

RESEARCH AND EDUCATIONAL POLICY IN NIGERIA: ROLE OF MATHEMATICS EDUCATION IN ENSURING NATIONAL DEVELOPMENT

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Abstract

Educational policy refers to the set of principles, laws, guidelines, and procedures that manage and regulate the operation of educational systems or institutions. These policies are developed by government bodies, academic institutions, and other stakeholders to ensure that education is delivered in a consistent, fair, and effective manner. They cover a wide variety of issues, including curriculum development, classroom management, assessment and testing standards, teacher training and education, funding and resource allocation, and the rights and responsibilities of students and teachers. On the other hand, the main goal of mathematics education is to produce competent and effective mathematics teachers, with necessary skills, competencies, intellectual and moral training, who will assume responsibility and leadership roles in various educational agencies for effective national development. This paper discusses the meaning and purpose educational policy within the context of educational research that are so related to mathematics education, as stipulated in the National Policy on Education (NPE Revised 2013). Also, concepts and determinants of national development that can be derived from the implementation of mathematics education policies were discussed, as well as the roles of mathematics education in ensuring national development. The paper concluded that effective implementation of the policies related to mathematics education is inevitable, as they are geared towards problem solving skills, teamwork, digital literacy, critical thinking, scientific literacy, communication skills, enterprise skills, and management skills, as contained in the latest mathematics education policy (CCMAS 2022), which form part of the determinants of national development in the 21st century.

Key words: Research; Educational Policy; Mathematics Education; National Development.

Introduction

Effective teaching and learning of mathematics at all levels of schooling in Nigeria is one of the major keys to development (UDEY, 2020). Both national and human development, depend largely on the development of science and technology for which mathematics is the bedrock. The report of the commission on the review of education in Nigeria (2004) suggests that the focus of education in the country should be accustomed to production rather than a consumption culture, which can only be achieved by effectively overhauling the educational system with a bias toward mathematics, science, and technology.

In this regard, the FGN (2010) laments that Nigeria cannot afford to maintain her current

posture of a consumer nation for a much longer time in any aspect of her national life. The country must rise from the deplorable state as willing acceptor of all sorts of garbage to a proud donor of useful, new ideas. It is well known that mathematics, science and technology can enhance the prosperity of any society, without which the resources of nations cannot be structured for industrial growth and development (Oyedun, 2005).

Mathematics is a discipline that deals with the study of numbers, quantities, and shapes. It involves using logical reasoning, calculations, and equations to understand and describe patterns and relationships between various objects and concepts. Mathematics Education is the key to the success in the efforts to meet up with modern world of science and technology. Adetula (2009), laments that Mathematics is pervasive in today's world and competence is vital to every individual's meaningful and productive life while outstanding ability is the precious societal resource solely needed to maintain leadership in a scientific and technological world (Adetula, 2009). In essence, Mathematics is integral to everything about life. Every occupation individual may choose to pursue in life are full of the opportunity and the need to apply Mathematical studies provides example of the power of free and rational thought, since it reflects societal thought, feelings, beliefs and action. Therefore, its study is very important for self and national development.

Concepts of Research and Educational Research

Research refers to the systematic investigation, collection, analysis, and interpretation of data in order to solve problems, proffer solutions, fill some gaps or even contribute to the existing knowledge. Educational research is a systematic investigation in which empirical approaches are used to solve educational problems. It uses rigorous and well-defined scientific processes to collect and evaluate data in order to solve problems and develop knowledge in education. Mizan (2022) defined educational research as a type of research that discovers the relationship between students' behaviour and classroom performance as well as a systematic and scientific study into the relationship between students' social skills and their learning behaviors. In other words, educational research refers to a systematic attempt to gain a better understanding of the educational processes, with a view to improving its efficiency. It is the application of scientific method to the study of educational problems.

Here are the various types of research in education depending on the purpose and design:

1. Descriptive Research; which aims to describe a phenomenon or situation without manipulating variables.
2. Correlational Research; this explores the relationship between two or more variables.
3. Experimental Research, which involves the manipulation of a variable in order to observe its effect on another variable.
4. Quasi-Experimental Research; this is similar to experimental research but does not involve random assignment of participants into groups.
5. Case Study Research, which is an in-depth investigation of a particular individual, group, or organization over a long period.
6. Survey Research, which uses questionnaires or interviews to gather data from a sample on people's opinion, views, feelings, emotions, interests.
7. Action Research; this is a participatory and collaborative approach involving

stakeholders to identify a problem, proffer a solution, and evaluate the outcome to improve the practice.

