

## CHAPTER 12

### The Demand for STEM Skills in the 21st Century for the Development of Nigerian Educational System

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#### Introduction

Nigeria is experiencing an increasing demand for STEM (Science, Technology, Engineering, and Mathematics) skills due to the country's expanding technology sector and the need for a skilled workforce to drive innovation and economic growth. According to a report by the World Economic Forum, Nigeria is facing a skills gap in STEM fields, with employers struggling to find qualified candidates for technical roles (World Economic Forum, 2019). This has led to a push for more investment in STEM education and training to meet the demands of the evolving job market. STEM, which stands for Science, Technology, Engineering, and Mathematics, is more than just a collection of subjects. It's an interdisciplinary approach that integrates these crucial areas into a holistic framework for teaching and learning. Science explores the natural world, from the tiniest atoms to complex ecosystems. It involves understanding natural phenomena, conducting experiments, and making observations. Technology encompasses gadgets, software, and tools that make our lives easier and more connected. It includes everything from smartphones and computers to advanced medical devices. Engineering is where design and utility intersect. Engineers create solutions by designing bridges, buildings, circuits, and other practical systems. Mathematics serves as the language underlying all STEM fields. It involves crunching numbers, analyzing patterns, and predicting outcomes. STEM education aims to develop not only knowledge but also the ability to apply that knowledge in real-world scenarios. It prepares students for the jobs of tomorrow by fostering problem-solving skills, creativity, and collaboration. The shift toward STEM education recognizes that challenges require individuals who can creatively and collaboratively apply knowledge, rather than merely memorizing facts. STEM isn't just about learning; it's about interconnecting fields to solve real-world problems and prepare students for a tech-savvy job market.

The Nigerian government has recognized the importance of STEM skills in driving national development and has implemented various initiatives to promote STEM education and training. For example, the government has launched programs such as the National Science, Technology, and Innovation Policy to encourage STEM education and research in the country (Nigerian Government, 2020). Additionally, the government has also established specialized STEM schools and centers to provide students with hands-on training and practical experience in STEM fields. In the private sector, Nigerian companies are increasingly looking for employees with STEM skills to drive innovation and remain competitive in the global market. A study by the

African Institute for Science Policy and Innovation revealed that there is a growing demand for STEM professionals in sectors such as telecommunications, energy, and manufacturing in Nigeria (African Institute for Science Policy and Innovation, 2018). This demand is expected to continue to increase as Nigeria seeks to diversify its economy and move towards a knowledge-based society. Overall, the demand for STEM skills in the 21st century in Nigeria is on the rise, and the country must invest in STEM education and training to meet the needs of the evolving job market and drive national development. Efforts by the government and private sector to promote STEM education and training will be essential in bridging the skills gap and ensuring that Nigeria remains competitive in the global economy.

Climate change has had a significant impact on Nigeria, affecting various aspects of the country's environment, economy, and social well-being. Some of the key impacts of climate change in Nigeria include changes in precipitation patterns, sea-level rise, increased frequency of extreme weather events, and food insecurity. Climate change has led to changes in precipitation patterns in Nigeria, resulting in both periods of drought and intense rainfall. These changes have had a significant impact on agriculture, water resources, and food security in the country (Oguntayo et al., 2021). Rising sea levels as a result of climate change pose a threat to coastal areas in Nigeria, leading to erosion, saltwater intrusion, and displacement of communities living in coastal regions (Edwards et al., 2019). Climate change has been linked to an increase in the frequency and intensity of extreme weather events such as floods, heat waves, and storms in Nigeria. These events have caused widespread damage to infrastructure, homes, and livelihoods, exacerbating poverty and inequality in the country (Abaje et al., 2020). According to Akinleye and Olajide (2020), Climate change impacts on agriculture, such as changes in temperature and precipitation, have resulted in reduced crop yields and increased food insecurity in Nigeria. This has implications for food availability, access, and nutrition security for vulnerable populations in the country.

One of the key areas where STEM skills are in high demand in Nigeria about climate change is in the field of renewable energy. As the country seeks to reduce its dependence on fossil fuels and transition to cleaner and more sustainable energy sources, there is a need for professionals with a strong background in STEM disciplines to develop and implement renewable energy technologies. These impacts highlight the urgent need for adaptation and mitigation efforts to address the challenges posed by climate change in Nigeria and build resilience in vulnerable communities. According to a report by the World Bank, Nigeria's renewable energy sector has the potential to create over 52,000 new jobs by 2022. This highlights the increasing demand for skilled professionals in this sector, including engineers, scientists, and technicians with expertise in renewable energy technologies. In addition, there is also a growing need for STEM skills in other areas related to climate change, such as environmental conservation, water resource management, and sustainable agriculture. Professionals with expertise in these areas can play a crucial role in developing and implementing strategies to mitigate the impacts of climate change and build resilience in communities across Nigeria. Overall, the demand for STEM skills in addressing

climate change in Nigeria is expected to continue to grow as the country faces increasing challenges related to climate variability and extreme weather events. Investing in STEM education and training programs can help to build a skilled workforce that is equipped to tackle these challenges and drive sustainable development in the country.

