THE ROLE OF SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) EDUCATION INDUSTRIES AND INNOVATIVE ECONOMY FOR SUSTAINABLE NATIONAL DEVELOPMENT

Ibrahim Umar Haruna[1] and Sani Saidu[2]
[1,2]Department of Mathematics, Federal College of Education, Zaria
Email; haruna.ibrahim6@gmail.com, haruna.ibrahim6@yahoo.com

Abstract
The paper try to examined the role of (STEM) education in industries, and innovative economy for sustainable national development. As new digital technologies emerge due to covid 19 pandemic, so too d new industries and new source of wealth for the economy with this comes the need for new skills. Our educational system is malfunctioning, creating in particular problems of scientific and technological manpower production. The situation is so pronounced today that the nation faces crisis of scarcity of scientific and technological manpower. In essence, we are producing less and less of leaders of tomorrow: the managers, the entrepreneurial class, the teachers, the doctors, the policy makers, the law enforcement makers, the professionals. This is because the transition through the various levels of education is not in favor of science, technology, engineering and mathematics (STEM) career. The present situation necessitated the quest to examine the relevance of (STEM) education and economic empowerment in enhancing innovation and national development. Relevant implications for therapeutic counseling intervention and the way forward were extensively explored.

Keywords*: Role of STEM Education, Industries, Innovative Economic, National Development.*

Introduction

Nigeria is a developing nation tending towards national development. She tries to achieve this by putting all effort to harness the three major components of development which are human, material and natural resources to ensure political, social, economic and religious stability. These indices are what a growing society like Nigeria needs to experience national development. Nigeria is regarded as one of the developing countries because she is still grappling with such petty issues as poverty, the stigma of urban population, rural stagnations, unemployment, inequalities, religious bigotry, ethnicity and insecurity.(Lawal and Oluwatoyin 2015).

As the office of the chief scientist stated in its 2017 report Science, Technology, Engineering and Mathematics (STEM), is the Nigerian future. Our nation's economy can no longer be underpinned by the strength of the mining and oil sectors if we are to prosper in the long term against other countries now prioritizing STEM education to build new jobs, create growth and drive innovation.

To ensure sustainable economic growth and development it is more important than ever for the nation's educational system to focus on STEM courses In Nigeria, an average citizen may not be able to boast of three square meals due to economic crunch that have salvaged the people over the years. The economic condition seems to be at a standstill because of certain factors that have militated against her development. Nigeria economic recession could be attributed to poor implementation of (STEM) education and lack of economic empowerment which Baro (1991)

believed has entrapped most Nigerians into low economic status which has affected tremendously its national development.

National: National, according to Longman active study dictionary is a concept that refers to the whole part of a nation. That is, it embraces all aspect of a country.

Development: Development is the qualitative and quantitative changes that occur in the life of the citizens of a nation. Its relevance to the growth and stability of a country is equal to none. Development is the bedrock to achieving national development and it pervades all aspect of the society. Development, according to Gboyega (2003) is an idea that embodies every attempt to improve the condition of human existence in all ramifications. Such improvement could only be done when the educational and economic status of the people are given due attention. Naomi (1995) also referred to it as the economic growth, equitable distribution of health care, education, housing and other essential services Knowledge Review Volume 28 No. 2, December, 2013, that could assist in improving individual and collective quality of life. In this regard, this study focuses on the educational and economic aspect of growth because they have major impact on other areas of the societal life of the people.

National Development; National development involves the entire social, economic, political as well as religious stability of a given nation. Some of the challenges that bedevils national development as highlighted by Lawal and Abe (2011) includes lack of executive capacity responsible for the formulation and implementation of national plans, lack of good governance, high level of corruption and indiscipline and the mono-economic base of the country. Other factors could be unstable educational policies, lack of adequate support for (STEM) education. These factors combined to fetter Nigeria national development hence it continued to function as one of the underdeveloped nation in Africa.

Nigeria Development Plans: Nigeria development plans are strategies meant to facilitate national development. The plan of the Nigerian government as reflected in vision 2020 is to be one of the top twenty economics in the world by the year 2020. This desire can be actualized according to Adesina (2011), through two broad objectives spread over long term. They are:

1. To optimize her human and natural resources potential by achieving rapid and sustainable economic growth.
2. To translate economic growth into equitable social development that guarantees a dignified and meaningful existence for all her citizens.

