

Improving Science Technology and Mathematics Education (STME) in Nigerian Secondary Schools: Addressing Fundamental Imperatives

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Introduction

Science, technology and mathematics education is crucial for the development of any nation, as it equips citizens with the knowledge and skills necessary to drive innovation, economic growth, and sustainable development. However, the teaching and learning of science and technology in Nigerian secondary schools face numerous challenges, including outdated curriculum, inadequate resources, and a lack of qualified teachers. This paper argues that improving science, technology and mathematics education in Nigerian secondary schools requires a multifaceted approach that addresses these challenges and prepares students for success in an increasingly complex and technology-driven world.

Benefits of improved science, technology and mathematics education

Here are some potential benefits of improved science, technology and mathematics education in Nigerian secondary schools:

1. Better Career Opportunities

- Increased opportunities for students to pursue careers in STME fields
- Improved employability and job prospects

2. Economic Growth and Development

- Contribution to economic growth and development through innovation and entrepreneurship
- Improved competitiveness in the global economy

3. Improved Scientific Literacy

- Increased scientific literacy among citizens
- Better informed decision-making on science-related issues

4. Addressing Global Challenges

- Ability to address global challenges such as climate change, health pandemics, and sustainable development
- Contribution to global solutions and innovations

5. Improved Health and Environmental Outcomes

- Ability to address local health and environmental challenges
- Improved quality of life and well-being

6. Increased Innovation and Entrepreneurship

- Increased innovation and entrepreneurship in STME fields
- Development of new products, services, and processes

7. Improved Critical Thinking and Problem-Solving

- Improved critical thinking and problem-solving skills among students
- Ability to adapt to changing technologies and environments

8. Better Preparation for Tertiary Education

- Better preparation for tertiary education in STME fields
- Improved success rates in STME-related courses

9. Increased Competitiveness

- Increased competitiveness in the global economy
- Ability to attract foreign investment and partnerships

10. Improved National Development

- Contribution to national development through science and technology
- Improved quality of life and well-being for citizens.

These benefits can have a positive impact on individuals, communities, and the nation as a whole, highlighting the importance of improving science and technology education in Nigerian secondary schools. However, science and technology education in Nigeria is bedevilled by some impediments as itemized below.

Challenges in Science, Technology and Mathematics Education

Despite its importance, science and technology education in Nigerian secondary schools faces numerous challenges, including:

- 1. Outdated Curriculum:** The science and technology curriculum in Nigerian secondary schools is often outdated, failing to reflect modern scientific discoveries and technologies (Adeyinka, 2018). Failure to incorporate modern scientific discoveries and technologies and lack of relevance to real-world problems and applications
- 2. Inadequate Resources:** Many Nigerian secondary schools lack the resources and infrastructure needed to support effective science and technology education, including

laboratories, equipment, and internet access (Nigerian Educational Research and Development Council, 2018). There is the problem of limited access to laboratories, equipment, and materials and poor maintenance of existing facilities and equipment. It has also been reported by United Nations Children's Fund that as at 2019, only 10% of public schools have functional science laboratories.

3. Lack of Qualified Teachers: There is a shortage of qualified science and technology teachers in Nigerian secondary schools, with many teachers lacking the necessary training and support to effectively teach these subjects (UNESCO, 2019). The student-teacher ratio in science classes is 120:1, compared to the international standard of 20:1 (World Bank, 2020). Also, limited opportunities for teacher professional development, brain Drain and Teacher Attrition, loss of qualified teachers to other industries and countries high teacher turnover rates are impediments to functional science and technology education in Nigeria.

4. Emphasis on Theory over Practical Experiments: Science and technology education in Nigerian secondary schools often emphasizes theory over practical experiments, limiting students' opportunities for hands-on learning and experimentation (Okebukola,2017). There is over reliance on textbook-based learning, emphasis on theory over practical experiments and limited opportunities for hands-on experimentation and exploration.