Concept of Educational Policy

Educational policy can be viewed as the proposed action or blueprint regarding the practice of education. Education policy is the term used to refer to the principles and judgements that influence education, including all the laws that govern the setting up and running of educational institutions (Bordia, 2022). The policies are established by government bodies, academic institutions, and other stakeholders to ensure that education is presented in a consistent, fair, and effective manner that suits the education philosophy of a nation. Educational policies cover a wide range of issues, including curriculum development, classroom management, assessment and testing standards, teacher training, funding and resource allocation, and the rights and responsibilities of students and teachers. The ultimate goal of any educational policy should be to promote equal access to quality education and to prepare individuals for success in life, work, and good citizenship.

Also, UNESCO (2015) posit that educational policy consists of the principles and government policies in the educational sphere and the collection of laws and rules that govern the operation of the education systems. Okoroma (2001) opined that education policies are initiatives primarily formulated by governments that determine the direction of an educational system. Hence, every modern society needs some educational policies to guide it in such initiation towards achieving the purpose and objectives for which educational institutions were established.

The purposes of educational policy, as described by Bordia (2022) are as follows:

- 1. Optimization of Cost:** This entails there should be some kind of regulatory system in place for the influx and expenditure of money in every educational institution. This can be done by setting a budget for the same as part of an elaborate education policy. The policy should make the distinction between costs that are inevitable and those which are not so that a proper plan can be formulated.
- 2. Maintaining Compliance:** Every educational institution is obligated to follow the law of the land, and this is possible only if there is strict legal action against non-compliance. Educational policy is important because it keeps all institutions within the framework of the law and forces them to abide by it, failing to do so resulting in penalties prescribed in the policy.
- 3. Safety in the Learning Environment:** This demands that educational policies should make provision for how safe students feel in their learning environment. The policy can mandate all schools to adhere to a certain standard when it comes to both physical safety as well as mental well-being of the students and teachers alike, to ensure a safe environment for all.
- 4. Promote an Active Learning Culture:** Since schools primarily focus on academics, it is imperative that the education policy should promote a learning culture through the staff. The policy needs to enable teachers to promote and provide an active culture around sharing knowledge through formal and informal means so that the students can build their intellect together.

- 5. Equality and Diversity Inclusion:** All schools should be unbiased in their treatment of students even whereby some schools are religiously inclined and some others have political affiliations, this should never be made apparent to the students. Educational policies should make sure that the learning environment in a particular institution is not tainted by political and religious connotations.

The National Policy on Education

The National Policy on Education (NPE) of the Federal Republic of Nigeria (FRN) is a document that outlines the guidelines and principles for the administration of education in Nigeria. The first NPE was formulated in 1977 and subsequently revised in 1981, 1998, 2004 and 2013. The current version was approved in 2013. The document covers all levels of education in Nigeria, from pre-primary up to tertiary education, and sets out the goals, objectives, and strategies for the provision of education at the different levels in Nigeria. It provides a framework for the development of educational programs, curricula, and pedagogical practices.

The National Policy on Education is based on some key principles that include:

- i. Access to education for all Nigerian children, regardless of religion, ethnicity, gender, or socioeconomic background.
- ii. Quality education that meets global standards and equips students with critical thinking and problem-solving skills.
- iii. Relevance of education to the needs of Nigerian society and the global economy.
- iv. Equity and fairness in the distribution of resources for education.
- v. Accountability and transparency in the management of educational institutions.

Thus, the NPE provides a roadmap for achieving national development goals, as education is an essential tool for economic growth, social cohesion, and human development.

Concepts of Mathematics and Mathematics Education

Mathematics is a discipline that deals with the study of numbers, quantities, and shapes. It involves using logical reasoning, calculations, and equations to understand and describe patterns and relationships between various objects and concepts. Mathematics is applicable across various fields such as science, engineering, finance, and technology. It covers several branches like arithmetic, algebra, geometry, trigonometry, calculus, and statistics, each of which has its own set of concepts and principles.

