



Functional Mathematics Education, a Dorsal Spine for Security and National Development in Nigeria

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Abstract

Mathematics has through ages permeated every facet of human and national development. In fact, Mathematics education has everything to do with the state of the nation and the world at large. Mathematicians and Mathematics educators have been very much involved in issues affecting the society, even in the face of increasing threat to security and national development. Issues pertaining to insecurity such as arm banditry, kidnapping, boko haram, petroleum pipeline vandalism, militancy, herdsman and farmers clash, instances of human right violation among others have combined to stand in the way of national development by constituting an impasse for educational progress and technological development in Nigeria. However, education and Mathematics knowledge in particular, is fundamental in addressing such critical issues of the nation as Mathematics is seen as an effective tool for addressing even crime and security challenges. Therefore, this paper is addressed under the following sub-headings: Mathematics and Mathematics education, the need for functional Mathematics education in Nigeria, security and state of insecurity in Nigeria, national development, functional Mathematics education for security in Nigeria, functional Mathematics education for national development in Nigeria. Based on the discussions, conclusion and recommendations were also made.

Keywords: Mathematics, Functional Mathematics Education, Security, National Development.

Introduction.

Mathematics is generally viewed as the mother of science that is concerned with the study of structure, order and relation evolving from the elementary practices of counting, measurement and description of the shapes of objects. Mathematics has through ages permeated every facet of human and national development. A rational human being for instance, cannot think or act without involving some logical ability upon which every form of developmental stride is based. Mathematics is the only subject, which encourages the acquisition of specialized science skills and knowledge to explain the natural phenomena of life in the society (Das, 2019). In fact, Mathematics education has everything to do with the state of the nation and the world at large. Any nation that failed to develop in whatever form must have been given inadequate attention to education and Mathematics education in particular. Mathematicians and Mathematics educators have been very much involved in issues affecting the society, even in this era of increasing threat to security.

The term, security refers to the state or condition of being free from any form of danger or threat to life and property. According to

Amenaghawon (2020), security is a situation in which citizens are free from any threats to their lives and means of livelihood, safe from bodily harm, diseases, unemployment and human rights violations within the sovereign nation where they live. The security of a nation is a collective responsibility of both the government and the citizenry. Any breach of peace and security resulting in the loss of life, property or livelihood is regarded as insecurity. Just as the saying goes, “no meaningful development can thrive in an atmosphere of insecurity”. Issues pertaining to insecurity in Nigeria, ranges from banditry, kidnapping, boko haram (western education is a taboo), petroleum pipeline vandalism, militancy, herdsman and farmers clash, instances of human right violation among others. Those issues constitute an impasse for educational progress, industrial and technological development and advancement of the country, thereby jointly halting national development.

National development is determined by the levels of; citizen’s standard of living, agricultural and technological productivity, exploration of the natural and mineral resources of the society, dependence on imported materials, heavy industrial presence, literacy and numeracy rate of the citizens, health care

delivery and unemployment. Yadav (2019) identified critical areas of National development to include; social, intellectual, cultural, educational system, economics, moral, science and technology, medical science and agriculture, and women empowerment. According to Sulai and Sulai (2021), National development is a process of societal advancement, where improvement in the well-being of people is generated through strong partnership between all sectors of government. A cursory view of national development in Nigeria leaves a lot to be desired as the country still grapple with threats to security and National development such as corruption, nepotism, poverty and unemployment. Mathematics therefore, plays a significant role in every facet of the National development. Education and Mathematics knowledge in particular, is fundamental in addressing security issues of a nation, as Mathematics is seen as an effective tool for solving problems including issues pertaining to crime and insecurity. The pertinent question in mind is, “how can functional mathematics education be a dorsal spine for security and national development in Nigeria?”

