

## Mathematics Education as a Tool for Technological Development, Self-Reliance and Sustainable Development in Gombe State

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### Abstract

The development of any nation depends on her scientific and technological advancements. Therefore, the paper examined the role of mathematics education on the technological development, self-reliance and sustainable development in Gombe state. A total of two thousand, six hundred and fifty (2,650), respondents consisted of Gombe State Ministry of Education officials, parents, principals, vice principals, teachers, students and others from forty (40) each of junior and senior secondary schools purposively and randomly selected and used for the study. Data collected using well designed and open ended questionnaire and analyzed using frequency counts, percentages and regression analysis statistical tool to answer the research question and to treat the research hypothesis of the study at 0.05 alpha level of significance revealed that there is effect of mathematics education on the technological development, self-reliance and sustainable development in Gombe state. Recommendations were given based on the findings of the study, since mathematics is the bedrock of scientific and technological development of any nation.

**Keywords:** *Mathematics, Technological, Self-reliance and Sustainable development.*

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### **Background to the Study**

Mathematics is a set of concepts, facts, principles and operations that are fundamental to the existence of every individual. The importance of mathematics education cannot be over emphasized. Abdullahi (2005), noted that in the traditional society, before the introduction of formal education, mathematics was mainly used in taking stock of daily farming and trading activities. Most traditional societies have their number systems which were either base five, ten or twenty as could be observed in their market days and counting systems. This has remained its position in the Nigeria educational system till date even with the introduction of different systems of education such as 7-5-4, 6-3-3-4 and 9-3-4.

Mathematics is one of the core subjects from primary through junior secondary and senior secondary school levels of the educational system, (Olonade, 2000). In tertiary level of education, mathematics must be taken compulsorily by any students irrespective of the area of specialization through general studies as general mathematics for those not majoring in it. This is because there is hardly any area of science, technology and humanities that does not make use of the knowledge of mathematics to explain its own concepts, theories or models. Mathematics according to Simeon and Francies, (2012), is the queen of science and technology and a tool for scientific and technological development.

However, mathematics education is the teaching and learning of all the themes that constitute the subject in all the levels of education. Agboyor, (2013), noted that the knowledge of mathematics imparted to children of school age could mark the beginning of technological spread that could give birth to technological development, self-reliance, and sustainable development if earnestly implemented which is the basic of this study. Ajayi and Muraina, (2011), described mathematics as the queen of all sciences and servant to all discipline. Mathematics education can also be seen as the practice of teaching and learning of mathematics in a way of solving problems involving learning the algorithms and formulae necessary for computations. It is a platform to learn and teach mathematics with better ways (Google).

The learners of mathematics should be able to instill in them the principles and practices required to see and evaluate business opportunities, to gather the necessary resources and the desire to take advantage of them as well as initiating appropriate action to ensure success in any chosen professional and occupation to enhance technological development, self-reliance and sustainable development, this is in line with the summary of the national objectives of primary and secondary education as it relates to mathematics education to include:

1. To lay a solid foundation for the concept of numeracy and scientific thinking.
2. To give the child opportunities for developing manipulation skills that will enable him to function effectively in the society within the limit of his capacity.
3. To provide the basic tools for further advancement as well as preparation for trades and crafts of his locality
4. To build on the function of primary level so that the child can make a useful living professionally, economically and socially.
5. To generate interest in mathematics and to provide a social foundation for everyday life.

6. To develop computational skills and the ability to recognize problems and solve them with related mathematics knowledge.

Also, Trombley and Weiss, (1993), defined basic mathematics skills as those skills that the majority of school graduates would be able to perform successfully after exposure to the typical mathematics curriculum. The National Council of Teachers of Mathematics (2011), put it that basic skills of mathematics must not be limited to routine computation at the expense of understanding, application and problem solving, since the identification of basic skills in mathematics is a dynamics process and should be continually updated to reflect new and changing needs of the people and society at large.

Mathematics has gone through several developments since formal education was introduced in Nigeria, from the era of formal Arithmetic, Algebra, Geometry and others, via traditional and modern mathematics to the present day “general mathematics” (Aguele, 2004). The world today is aptly regarded as global village, characterized by computer and information communication technology. This age has brought with it lots of sophistications in mathematics to be able to sustain these developments. It is against this background that this paper find out the role of mathematics education on technological development, self-reliance and sustainable development in Gombe state of Nigeria.

### **Statement of the Problem**

There is need for a change in our perception about employment. Several decades ago, the possession of certificate has a guarantee for employment. But nowadays the reverse is the case. The school graduates and school leavers should device way of earning their living so as to cater for themselves and their family members as well as contribute to the development of the country as a whole, this is through self employment which will provide technological development, self-reliance and sustainable development all through the knowledge of mathematical skills.