This is a long term plan meant to promote Nigeria's economy and technological growth. The Nigeria vision 2020 is a blue print that could be implemented employing a series of media embedded in the principles of the National Economic Empowerment and Development Strategy (NEEDS). The Nigeria targets for 2020 (economic transformation plan) is meant for Nigerians; and if this is meant to assail the need of Nigerians, It means the people need to be empowered by exposing them to productive activities that will enhance their potentials for national growth. Osofisan (2009) highlighted the following as pre-request for a nation that is tending towards national development which according to him, are means of achieving the first main objective of Nigerian vision 2020: national security and social stability, national growth, improved efficiency and quality of life, creation of a new culture and society, agricultural production of food, improved health sector and poverty alleviation. All these cannot be fully attained when Nigerians who are the benefactors are not empowered economically and Mathematics education which is the bedrock of economic and technological development is at low ebb in terms of

performance both at the primary and secondary levels of education. It is against this backdrop that this study examined the relevance of (STEM) education and economic empowerment as a means of achieving national development and to give relevant suggestions as to the way forward.

The State of Nigerian Economy; Economy is activities related to the production and distribution of goods and services in a particular geographical location (Invest words, 2012). According to Wikipedia dictionary (2012), it could also be referred to as wealth or resources of a country especially in terms of production and consumption of goods and services. In view of this, the wealth and resources can only be brought to bear in the life of the people when they are economically empowered and (STEM) education is given its rightful place.

The fact that Nigeria is rated as the third fastest growing economy in the world (Baro, 1991) ought to call for celebration. However, this seem not to be an exciting news because the economic growth and development plans of Nigeria have not materialized since growth and development are not synonymous.

Economic growth has to do with income per capita, employment rate, schools – electricity – hospital -airport -number of telephones per capita, road networks, and others (Okolo, 2012). These quantitative issues are to be considered in relation to qualitative facts such as level of illiteracy, state of health care and others. Even with the Nigeria growing economy being placed at 7.8 percent per annum (Gross Domestic Product-GDP), Nigeria still grapples with unemployment, inflation, low industry production, poor power supply and others. The Nigeria economic condition calls for urgent attention as Okolo (2012) further noted that although agriculture has 7.8 percent as its contribution to Nigeria GDP, yet provides little to its revenue base, and there is unemployment, still an importer of food and a culprit to inflation growth. The government and non-governmental agencies need to give this an urgent attention. Activities that can help cushion the sorry state of Nigeria national development need be given due consideration. One of such activities is empowerment.

Innovative Economic for National Development: Innovative economy involves techno-logical investment of power, especially legal power or official authorities on people. Nigeria could experience national development if her citizenry are equipped or supplied with certain ability that enables them to be self-reliant. Such economic empowerment programs according to Kewkes (2002) are aimed at decent productive work for all. The work for all which is part of economic growth that enhances national development could be made possible through the effective implementation of mathematics education from the grass root level. It should begin from primary and secondary school students, both in urban and rural area. The implication of this is that the Nigerian economy should be positioned in such a way that Mathematics is made relevant in achieving national development and as a means of placing science and technology in the forefront of nation building and helping to facilitate the realization of a dynamic economy.

(STEM) Education: (STEM) education is the teaching and learning of all the themes that constitute (STEM) in the primary, secondary or tertiary institution. The knowledge of Mathematics imparted to children of school age could mark the beginning of technological spread that could give birth to national development if earnestly implemented. Globally, according to Anigala (2011), Mathematics had gained an indisputable importance because it is a recurrent denominator in all scientific researches. Its relevance was also attested to by Agugah (2005) when he noted that Mathematics occupies a unique position in the scientific attempt at globalization through information and communication management. As significant as this

phenomenon in enhancing economic, sociopolitical and other pre-requisites of national development, its pride of place have not been given full recognition hence the government has found it very difficult to satisfy her citizens and socio-vices have taken its toll on the people.

The main component of a comprehensive frame work that constitutes (STEM) education as stated by Aniefiok and Imeh (2013) includes the learner, teacher, instructional method, materials, media activities and organization for instructions. The indices highlighted above have been sparingly attended to and as a result, national development assumes the mode of slow development.

The research study by Iji and Foin (2004) on comparative study of (STEM) education outcome between specialist and non-specialist primary schools in River State gave credence to the above assertion when the findings revealed that there was no significant difference in the mean achievement of specialist and non-specialist pupils in (STEM) fields and that there was a significant difference in Mathematics problem-solving behavior and primary Mathematics interest inventory. It implies that lack of adequate attention given to Mathematics education resulted to almost the same output in the achievement of Mathematics specialist and non-specialist. The same reason could also be attributed to the remarkable differences in Mathematics problem-solving behavior and students' interest inventory.