Mathematics and Mathematics Education

Mathematics is a branch of science that deals with numerical operations. Kolawole (2004) defined it simply, as a human invention born out of human resolve to solve problems. Obado (2010) see mathematics as a language that uses careful defined term concise symbolic representation which adds precision to communication. Based on these definitions, mathematics is clearly viewed as human effort to solve problems through the use of carefully defined symbols for communication. It reveals hidden patterns that help us to understand the world around us. For example, symmetry in lengths of day and night, season (summer and winter), plants, objects and even animals help us to understand and appreciate mathematics. It is a diverse discipline that deals with data, measurements and observations from science, with inference, deduction, and proof; and with mathematical models of natural phenomena, human behavior and social systems (Jayanthi, 2019). Afolabi (2020) admitted that mathematics sharpens the mind, reasoning ability and is responsible for personality development of an individual. In fact, every occupation that a person may choose to pursue in life is full of the opportunity and the need to apply mathematics. Mathematics therefore, is in many respect the systematic application of some highly regarded human values such as integrity, diligence, truthfulness, honesty, trust, cooperation, tolerance, accuracy, fairness, curiosity, openness to new ideas, skepticism and imagination. Thus, the result of an

effective teaching of mathematics will reinforce these generally desirable human attitudes and values because mathematical studies provides example of the power of free and rational thought, since it reflects societal thought, feelings, beliefs and action.

Mathematics education is simply put as the practice of teaching and learning of mathematics along with scholarly researches. It is the teaching and learning of all the themes or topics that constitute Mathematics in the primary, secondary or tertiary institution. Haruna (2014) viewed Mathematics education as the key to success in an effort to meet up with modern world of science and technology. These views imply that the subject forms a basis for scientific and technological advancement which are the necessary condition for the economic development of a nation. Therefore any shortcoming in Mathematics education will surely constitute a setback to the realization of the objectives of science and technology in the present global technological advancement.

The Need for Functional Mathematics Education in Nigeria

Mathematics education is inseparable from life. It ensures that the knowledge of Mathematics is applied to all areas of life including business, economics, finance, engineering, farming, sports, sciences and arts, and that everybody excels in his/her area of specialization (Sulai & Sulai, 2021). In Nigeria, Mathematics education is accorded prominence as a core discipline in the nation’s educational system, especially at the primary and secondary levels of education. This is in view of its unique nature, characteristics and uncommon attributes (Afolabi, 2020). It equips the individual learner with logical, realistic, analytical, systematic, critical and creative thinking abilities to be able to contribute to the national development of the country.

A functional Mathematics education ensures that the goals of Mathematics education for national development are pursued and attained. The utmost goal of Mathematics education is to cooperate in building up a civilization in peace, which is free of inequity, arrogance and bigotry and gives the opportunity to every individual to reach the full realization of its capabilities (D’Ambrosio, 2015). The strategy of a functional Mathematics education system to pursue goals is the Mathematics curriculum, which is usually organized in three strands: objectives (why), contents (what) and methods (how). In Nigeria, a functional Mathematics educator is expected to teach Mathematics with the national goals of education in mind which is the

inculcation of national consciousness, national unity, acceptable values and attitude.

In teaching Mathematics to inculcate national consciousness and national unity, Afolabi as cited in Afolabi (2020) recommended that students sit and work together in groups irrespective of tribal, ethnic or cultural affiliations, individual and gender differences as well as dealing with students with respect. Teaching Mathematics to inculcate acceptable values and attitude allows children to work, play and sit together regardless of their social status (rich or poor background) and religious beliefs without giving room for superiority or inferiority complex (Afolabi, 2020). In the light of this, a democratic classroom is advocated in such a way that students are involved in decision making, air their views, share ideas and tolerate one another.

Therefore, a functional Mathematics education is needed to address the challenges posed as a result of disunity, religious and cultural bigotry and gender stereotype that are typical characteristics of most cultural groups in Nigeria and thus affecting the educational system negatively.

Security and State of Insecurity in Nigeria

Security is simply, the protection of a person's life and properties by a force or constituted authority. Abubakar, Charles-Ogan, Wokocho and Okoro (2015) defined security as the measures taken to guarantee the protection or safety of an individual, structure, organization or a nation from danger or worry. It describes a situation in which citizens are free from any form of threat to their lives and means of livelihood, safe from diseases, bodily harm, unemployment and human rights violations in the sovereign nation where they live (Amenaghawon, 2020). It is the provision of an enabling or conducive environment that ensures people go about their normal daily activities without any form of threat to their lives and properties. Amenaghawon (2020) further presented the general argument about security which does not mean absence of threats or worries, but the ability to rise to the challenges posed by those threats with expediency and expertise. Security is the responsibility of both the government and the citizens. This is because, as the government takes measures to guarantee safety of lives and properties of its citizens, the citizens on the other hand must ensure compliance and tolerance. A violation of this trust by any of the parties or both will result in insecurity.