There is a growing need for Science, Technology, Engineering, and Mathematics (STEM) skills in agriculture in Nigeria to address the challenges posed by climate change, improve agricultural productivity, and enhance food security. STEM skills play a crucial role in driving innovation, sustainable agricultural practices, and digital solutions in the agricultural sector. STEM skills are essential for the adoption of digital agricultural technologies such as precision farming, remote sensing, and data analytics. These technologies can help farmers monitor crop growth, optimize resource use, and make data-driven decisions to improve productivity and profitability (Ajagbe et al., 2021). STEM skills are critical for the implementation of climate-smart agricultural practices that help farmers mitigate and adapt to the impacts of climate change (Ifeanyi et al., 2020). These practices include conservation agriculture, agroforestry, and climate-resilient crop varieties, which require expertise in soil science, plant breeding, and agronomy. STEM skills are necessary for the development and application of biotechnological solutions in agriculture, such as genetically modified crops, biopesticides, and crop improvement techniques. These technologies can improve crop yields, pest resistance, and nutritional value, contributing to food security in Nigeria (Olatoye et al., 2019). STEM skills are vital for conducting agricultural research, innovation, and extension services to address production challenges, optimize resource use, and promote sustainable agriculture practices. This includes expertise in agricultural engineering, crop science, animal science, and agricultural economics (Adigun et al., 2021). By investing in STEM education and skills development in agriculture, Nigeria can build a skilled workforce that can drive agricultural transformation, enhance food security, and contribute to the sustainable development of the country's agriculture sector.

The demand for Science, Technology, Engineering, and Mathematics (STEM) skills in the health sector in Nigeria is increasing due to the need for innovative solutions, data-driven decision-making, and the application of advanced technologies to address health challenges in the country. STEM skills are critical for enhancing healthcare delivery, improving public health outcomes, and advancing medical research in Nigeria (Ojo et al., 2021). STEM skills are essential for the implementation of health informatics systems, electronic health records, and data analytics in healthcare facilities. These technologies help healthcare professionals streamline patient care, monitor health trends, and improve disease surveillance in Nigeria (Adebayo et al., 2020). STEM skills are necessary for developing and maintaining medical devices, equipment, and innovative healthcare solutions in Nigeria. Biomedical engineers play a key role in designing, testing, and implementing healthcare technologies that enhance diagnosis, treatment, and patient care in the healthcare sector (Okeke et al., 2018). Obi et al., (2019) assert that STEM skills are crucial for conducting genomics research, personalized medicine, and genetic testing in the healthcare sector in Nigeria. These technologies can help healthcare providers tailor treatments to individuals'

genetic profiles, improve disease diagnosis, and enhance healthcare outcomes. STEM skills are vital for conducting public health research, disease surveillance, and epidemiological studies to address health challenges in Nigeria. These skills enable public health professionals to analyze health data, identify health trends, and develop evidence-based interventions to improve population health (Ojo et al., 2021). By investing in STEM education and skills development in the health sector, Nigeria can build a competent workforce that can drive healthcare innovation, improve health outcomes, and enhance the quality of healthcare services in the country.

There is a growing demand for STEM skills in the Information and Communication Technology (ICT) sector in Nigeria. The country's digital economy is expanding, prompting the need for skilled professionals in disciplines such as computer science, software development, data analytics, and cybersecurity. According to a report by the National Bureau of Statistics (NBS, 2021), the ICT sector in Nigeria has been a major driver of economic growth and job creation. The report highlights the importance of STEM skills in meeting the demands of the fast-growing digital economy in the country. Additionally, a study by the International Labour Organization (ILO, 2020) on the digital economy in Nigeria noted that there is a shortage of skilled professionals in the ICT sector, particularly in emerging areas such as artificial intelligence, machine learning, and blockchain technology. This shortage is creating opportunities for individuals with STEM skills to fill the gap and contribute to the sector's growth. Furthermore, a report by the World Bank (2019) highlighted the need for Nigeria to invest in developing STEM skills to drive innovation and compete in the global digital economy. The report emphasized the importance of equipping the workforce with relevant STEM skills to take advantage of the opportunities offered by technological advancements in the ICT sector. The demand for STEM skills in the ICT sector in Nigeria is evident, and individuals with expertise in these areas are well-positioned to capitalize on the growing opportunities in the country's digital economy.