Mathematics education is the specialized training given to world-be teachers in a formal school system, so as to equip and nurture them for the great task of teaching. Teacher-education connotes process of preparing teachers for professional roles of reflective practitioners (Achuonye, 2010). Mathematics education is very critical because qualitative education cannot be attained by any nation if the quality of the teacher is not enhanced.

Effective mathematics education requires a curriculum that provides a balance of conceptual understanding, procedural fluency, and problem-solving skills, and teachers play a critical role in helping students navigate through the complexities of mathematics

and providing opportunities for students to apply their skills to real-world situations. Mathematics education also emphasizes the importance of developing critical thinking skills, which enable students to analyse mathematical problems and make connections between different concepts. This helps students develop a deeper understanding of mathematics and prepares them for success in future academic and professional endeavours.

Importance of Mathematics Education to National Development

Esangbedo (2014) states that students need to see the real need for mathematics; that, Mathematics is in our usage at every situation. Study of Mathematics education showed that we need mathematic knowledge due to its importance in our daily life. Thus, Mathematics is used in every day transactions, such as buying and selling as well as planning present and future transactions and savings in the future. Researches such as Esangbedo (2014) have shown that many entry-levels jobs require employees with some Mathematics knowledge, even understanding, and the basic functions could be advantageous. Hence, some important skills obtained from Mathematics education may include: Ability to identify and analyse patterns, Logic and critical thinking skills, Ability to see relationship and Problems solving skills.

Concept of National Development

National development refers to the overall economic, social, and political progress of a nation. It involves improving the standard of living, reducing poverty and inequality, enhancing economic growth, promoting social justice, and ensuring political stability in any nation. National development requires the coordinated efforts of the government, private sector, and civil society in creating an enabling environment for growth and development through investing in education, health, infrastructure, technology, and innovation to create opportunities for citizens and enhance their well-being. National development is aimed at improving the quality of life for citizens and building a prosperous and sustainable future for the nation.

National development is often equated with economic development (Anumudu, 2023). National development is the extent to which a nation is able to overcome her complex socioeconomic, political and cultural issues to ensure progressive changes in the quality of life of all her citizen. There are so many problems that could not hinder national development in Nigeria among which include, low gross national product, low levels of technological development, low standard of living, high level of unemployment and under employment, dependence of agriculture that is not even mechanized.

This is true particularly in Nigeria, where the equipment, facilities and materials needed for practical and meaningful education are either lacking, not in good shape or grossly inadequate, particularly in the field of science, whereby some lecturers cannot find a single microscope in a good working condition or the commonest chemical to undertake routine experiment for their students. Some of these apparatuses, equipment exists, they have either become obsolete or are in a very bad state of repairs.

Roles of Mathematics Education in Ensuring National Development

It is clear that mathematics education touches all aspect of human endeavour, and plays significant role in the national development as well as in our everyday activities, as captured in the following fields: Engineering, Agriculture, Accountancy, Medicine, Law, Politics, Computer Programming, Chemistry, Biology and Architecture

- i. **Engineers:** Engineers use mathematical equation to study the chemistry of materials in order to use the right materials for the project. Mathematics education studies show that, industrial engineers require mathematics to design, develop, test and evaluate integrated systems for management. Industrial production processes, including human work factors, quality control, logistics and materials flow, cost analysis, and production coordination. In civil engineering, algebra is used on a daily basis and they work exclusively on differential equation in engineering mathematics, statistics as well as calculus.
- ii. **Agriculture:** Mathematical skills are used in agriculture for example, to calculate the rate of application of fertilizer to avoid error. Mathematics knowledge enables the agriculturist, to calculate the nozzle size needed, the amount of pressure, the flow rate and quantity of water needed. Farmers also use the knowledge of mathematics to measure their land and estimate particular harvest from some part of the land, as the major problem facing Nigerians today is that of starvation and poverty (Esangbedo, 2014). Hence, government at all levels need to understand that Mathematics is necessary for science and technology which a basis national development.
- iii. **Accountants:** Mathematics is an essential tool for accountants. An accountant needs a strong understanding of mathematics as it allows them to perform financial analysis and make sound decision in their work. They need to understand and use mathematical concept, such as arithmetic, algebra, geometry, and statistics. They assist business by working on their taxes and planning for upcoming years. They work with tax codes and forms, use formulae for measuring interest, and spend a considerable amount of energy organizing paper work. Thus, in a growing economy, more managerial problem arises to make faster and better decision, managers are resorting to mathematics (Idahosa & Awole, 2008). Again, mathematical analysis becomes necessary in business decision making when the chief executive and his team are faced with the problems of selecting from among several alternatives a plan for expanding capacity (Esangbedo, 2014).
- iv. **Medical Doctors:** Mathematics education studies show that there are so many ways that mathematics is vital in human and veterinary medicine. Medical profession may be calculating the risk of diseases spreading, how much medicine to give, how quickly the heart is beating, or whether the patient is improving or declining. Mathematics is incorporated in to the daily lives of the health care professionals, you may be wondering why nursing and medical students need to study mathematics as part of their course. Doctors and Nurses use mathematics when they write prescriptions or administer medications. Hence, medical doctors must understand the dynamic system of the human body, their concern is always to find out the illness situation of the current time so as to proper appropriate drugs to the patient according to the mathematical prescription (Esangbedo, 2014).
- v. **Lawyers:** Many lawyers feel that training in mathematics improve their analytic skills. Personal finance concepts and accounting principles being comfortable with