Insecurity refers to the inability to provide protection to lives and properties occasioned by unemployment, bad governance, lack of quality education, ethnic or religious superiority, corruption, perceived

victimization among others. Accordingly, Amenaghawon (2020) viewed insecurity as a state of danger, anxiety, uncertainty, lack of protection and safety. Nigeria's economy is being bedeviled by a myriad of insecurity challenges. Muhammad, Yusha'u and Lawal (2017) identified some of these issues as; corruption and fraud, ethnic and religious crisis, food crisis, robbery (armed and unarmed), kidnapping, human trafficking and human right abuses, militancy, insurgencies (Boko Haram, pipeline vandalization among others) and cultism among others. The authors pointed out corruption as the strongest social ill that has plunged Nigeria's political, economic, educational and social system into a dysfunctional state and depression resulting in the citizens living under the cloud of insecurity.

The above security problems are said to have historical origin. This is because the British colonial masters amalgamated the northern and the southern protectorates with no consideration of disparity of culture, religion, ethnicity and fear of domination of the minority by the majority groups among others. Consequently, it has led to competition for power and other valuable resources or assets among the groups resulting in hatred, hostility, disunity and insecurity. These problems have remained persistent because measures were not put in place to reduce their spread to the barest minimum. Therefore, Charles-Ogan (2014) recommended an effective and functional mathematics education at all levels of education so as to transform acquired mathematical skills to solve the nation's security challenges. In order to curb the excesses of Nigerian youth who constitutes a social menace and security threat to national unity, Muhammad, Yusha'u and Lawal (2017) advocated the need for the youth to acquire Science Technology and Mathematics (STM) education. This implies that functional Mathematics education should be explored as an effective measure in addressing insecurity issues bedeviling Nigeria's economy.

National Development in Nigeria

Development refers to the qualitative and quantitative changes that occur in the lives of people living in a society and is the bedrock to achieving national development. Sulai and Sulai (2021) defined national development as a process of societal advancement, where improvement in the well-being of people is generated through strong partnership between all sectors of government. It involves the entire social, economic, political and religious stability of a given nation (Agbajor, 2013). Sulai and Sulai also claimed that the development of any nation starts with the development of the individuals within it, since their knowledge, skills and competences

determine to a great extent the level of wealth and development of the nation.

National development is made up of essential elements. Yadav (2019) identified several components of national or societal development to include social, intellectual, moral, economic, vocational, cultural, educational system, science and technology, women empowerment, medicine science and agriculture. A general improvement in these critical areas will enhance or improve national development. To experience national development in Nigeria, Agbajor (2013) encouraged an effective harnessing of its three major components which are; human, material and natural resources to ensure political, social, economic and religious stability. Agbajor added that, an effective implementation of Mathematics education from the grass root level is relevant in achieving national development.

Nigeria continues to rank low in the United Nation Development Programme (UNDP) reports on Human Development, falling from 158th position in 2010 to 163rd position in 2021. The 2021 report cited insurgency as a major challenge to the country's national development subjecting many people to mental and psychological distress, severe emotional and post-traumatic disorder and depression. Consequently, there is the existence of a very big gap between the knowledge provided by the educational system at the primary and secondary levels and the actual need of the society (Haruna, 2014). The author stressed the need for a "functional Mathematics", as the heart of a conjoint twins, "science and technology". The heart cannot be destroyed or partly injured because both the conjoint twins, also referred to as science and technology are critical for national development.

Functional Mathematics Education for Security in Nigeria

The role of mathematics education in enhancing the security architecture of Nigeria and other nations is enormous. Charles-Organ (2014) identified critical security areas where mathematics plays an important role. These areas of security are in the aspects of; data security, financial security, food security, economic security and wavelet transformation or signals intelligence.

Data security or cryptography involves the use of number theory and prime number aspects of mathematics to encrypt and decrypt data. In cryptography, sensitive or secret information can be hidden or converted into a non-readable format and stored for onward transmission across insecure networks until it gets to the right person. Data security or cryptography is mostly applicable in institutions

and agencies such as banks, police force, military and paramilitary forces.

