FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

MODELLING THE PATH TO NATIONAL DEVELOPMENT THROUGH MATHEMATICS EDUCATION: THE MISSING LINK

BY:

PROFESSOR GIMBA RAMATU WODU

(LMAN & MSTAN) NCE & B.Ed (ABU, Zaria), M.Tech (FUT, Minna), PhD (UNN)

Professor of Science Education (Mathematics)

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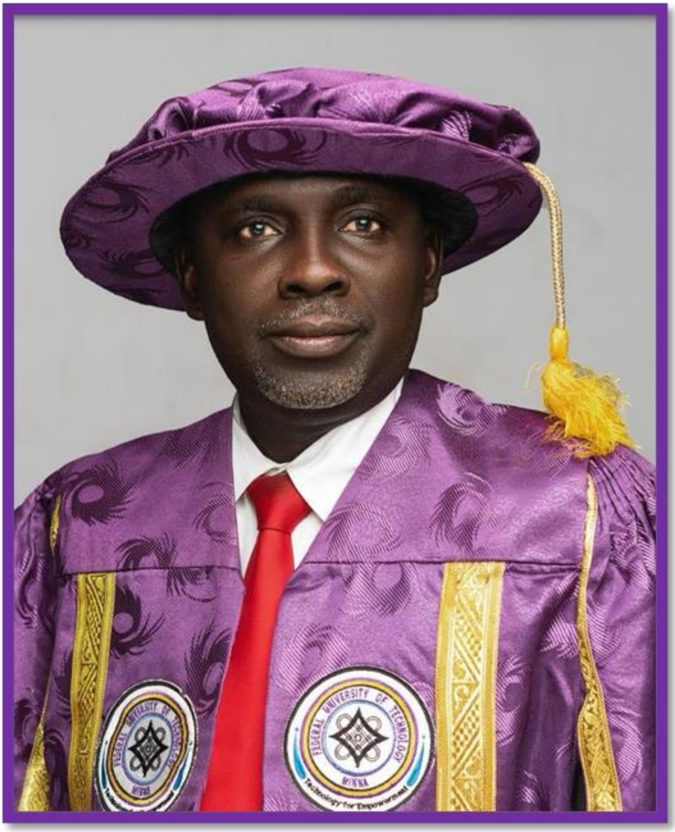


Prof. Faruk Adamu Kuta
B.Sc. (UDUS), M.Tech. (FUTMIN), PhD (ATBU)
Vice-Chancellor

Professor Gimba Ramatu Wodu, (LMAN & MSTAN)
NCE & B.Ed (ABU, Zaria), M. Tech (FUT, Minna), PhD (UNN)
Professor of Science Education (Mathematics)

MODELLING THE PATH TO NATIONAL DEVELOPMENT THROUGH MATHEMATICS EDUCATION: THE MISSING LINK

1.0 Introduction

"***Mathematics education is not merely about numbers; it is about nurturing the human capacity to think, reason, and solve problems***." With this understanding, we recognise mathematics education as a discipline that extends beyond teaching formulas or preparing students for examinations. It includes curriculum design, pedagogy, assessment, technology integration, and the cultural contexts in which mathematics is applied. Essentially, mathematics education is the science and art of making mathematics accessible, meaningful, and transformative for learners at all levels. Globally, mathematics education has shifted from rote memorisation towards fostering creativity, problem-solving, collaboration, and resilience skills indispensable for navigating the complexities of the 21st century. In Nigeria, mathematics is compulsory across basic and secondary education, a policy decision reflecting its centrality to human capital development.

1.1 Overview of Mathematics Education

Mathematics education, in the sense of individuals recognising shapes, quantities, and patterns, is as old as civilisation itself, shaped over millennia by diverse cultures, influential thinkers, and evolving pedagogical movements. The significance of mathematics cannot be overstated. It cultivates discipline, logical reasoning, and mental rigour, all of which are essential for understanding both the natural world and human society. Beyond this, mathematics serves as the foundation for learning in other disciplines, including the sciences, social studies, music, and the arts (Park et al., 2021).

Acting as a gatekeeper, mathematical knowledge opens doors to personal and professional advancement. It is the key that enables learners to achieve academic success and equips nations with a scientifically and technically skilled workforce. In other words, the vitality of mathematics education directly mirrors the developmental trajectory of any nation. Its capacity to expand learning opportunities has created a growing demand for mathematics instruction at all levels of education, particularly in higher education, where innovation and specialized skills are nurtured.

Over the years, I have engaged in research that underscores this pivotal role of mathematics education in shaping Nigeria's development. My scholarly contributions through investigations, recommendations, and evidence-based conclusions have addressed the gaps and highlight pathways for harnessing mathematics education as a true driver of national progress. Today, in this inaugural lecture, I stand before you to present these contributions to knowledge, not only as an academic exercise but as a call to action for aligning mathematics education more directly with the aspirations of our society.

2.0 Mathematics Education Over Time

The history of mathematics education is a path towards a practical need for philosophical investigation. It indicates the way that civilisations were concerned with various forms of knowledge instead of focusing on primitive trade and survival, and switching to logic and universal truths. The historical development in Mathematics Education could be categorised into: Early Antiquity, Greece and the Roman Empire, and the Middle Ages:

2.1.1 Early Antiquity

Elementary Mathematics was part of the education system in most ancient civilisations, including ancient Egypt, China, the Vedic society in India before 500 BCE, ancient Greece, and the Roman Empire, to mention a few. In most cases, formal education was only available to Male children with a sufficiently high status, wealth or caste in that era, and going by this, the first professional group in history to apply mathematical knowledge was that of the Scribes, and their activity enabled a rational administration of the societies in Mesopotamia and Egypt. Another Early Antiquity of mathematics education was many writings on Mathematics and its methodology, which dated back to 1800 BCE, evident through the social process of establishing bookkeeping for the goods delivered by the population in the form of taxes, recorded on clay tablets. The Rhind Mathematical Papyrus and the Moscow Mathematical Papyrus are famous ancient works on Mathematics from Egypt, which are another Early example of mathematics education (Schubring, 2011). The most important mathematical text and mathematics textbook of antiquity is the Elements of Euclid, written about 300 BCE, which has appeared in more editions than any work other than the Bible. In the Elements, Euclid, who lived in Alexandria in present-day Egypt, deduced the principles of what is now called Euclidean geometry from a small set of axioms. Euclid's accomplishment was to present them in a single, logically coherent framework, making it easy to use and easy to reference, including a system of rigorous mathematical proofs that remains the basis of Mathematics to the present day (Katz, 1993). The Elements served as the main textbook for teaching Mathematics, especially geometry, from the time of its publication until the late nineteenth or early twentieth century.

2.1.2 Greece and the Roman Empire (The Quadrivium)

Other roots of Mathematics Education as a field of didactic activity go back several millennia. For instance, in the fifth century BCE, Socrates used adroit questioning to lead a slave boy to discover that the area of a square on the diagonal of another square is twice that of the smaller square, as related in Plato's Meno (Kilpatrick, 1992). Pure Mathematics emerged first in Greek city-states, with a strict epistemological and social separation between practical arithmetic and theoretical mathematics. For the sons of higher social strata within the free citizens, there was some elementary schooling, including arithmetic, and thereafter the possibility to study with a focus on rhetoric, or to follow a more philosophical-scientific education. Contrary to the training for the highly valued scribal profession in Mesopotamia and Egypt, the training of practitioners, like land-surveyors, was left to individual initiative or organisation by the respective professional group (Schubring, 2011). In the Roman Empire, basic features of the Greek-Hellenist educational structures were adopted and further developed. By the end of Classical Antiquity, these foci of general education became conceptualised as the seven liberal arts, first defined by Plato (424/423–348/347 BCE); the trivium for the rhetorical formation and the quadrivium for the selection of those who would continue the four mathematical disciplines: arithmetic, geometry, music/harmony, and astronomy.

These liberal arts should constitute the counterpart to the traditionally less valued mechanical arts (Schubring, 2011). Nicomachus of Gerasa (c. 60–120) was a Neo-Pythagorean, and ideas presented in his textbook, "**Introduction to Arithmetic (*Arithmetike eisagoge*)**", were to exert an impact on European arithmetic textbooks into the nineteenth century. Nicomachus's ideas were conveyed to European medieval education by Boëthius (c. 480–524/5), who was a philosopher born in Rome. His loose translation of Nicomachus's treatise on arithmetic, ***De institutione arithmetica libri duo***, contributed to medieval education in mathematics. Nicomachus wrote that unity was not a polygonal number. This meaning became confused in Boëthius's translation, with the result that one was believed not to be a number, and early modern age authors promoted this idea (Swetz, 1992).