5. Limited Access to Technology: Many Nigerian secondary schools lack access to modern technology, including computers, software, and internet connectivity, hindering students' ability to develop essential technological skills (World Bank, 2019). Limited access to computers, software, and internet connectivity Inability to develop essential technological skills (Nigeria Communications Commission,2019)

6. Overcrowded and poorly ventilated classrooms: The following statistics are worth noting when it comes to overcrowded classrooms especially as it affects science and technology education in Nigeria:

Average student-to-classroom ratio in Nigeria: 120:1 (UNESCO, 2019). 70% of public schools in Nigeria have overcrowded classrooms (Nigeria National Bureau of Statistics, 2019), 60% of classrooms in Nigeria lack adequate ventilation (World Bank, 2018), 40% of students in Nigeria study in classrooms with poor air quality (UNICEF, 2019). Though these statistics date back to 2018 and 2019, nothing has changed significantly in 2024. These conditions have led to reduced academic performance, increased risk of respiratory problems

and other health issues, decreased student engagement and motivation, increased stress and discomfort for students and teachers.

7. Assessment and Evaluation: Some problems of assessment and evaluation in science, technology and mathematics education in Nigeria include:

- a) Overemphasis on theory: Assessments focus on theoretical knowledge rather than practical skills.
- b) Lack of standardization_: Inconsistent assessment standards across schools and regions.
- c) Inadequate teacher training_: Teachers lack training in assessment and evaluation methods.
- d) Limited resources: Insufficient materials, equipment, and technology for effective assessment.
- e) Cultural bias: Assessments may be biased towards urban or Western cultural contexts.
- f) Cheating and malpractice: Widespread cheating and malpractice undermine assessment validity.
- g) Over reliance on written tests: Neglect of practical, oral, and project-based assessments.
- h) Inadequate feedback: Students receive insufficient feedback on their performance.
- i) Curriculum overload: Assessments cover too much content, leading to superficial understanding.
- j) Lack of technology integration: Assessments fail to incorporate technology and digital literacy.
- k) Inequitable access: Disparities in access to assessment opportunities and resources.
- l) Corruption and politicization: Assessment outcomes influenced by corruption and political considerations.

These challenges hinder the effectiveness of assessment and evaluation in science, technology and mathematics education in Nigeria, making it essential to address them to improve student learning outcomes.

8. Funding and Budgetary Constraints: Limited allocation of resources to science, technology and mathematics education as reported by Federal Ministry of Finance (2020) and inability to invest in modern equipment and facilities. As at 2020, Education receives only 7.1% of the national budget, with a smaller fraction allocated to science and technology

education. Funding and budgetary constraints are significant challenges facing science and technology education in Nigeria, including:

- a) Inadequate government funding: Insufficient allocation of funds for science and technology education (Federal Ministry of Education, 2020)
- b) Low budgetary allocation: Science and technology education receives a small percentage of the national budget (National Bureau of Statistics, 2020).
- c) Inconsistent funding: Unpredictable and irregular funding for science and technology initiatives (UNESCO, 2019).
- d) Dependence on external funding: Over-reliance on international organizations and donors for funding (UNESCO, 2019 & World Bank, 2019).
- e) Limited private sector investment: Inadequate investment from private companies in science and technology education (Nigerian National Assembly, 2020 & World Bank, 2019).
- f) High maintenance costs: Insufficient funds for maintenance of equipment, facilities, and infrastructure.
- g) Brain drain and talent loss: Inability to retain talented scientists and technologists due to lack of funding.
- h) Outdated equipment and resources: Inadequate funding for modern equipment, technology, and educational resources.
- i) Limited access to research funding: Insufficient funding for research initiatives and projects.
- j) Inefficient use of funds: Mismanagement and misallocation of available funds.
- k) Corruption and misappropriation: Diversion of funds meant for science and technology education.
- l) Lack of transparency and accountability: Poor tracking and monitoring of funds allocated to science and technology education.