numbers can help attorneys practicing in these areas serve their clients more effectively. Studies show that mathematics requires an understanding of formulas and proofs that can train the mind to think logically. This can be particularly important for attorneys who are dealing with emotionally charged cases as well as in the courtroom or during intense negotiation. Therefore, strong analytic skills can enable the lawyers to perceive weakness in witness stories or in case made by a logic to craft persuasive argument to present before juries and judges.

- vi. **Politicians:** According to studies in mathematics education, elections are all about numbers; numbers are important for winning. The election process, elective periods, and progress factor are dependent on numbers. The ability to distinguish between good and bad mathematics in political context is detrimental to effect citizens.
- vii. **Computer Programmers:** Computer programmer create complicated sets of instructions called programme software to help use computers to solve problems. They must to have strong basic skills. Charles Babbage, a Cambridge mathematician was the first to conceive the ideas of mathematical device to compute and store information. The first generation of computer come in to being during 2nd world war in 1939-1945. The emergence of computers has greatly accelerated the development of powerful algorithms for solving problems.
- viii. **Chemists:** Mathematics is used widely in chemistry, and is absolutely necessary to explore, important concepts in chemistry. Without some basic mathematics skills these calculations and therefore chemistry itself will be extremely difficult.
- ix. **Biologists:** Mathematics education allows biologist to describe how molecules move in and out of the cells, how drug get broken down in the body, how bacteria shuttle through blood vessels and many other physiological processes. Study has shown that mathematical biology is a field of research that examines mathematical representations of biological systems.
- x. **Architect:** Mathematics education researches have shown that, geometry, algebra, and trigonometry all plays a significance role in an architectural design. Architect apply this mathematics forms to plan their blueprint or initial sketch design. They also calculate the probability of issues the construction team could run in to as they bring design vision to life in three dimensions. According to Esangbedo (2014) architect designs, building for structural integrity and beauty, they must to know how to calculate loads for finding acceptable materials in design.
- xi. **Managers:** Business mathematics helps in assessing the financial performance of the business. It helps in estimating the incomes and expenditures along with risk analysis. It also helps in the assessment of the rivals and their key areas along with their business strategies.

Conclusion

The foregoing reveals that mathematics education is an essential component of national development as it helps to develop critical thinking, problem-solving, and analytical skills in individuals. Through mathematics education, citizens can acquire the necessary skills that enable them to contribute effectively to the growth of the economy. The present school system still needs to be completely overhauled to suit the stark realities of the Nigerian economy.

Our schools should pay more attention to technology saleable skills from secondary schools to universities and trade students. The principle of appropriate technology, which require less capital, but more labour intensive is the solution for reducing the ever-increasing rate of graduate unemployment. It is only by the adaption of appropriate technology with the system of functional education that Nigeria will acquire a technological identity. Appropriate technology requires attitude changes of Nigerians to appreciate what is hers, mathematics and appropriate technology will not only make the nation self-sufficient by alleviating poverty, but make individual self-employed and self-sufficient. Hence, effective implementation of all policies related to mathematics education at all levels will ensure our national development.

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