2.1.3 Middle Ages

Another noticeable period in the development of Mathematics Education was the Middle Ages, where China was the first state to introduce official and sophisticated examinations for entering into its administrative careers. Mathematics was one of the subjects for these examinations, which became systematically organized by the sixth century to remain in practice for about 700 years. These examinations were of particular interest to Mathematics learning, since they led to the first official list of textbooks admitted for the preparatory training, comprising, among others, the ***Jiu zhang suan shu*** – the Nine Chapters of Calculation (Schubring, 2011). Also, the rise of the Frankish Empire facilitated a certain advancement of learning in Christian Europe of the Middle Ages. In some schools attached to monasteries, some parts of the seven liberal arts were taught, but given the future career of priests, the mathematical knowledge taught there focused on the '***computus'***, basic astronomical knowledge to calculate the calendar for the religious holidays (Schubring, 2011).

The Medieval Latin manuscript '***Propositiones ad Acuendos Juvenes*** – 'Problems to Sharpen the Young' is one of the earliest known collections of recreational mathematics problems. The text is attributed to Alcuin of York (735–804), who was an English scholar and teacher from York, Northumbria. At the invitation of Charlemagne, the King of the Franks and Emperor of the Romans, he became a leading scholar and teacher at the Carolingian court (Katz, 1993). Manuscripts from this period and later contain many recreational mathematics problems, many of which may have been conveyed from generation to generation and from culture to culture (Tropfke, 1989). ***Āryabhaṭ a*** was born in 476 in India. He was the author of several treatises on Mathematics, among which is his major work, ***Āryabhaṭ īya***, a compendium of Mathematics and astronomy, which has survived to modern times and the place-value system, first seen in the third century, was clearly in place in his work. As a result of this place-value idea, which was transferred to the Islamic world from India and later to Europe, significant impact on the Mathematics Education of the world was exerted. Another noticeable history of Mathematics education was the earliest text that deals with Hindu numbers, available in Latin translations, is the ***Kitāb al-jam′val tafrīq bi hisāb al-Hind – Book on addition and subtraction*** after the method of the Indians by Muhammad ibn-Mūsā al-Khwārizmī (c. 780–850), and in his text, al-Khwārizmī introduced nine characters to designate the first nine numbers and a circle to designate zero, and demonstrated how to write any number using these characters in our familiar place-value notation. Al-Khwārizmī's work was important, not only in the Islamic world but also because it introduced many Europeans to the basics of the decimal place-value system, which gave birth to modern Mathematics (Katz, 1993). Let's take a pause here on the historical/origins of Mathematics Education from a global perspective and talk about the history of Mathematics Education in our dear country, Nigeria. It is within this national context that we can better understand the challenges, opportunities, and the "missing link" in aligning mathematics education with national development.

2.2 History of Mathematics Education in Nigeria

Mathematics Education in Nigeria has come a long way, firstly in the traditional society, before the introduction of Formal Education in Nigeria. Mathematics was used mainly in taking stock of daily farming and trading activities within and outside the country, and in that era, most traditional societies had their number systems, which were either base five or twenty, which could be seen in their market days and counting systems. However, the coming of the missionaries introduced formal (Western-type) education into the Nigerian education system. In this system of education, Mathematics occupied a central position in the school curriculum, and that has remained the position of Mathematics Education in the Nigerian educational system today, irrespective of the system of education adopted by the government. For instance, in the 6-3-3-4 system, Mathematics is considered a core subject from Lower Basics to Junior Secondary and Senior Secondary school levels of the educational system in the country. This important position occupied by the subject in the school curricula is borne out of the role of Mathematics in scientific and technological development, a sine qua non in national building.

As Baiyelo (1987) observes, mathematics is widely regarded as the language of science and technology. This observation was also made by Abiodun (1997), who stated that while science is the bedrock that provides the springboard for the growth of technology, Mathematics is the gate and key to the sciences. Ukeje (1997) in acknowledging the importance and contribution of Mathematics to the modern culture of science and technology stated that ***"without Mathematics there is no science, without science there is no modern technology and without modern technology there is no modern society meaning, Mathematics is the precursor and the queen of science and technology and the indispensable single element in modern societal development***". Mathematics Education is therefore indispensable in nation-building.

Since the introduction of formal education in Nigeria, Mathematics Education has gone through several developments. There have been controversies from the era of formal Arithmetic, Algebra, Geometry, through the period of traditional Mathematics and the modern

Mathematics to the present and to everyday general Mathematics. These have always been necessitated by the realization of the role Mathematics should play in the nation's scientific and technological development, as well as responses to societal needs and demands (Aguele, 2004). The World today is aptly regarded as a global village, characterised by computers and information technology. This age has brought with it lots of sophistication in mathematics to sustain these developments. Against this background, this lecture will therefore examine the role of Mathematics in nation-building and take a look at the vision and nature of Mathematical instruction, and the challenges of Mathematics in the 21st century in Nigeria.

2.3 Implications of the Historical Perspectives of Mathematics Education to Contemporary Education

Mathematics Education, understood in its most fundamental sense, the human ability to perceive quantity, space, patterns, and relationships, is as old as civilisation itself. From ancient African civilisations to the intellectual traditions of Asia, Europe, and the Arab world, mathematics has evolved as a universal language shaped by diverse cultures, great thinkers, and transformative pedagogical movements. Its indispensability lies not merely in the computation of numbers but in its ability to cultivate discipline, logical reasoning, clarity of thought, mental rigour and provision of skills essential for understanding an increasingly complex world (Park et al., 2021). Moreover, mathematical competence underpins learning in the sciences, social sciences, technology, finance, music, art, and virtually every domain of human endeavour. It is the gateway to academic achievement and the foundation of a scientifically and technologically skilled workforce.

This global and historical heritage carries powerful implications for our contemporary educational landscape, particularly in Nigeria. First, recognising mathematics as a shared human creation dispels the misconception that it is foreign or abstract; instead, it situates mathematics within our global intellectual inheritance. This perspective encourages inclusive and culturally responsive teaching that honours the multicultural roots of mathematical thought. Second, history shows that mathematics education has always evolved to meet societal needs from the geometric techniques of ancient builders to the algebraic systems of Islamic scholars and the structured curricula of industrialised nations. This evolution underscores a clear lesson for us: Nigeria's mathematics curriculum cannot remain static. It must respond dynamically to the demands of a digital, data-driven, and innovation-based global economy.

This is where curriculum development emerges as a core and strategic dimension of Mathematics Education. A well-crafted curriculum does more than sequence topics; it translates national aspirations into educational experiences. When aligned with societal needs, a mathematics curriculum becomes a tool for producing problem-solvers, creative thinkers, and innovators capable of driving national development. Globally, nations that strengthened mathematics through coherent, forward-looking curricula, such as Singapore, Japan, and Finland, experienced corresponding growth in technology, industry, and global competitiveness. Their success provides a powerful mirror for Nigeria: our development trajectory will reflect the quality, relevance, and responsiveness of our mathematics curriculum.

Furthermore, the historical development of mathematics education reveals that excellence in the discipline has always depended on intentional investment in teacher preparation and pedagogical research. No society has achieved mathematical competence through wishful thinking; it is the product of deliberate teacher training, evidence-based instructional strategies, and sustained professional development. For Nigeria, this points to the urgent need to strengthen teacher education programmes, improve pedagogical support systems, and promote research-driven instructional reforms. Our progress in mathematics, and indeed in national development, hinges on how well we equip teachers to inspire learning, demystify concepts, and nurture curiosity.

Finally, the historical trajectory of mathematics education highlights a universal truth: mathematics has always been a tool of societal transformation. Whether used to build ancient pyramids, navigate seas, develop trade systems, or now to power artificial intelligence, cybersecurity, and global finance, mathematics has consistently shaped human progress. For Nigeria, this truth carries an unmistakable implication. The missing link in our national development has never been the absence of mathematics, but the underutilisation of its transformative potential. A robust, relevant, and forward-thinking mathematics education system—rooted in strong curriculum development, informed by its global heritage, and responsive to Nigeria's developmental realities is not just an academic necessity; it is a national imperative. As I stand before you today, I present this integrated perspective not merely as theory but as part of my scholarly contribution built through years of research, reflection, and experiential engagement with the dynamics of mathematics education in our country. It is my conviction that strengthening mathematics education is synonymous with strengthening Nigeria's future, and that modelling a path to national development must begin with reclaiming the power of mathematics as the engine of knowledge, innovation, and societal transformation.

2.4 Scope of Mathematics Education

Mathematics education is a multidisciplinary field that integrates the teaching and learning of mathematics with the study of human development, pedagogy, curriculum design, and the philosophy of knowledge. It goes beyond the transmission of mathematical facts and procedures to encompass how individuals develop conceptual understanding, problem-solving skills, logical reasoning, creativity, and the ability to apply mathematics to real-world contexts. The scope of mathematics education can be viewed from several interrelated dimensions. First, it involves curriculum development, which determines how mathematical content is appropriate at different levels of learning and how it aligns with societal needs. Second, it covers pedagogical approaches, including traditional, technology-driven, and experiential strategies that influence how mathematics is taught and understood. Third, it extends to assessment and evaluation, focusing not only on learners' mastery of concepts but also on their attitudes, beliefs, and dispositions toward mathematics.