These funding and budgetary constraints hinder the development of science and technology education in Nigeria, making it essential to address them to improve the quality and effectiveness of education.

9. Societal and Cultural Factors: Societal and cultural factors that hinder science, technology and mathematics education in Nigeria include:

- a) Socio-cultural beliefs and values: Some Nigerian cultures may view science and technology as conflicting with traditional beliefs (Okebukola, 2018).
- b) Gender stereotypes: Girls may be discouraged from pursuing science and technology careers due to societal expectations (Oyedeji, 2020).
- c) Religious beliefs: Some religious interpretations may conflict with scientific theories, leading to resistance to science education (Akpan, 2019).
- d) Parental influence: Parents may prioritize traditional or vocational education over science and technology (Omoifo, 2018).
- e) Socio-economic status: Students from low-income backgrounds may lack access to quality science and technology education (Oladele, 2020)
- f) Cultural emphasis on rote learning: Nigerian culture may prioritize memorization over critical thinking and problem-solving (Nwosu, 2019).
- g) Language barriers: English language proficiency may hinder science and technology learning for non-native speakers (Oyetunde, 2018)
- h) Societal attitudes towards STME: Nigerian society may not fully value or support science, technology, engineering, and mathematics (STEM) education (Adeniran, 2020).
- i) Cultural relevance and context: Science and technology education may not be tailored to Nigerian contexts and needs (Okeke,2019).
- j) Brain drain: Talented Nigerian scientists and technologists may emigrate, depriving the country of expertise (Oyedeji, 2019).
- k) Societal pressure for quick results: Emphasis on quick fixes rather than long-term scientific solutions (Nwosu, 2020).
- l) Cultural emphasis on certificate over competence: Prioritizing educational certificates over practical skills and competence (Oyedeji, 2019).
- m) Addressing these societal and cultural factors is crucial to improving science and technology education in Nigeria.

10. Poor Learning Environment: These challenges hinder the effectiveness of science and technology education in Nigerian secondary schools, limiting students' opportunities to develop the knowledge, skills, and competencies needed to succeed in an increasingly complex and technology-driven world. The resulting effects of dysfunctional science and technology education in Nigerian secondary schools are listed below.

Summarily, Low enrollment rates (Nigeria National Bureau of Statistics 2019), Poor performance in science exams (West African Examinations Council, 2020). Low number of STEM graduates (National Universities Commission, 2018) and shortage of science teacher (Federal Ministry of Education,2020) have been identified as the bane of functional Science and technology education in Nigeria. Also, inadequate facilities and resources (United Nations Children's Fund, 2019), low budget allocation (Federal Ministry of Finance, 2020), poor student-teacher ratio (World Bank, 2020), limited access to technology (Nigeria Communications Commission, 2019), low participation in science competitions (International Science Olympiad, 2020) and brain drain (World Bank,2019) have also been implicated as problems of science and technology education in the country

Effects of poor science, technology and mathematics education

Here are some effects of poor science, technology and mathematics education in Nigeria.

1. Brain drain: Inadequate science and technology education leads to a shortage of skilled professionals, contributing to brain drain (Adejumobi, 2018). World Bank (2019) also reported the malady of brain drain in Nigeria owing to dysfunctional science and technology education.
2. Economic stagnation: Poor science and technology education hinders economic growth, innovation, and competitiveness in Nigeria (Oyebanjo, 2018).
3. Limited industrial development: Inadequate preparation for STME careers limits Nigeria's industrial development and manufacturing capacity (FRN, 2019).
4. Dependence on foreign technology: Nwagwu (2019) has warned that over-reliance on foreign technology affects national security and hinders domestic innovation.
5. Environmental challenges: Poor understanding of environmental issues exacerbates environmental challenges like pollution and climate change (Akpoborie, 2018).
6. Healthcare challenges: According to Ojo (2019), insufficient preparation for healthcare careers worsens healthcare disparities and challenges in Nigeria.
7. Limited opportunities for women: Poor science and technology education limits opportunities for women in STEM fields, perpetuating gender inequality according to Okebukola (2018).
8. Inadequate infrastructure development: Poor science and technology education hinders infrastructure development, affecting transportation, energy, and communication (FRN, 2019).