Financial security refers to a person's ability to possess enough finances to comfortably cover monthly expenses, recover from financial setbacks and save for the future. Abubakar, Charles-Organ, Wokocha and Okoro (2015) viewed financial security as a financial instrument which is a tradable asset of any kind, either cash, evidence of an ownership interest in an entity or a contractual right to receive or deliver cash or another financial instrument. Financial security is visible when dealing with personal financial security or handling Automated Teller Machine (ATM) or bank transactions. Personal financial security relates to the application of mathematics skills in dealing with a person's day to day budget. With ATM cards, a person needs a 4-digit code to be able to access a world of opportunities of transactions such as withdrawal and transfer of cash, payments of bills, to mention but a few. Banks on the other hand give out loans based on simple interest rates or compound interest rates. Mathematical knowledge is needed in these transactions to ensure that a person is not surcharged.

According to United Nations' Committee on World Food Security (UNCWFS), Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. Abubakar, Charles-Organ, Wokocha and Okoro (2015) defined food security as a condition related to the ongoing availability of food. Household food security exists when all members at all times have access to enough food for an active healthy life. Mathematical skills are used to calculate food security indicators which can be explicitly explained using mathematical variables as percentages, rates, graph and numbering. These include: Household Dietary Diversity Scale (HDDS) which measures the number of different food groups consumed over a specific reference period, Household Hunger Scale (HHS) which measures the experience of household food deprivation based on a set of predictable reactions captured through a survey and summarized in a scale, Coping Strategies Index (CSI) determines or assesses household behavior and rates them based on asset of varied establishment behaviors as how households cope with food shortages.

Economic security involves the use of mathematical skills to measure and interpret the economic indices of a nation. One primary indicator used to gauge the economic health of a country is the Gross Domestic Product (GDP), which is expressed as the ratio of total naira value of all goods to the

services provided over a specific time. A negative GDP is a sign of recession which signifies unhealthiness while a positive GDP implies healthiness. Other economic indicators that also require Mathematics skills are: Human Capital Index (HCI), Education Index (EI), Mean Years of Schooling Index (MYSI), Expected Years of School Index (EYSI), Income Index (II) and Consumer Price Index (CPI) which is used to measure reflection ultimately, the aspects of ratio, percentages, ordinal counting and algebra of numbers are essential Mathematics used in interpreting the economy of any nation (Charles-Organ, 2014).

Wavelet transformation or signal intelligence involves the application of principles of Mathematics and Physics in solving difficult civil and security problems. This powerful statistical tool has a wide range of applications in areas such as signal processing, data compression, fingerprint for detecting the properties of quick variation of values, internet traffic description for designing the services size, industrial supervision of gear-wheel, computer graphics and multi-fractal analysis, wave propagation, image processing, pattern recognition, detection of aircraft and submarines.

Functional Mathematics Education for National Development in Nigeria

Mathematics plays a significant role in the national development of a nation. The level of mathematical skills and competences determines to a large extent the level of science and technology, which is the basic requirement for national development (Jayanthi, 2019). It is earlier noted that national development consists of social, moral, intellectual, economics, vocational, cultural, spiritual, science and technology, medicine science and agricultural development. Development in these areas of a nation will address the major components of national development in the areas of human, material and natural resources.

Social development is achieved when individuals cooperate with each other in group as group work enhances social skills. Social skills are a requisite for social life in the society which can be achieved with a functional Mathematics education. This is because solving mathematical problems involve group work and cooperation among members.

Intellectually, mathematics plays an important role of developing the mental faculties of students through problem solving. Any mathematical problem activates the child's brain in solving that problem, which is also necessary for constructive and creative process.

In economics development, Mathematics forms the basis of most scientific and industrial research and development and permeates other fields in the physical sciences, technology, business, financial services and many areas of ICT. It has inputs and outputs in much of the design and control of high-technology systems and is also applicable in the medicine science, biology and other social sciences.