Furthermore, mathematics education plays a crucial role in national development by equipping learners with critical thinking and quantitative skills needed in science, technology, engineering, finance, and everyday decision-making. It also addresses issues of equity, ensuring that learners from diverse backgrounds have access to meaningful mathematical experiences. In today's knowledge-driven society, mathematics education connects with fields such as psychology, computer science, and educational technology, thereby expanding its relevance and application. In summary, the scope of mathematics education is broad and dynamic, encompassing content, pedagogy, learner psychology, curriculum policy, technology integration, and its role in fostering innovation and national development. It is not merely about "learning mathematics" but about preparing individuals to engage thoughtfully and productively with a world that is increasingly shaped by quantitative and logical reasoning. The scope of Mathematics Education contributes both directly and indirectly to the fundamental ways that are dynamic, abstract, and interdisciplinary enterprises.

a. It is dynamic because it touches all other fields of life.
b. It is abstract because of the complex nature and components it entails, and people involved always have anxiety towards its study.
c. It is an interdisciplinary enterprise because, today, mathematics is used throughout the world as an essential tool in many fields, including Natural Science, Engineering, Medicine, and the Social Sciences.

Yadav (2017) noted that Carl Friedrich Gauss referred to mathematics as the ***'Queen of Science'***, but unfortunately, students fear this Queen, although the subject is essential to the growth of many other disciplines. For this lecture, Mathematics Education will be discussed in the following scopes: Curriculum Development, Assessment and Evaluation, Technology Integration, Research and Innovation, and Interdisciplinary connections.

2.4.1 Curriculum Development as a Scope of Mathematics Education/Curriculum Development: A Core Perspective in Mathematics Education

"***If we teach today's students the way we taught yesterday's, we rob them of tomorrow.***" This famous remark by John Dewey reminds us that the curriculum is never static; it must evolve with time and context. In mathematics education, curriculum development stands as a core perspective because it determines what is taught, how it is sequenced, and how it aligns with learners' developmental needs and societal demands. A well-designed curriculum goes beyond listing topics; it provides coherence, progression, and relevance, ensuring that mathematics nurtures critical thinking, problem-solving, and quantitative literacy (NCTM, 2020; Višňovská and Cortina, 2025). In today's knowledge-driven world, mathematics curricula must respond to the demands of technology, data science, and interdisciplinary learning, while also addressing issues of equity and access (OECD, 2025). For example, incorporating statistics, computational thinking, and data science prepares learners for a data-driven society (Cusumano et al., 2025), while culturally responsive approaches, such as ethnomathematics, make mathematics meaningful and relevant to learners' experiences (Batiibwe, 2024). Therefore, curriculum development involves more than merely delivering content; it aims to shape learners' mathematical experiences, empower individuals, and contribute to both national and global development.

Mathematics Education focuses on teaching and learning of Mathematics at all educational levels, from early childhood through post-secondary and adult education, which addresses a range of topics, from Fundamental Arithmetic and number Theory, to Advanced Calculus, Statistics, and Applied Mathematics. Mathematics Education also includes teacher preparation, curriculum design, instructional methods, assessment, and educational technology. Nonetheless, it is crucial to emphasise that the traditional Mathematics curriculum lacks applications to other subjects, disperses knowledge across courses, and creates a disconnect between course materials and students' practical mathematical experiences, which can make any curriculum uninteresting and not pique curiosity or show how Mathematics applies to daily life. As a result, students become less motivated to learn Mathematics over time. This gap can be filled by a well-designed curriculum that includes real-world applications, but the uneven use of curricula in various geographical areas is another problem that could affect national development. Some schools have more qualified teachers and better resources than others. Therefore, Students are given unequal learning chances as a result of this discrepancy. Furthermore, the current curriculum does not adequately prepare students for higher education or the job market. Consequently, there is a need to develop or review the mathematics curriculum to align with the needs and aspirations of people in the 21st century.

2.4.2 Technology Integration as a Scope of Mathematics Education

The integration of technology is not an end in itself but a means to achieve deeper, more accessible, and more authentic mathematical learning. Its core rationales are: ***Enhanced Visualisation and Conceptual Understanding***: Static textbooks often fail to represent the dynamic, continuous nature of mathematical ideas. Tools like dynamic geometry software allow students to manipulate variables and instantly observe the effects, bridging the gap between abstract symbols and tangible meaning. For instance, dragging a vertex of a triangle to explore invariant properties makes geometry an experimental science. ***Dynamic Modelling and Multiple Representations***: Technology facilitates seamless movement between algebraic, graphical, numerical, and (in some cases) verbal representations. A function can be manipulated as a symbolic equation, its graph can be altered in real-time, and its table of values updates automatically. This interconnectedness helps students to perceive mathematics as a coherent whole rather than a set of disconnected procedures. ***Reduction of Cognitive Load on Computation:*** By automating routine calculations and algebraic manipulations (for example, factoring complex polynomials, computing definite integrals), technology frees students' cognitive resources to focus on higher-order thinking: problem formulation, strategic planning, interpretation of results, and critical analysis.

Technology integration is a fundamental and irreversible dimension of contemporary mathematics education, and its power lies not in automation but in amplification, which enhances learners' capacity to investigate, picture, think logically, and link in teaching and learning mathematics. The central challenge for the field is to move beyond technical adoption and foster a generation of educators with deep Technological Pedagogical Content Knowledge (TPACK) who can design learning experiences that leverage technology to make mathematics more meaningful, equitable, and powerful for all students.

2.4.3 Research and Innovation as Scopes of Mathematics Education

The interplay between Research and Innovation (R&I) and Mathematics Education constitutes a dynamic, bi-directional relationship. While mathematics education traditionally focuses on transmitting established knowledge, its scope is profoundly expanded and reshaped by ongoing mathematical research and pedagogical innovation. This analysis examines how R&I informs practice, transforms learning environments, redefines educational objectives, and presents both challenges and future trajectories for the field. The scope of mathematics education thus evolves from a static repository of procedures to a living discipline that cultivates inquiry, creativity, and application. The relationship between R&I and Mathematics Education is synergistic and essential for the discipline's vitality. Mathematical research provides new knowledge and deeper understandings that refresh educational content and epistemology. Innovation provides the mechanisms to translate these insights into transformative learning experiences. By fostering research skills and an innovative mindset, mathematics education can fulfil a broader purpose: to develop empowered, critical thinkers who see mathematics not as a fixed canon, but as a dynamic, human endeavour for exploration and creation. The primary challenge for the field is to build agile, equitable, and supportive systems that can absorb the fruits of R&I by ensuring that mathematics education evolves in step with the discipline it represents and the innovative society it aims to serve.

2.4.4 Interdisciplinary Connections as Scope of Mathematics Education

Interdisciplinary connections ground abstract mathematical concepts in real-world contexts, answering the perennial student question: "***When will I ever use this***?" By demonstrating mathematics as a living tool rather than an isolated set of procedures, educators increase students' motivation and engagement. This relevance transforms mathematics from an academic exercise into a vital language for describing and solving authentic problems. Connecting mathematics to other disciplines requires students to adapt and apply concepts in novel contexts for promoting transferable understanding. For instance, applying algebra to physics problems or statistics to social sciences forces learners to grasp the essence of mathematical ideas rather than simply memorising algorithms. This process aligns with constructivist theories of learning, where knowledge is built through meaningful connections. Mathematics serves as the primary tool for modelling phenomena across disciplines. Interdisciplinary approaches allow students to experience the complete modelling cycle: identifying a problem, mathematising it, solving, interpreting results, and refining the model. This mirrors how mathematics functions in research, industry, and public policy, thereby preparing students for complex, multidimensional problem-solving beyond the classroom.

Interdisciplinary connections are not merely an enrichment activity but a fundamental component of mathematics education's scope and purpose. They restore mathematics to its rightful place as a universal mode of inquiry embedded in human endeavour. The theoretical justifications from relevance to deep understanding are robustly supported by cognitive science and educational research. Successful implementation requires intentional pedagogical design, collaborative teaching structures, and administrative support. The examples across sciences, computer science, and the arts demonstrate the rich possibilities when disciplinary boundaries become permeable.

Ultimately, the benefits extend beyond improved test scores to cultivating alert thinkers who can navigate complex, real-world problems. Mathematics education, when conceived in interdisciplinarity, becomes not just preparation for specific careers but for informed, analytical citizenship and lifelong learning. The future of mathematics education lies not in further isolation but in deliberate, meaningful connection with all domains of knowledge.

2.5 The Role of Mathematics Education in the Development of a Society (Nigeria)

"***If a nation's prosperity is an equation, mathematics is the constant that makes every variable intelligible***." In Nigeria, the role of mathematics education reaches far beyond examination halls: it is the scaffolding for human capital, technological sovereignty, and inclusive growth.