9. National insecurity: Dependence on foreign technology and inadequate domestic innovation compromise national security (Nwagwu, 2019).
10. Global competitiveness: Oyebanjo (2018) has posited that poor science and technology education affects Nigeria's global competitiveness, influencing trade, innovation, and economic development.

These effects have far-reaching consequences for individuals, communities, and the nation as a whole, highlighting the need for urgent attention to improve science and technology education in Nigerian secondary schools. Hence the recommendation below.

Recommendations for Improvement

Improving teaching and learning of science, technology and mathematics education in Nigerian secondary schools requires a comprehensive approach that includes curriculum reform, investment in resources and infrastructure, teacher training and support, and emphasis on practical experiments and hands-on learning. Specifically, some recommendations for improving science and technology education in Nigerian secondary schools are here suggested.

A. Curriculum Reform

Curriculum reform can significantly improve science and technology education in Nigeria in several ways:

1. Alignment with global standards: Updating the curriculum to reflect international best practices and standards can ensure Nigerian students are competitive globally.
2. Relevance to societal needs: Incorporating emerging technologies and fields like renewable energy, biotechnology, and data science can prepare students for Nigeria's development challenges.
3. Practical, inquiry-based learning: Emphasizing hands-on experiments, projects, and problem-solving can foster critical thinking, creativity, and innovation.
4. Inclusive and gender-sensitive: Ensuring the curriculum encourages participation from diverse groups, including girls and women, can help address gender disparities in STME fields.
5. Teacher training and support: Providing educators with resources, training, and continuous professional development can enhance their capacity to effectively implement the reformed curriculum.
6. Interdisciplinary approaches: Integrating science, technology, engineering, and mathematics (STME) with other subjects can promote a more comprehensive understanding of complex issues.

7. Assessment and evaluation: Implementing competency-based assessments can measure students' practical skills and understanding, rather than just theoretical knowledge.
8. Industry partnerships and collaborations: Fostering links with industries, research institutions, and organizations can provide opportunities for students to engage in real-world projects and applications.

By addressing these areas, curriculum reform can revitalize science and technology education in Nigeria, producing a more skilled, innovative, and entrepreneurial workforce to drive the country's development.

B. Teacher Training and Support

Teacher training and support can significantly improve science and technology education in Nigeria in the following ways:

1. Enhanced subject matter expertise: Teachers will be better equipped to teach complex science and technology concepts.
2. Improved pedagogical skills: Teachers will learn innovative and effective teaching methods, increasing student engagement and understanding.
3. Increased confidence: Teachers will feel more confident in their ability to teach science and technology, leading to more effective instruction.
4. Better classroom management: Teachers will learn strategies to manage classrooms effectively, creating a conducive learning environment.
5. Increased use of technology: Teachers will learn to effectively integrate technology into their teaching practices, enhancing student learning.
6. Alignment with global standards: Teachers will be trained on international best practices, ensuring Nigerian students are competitive globally.
7. Practical, inquiry-based learning: Teachers will learn to emphasize hands-on experiments and projects, fostering critical thinking and problem-solving skills.
8. Addressing gender disparities: Teachers will learn strategies to encourage girls and women to pursue science and technology fields.
9. Community engagement: Teachers will learn to engage with local communities, involving them in science and technology education.

10. Continuous professional development: Teachers will be encouraged to pursue further education and certifications, staying updated on the latest developments in their subject area.

By investing in teacher training and support, Nigeria can improve student achievement in science and technology, increase the number of students pursuing STME fields, develop a more skilled and innovative workforce, enhance Nigeria's global competitiveness. This, in turn, can enhance development in Nigeria.

