in the teaching of mathematical terminologies making the whole process vague. This was consistent with the teachers' responses in the questionnaire where majority of the teachers agreed with the fact that a list of definitions can go a long way in helping the students to understand mathematical words.

The students viewed from the study indicated that the teacher's predominant use of mathematical terminologies has affected their understanding of the whole mathematical concepts. The teachers' excessive use of this technical terms without prior knowledge or standard explanation of the terminologies has affected the students learning of mathematics as whole. Mulenga, (2020) state that there is no significant relevance in teaching and learning when there is language barrier between the student and the teachers. This means that any term or word to be use by the teacher most is in compliance with the student understanding of the word. The opportunity to substitute mathematical terminologies with an unconventional term denied the opportunity to use mathematical terminologies.

#### CONFLICT OF INTEREST

There was no serious conflict of interest in the work from the start to the end. However, trace of constructive argument has been the subject of improving the research work.

#### ACKNOWLEDGEMENT

The research team wishes to acknowledge the effort of a colleague Luka Yelwa Barde for his continuous efforts to oversee the success of the research. He has been supportive with ideas, manuscript proofreading and publication process. A special thanks goes to Tertiary education trust fund TETFUND under the allocation scheme of Umar Suleiman College of Education Gashua Yobe State Nigeria.

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