Mathematics education equips the skills Nigeria needs for competitiveness in a digital and innovation-driven economy: numeracy, logical reasoning, problem-solving, modelling, and data literacy. These competencies are explicitly recognised in national curriculum frameworks, where mathematics is positioned as a fundamental discipline for scientific and technological development, as well as for everyday life. At basic and senior secondary levels, national syllabuses emphasise mathematical competency, conceptual understanding, and the translation of real-world problems into mathematical language, whose aims are directly tied to entrepreneurship and everyday living in the global world.

Nigeria's broader policy landscape reinforces this centrality. The National Digital Economy Policy and Strategy (2020–2030) identifies eight pillars, including Digital Literacy and Skills and Digital Society and Emerging Technologies, that all presuppose strong school mathematics foundations for coding, analytics, AI, and cybersecurity pipelines (Federal Ministry of Communications and Digital Economy, 2020). Likewise, the Nigeria Start-up Act (2022) seeks to catalyse a tech ecosystem whose talent base depends on mathematically literate graduates and teachers capable of integrating computational thinking and data into classroom practice (Federal Republic of Nigeria, 2022). These policy thrusts align with global evidence that technology's educational promise is realised only when learners have robust foundational skills, among which mathematics is pivotal (UNESCO, 2023).

At the level of system performance and equity, mathematics education is a lever for addressing learning gaps and advancing national development. World Bank education diagnostics consistently underscore the need to improve foundational learning and numeracy to expand productivity and reduce poverty agenda that has attracted significant basic-education investments in recent years (World Bank, 2025). Curriculum renewal has been a persistent Nigerian focus. Analysis of the 9-Year Basic Education Mathematics Curriculum highlights shifts toward activity-based, hands-on learning, integration of quantitative reasoning, and assessment practices that prioritized project work and problem-solving features designed to connect mathematics with both life skills and national priorities (Awofala, 2012). Continued alignment among curriculum, teacher development, and assessment, together with strategic use of technology, remains essential to translate policy intent into classroom impact and, ultimately, into economic and civic outcomes.

Consequently, mathematics education in Nigeria is not merely a subject but a nation-building strategy: it equips citizens to make data-informed decisions, fuels the digital economy, strengthens innovation ecosystems, and widens pathways to inclusive prosperity (Federal Republic of Nigeria, 2022; UNESCO, 2023). There is no doubt that Mathematics is pervasive in this modern world of science and technology. This is because, according to Adetula (1989), Mathematical competence is vital to every individual's meaningful and productive life. Thus, outstanding Mathematical ability is a precious societal resource, solely needed to maintain leadership in a scientific and technological world. Also, Abdullahi (2007) buttressed this by stating that science and technology have become the instruments for the formation of national development and productivity. Therefore, we must give maximum priority to Science, Technology, and Mathematics.

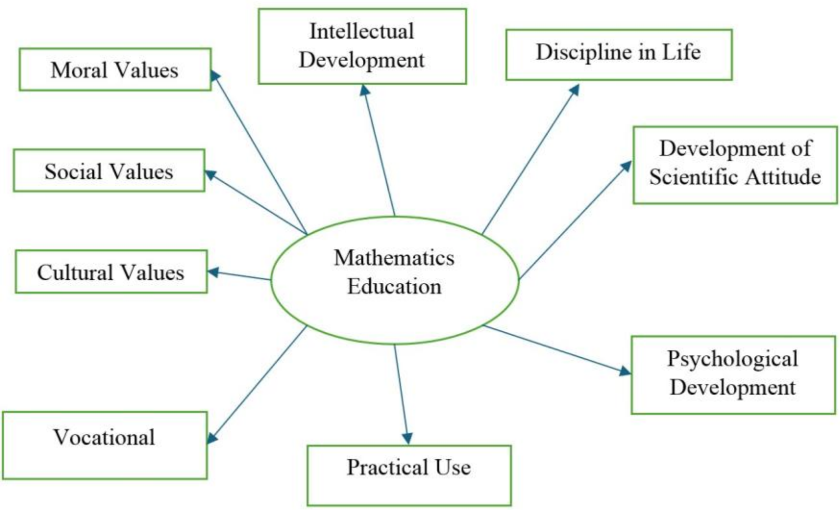
Today, it is a reality that the creation, mastery, and utilisation of modern science and technology are what distinguish the so-called developing nations from the developed nations of the world. That is to say that a nation's standard of living depends on that nation's science and technology level. While science is the bedrock that provides the springboard for the growth of technology, **Mathematics is the gate and key to the sciences**. In other words, it is the level of mathematics that determines the level of the science and technological component of any nation. The foundation of science and technology, which is the basic requirement for the development of the nation, is mathematics. Therefore, mathematics could play a vital role in nation-building (Nigeria) (Alagbe, 2012).

Mathematics, as observed by Abiodun (1997), is the major tool available for formulating theories in the sciences as well as in other fields, and it is used in explaining observation and experiments in other fields of inquiry. Adeyegbe (1987) observed earlier that there is hardly any area of science that does not make use of mathematical concepts to explain its concepts, theories, or models. Mathematics is the science of the methods by which quantities sought are deducible from others known or supposed. Thus, anyone who neglects Mathematics may not be able to go far in the sciences and other aspects of the world. Practical work and observation of nature are the main sources of scientific discoveries, and Mathematical methods play a very important role in this. Mathematical methods lie in the foundation of Physics, Mechanics, Engineering, Economics, Chemistry, and other fields.

According to Alagbe (2012), an important feature of the application of Mathematics to sciences is that it enables us to make scientific predictions that are drawn based on logic, and with the aid of mathematical methods, correct conclusions that agree with reality are then confirmed by experience, experiment, and practice. Thus, Mathematics is the bedrock of science and technology, which is the springboard of national development. Mathematics today has an enormous impact on science and society. The influence may be silent and appear hidden, but it has shaped our world in many ways. Mathematical ideas have helped to make possible the revolution in electronics, which has transformed the way we think and live today. The advances in science and technology are made possible by the numerous developments in Pure Mathematics. Mathematical sciences have improved the ability to predict the weather, measure the effects of environmental hazards, project the outcomes of electrons, and so on. Mathematical methods, structures, and concepts have become indispensable to the functioning of the technological society. Indeed, in this period of Artificial Intelligence, high technology, and internet super highways, no nation can make any meaningful achievement, particularly in economic development, without technology, whose foundation is science and Mathematics. In the present age of science and technology, the achievement of any meaningful economic development is largely dependent on science and technology, which is also dependent on Mathematics. Today, Mathematics in its various forms has found applications in economics, science, chemical and energy development, engineering, and technology, and it has become a veritable and indispensable tool in national development.

Similarly, Wasagu (2007), Itamah, (2007), and Ifamuyiwa, (2007) all agreed to the fact that knowledge of Mathematics equips the child with the necessary skills needed for solving related mathematical problems in daily life. Hence, the strategic position occupied by school Mathematics could be attributed to the virtue of its extensive and practical applications, and the aesthetic appeal of its methods and results. For instance, the primary and secondary school Mathematics curriculum, according to Adetula (1989), is very ambitious in terms of content and context; if well taught, it will provide every learner with the opportunity to choose from the full range of future career paths, be it in Sciences, Engineering, Agriculture, Business, and Commerce. Hence, it is reasonable to say all professionals are engaged in Mathematical reasoning to carry out their job effectively. Also, if mathematics is taught well, it is a subject of beauty, elegance, and excitement in logic and coherence. The result of its learning helps the learner in the development of a habit of accuracy, logic, and systematic order in the arrangement of information. Consequently, it makes the mind of the learner analytic as it provides him with the information and intelligence, and precise reflective thinking. It also enables learners to make good decisions about life problems and prepares them for adult life. For any meaningful development to take place in this era of Science and Technology, its citizenry must be mathematically literate. This fact was buttressed by several writers, for example, Odili (2006) opined that it is not surprising to discover that the most effective and unparalleled accomplishment of human beings is founded in their effort to utilize their Mathematical reasoning. Odili (2006) further said that there can be no real development technologically without a corresponding development in mathematics, both as conceived and in practice. Others, like Wasagu (2007), said that the present categorization of nations into Developed, Underdeveloped, Poor, or Rich, etc., is a result of scientific or technological advancement, which simply means having a scientifically and technologically literate society. In other words, a literate society and an illiterate society are determined by Science, Technology, and Mathematics, which are seen as the fundamental basis for economic growth, sustainability, and self-reliance.

2.6 Mathematics Education in all Aspects of Human Existence



Taking a cue from the submission of Ahmad (2019), Mathematics is seen applied in building bridges, satellite navigation, codes and communication, internet and phones, supply chains, banking and finance, automotive designs, robotics, computer circuits, artificial intelligence, pharmacy and medicine, population dynamics, data analysis, surveying, among others. Stat Analytical (2022) included many other things as applications of Mathematics to human life, such as social and humanities. Today, there are fields of study in the humanities where Mathematics prominently surfaces. For instance, in culture studies, literary criticism, anthropology, musicology, and art criticism, Mathematics is prominent. It is therefore safe to say that Mathematics is useful to everybody, whether an individual is pursuing schooling or is completely out of school. Mathematical knowledge may even be connected to many other not-so-obvious benefits.