C. Resource Allocation

Resource allocation can significantly improve science and technology education in Nigeria in the following ways:

1. Adequate funding: Providing sufficient budget for science and technology education can lead to better infrastructure, equipment, and materials.
2. Laboratory equipment and materials: Allocating resources for modern laboratory equipment and materials can enhance hands-on learning and experimentation.
3. Technology infrastructure: Investing in technology infrastructure, such as computers, internet, and software, can facilitate digital learning and research.
4. Library resources: Providing access to relevant textbooks, journals, and online resources can support research and learning.
5. Teacher training and development: Allocating resources for teacher training and development can enhance their capacity to teach science and technology effectively.
6. Student support: Providing resources for student support services, such as mentorship, counseling, and scholarships, can increase student motivation and retention.
7. Partnerships and collaborations: Allocating resources for partnerships with industries, research institutions, and organizations can provide opportunities for real-world learning and applications.
8. Infrastructure development: Investing in school infrastructure, such as classrooms, laboratories, and workshops, can create a conducive learning environment.
9. Digital resources: Providing access to digital resources, such as educational software, apps, and online platforms, can enhance teaching and learning.
10. Monitoring and evaluation: Allocating resources for monitoring and evaluation can help track progress, identify areas for improvement, and inform policy decisions.

By allocating resources effectively, Nigeria can improve the quality of science and technology education, increase student interest and engagement, develop a more skilled and innovative workforce Enhance Nigeria's global competitiveness.

D. Technology Integration

Technological integration can significantly improve science and technology education in Nigeria in the following ways:

1. Enhanced engagement: Technology can increase student engagement and motivation in science and technology subjects.
2. Virtual labs and simulations: Technology can provide virtual labs and simulations, making experiments and investigations more accessible and safer.
3. Online resources and materials: Technology can provide access to a wealth of online resources, including educational videos, podcasts, and interactive materials.
4. Collaboration tools: Technology can facilitate collaboration among students, teachers, and experts, both locally and globally.
5. Personalized learning: Technology can enable personalized learning, tailoring instruction to individual students' needs and abilities.
6. Data analysis and visualization: Technology can aid in data analysis and visualization, helping students better understand complex concepts.
7. Remote learning opportunities: Technology can provide remote learning opportunities, expanding access to science and technology education.
8. Access to global experts: Technology can connect students with global experts and practitioners, enriching their learning experience.
9. Development of digital skills: Technology can help students develop essential digital skills, preparing them for a technology-driven workforce.
10. Improved assessment and feedback: Technology can enhance assessment and feedback, providing more accurate and timely evaluations of student learning.

By integrating technology into science and technology education, Nigeria can improve student outcomes and achievement, increase access and equity in education, develop a more skilled and innovative workforce, enhance Nigeria's global competitiveness. This, in turn, can drive economic growth, innovation, and development in Nigeria.

E. Emphasis on Practical Experiments

Emphasis on practical experiments can significantly improve science and technology education in Nigeria in the following ways:

1. Hands-on learning: Practical experiments provide hands-on experience, making learning more engaging and effective.
2. Deeper understanding: Experiments help students develop a deeper understanding of scientific concepts and principles.
3. Development of scientific skills: Practical experiments help students develop essential scientific skills, such as observation, measurement, and analysis.
4. Critical thinking and problem-solving: Experiments encourage critical thinking and problem-solving, essential skills for scientific inquiry.
5. Contextual learning: Practical experiments help students connect theoretical concepts to real-world applications.
6. Improved retention: Hands-on learning experiences can improve retention of scientific concepts and principles.
7. Preparation for real-world applications: Practical experiments prepare students for real-world applications and technological innovations.
8. Development of research skills: Experiments help students develop research skills, essential for scientific advancement.
9. Collaboration and teamwork: Practical experiments encourage collaboration and teamwork, essential skills for scientific research.
10. Enhanced curiosity and creativity: Hands-on experiments can foster curiosity and creativity, driving innovation and discovery.