Vocationally, mathematics education prepares students for technical and other vocations to enable them earn their living for self independence. These occupations include engineering, architecture, accountancy, banking, business, even in agriculture, tailoring, carpentry, surveying, and the office work (Yadav, 2019). In the same vent, Haruna (2014) explained the need to upgrade the mathematical knowledge of bricklayers, carpenters, tailors, farmers, market traders, and their likes in order to reduce poverty in the society using topics such as simple geometry, areas and volumes of solid figures, everyday arithmetic, simple proportions, ratios, and statistics. For roadside welders to effectively appreciate the areas and volumes of the rectangular or cylindrical objects being constructed for kerosene surface tanks and underground petrol tanks respectively, they need to have the knowledge of how to find the areas and volumes of this objects and the number of liters they can contain. The construction of measuring cans of similar shapes but of different sizes to measure engine oil and other liquids is best carried out if these road side welders are exposed to elementary mathematics. Carpenters and bricklayers need simple trigonometry to know how to measure angles such as 30° , 45° , 60° , 90° , etc that are used in roofing houses or building structures.

In moral development, Mathematics develops all those qualities which a person of strong character must possess such as cleanliness, honesty, reality and so forth. It is responsible in developing an individual's personality.

In developing science and technology, Haruna (2014) viewed science and technology as 'conjoint twins' sharing a common heart called 'mathematics'. He added that, destroying the heart will destroy the twins and partly injured one of the heart you partly injured the other as well as the heart. This shows that mathematics is an indispensable tool in the realization of scientific and technological objectives.

Conclusion

The paper discussed the necessity or adequacy of a functional Mathematics education in addressing insecurity challenges and promoting national development in Nigeria. The increasing

threat to security in the country caused majorly by corruption, unemployment and poor educational system remained a serious concern. This called for the need to overhaul the educational system at all levels, particularly Mathematics education, considering the role it plays in the life of a person and in nation building at large.

Recommendation

Based on the above review, the following recommendations could be made:

1. The government should increase support for Mathematics education by providing conducive environment for its effective functioning.
2. Curriculum planners should work to ensure that child centered approach or method of teaching which promote group participation is considered in the Mathematics curriculum.
3. Mathematics teachers should encourage group work among students regardless of class status, religion, gender and ethnicity, and every classroom activity should be interpreted in light of the goals of education.
4. Students should be encouraged to understand that Mathematics is studied not just for the purpose of passing examination in order to gain admission into tertiary institution, but also to appreciate the beauty it adds to life.

References

- Abubakar, R. B., Charles-Ogan, G., Wokocha, A. & Okoro, J. (2015). Mathematics education as a tool for self-employment and security. *European Journal of Research and Reflection in Educational Sciences*, 3(2), 61-69.
- Afolabi, S. S. (2020). Roles of mathematics as a change agent for national development. *IMSU Journal of Educational Studies and Research (IMSUJESR)*, 10(1), 9-16.
- Agbajor, H. T. (2013). The impact of mathematics education and economic empowerment on national development in Nigeria: implications for counseling practice. *Knowledge Review* 28(2), 1-7.
- Alata, S. M. (n.d.). The role of mathematics education in transforming Nigeria society.
- Amenaghawon, C. O. (2020). The place of mathematics in the fight against insecurity in a democratic society. *Capital Journal of Educational Studies (CAJES)*, 6(3), 71 – 82.
- Charles-Ogan, G. (2014). Impact of mathematical skills on national security. *European Scientific Journal*, 10(33), 109-114.
- Das, K. (2019). Role of ICT for better mathematics teaching. *International Journal of Education* 7(4), 19-28.
- D'Ambrosio, Ubiratan 2015. How Mathematics Education can help in shaping a better world? ICME 11 Proceedings, pp.248-263
- Haruna, I. U. (2014). Mathematics education for national development values and attitudes in the socio cultural context of the Nigerian society. *International Journal of Novel Research in Education and Learning*, 1(1), 10-14.
- Jayanthi, R. (2019). Mathematics in society development - a study. *Iconic Research and Engineering (IRE) Journals* 3(3), 59-68.
- Muhammad, R., Yusha'u, M. A. & Lawal, N. I. (2017). Science, Technology and Mathematics (STM) education for human security and sustainable development. *IOSR Journal of Mathematics (IOSR-JM)* 13(6), 67-72.
- Sulai, M. E. & Sulai, E. I. (2021). Science Technology Engineering and Mathematics (STEM) education: a tool for national development.
- Yadav, S. (2019). Role of mathematics in the development of society. *International Journal of Research and Analytical Reviews (IJRAR)* 6(4), 295-298.