2.6.1 Mathematics Teaching and Learning in the 21st Century

Having examined the scope of mathematics education and highlighted curriculum development as a core perspective, it becomes necessary to ask: How do these frameworks come alive in the classroom? A well-crafted curriculum remains lifeless unless it is translated into effective teaching and meaningful learning. This is where the heart of mathematics education lies in the daily encounters between teachers, learners, and mathematical ideas. "***We cannot prepare our students for tomorrow by relying solely on the methods of yesterday***." This statement captures the essence of mathematics teaching and learning in the 21st century. The world today is characterised by rapid technological advancement, global interconnectivity, and an unprecedented reliance on data. Mathematics classrooms can no longer operate as spaces where learners memorise procedures for passing examinations; they must be transformed into laboratories of reasoning, creativity, and application.

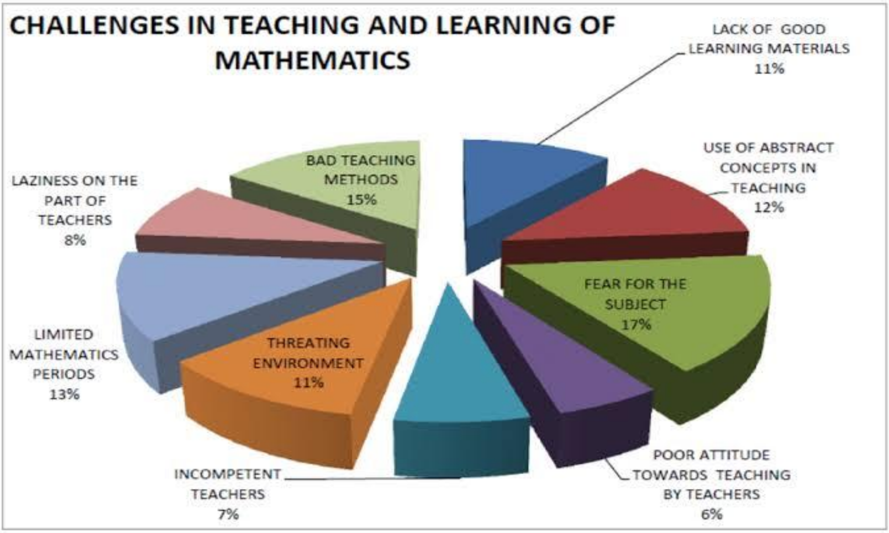
Teaching mathematics in this new era requires a decisive shift from teacher-centred approaches to learner-centred engagement. Learners are expected not only to manipulate symbols but also to interpret, model, and solve complex, real-life problems. The National Council of

Teachers of Mathematics (2020) advocates for a vision where mathematics education fosters critical reasoning, collaboration, and equity qualities essential for learners to thrive in diverse contexts. Similarly, Boaler (2016) argues that teachers should design inquiry-based tasks that cultivate resilience and mathematical confidence, moving beyond the myth that only a select few can excel in mathematics.

Technology has become both a challenge and an opportunity. From dynamic geometry software to AI-driven adaptive platforms, digital tools now expand the ways learners can visualize abstract concepts, receive instant feedback, and personalize their learning trajectories (UNESCO, 2023). In Nigeria, the National Digital Economy Policy and Strategy (2020–2030) positions digital literacy as a cornerstone of national development, underscoring the responsibility of mathematics educators to integrate technology meaningfully in classrooms (Federal Ministry of Communications and Digital Economy, 2020). Yet, this integration must be done carefully; UNESCO (2023) warns that inequitable access and inadequate teacher preparation can turn technology into a divider rather than a bridge. Equally significant is the push toward equity and cultural relevance in mathematics teaching. In multi-ethnic contexts such as Nigeria, mathematics must connect with learners lived realities. Ethnomathematics, which draws on indigenous practices and cultural contexts, has been shown to enhance students' motivation and deepen conceptual understanding (Batiibwe, 2024). By embedding culturally responsive approaches, Nigerian classrooms can dismantle the alienation many learners feel toward mathematics and reposition it as a tool for empowerment and societal participation.

In the Nigerian context, challenges persist. Overcrowded classrooms, limited instructional resources, and assessment systems heavily skewed toward high-stakes examinations often restrict innovation in teaching. However, these same challenges present opportunities. Through deliberate policy alignment, continuous teacher professional development, and the innovative use of digital platforms, mathematics teaching and learning can be reimagined to produce learners who are problem solvers, data-literate citizens, and drivers of national development (World Bank, 2025). In conclusion, mathematics teaching and learning in the 21st century is not merely about transmitting knowledge; it is about cultivating a generation of thinkers and innovators. It demands teachers who are facilitators, curricula that are dynamic and relevant, and learning environments that encourage creativity, equity, and resilience. When mathematics education is approached in this way, it becomes a powerful instrument not just for academic success, but for national transformation.

2.7 Challenges of Mathematics Teaching and Learning in Nigeria



The chat above presents nine distinct challenges, which can be thematically grouped for a more structured analysis.

2.7.1 Pedagogical and Teacher Competency Deficits

This category encompasses "Bad Teaching Methods" (15%), "Use of Abstract Concepts in Teaching" (12%), "Incompetent Teachers" (7%), "Poor Attitude Towards Teaching by Teachers" (6%), and "Laziness on the Part of Teachers" (8%). Cumulatively, these teacher-related issues account for 48% of the challenges identified, highlighting a central failure in the educational core.

a. Incompetence and Poor Methods: In Nigeria, a significant proportion of mathematics teachers, particularly in public and rural schools, are either unqualified or underqualified (Adekoya and Olatoye, 2014). This leads to reliance on rote memorisation and teacher-centred "chalk-and-talk" methods, the "bad teaching methods" cited. The "use of abstract concepts" is a direct consequence; without concrete, contextualised teaching aids, teachers default to presenting mathematics as a set of opaque rules rather than a practical tool for problem-solving. This approach alienates students and fails to build foundational conceptual understanding (Nnaka and Anaekwe, 2017).
b. Attitude and "Laziness": The labels "poor attitude" and "laziness" must be critically examined beyond individual failings. They are often symptoms of systemic demoralisation. Factors such as poor and irregular remuneration, lack of professional development opportunities, and overcrowded classrooms contribute to low teacher morale and motivation (Ubogu and Ojo, 2020). When teachers are not adequately supported or valued, a negative attitude towards their profession and a decline in diligence are predictable outcomes.

2.7.2 Resource and Infrastructural Constraints

This theme includes "Lack of Good Learning Materials" (11%) and "Limited Mathematics Periods" (13%). Learning Materials: The chronic underfunding of the education sector in Nigeria, often falling below the UNESCO-recommended 15-20% of the national budget, directly results in a dearth of textbooks, manipulative, and laboratory equipment (World Bank, 2018). This scarcity forces both teachers and students to engage in mathematics in a theoretical vacuum, exacerbating the challenge of abstraction. Timetable Constraints: "Limited Mathematics periods" is a logistical issue rooted in a congested curriculum and, at times, poor school administration. However, it is also a political and prioritization issue. The insufficient time allocated prevents the deep engagement and practice necessary for mastering mathematical concepts, leading to superficial learning.

2.7.3 Psycho-Social and Environmental Factors

This group comprises "Fear for the Subject" (17%), the highest single challenge, and "Threatening Environment" (11%). Mathematics Anxiety ("Fear for the Subject"): The 17% attribution to fear underscores a significant psycho-social barrier. In Nigeria, mathematics is often culturally perceived as an inherently difficult subject, a filter for "brilliant" students. This perception, combined with the pedagogical failures mentioned, fosters widespread mathematics anxiety. Students who experience early failure or harsh teaching methods develop a mental block, which inhibits cognitive engagement and perpetuates a cycle of underperformance (Akinoso, 2015). "Threatening Environment": This element extends beyond the physical classroom. In the Nigerian context, a "threatening environment" can refer to: Physical Infrastructure: Dilapidated classrooms with leaking roofs, inadequate lighting, and insufficient ventilation. Social Dynamics: Corporal punishment, bullying by peers, and verbal abuse from teachers, which create a psychologically unsafe space for learning. Broader Socio-political Context: In conflict-affected regions such as the Northeast, the "threatening environment" is literal, with school attacks by insurgent groups making education a perilous endeavour (UNICEF, 2021).