By emphasizing practical experiments, Nigeria can improve student understanding and retention of scientific concepts, develop a more skilled and innovative workforce, enhance Nigeria's global competitiveness in science and technology, drive economic growth and development through innovation and technological advancements.

F. Assessment and Evaluation

Assessment and evaluation can significantly improve science and technology education in Nigeria in the following ways:

1. Identifying knowledge gaps: Regular assessments help identify areas where students need improvement, enabling targeted interventions.

2. Measuring progress: Evaluations measure student progress, helping teachers adjust instruction to meet student needs.
3. Improving instruction: Assessment data informs instruction, enabling teachers to refine their methods and improve student learning.
4. Enhancing accountability: Evaluations hold teachers and schools accountable for student learning, promoting a culture of excellence.
5. Informing policy decisions: Assessment data informs policy decisions, ensuring education policies are data-driven and effective.
6. Developing critical thinking and problem-solving skills: Assessments can be designed to test critical thinking and problem-solving skills, essential for science and technology education.
7. Benchmarking against international standards: Evaluations can compare Nigerian students' performance to international standards, identifying areas for improvement.
8. Certifying student competence: Assessments can certify student competence in specific skills or subjects, preparing them for further education or the workforce.
9. Encouraging continuous improvement: Regular evaluations encourage continuous improvement, driving innovation and excellence in science and technology education.
10. Providing feedback for improvement: Assessments provide feedback for students, teachers, and policymakers, guiding improvements in science and technology education.

By implementing effective assessment and evaluation strategies, Nigeria can improve student learning outcomes in science and technology, develop a more skilled and innovative workforce, enhance Nigeria's global competitiveness in science and technology, drive economic growth and development through innovation and technological advancements.

G. Community Engagement

Community engagement can significantly improve science and technology education in Nigeria in the following ways:

1. Partnerships with local industries: Collaborations with local industries can provide resources, expertise, and real-world applications for science and technology education.
2. Mentorship programs: Community mentors can inspire and guide students, providing role models and career guidance.

3. Science outreach programs: Community-based science outreach programs can promote science literacy and interest among students and the general public.
4. Resource sharing: Community resources, such as libraries and technology centers, can be shared with schools to enhance science and technology education.
5. Cultural relevance: Community engagement can help make science and technology education more culturally relevant and responsive to local needs.
6. Parental involvement: Community engagement can encourage parental involvement in science and technology education, leading to greater support for students.
7. Community-based projects: Students can work on community-based projects, applying science and technology to real-world problems and developing practical skills.
8. Inter-generational learning: Community engagement can facilitate inter-generational learning, where students learn from community members and vice versa.
9. Promoting STME careers: Community engagement can promote STME careers and opportunities, inspiring students to pursue science and technology fields.
10. Sustainability and environmental awareness: Community engagement can integrate sustainability and environmental awareness into science and technology education, promoting responsible innovation.

By engaging with the community, Nigeria can improve the relevance and effectiveness of science and technology education, develop a more skilled and innovative workforce, enhance Nigeria's global competitiveness in science and technology and drive economic growth and sustainable development.

H. Student Support

Student support can significantly improve science, technology and mathematics education in Nigeria in the following ways:

1. Mentorship programmes: Pairing students with experienced mentors can provide guidance, encouragement, and career guidance.
2. Scholarships and financial aid: Providing financial support can help students pursue science and technology education, reducing financial barriers.
3. Guidance and Counseling: Offering counseling and guidance services can help students make informed career choices and overcome academic challenges.

4. Tutoring and academic support: Providing additional academic support, such as tutoring, can help students succeed in science and technology subjects.
5. Career guidance and exposure: Exposing students to various science and technology careers can inspire and motivate them to pursue these fields.
6. Role models and guest speakers: Inviting role models and guest speakers can inspire and motivate students, providing real-world examples of science and technology applications.
7. Internships and work experience: Providing opportunities for internships and work experience can help students apply theoretical knowledge in practical settings.
8. Student organizations and clubs: Supporting student organizations and clubs focused on science and technology can foster a sense of community and promote student engagement.
9. Awards and recognition: Recognizing and rewarding student achievements in science and technology can motivate and encourage students to excel.
10. Psychological support: Offering psychological support can help students cope with academic pressure, stress, and other challenges associated with science and technology education.