STEM education plays a crucial role in shaping Nigeria's educational system and contributing to the nation's development. Some of the benefits of STEM skills include:

1. **Promising Jobs of the Future:** STEM education equips students with the skills needed for emerging job markets. As technology continues to advance, jobs in science, engineering, and technology fields become increasingly valuable. By emphasizing STEM, Nigeria can prepare its youth for promising careers in areas such as data science, artificial intelligence, renewable energy, and biotechnology.
2. **Innovation and New Knowledge:** STEM fosters innovation by encouraging critical thinking, problem-solving, and creativity. Students learn to apply knowledge to real-world challenges. A strong STEM foundation leads to the creation of new knowledge, inventions, and breakthroughs that benefit society and drive economic growth.
3. **Global Competitiveness:** Countries with robust STEM education systems are better positioned in the global economy. They produce skilled professionals who contribute to research, development, and technological advancements. Nigeria can enhance its global

competitiveness by investing in STEM education and nurturing a generation of capable scientists, engineers, and technologists.

4. **Addressing Societal Challenges:** STEM skills empower individuals to tackle pressing issues such as healthcare, agriculture, and environmental sustainability. For instance, STEM-trained professionals can develop innovative solutions for disease prevention, food security, and clean energy production.
5. **Building a Knowledge-Based Economy:** A knowledge-based economy relies on intellectual capital, research, and innovation. STEM education provides the foundation for such an economy. By emphasizing STEM, Nigeria can transition from resource-based industries to knowledge-driven sectors, fostering sustainable economic growth.
6. **Self-Reliance and Teamwork:** Collaborative experimentation in STEM teaches self-reliance and teamwork. Students learn to work together, communicate effectively, and solve complex problems.
7. **Economic Growth:** STEM skills drive economic growth by fostering innovation, research, and development. A strong STEM workforce contributes to industry growth, job creation, and increased productivity.
8. **Addressing Societal Challenges:** STEM education equips individuals to tackle pressing issues such as healthcare, agriculture, and environmental sustainability. For instance, STEM professionals can develop solutions for disease prevention, food security, and clean energy production.
9. **Global Competitiveness:** Countries with robust STEM education systems are better positioned in the global economy. Nigeria can enhance its competitiveness by investing in STEM, producing skilled professionals, and contributing to technological advancements.
10. **Youth Empowerment:** Nigeria's youth population is projected to be substantial by 2050. Converting this youth dividend into a highly skilled STEM workforce can be a game changer for the nation's progress.
11. **Strategic Role in Development:** The African Union's Agenda 2063 recognizes the strategic role of STEM education in fast-tracking Africa's development. STEM skills are essential for addressing megatrends such as emerging technologies, cybersecurity, climate change, and global health.
12. **Challenges and Opportunities:** Challenges include low participation in STEM fields, especially among women, and deficiencies in awareness of STEM career opportunities. However, advancements in teaching methodologies and curriculum development offer opportunities for progress.

The demand for STEM (Science, Technology, Engineering, and Mathematics) skills is increasingly recognized as a crucial factor in the development of Nigeria's educational system. The Federal Ministry of Education has acknowledged the importance of STEM education as a tool for empowering citizens to overcome poverty and reduce social vices arising from joblessness. The National Policy on Science and Technology Education (2019) aims to address the challenges of delivering quality science and technical education in Nigeria. There is a noted gap between the

skills demanded by Nigeria's economy and the output of the educational system, particularly in STEM disciplines. This gap is partly responsible for the country's slow technological advancement and the type of education that breeds poverty rather than wealth creation.

To address these challenges, more emphasis must be placed on STEM education. It is necessary for the growth and development of the nation, and if Nigeria is to remain the giant of Africa, STEM education must be prioritized. However, STEM education in Nigeria currently faces challenges such as inadequate funding, high numbers of out-of-school children, infrastructural challenges, lack of creativity and employability skills, low research output, and poor quality of teachers (Fomunyam, 2019). To bridge the gap with developed countries, Nigeria must prioritize education and invest in its future through comprehensive reforms and targeted interventions. Promoting inclusive STEM-focused schools is seen as a mechanism to achieve technology-driven socioeconomic development and enhance Nigeria's global competitiveness. Therefore, the development of STEM skills through a robust educational system is essential for Nigeria's future prosperity and position in the global economy.

## **Conclusion**

In summary, STEM education is not only about subject knowledge; it's a catalyst for national development, job creation, and a brighter future for Nigeria. Investing in STEM now will yield long-term benefits for the country's prosperity and progress. Nigeria must harmonize its STEM education with international benchmarks, enhance teacher training, update curriculum content, and integrate modern technologies. By doing so, Nigeria can equip its students with relevant skills for the global market and contribute significantly to national development.

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