2.7.4 Socio-Economic, Political, and Cultural Synthesis: Socio-Economic Conditions

Widespread poverty exacerbates nearly every challenge. It limits the government's tax base for education funding, forces families to prioritize immediate economic survival over schooling, and prevents parents from purchasing learning materials. The gap between private schools in affluent urban areas and public schools in poor/rural areas creates a stark inequality in educational quality, thereby reinforcing socio-economic stratification (Adeyemi and Adu, 2018). Political Context: Policy instability, corruption in the allocation of educational resources, and a lack of robust teacher training initiatives reflect a political system that has failed to prioritize human capital development. The implementation of curricula is often haphazard, and oversight of teacher quality is weak. Cultural Significance: Cultural perceptions of mathematics as a "masculine" or "elitist" subject can influence parental expectations and students' self-belief, particularly for girls. Furthermore, a cultural emphasis on high-stakes examination results (e.g., WAEC, JAMB) over genuine understanding promotes a "**pass-at-all-costs**", mentality that encourages rote-learning over conceptual mastery.

The chat above serves as a stark diagnostic tool, revealing that the challenges in mathematics education are multifaceted and systemic. In Nigeria, these challenges are not merely a list of problems but are interconnected symptoms of deeper socio-economic disparities, political neglect, and cultural perceptions. Addressing "bad teaching methods" requires investing in teacher training and welfare. Alleviating "fear" necessitates creating psychologically safe classrooms and reforming pedagogical approaches. Solving the "lack of materials" demands a political commitment to increased and transparent education funding. A holistic, multi-sectoral reform agenda is therefore imperative to break this cycle of failure and unlock the potential of mathematics education for national development.

Life in general has two faces: hard and soft, good and bad, benefits and challenges. Due to the rapidly growing technological and scientifically engineered society of today, one may wonder what the challenges to Mathematics Education in Nigeria should be, and in addition, one can ask, what should be the nature of Mathematical instruction that is capable of propelling a veritable and dynamic society? To learn the essential Mathematics needed for the 21st century, students need a non-threatening environment in which they are encouraged to ask questions and take risks. The learning climate should incorporate high expectations for all students, regardless of sex, race, handicapping condition, or socioeconomic status. Students need to explore Mathematics using manipulatives, measuring devices, models, calculators, and computers. They need to have opportunities to talk to each other about Mathematics modes of instruction that are suitable for the increased emphasis on problem-solving, applications, and higher-order thinking skills. For example, cooperative learning allows students to work together in problem-solving situations to pose questions, analyse situations, try alternative strategies, and check for the reasonableness of results.

In this circumstance, the following propositions regarding the nature of Mathematics instruction to boost the status of Mathematics become relevant. These include:

a. Students should experience Mathematics as active, engaging, and dynamic.
b. They should learn to view Mathematics as a human discipline to which people of many backgrounds have contributed.
c. Classroom activities should be organized to build on students' previous experience because they tend to remember more ideas and information acquired through experience.
d. Mathematics instruction should at all times incorporate appropriate use of technology, especially calculators and computer packages, and programs and applications that motivate and enable students to recognise that theory contributes to their understanding of Mathematics.
e. Mathematics instruction should make extensive use of writing assignments, open-ended projects, and cooperative learning groups.
f. Mathematics instruction should acquaint students with the history of Mathematics and its numerous connections to other disciplines.
g. Teachers should use a variety of teaching strategies and should employ a broad range of examples.
h. Students should be allowed to participate in mathematical discourse to build their confidence in knowing and using Mathematics. This can be achieved through active participation in students' mathematical clubs and societies.
i. Students should be encouraged to pursue independent explorations in Mathematics. Some of these propositions are synonymous with those put forward by the National Council of Teachers of Mathematics (NCTM).

Several definitions of sustainable growth or development have been given. In this lecture, sustainable growth is understood as everything humanity and nature require for their existence, both now and in the future. According to Ogunyemi (2004), the World Commission on

Environment and Development (WCED) has emphasized sustainable growth to integrate issues of economic growth, social development, and environmental protection; hence, Ogunyemi suggested that sustainable development is anchored on three pillars: namely, improvements in the environment, the economy, and society. When they attain a balanced equilibrium for the betterment of man. Similarly,

Musa (2006) opined that Mathematics of the present generation is a sophisticated intellectual activity. Hence, it is very difficult to define considering the category of audience. In other words, the uses and values of Mathematics to the individual and society are numerous. However, in this age of science and technology, the knowledge of Mathematics is a need and a powerful tool for the development of a nation, as mentioned earlier. Individuals learn Mathematics, use it to develop Science and Technology, which brings sustainability and motivation in promoting or improving the quality of life. This can be assured if there is balance in the physical, mental, and emotional growth of the individual and the nation at large. In light of this, sustainable growth or development in Mathematics Education should be understood beyond the traditional view of Mathematics Education, which focuses merely on the dissemination of knowledge; rather, Mathematics Education should be seen as a process of sustaining growth in our system of thinking, which requires creativity, flexibility, and critical reflection in all our fields of endeavour. Despite the significant role played by the knowledge of Mathematics in the development of the individual and the nation, a great number of students have not chosen Science, Technology, and Mathematics over the past years, which has deteriorated to the extent that certain policies had to be modified. Musa (2006) specifically reported that with the developmental stages of Nigeria from 1960 to 1990, one can notice little growth and very small development, not commensurate with the resources the nation was able to generate within the same period. He therefore concluded that it is appropriate to assess our present level of development by comparison with UNDP goals. For example, can the UBE programme be successful and different from UPE? What are the roots of our Mathematics Impotency? There is no doubt in the fact that our most serious

Mathematics Education disability has to do with a lack of creative Mathematical application.

3.0 The Missing Link

"***Mathematics is often called the language of science; yet, in Nigeria, we have not fully learned to speak it fluently in the service of development***." This paradox captures the essence of the missing link between mathematics education and national development. On paper, mathematics is acknowledged as indispensable to science, technology, innovation, and economic competitiveness. Yet, in practice, the pathway from mathematics classrooms to national transformation remains fragmented.

3.1.1 Missing Link in Terms of National Development:

a. **Weak connection to real-world problems** – Mathematics Education is often taught as abstract formulas, not as a tool for Engineering, Technology, Finance, Agriculture, or Policy in Nigeria. So, students do not see how Mathematics Education drives innovation, Gross Domestic Product growth, or problem-solving for national issues.
b. **STEM leakage** – Poor Mathematics Education foundations at basic/secondary levels mean fewer students qualify for high-demand STEM careers within the country and the whole world, and that directly limits a Nigerians technological and industrial capacity.

3.1.2 Missing Link in Instructional Strategies in Classroom Teaching & Learning

a. **Teacher-centred methods still dominate Nigerian Classes** – Lots of "chalk and talk", activity-based, inquiry, or problem-based learning are mostly what teachers use to teach mathematics education across all schools in the nation, thereby making students memorise procedures instead of reasoning.
b. **Limited use of manipulatives and technology** for teaching of Mathematics, for example, GeoGebra, Desmos, simple counters, or even locally made aids are underused in Nigerian classes; therefore, Mathematics Education stays abstract when it could be visual and

hands-on for the students. Struggling students get left behind, gifted ones get bored. Little use of scaffolding or enrichment.

c. **Teaching mathematics with a weak link to local context** – Teachers in Nigerian schools, for example, teach the topic and content of word problems, using "***John bought 3 apples***" instead of scenarios from Nigerian markets, agriculture, or business that students can easily relate to, for instance, "***Audu buy 3 mudus of garri***".

One critical missing link is the disconnect between curriculum and societal needs. While Nigeria's mathematics curriculum emphasises procedural competence, it often neglects the skills most needed in the 21st century, such as critical thinking, creativity, computational literacy, and application to real-life challenges (Gimba et al., 2018). This gap has produced generations of learners who see mathematics primarily as an examination subject, rather than as a tool for solving pressing national problems such as unemployment, financial illiteracy, and digital exclusion.

In summary, **the missing link** is the failure to translate its power into practice through relevant curricula, empowered teachers, equitable technology integration, innovative pedagogies, and cultural reorientation. Unless these gaps are bridged, mathematics education will remain an untapped resource, and national development will continue to fall short of its potential. Conversely, by addressing these links, Nigeria can model a pathway where mathematics education becomes not just a classroom subject but a catalyst for innovation, equity, and sustainable development.

4.0 My Contributions to Mathematics and Science Education

Mr. Vice-Chancellor, apart from the Science Education courses being taught within and outside this great University, I have contributed to the knowledge of Mathematics and Science Education in fifty-one journal publications and many conference proceedings, both in and outside Nigeria. All these are geared toward assisting overcoming teaching and learning difficulties in science and other related subjects, as well as providing the Missing Link for modelling the path to national development through mathematics education. So, some of my contributions to Mathematics and Science Education are as follow:

4.1 Teaching Contributions

I have taught the following Undergraduate and postgraduate courses within and outside this great university: History and Philosophy of Science, Technology and Mathematics, History of Education in Nigeria, Educational Psychology, Educational Administration, Micro Teaching, Guidance and Counselling, Elementary Mathematics, Research Methods and Statistics, Set Theory and Abstract Algebra.