There is need for systematic study of processes, techniques, skills and method used to invest useful things into human environment and improve lives. This will enable Nigeria to move from consumer to producer nation. There is need for total sustainable development of the learners through the knowledge of mathematics. It is a reality that the creation, mastery and utilization of modern science and technology that basically distinguishes the so called developing from the developed nation of the world

### **Purpose of the Study**

The study was to investigate the role of mathematics education as a tool for technological development, self-reliance, and sustainable development in Gombe state, Nigeria. The researchers carried out this study on the issue of teaching and learning of mathematics to provide technological development, self-reliance, and sustainable development on the learners and the country as a whole. Parents, teachers, educational policy makers and stake holders in education have been expressing great concerns about the role of mathematics education on the technological development, self-reliance, and sustainable development. Specifically, the study sought to determine:

- i. The role of policy makers that is ministry of education officials on the teaching and learning of mathematics to provide technological development, self-reliance and sustainable development.
- ii. The role plays by parents on the teaching and learning of mathematics to provide technological, self-reliance, and sustainable development.
- iii. The aspect of school principals on the teaching and learning of mathematics to provide technological development, self-reliance and sustainable development.
- iv. To shed light on the roles of teacher as facilitators of knowledge on the teaching and learning of mathematics to provide technological development, self-reliance and sustainable development.

### Research Question

The only postulated research question for the study in “Is there any effect of mathematics education on technological development, self-reliance and sustainable development in Gombe state?”

### Research Hypothesis

The only postulated null hypothesis is “There is no significant effect of mathematics education on technological development, self-reliance and sustainable development”.

### Research Methodology

The research was survey type in nature, where the required data was collected directly with the use of designed questionnaire and ended type. The items on the questionnaire were drawn from the variables of research question and the hypothesis.

### Population and Sampling Techniques

The population of the study consisted of all the Gombe State Ministry of Education officials, parents, principals, vice principals, teachers, students and others in Gombe state. However, the target population consisted of six(6) out of eleven (11) local government areas in the state and forty(40) each of junior and senior secondary schools purposively and randomly selected and used for the study. The subjects used comprised of Gombe state Ministry of Education officials, parents, principals, vice principals, students and others from the state. A total of two thousand, six hundred and fifty (2,650) in number as shown in the table I below

**Table 1:** The Distribution of Respondents Used for the Study.

S/N	SUBJECT	NUMBER
1.	M.O.E official	220
2.	Parents	600
3.	Principals	80
4.	Vice principals	60
5.	Teachers	340
6.	Students	200
7.	Others	50
	Total	2650

### **Research Instrument**

In order to obtain relevant data for the study, modified and developed questionnaire adopted from Likert scale was used. It required the respondents to answer Strongly Agreed (SA), Agreed(A) and Disagreed(D) to the statement each contained in the questionnaire. Two thousand six hundred and fifty (2,650) copies of the questionnaire were produced and administered to the respondents by the researchers.

The instrument was given to two experts in educational research, measurement and evaluation, their observations and corrections were implemented before using it for this study. Since the research question consisted of all the variables of the study and was based on the responses of each group of the respondents, both the face and the content validity of the research were satisfied.

Test, retest method was used to find the reliability of the instrument on two (2) different groups. Pearson Product Moment Correlation Coefficient (r) of 0.75 was obtained and it was shown that the instrument could be used for the study appropriately.

### **Analysis of Data**

Data collected from the Gombe state Ministry of Education officials, parents, principals, vice principals, teachers, students and others purposively and randomly selected and used for the study using closed questionnaire were analysed by statistical tool of frequency counts, percentages and regression analysis to answer the only postulated research question and to treat the only null hypothesis of the study at 0.05 alpha level of significance.

### **Results**

Data collected from two thousand, six hundred and fifty (2,650) respondents, consisted of Gombe State Ministry of Education officials, parents, principals, vice principals, students and others, analyzed using frequency counts, percentages and regression analysis to answer the postulated research question and to treat the only hypothesis of the study at 0.05 alpha level of significance as shown in the table 2 below.

**Table 2:** Percentage Responses of the Role of Mathematics Education on the Technological Development, Self-Reliance, Sustainable Development

RESPONDENTS	STRONGLY AGREED	AGREED	DISAGREED	TOTAL
M.O.E officials	160 73.3%	40 18.0%	20 9.0%	220 100.0%
Parents	500 83.0%	100 17.0%	0 0	600 100.0%
Principals	60 75.0%	20 25.0%	0 0	80 100.0%
Vice principals	130 81.3%	20 12.5%	10 6.2%	160 100.0%
Teachers	240 70.5%	60 17.6%	40 11.9%	340 100.0%
Students	1020 85.0%	120 10.0%	60 5.0%	1200 100%
Others	30 60.0%	15 30.0%	5 10.0%	50 100.0%
Totals.	2140 80.8%	375 14.2%	135 5.0%	2650 100.0%

From the table 2 above, it can be seen that two thousand, one hundred and forty (2,140), representing 80.8% of the respondents strongly agreed while three hundred and seventy five (375), representing 14.2% agreed and one hundred and thirty five (135), representing 5.0% disagreed that mathematics education can provide technological development, self-reliance and sustainable development.