Factors Affecting (STEM) Education:

The challenges facing (STEM) education in Nigeria is not peculiar to it, it is rather a reoccurring decimal that cuts across performance in academics generally that have affected Nigeria economy on the long run. Some of the factors affecting STEM education were highlighted by some researchers to include: Awolola (1988) identified poor study habit to be responsible for lack of attention, perseverance, day–dreaming, worry, anxiety, and negative feelings toward the study of Mathematics. Performance of students in Mathematics, attitudes towards Mathematics achievement, sex differences in Mathematics and the complexity of preparing STEM teachers (Lassa, 1984), inability to incorporate new development in science and technology into Mathematic education, lack of acceleration of programs for the continued professional development of teachers, inability of STEM educators to find new assessment instruments that reflect the new expectation of STEM education, un-conducive environment and lack of manipulative measuring devices such as calculators, computers and others (Aguele & Usman, 2007).

Other factors include:

1. Science, Technology, Engineering & Mathematics is excessively involved in figures and symbols.
2. It is very abstract in nature.
3. Lack of qualified STEM teachers in schools.
4. Carry-over beliefs that STEM is too difficult.
5. Faulty teaching methods.
6. Inadequate STEM teaching aids and materials.
7. Lack of STEM text books.

Science, Technology, Engineering, & Mathematics (STEM) Education and National Development

Mathematics is the core of science and technology which every country need to improve its human, material and natural resources. Where Mathematic education is already faulty, the nation

is faced with reduction in both scientific and technological input and output (production). Mathematics is embedded in these two forces of development and it is the chief ingredients that make insignificant the great terrors given birth to by cruelty, oppression and civil war, kidnapping which are products of unemployment (Salman; Olawoye &Yahaya, 2013). People resort to this negative vices because they are not empowered to be creative and productive which could be traceable to faulty foundation in STEM that give birth to poor development.

Mathematics plays a very important role in the implementation and use of science in Nigeria. Emphasis should therefore be laid on its popularity in other to facilitate its teaching and learning process at the primary, secondary and tertiary levels of education so as to boost national development. The essence of this, according to Odeyemi (1983), is to ensure that the knowledge of Mathematics is properly imparted in students to enhance science education and its organization in a way that it will be possible to feed, clothe and house the whole Nigerian population not luxuriously, but sufficiently to prevent great suffering, combat disease and make chronic ill-health rare. In other words, according to him, it will be possible to prevent the increase of population from outrunning food supply. Education, therefore, constitutes the major focus as it could be used for economic growth. STEM education forms the basis of Nigerian education. Its challenges pose further economic threat to any developing nation. These challenges according to Salman; Olawoye & Yahaya (2013) have led to different reforms at various levels of education. The reforms are however, meant to improve the lives of the people that they might become self-reliant.

Implications for Counseling Practices;

The role of STEM Education and Innovative Economic on National Development in Nigeria: Implications for Counseling Practice. There can only be meaningful overall development when the components that make up national development are fully known, understood and harnessed. The counseling profession provides a base for this by assisting government, nongovernmental organizations and the entire populace in diagnosing, prescribing and monitoring the cause and effect of activities that fosters development.

Professionally trained economist, seasoned educators, federal and state ministries of education in collaboration with trained counselors could organize training programs for STEM teachers to beef up their knowledge and skills with a view of upgrading their pedagogical performance. The training should be a continuous process, hence it is been referred to as re-training programs. The purpose of the training is to prevent academic retardation and improve their teaching skills.

STEM counseling programs could be organized by counselors in school and non-school settings for the entire populace employing individual and group counseling approach with the aim of facilitating effective understanding and practice of STEM. The individual approach involves the process whereby students and teachers with challenges in STEM fields are encouraged to chat with school counselors who diagnoses and proffers relevant solution to prodding STEM issues, while in group counseling, counselors meet with several students with similar STEM problems. In this technique, counselors could also arrange students into groups of five with at least two students who are acquainted with STEM principles as facilitator. The students meet at stipulated time and place to discuss STEM topics and solve problems associated with it. Counselors play a supervisory role to each group. He visits each group before and after each STEM test or examination to assess or evaluate their performance.

In support of the above counseling process, Odeyemi (1983) carried out a study on the effects of small-group counseling on secondary school Mathematical behaviour to ascertain the cause of the problem facing Mathematic education and to give relevant recommendation. The result of the program showed significant changes in the attitudes of form three and four students towards Mathematics while attitude of form one and two remained unaffected. The findings also revealed that the treatment provided by the program cured part of the participants' learning ailments in Mathematics as evident by the improved achievements in the post-tests over those in the pre-tests.

A study of this form goes to show that counseling has undoubted role to play in the teaching and learning of STEM. Counselors need to provide grassroots' attention to pupils and teachers with STEM challenges. The counseling encounter should begin with the crèche levels of education. This is necessary to correct STEM deficiencies and erroneous ideas about it.