4.2 Research Contributions

4.2.1 Development of Computer-Assisted Instruction Package on Students' Achievement in Mathematics, Set Theory, Geometry, etc.

Mr Vice-Chancellor, Sir, it is not unusual to find students in many secondary schools who cannot perform simple constructions, plot, or draw with their bare hands as required in Geometry, which is an aspect of Mathematics. This issue of students failing to draw and solve equations related to geometric shapes and figures has been an area of study over the years, as stated in the following studies.

1. Effect of Computer-Assisted Instruction Package on Students' Achievement in Mathematics Set Theory (Gimba and Agwagah, 2013). The study investigated the effect of a computer-assisted instruction package on students' achievement in set theory in Chanchaga Local Government Area. The result revealed that the mean and standard deviation scores of the post-test scores of the experimental and control groups were respectively in favour of the experimental group. The study revealed no significant difference in the achievement of male and female students taught using the CAI package. Some recommendations were made, among which is that mathematics teachers should include the use of a computer-assisted instruction package as one of the strategies to be employed in classroom teaching and learning. The study found that students

taught Set Theory with the use of Computer-Assisted Instruction performed better than those taught using the lecture method.

2. Effects of Computer-Assisted Instructional Package on Achievement and Interest of Senior Secondary School Students in Mathematics in Bida Metropolis, Niger State, Nigeria (Gimba, *et. al.,* 2014). The study compared the effects of the researcher-designed Computer-Assisted Instruction (CAI) package on achievement and interest of senior secondary school students in set theory to the traditional teaching method. The study was carried out in Bida Metropolis. Two senior secondary schools were purposively chosen because of the availability of computers in these schools. A sample of one hundred and nine (109) SSI students was involved in the study. The design used was quasi-experimental. Two intact classes were used, and four research questions and four hypotheses guided the study. The mean, standard deviation and t-test were used to test the hypotheses at a 0.05 level of significance. The result revealed that the mean and standard deviation of the post-test achievement score of experimental and control groups were 60.25 and Standard Deviation 0.12, and 31.15 and the Standard Deviation was 0.10, respectively, in favour of the experimental group. The interest inventory score of the experimental and control groups is 58.43, and the standard deviation was 0.18, and 32.23 and the standard deviations of 0.18 and 0.23, respectively, in favour of the experimental group. The study revealed no significant difference in the mean achievement and interest scores of male and female students taught using the CAT package. Some recommendations made include that mathematics teachers should include the use of a computer-assisted instructional package as one of the strategies to be employed in classroom teaching and learning. It was also discovered that students taught mathematics using computer-assisted instruction performed better than those taught using the lecture method.
3. Gimba, Oluwole, and Ahmed (2015) investigated the effect of a computer simulation instructional package on senior secondary school mathematics students' retention in arithmetic progression in Lavun Local Government area of Niger State. The findings of the

study revealed that students taught arithmetic progression through a computer-simulated instructional package retained the concept learnt more than their counterparts taught using the conventional lecture method. However, there was no significant difference in the retention of boys and girls taught using the package.

4. Abari, Gimba, Hassan and Jiya (2019), Effects of GeoGebra Instructional Package on Secondary School Students' Achievement in Geometry in Makudi Metropolis of Benue State. Mr Vice-Chancellor, Sir, we also found out that students taught Mathematics with the use of the GeoGebra instructional Package performed better than those taught using the lecture method.
5. Effect of Hypertext Pre-processor (PHP) Computer Package on Geometry Achievement of Senior Secondary School Students in Kontagora, Niger State, Nigeria. (Gimba, 2016). Mathematics, the queen of science, has been regarded as an abstract system built on abstract elements. This is the notion many students hold for geometrical shapes. Computer-assisted instruction (CAI), such as the PHP (Hypertext Preprocessor) application, was considered by the researcher as a medium to ease students' difficulties with geometrical shapes. The study used the pre-test, post-test design. Simple random sampling was used to select 40 students (20 males and 20 females). The experimental group was taught the geometrical shapes using the PHP CAI package, and the control group was taught the same concept using the conventional method. Two research questions and two hypotheses were formulated and tested at the 0.05 level of significance. The Geometry Achievement Test (GAT) was administered to the students as a pre-test and post-test, and the data collected were analysed using mean, standard deviation and t-test with the aid of SPSS Statistics. The findings revealed that there was a significant difference between the performance of students taught with the PHP CAI package and those taught with the conventional method, and there was no significant difference in the performance of male and female students taught with the PHP CAI package. Some recommendations were made, among which is that the federal authority should come to the aid of education by providing computer

systems in secondary schools to make teaching and learning more interesting.

Mr. Vice-Chancellor, Sir, I wish to present some of the software packages developed, validated, and assessed to foster meaningful teaching and learning of Mathematics in the course of this lecture. My research established that Mathematics Education involves Computer Simulation Instructional Packages, Information and Communication Technology (ICT) on Gender and student achievement, and Mathematics Modelling and Instructional Packages on secondary school students' achievement.

4.2.2 Research Contributions that cover other psychological constructs in Science Education included:

1. Gimba R. W., Hassan, Yaki, and Chado (2018) observed that students shy away from the study of Science and Technology, even though they occupy a central position in the development of the nation. This shows the negative attitude and poor performance in Science and Technology. This has prompted research into teachers' and students' perceptions of the problems associated with the effective teaching and learning of Science and Technology in junior secondary schools. Others include:
2. Effects of Guided Discovery Teaching Strategy on Senior Secondary School Students' Achievement in Geometry in Gwagwalada Area Council, Abuja, Nigeria. (Onochojare, Gimba, & Hassan, 2018). The purpose of this study was to determine the effect of Guided Discovery Teaching Strategy on senior secondary school students' achievement in Geometry in Gwagwalada Area Council, Abuja. The research design that was adopted for the study was the quasi-experimental type. A sample size of 107 SS 2 students from two co-educational senior secondary schools was used for the study. A multi-stage sampling technique was used first to select the schools. Then the classes used for the study were selected by simple random sampling using the ballot system. The Mathematics Achievement Test on Geometry (MATG), adapted from past WAEC questions, was

the only instrument that was used for data collection. The instrument was validated by four research experts and had a reliability coefficient of 0.89 after a pilot test was conducted on the instrument. Two research questions and two null hypotheses tested at the 0.05 level of significance guided the study. Mean and standard deviation were used to answer the research questions, while an independent t-test was used to test the hypotheses. Results from the findings showed that the students who were taught Geometry using the Guided discovery teaching strategy had better achievement scores than those who were taught using the conventional method. Also, there was no significant difference in the mean achievement scores of male and female students taught Geometry using the guided discovery teaching strategy. It was recommended among others that Mathematics teachers should use the guided discovery teaching strategy in the teaching and learning of Mathematics.

3. Modelling Technology Preparedness as an Antecedent of Mathematic Pre-service Teachers' Self-Efficacy, Perceived Usefulness and Intention toward Use of Information Technology in Nigeria. (Shittu, Gambari, Gimba, and Hassan, 2016). This study tests a specified model of information technology (IT) preparedness as an antecedent of pre-service teachers' self-efficacy, perceived usefulness, and intention toward IT use for teaching in Nigeria. A survey method was employed for conducting the study. The participants of the study comprise 200 pre-service teachers studying Mathematics education in one of the Nigerian universities. The instrument used for data collection was adapted and subjected to validation and a reliability check. A factor analysis revealed four constructs, and their reliability indexes were .73, .87, .90 and .91, respectively. Cronbach's alpha. The data of the study were subjected to factor analysis, confirmatory factor analysis, and finally, fitting the specified model of the study with the AMOS 20 statistical package. The finding showed that IT preparedness positively predicts pre-service teachers' IT self-efficacy, perceived usefulness and in turn predicts their intention towards use of IT for future classroom practice. Based on this finding, the study suggests, among others, the holistic deployment of

IT resources among teacher educators for pre-service teacher training.