### Hypothesis Testing

The only postulated null hypothesis for the study is “There is no significant effect of mathematics education on technological development, self-reliance and sustainable development in Gombe state”. The Regression Analysis results in shown in the table 3 below:

**Table 3:** Regression Analysis of the Effect of Mathematics Education on Technological Development, Self-Reliance and Sustainable Development in Gombe State.

MODEL	USISTEADIED COEFFICIENT	STANDARD ERROR	STANDARDIZED COEFFICIENT	SIGNIFICANT
(constant )	1.400	0.191	Beta	8.199 0.000
Mathematics	-0.033	0.135	0.020	-0.178 0.980

**Dependent Variable:** Technological Development, Self-reliance and Sustainable development

**Independent variable:** Mathematics Education.



From the table 3 above, it could be seen that the significant 0.980 is greater than the table-t of 0.178 at 0.05 alpha level of significance from regression weight ( $B = 0.033$ ,  $t = 0.178$ , significant of 0.980,  $p < 0.05$ ). therefore, since the significant of 0.980 is greater than the table-t of 0.178, the null hypothesis of no significant effect is thereby rejected at 0.05 alpha level of significance, hence, there is significant effect of mathematics education on the technological development, self-reliance and sustainable development. Effective teaching and learning of mathematics in schools can bring about technological development, self-reliance and sustainable development of any nation.

### **Discussion**

From the findings in the table II, it could be observed that two thousand, one hundred and forty (2,140) of 80.8% agreed, three hundred and seventy five (375) of 14.2% strongly agreed and one hundred and thirty five (135) of 5.0% disagreed, that there is effect of mathematics education on technological development, self-reliance and sustainable development. Also, in table III, it was revealed that there is significant effect of mathematics education on the technological development, self-reliance and sustainable development at 0.05 alpha level of significance.

This finding is in line with that of Tali, Mbwas and Abe, (2012), that wherever a person belongs in a society must utilize the knowledge of mathematics in one form or the other, since whoever earns and spends uses mathematics. This implies that business executives, buyers, hotel managers, real estate salesmen, restaurant workers, speculators, sports promoters, stock and bond salesmen, television producers, travelling salesmen and entrepreneurs use the knowledge of mathematics in self-reliance. The use of chemical for either weed or pest control require a sound knowledge of ratio in mixing the chemical. Similarly, a mason requires the knowledge of ratio and proportion for mixing concrete. The concept of variation is useful tool for tailors, the more times he spends on design the more amount of money he charges the owners of the cloth. All these mathematical concepts enable individual to acquire useful skills and become self-reliant. Therefore, mathematics is a tool for self-reliance.

Furthermore, in a related finding, Liza, (2014), stressed that the three major technologies- Agriculture, Medicine and Engineering all made substantial progress before they were meddled to science. The foundation of science and technology, which is the basic requirement for development of a nation is mathematics, therefore, mathematics is a tool for technological development of any nation. In a similar result of Okeke, (2007), technology is a systematic study of processes, techniques, skills and methods used to invest useful things into human environment and improve lives. Technology is not synonymous with applied science, but being more empirical in its approach to solving problems as in the case of mathematics education.

Lastly, UNESCO, (2003) noted that when the level of mathematics education is low, it hinders development and effects plans for a sustainable future. It is the type of education necessary to create jobs for sustainable livelihood in the society, mathematics have helped to improve the ability to solve our daily problems, predict weather, minimize cost and maximize profit, calculate our wages and adjust our expenditure to our incomes. Mathematics methods, structures and concepts have become indispensable to the functioning technological society.

In a related development, Odilli, (2006), opined that mathematics is a subject that helps the students to form the habit of clarity, brevity, accuracy, precision and certainty in expression and this will go a long way in providing the much needed skills to do business without fear. Mathematics education provides the capabilities for intellectual, manipulative, predictive and psychological skills for integration to enhance business ventures and sustainable livelihood.

### **Conclusion**

It could be concluded from the findings of the study that mathematics education should be improved and encouraged by the stake holders in education, parents, teachers and the students themselves. Mathematics is a vital tool for day to day activities in such fields as engineering, piloting, tailoring, agriculture, banking, medicine, etc. The paper concludes that mathematics education is a tool for becoming self-reliant, a tool for technological development and enhances sustainable development.

### **Recommendations**

Based on the findings of this study, the following recommendations are made:

1. Since mathematics is a key factor in technological development, government at various levels should take urgent steps to bridge the gap between the literates and illiterates in our society to enhance intellectual development of the citizenry and broaden their academic horizon in mathematics.
2. Government should provide facilities like affordable technologies, good roads, electricity, and access to information, water supply, workshops for individuals to showcase their talent in order to enhance self-reliance, job creation and sustainable development.
3. There is need for the provision of startup fund by the government for graduates who have acquired mathematical skills to enable them start up their own business. This will greatly reduce the dependence on government jobs and enhance sustainable living.



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