Conclusion

The study examined the impact of economic empowerment and STEM education on the promotion of national development. It further reviewed national development, Nigeria development plans, and the state of Nigerian economy, effect of economic empowerment on national development, STEM education and factors affecting it. The implications of this study to counseling were succinctly explained and relevant recommendations were also suggested.

Recommendations

The issues bedeviling Mathematics education and economic empowerment need immediate response and actions necessary for the promotion of national development in Nigeria. In view of this, the following serves as "waking suggestions" to that direction.

1. Mathematics should be taught from simple to complex.
2. There should be training and re-training programs for teachers.
3. Relationships between Mathematics and other related subjects should be vividly taught to Students by teachers.
4. Appropriate teaching aids relevant to students' age should be employed.
5. Teaching methods used by teachers should be applicable to age and class of students.
6. Previous experiences should be taken into cognizance when introducing new topics.
7. Mathematics group discussion should be encouraged among students.
8. Mathematical classes should be more practical than theoretical.
9. Students should be introduced to the use of computers and calculators to make learning interesting.
10. Federal and State Ministries of Education should recruit more qualified Mathematics teachers into schools.
11. Unqualified teachers should be sent for more training.
12. Teaching, learning and Mathematic programs should be subjected to regular evaluation.
13. There should be acceptable and reliable standards set for the teaching and learning of Mathematics in schools.
14. Education planners should create a flexible curriculum that will meet student's needs. As regards economic empowerment, its programs should aim at productive work for all and should Commence from grassroots' levels.

References

Adesina, A. E. (2011). Perceive impact of primary education on the attainment of Nigeria vision 20: 2020. Proceedings of the 2011 international conference on teaching, learning and change. International Assistance for Teaching and Learning (IATEL). 93-103.

Aguele, L. I. & Usman, K.O. (2007). Mathematics education for dynamic economic in Nigeria in the 21st century. *Journal of Social Science*, 15(3), 293-296.

Agugah, V. V. (2005). Primary mathematics and information and communication technology. A paper presented at the 42nd Annual Conference of the Mathematical Association of Nigeria.

Aniefiole, I.I. & Imeh, S.M. (2013). Importance of mathematics and factors affecting it. Retrieved January 11, 2013, from gojamss.com

Anigala, A. (2011). Study habits, self-concept and examination anxiety as correlates of students academic performance in mathematics in Nigeria. An unpublished Ph.D Thesis. Delta State University, Abraka.

Awolola, G. O. (1988). Study habits and academic performance of students from selected secondary Schools in Ogbomoso Township of Oyo State, Unpublished M.ED Thesis, University of Benin, Benin City.

Baro, J. (1991). Economic growth in a cross -section of countries. *Quarterly Journal of Economics*, 106, 2

Gboyega, A. (2003). Democracy and development: The imperative of local governance. An inaugural Lecture, University of Ibadan, pp. 6-7.

Iji, C. O. & Foin, W. (2004). Comparative study of mathematics education outcome between Specialist and non-specialist primary schools in River State, Journal of Educational Foundation (1). Invest words (2012).Economy. Investowords.com /1652/ economy.Html

Kewkes, L.R. (2002). Intimate partner violence: causes and prevention. The Lancet publication.

Lassa, P.N. (1984). The sorry state of mathematics education in Nigeria; An inaugural lecture delivered at the University of Jos on 20th January, 1984.

Lawal, T. & Abe, O. (2011). National development in Nigeria: Issues, challenges and prospects. *Journal of Public Administration and Policy Research*, 3(9), 237-241.

Naomi, O. (1995). Towards an integrated view of human right. Hunger Teach Net, 6 (3), 6-7.

Odeyemy, J.O. (1983). Effect of small group counseling on secondary school students mathematical behaviour. Psychology for Everyday Living. *Nigerian Journal of Applied Psychology*, 2(2), 83.

Okolo (2012). Paradox of Nigeria economic growth. Business Day. Retrieved Thursday April, 2012, from www businessdayonline.com

Salman, M. F., Olawoye, F. A. & Yahaga, L. A. (2013). Mathematics education and national development. Retrieved January 11, 2013, from resjournals.com/ERJ/PDF|Jun/salman

Sofisan, A. (2009). Science education for the emancipation of a recessed economy in the 21st century. Being a paper presented at the third national conference of the school of Oyo Federal College of Education (Special).

The Free Dictionary. (2012). Empowerment. www.thefreedictionary.com/empowerment

Wikipedia Dictionary. (2012). Economy. Wikipedia -dictionary.com