4. Yahaya, Gimba and Gana (2021), Impact of Special Intervention Course on Academic Achievement of Physics Students in Colleges of Education, Niger State. The study investigated the impact of the Special Intervention Course on the Achievement of Physics Students in Colleges of Education, Niger State, Nigeria. Quasi-experimental design, specifically Pretest, Posttest, non-equivalent, control group design was adopted for the study. Eighty-one (81) preservice teachers were sampled for the study. Two research questions were raised, and two corresponding null hypotheses were formulated and tested at the 0.05 level of significance. Two experts validated the research instrument used for the study. The test-retest method was used to determine the reliability coefficient of the Optics Achievement Test (OAT). The scores collected were analysed using the Pearson Product-Moment Correlation Coefficient formula, and a reliability index of 0.96 was obtained. The data collected were analysed using mean, standard deviation, and Analysis of Variance (ANOVA) with Statistical Package for Social Sciences (SPSS) version 23.00. The results of the study revealed that the preservice teachers in the Special Intervention Course performed significantly better than those taught Optics only, from the indication on the p-value. Based on the finding revealed that using the Special Intervention Course as a supplement in Physics, preservice teachers in the Experimental group perform better than the preservice teachers in the Control group of the study. NCCE should adopt the use of the Special Intervention Course pending the reintroduction of Optics I into the NCE Minimum Standard of Physics and other subjects, which was among the recommendations made for this study.
5. Assessment of Adequacy of Facilities and Required Personnel for Implementation of NCE Mathematics Curriculum among Colleges of Education, North-Central, Nigeria (Abdulrahman, Gimba and Hassan 2019).
6. Awareness of Nanoscience and Nanotechnology among Science Teachers in Science and Technical Schools in Federal Capital

Territory, Abuja, Nigeria (Aji, Gana and Gimba 2020). This study seeks to explore the awareness of Nanoscience and Nanotechnology among science teachers in science and technical schools. A survey lookup layout was adopted for the study. Two research questions and two hypotheses were defined to direct the examination. The populace comprised 224 science educators, and this likewise serves as the sample size for the examination. An instrument titled "Awareness of Science Teachers about Nanoscience and Nanotechnology Questionnaire" with a reliability coefficient of 0.96 was used. Simple percentage and frequency counts were utilised to respond to the examination questions, while Analysis of variance (ANOVA) was utilised to test the hypotheses. The findings from this investigation uncovered that science educators in science and technical schools are not aware of Nanoscience and Nanotechnology (NSNT). Similarly, the study additionally uncovered that science instructors in science and technical schools are not aware of the fundamental ideas upon which Nanoscience and Nanotechnology (NSNT) are based. Hence, both hypotheses were rejected. In the light of this, it was recommended among others that the government, ministry of education, board of science and technical schools, stakeholders and policymakers in the education sector should organize programs like the K-12 Nanoscience and Nanotechnology project to train science teachers in secondary schools and science and technical colleges on NSNT and how to teach NSNT and its fundamental ideas in the classroom.

5.0 My Contributions to Community Service

Mr Vice-Chancellor, Sir, I would like to share my contributions in the area of community social responsibilities. On supervision, I have supervised over 80 undergraduate research projects, 30 Master's Degrees and 19 PhD from FUT, Minna, and other tertiary institutions of this great country. I also served as a Resource Person at the Training Workshop for Primary School Teachers under the Millennium Development Goal Project. Mr. Vice-Chancellor, Sir, I have served as a member on more than 40 committees across the Department, School, and University levels. Mr. Vice-Chancellor, Sir, I have served as the Nigerian Universities Commission's (NUC) resource verification expert and accreditation panelist for some years, since becoming a professor, where I played a pivotal role in institutionalizing and elevating academic quality assurance, for new academic programs and accrediting existing ones to ensure strict compliance with the Benchmark Minimum Academic Standards. Mr. Vice-Chancellor, Sir, I have also served as an External Examiner for NECO and WEAC examination bodies in the country.

6.0 Recommendations

Mr. Vice-Chancellor, Sir, the following are the recommendations that would help to overcome the current educational challenges and the adoption of global best practices.

1. Provide regular training and workshops for Mathematics teachers to enhance their pedagogical skills and content knowledge.
2. Establish mentorship programmes and peer-support networks to help teachers share best practices and address challenges.
3. Develop a mathematics curriculum that is relevant to Nigerian culture and society, and prepare students for real-world applications.
4. Regularly review and update the mathematics curriculum to ensure that it aligns with national development goals and global best practices.
5. Provide schools with adequate resources, including textbooks, technology, and educational software, to support effective Mathematics teaching and learning.
6. Integrate Information and Communication Technology (ICT) into Mathematics Education to enhance teaching and learning.
7. Implement continuous assessment strategies to monitor students' progress and identify areas for improvement.
8. Develop and administer standardised tests to evaluate students' achievement and inform instruction.

9. Engage parents and guardians in mathematics education through workshops, seminars, and other activities.
10. Foster partnerships with industries and organisations to provide students with real-world applications and career opportunities.
11. Develop and implement policies that prioritize Mathematics Education and provide adequate funding for initiatives and programmes.
12. Allocate sufficient funds to support Mathematics Education initiatives, including teacher training, resource development, and infrastructure improvement.
13. Support research initiatives that investigate effective Mathematics teaching and learning strategies.
14. Encourage the development of innovative solutions, such as educational technology, to enhance Mathematics Education.

7.0 Conclusion

Mr. Vice-Chancellor, Sir, I wish to submit that from the above, it is apparent that Mathematics Education is the key to sustainable growth and self-reliance. In other words, Mathematics Education is the mirror of our civilisation; that is, the present and future civilisation lies on the fruit of Mathematics Education, and also, the future civilisation will depend on Mathematics Education. This is because Mathematics Education provides the foundation of a country's development process through science and technology. It is through mathematical knowledge that the values and skills for living in society, managing and sustaining growth, and self-reliance are acquired. This lecture has highlighted some of the challenges in Mathematics Education in Nigeria and given the following recommendations to ensure sustainable growth and self-reliance.

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BRIEF PROFILE OF THE INAUGURAL LECTURER

Professor (Mrs.) Ramatu Wodu Gimba is a distinguished Nigerian academic in the field of Mathematics Education, with a career spanning over three decades across secondary and tertiary education. Born on 5th October 1966 in Doko, Niger State, she is a Nigerian national from the Doko/Lavun Local Government Area. Fluent in Nupe, Hausa, and English, she is married with six children. Her academic journey began in Kaduna State, attending L.E.A. Demonstration School, Kawo, and L.E.A. Gwari Road. She completed her secondary education at Government Girls Secondary School, Kontagora, and Government Girls Science College, Minna, obtaining her Secondary School Certificate in June 1985. She earned a Nigerian Certificate in Education (NCE) from the College of Education, Minna, in 1988. Her higher education includes a Bachelor of Education in Mathematics from Ahmadu Bello University, Zaria (1997), a Master's in Technology (Mathematics Education) from the Federal University of Technology, Minna (2003), and a PhD in Science Education (Mathematics Education) from the University of Nigeria, Nsukka (2014).

Professor Gimba's professional career commenced in 1989 with the Voluntary Teaching Service. On 18th April 1990, she was formally appointed to Zarumai Model School, Minna, where she demonstrated exemplary service and rose steadily through the ranks from Master III to Assistant Chief Education Officer by 2005. Her dedication was recognized with the Best Teacher of the Year award in 2004. In 2005, she transferred her service to the Federal University of Technology, Minna (FUT Minna), joining the Department of Science Education as an Assistant Lecturer. Her academic progression was rapid and consistent: Lecturer II (2005), Lecturer I (2008), Senior Lecturer (2014), Associate Professor (2017), and full Professor in 2020, a rank she currently holds. As a professor, her contributions to manpower development are substantial. She has taught a wide array of undergraduate and postgraduate courses, including Educational Psychology, Philosophy of STM, Research Methods, Advanced Statistics, and various mathematics courses for FUT Minna and the National Teachers' Institute (NTI). Her commitment to mentorship is evidenced by the supervision of numerous undergraduate projects and over 45 postgraduate theses (M.Tech and PhD), with research foci on innovative instructional strategies like computer-assisted learning, mathematical modelling, and cooperative learning.

Professor Gimba has undertaken significant administrative roles, most notably as the Head of the Department of Science Education from 2016 to 2020. She also served as Examination Officer, Undergraduate Project Coordinator, Managing and Accounting Editor for the Journal of Science, Technology and Mathematics Education (JOSTMED), and represented her department on various school and university committees, including university examination misconduct committee, A&PC senate representative etc. Her scholarly output is robust, with numerous publications in international, national, and state journals, as well as conference proceedings and academic book chapters. Her research, often self-funded or supported by TETFund, explores the effectiveness of technology and constructivist approaches in teaching mathematics and science. She is an active member of several professional bodies, including the Teachers Registration Council of Nigeria, the Academic Staff Union of Universities, the Mathematics Association of Nigeria, and the Science Teachers Association of Nigeria.

Beyond the university, Professor Gimba has rendered extensive community and external service. She served as an examiner for NECO and WAEC for many years, acted as a resource person for teacher training workshops under the Millennium Development Goals project, and contributed to her community as a Patron of Quranic School and local associations. She also serves as an external examiner and assessor for promotions to several universities and colleges of education. Her excellence has been recognized through multiple awards, including Best Lecturer in the Department of Science Education (2011) by Nigerian Association of Science Students (NASS), FUT Minna. A Meritorious Award for contributions to JOSTMED (2015), and a Distinguished Service Award for contributions to the development of Niger State College of Education, Doko Centre (2022). Professor Gimba, whose hobbies include travelling and reading, resides in Minna. Her career embodies a profound dedication to advancing mathematics education, mentoring future generations, and serving her academic and local communities with distinction.

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