By providing comprehensive student support, Nigeria can improve student motivation and engagement in science and technology education increase student retention and success rates develop a more skilled and innovative workforce, enhance Nigeria's global competitiveness in science and technology, drive economic growth and sustainable development.

I. Monitoring and Evaluation

Monitoring and evaluation can significantly improve science and technology education in Nigeria in the following ways:

1. Tracking progress: Monitoring student performance and progress can identify areas for improvement.
2. Assessing program effectiveness: Evaluating science and technology programs can determine their impact and identify best practices.
3. Identifying resource gaps: Monitoring resource allocation can identify areas where resources are lacking or misallocated.

4. Informing policy decisions: Evaluation findings can inform policy decisions, ensuring evidence-based policy making.
5. Improving teacher performance: Monitoring teacher performance can identify areas for professional development.
6. Enhancing accountability: Monitoring and evaluation can promote accountability among educators, administrators, and policymakers.
7. Fostering continuous improvement: Regular monitoring and evaluation can drive continuous improvement in science and technology education.
8. Encouraging data-driven decision making: Monitoring and evaluation can promote data-driven decision making, reducing reliance on assumptions.
9. Identifying best practices: Evaluation can identify effective strategies and practices, promoting their adoption and scaling.
10. Reporting progress to stakeholders: Monitoring and evaluation can provide stakeholders with progress updates, demonstrating transparency and accountability.

By implementing effective monitoring and evaluation systems, Nigeria can improve the quality and relevance of science and technology education, enhance student learning outcomes and achievement, develop a more skilled and innovative workforce drive economic growth and sustainable development, strengthen accountability and transparency in education governance.

J. Policy and Leadership

Policy and leadership can significantly improve science and technology education in Nigeria in the following ways:

1. Clear policy direction: Establishing clear policies and guidelines can provide direction for science and technology education.
2. Increased funding: Allocating sufficient funds can support infrastructure, resources, and teacher training.
3. Leadership commitment: Demonstrating leadership commitment can prioritize science and technology education.
4. Teacher training and support: Providing training and support can enhance teacher capacity.
5. Curriculum reform: Reforming curricula can ensure relevance and alignment with global standards.

6. Promoting STME careers: Encouraging STME careers can inspire students to pursue science and technology fields.
7. Partnerships and collaborations: Fostering partnerships can leverage resources, expertise, and funding.
8. Monitoring and evaluation: Establishing monitoring and evaluation frameworks can track progress.
9. Addressing gender disparities: Implementing policies to address gender disparities can promote inclusivity.
10. Encouraging innovation and entrepreneurship_: Promoting innovation and entrepreneurship can drive economic growth.

By effective policy and leadership, Nigeria can improve the quality and relevance of science and technology education, increase student interest and engagement, develop a more skilled and innovative workforce, drive economic growth and sustainable development, enhance global competitiveness.

Conclusion

In conclusion, improving science, technology and mathematics education in Nigerian secondary schools is crucial for the country's economic growth, innovation, and global competitiveness. Despite the challenges, there are opportunities for reform and improvement. By addressing the challenges and implementing effective strategies, Nigerian secondary schools can provide students with a high-quality science and technology education that prepares them for success in the 21st century. In a nutshell, it should be understood that Science and technology education is essential for Nigeria's development. Challenges include outdated curriculum, inadequate resources, and lack of qualified teachers. Strategies for improvement include curriculum reform, teacher training, resource allocation, technology integration, partnerships, student support, monitoring and evaluation, and policy and leadership. Also, implementation of these strategies can lead to improved student outcomes, increased innovation, and economic growth

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