Kontagora International Journal of Educational Research (KIJER) ISSN: 3027-0618
Volume 2, Issue 1, January 2025
https://fuekjournals.org/index.php/kijer

Addressing Global Economic Challenges using Mathematics Education Strategies for Sustainable Development

[1]WAHAB, Saheed Kolawole, [2]AKINLEYE, Odunayo Temilade

Corresponding author: wahabsaheedkolawole@gmail.com, 08038451031

[1] School of ECCE and PES, Mathematics Unit, Department of Primary Education Studies, FCT College of Education Zuba Abuja
[2] School of Science, Department of Mathematics, Osun State College of Education, Ila Oragun

To cite:
Wahab, S. K., & Akinleye, O. T. (2025). Addressing global economic challenges using mathematics education strategies for sustainable development. *Kontagora International Journal of Educational Research, 2*(1), 298–307.

DOI: https://doi.org/10.5281/zenodo.14879137

Abstract

This paper explores the pivotal role of Mathematics Education in addressing global economic challenges and fostering sustainable development. The discussion highlights how mathematics education can equip students with critical analytical and problem-solving skills essential for tackling contemporary global challenges such as climate change, economic inequality, unemployment, and resource depletion. By integrating data analysis, financial literacy, optimization techniques, and interdisciplinary approaches into the curriculum, mathematics education can significantly contribute to economic stability and innovation. Furthermore, the paper outlines the conceptual framework which x-ray how Mathematics educational strategies can reduce global economic challenges. It emphasizes the need for mathematics curriculum to align with sustainable development goals (SDGs) to prepare students for a dynamic global economy. The proposed educational strategies aim to bridge existing gaps, ensuring that students are well-equipped to contribute meaningfully to economic growth, environmental conservation, and social welfare. The paper concludes with a call for enhanced training for mathematics educators and the adoption of practical, resource-oriented teaching methodologies to achieve these educational objectives. Government and international organisation should prioritize funding for education systems that integrate mathematics and economic applications. Through these measures, mathematics education can play a transformative role in resolving global economic challenges and promoting sustainable development.

Keywords: Mathematics Education, Economic Challenges, Sustainable Development

Introduction

Mathematics is a computational skill that deals with arithmetic, quantities, figures and numbers. Sunita (2019) claims that Mathematics helps to understand the progress of our present-day world and it is a veritable tool for improving the quality of life for all citizens. Also, Tsafe (2012) affirmed that mathematics could be found in virtually every sphere of human endeavour. Mathematics is an essential tools for everyday living which is inevitably useful in peoples' daily endeavour (Sam-Kayode, 2017).

Ugwuda (2014) viewed mathematics as the bedrock of scientific and technological development in any country. Wahab (2019) submitted that Mathematics is an instrument for validation in the developmental affairs such as social, technological et cetera through the manipulation of data. Mathematics possesses the potentials of developing life-long skills in learners which will enable them to contribute meaningfully to the development of their society (Abakpa & Agbo-Egwu, 2014). Mathematics plays a significant role in achieving sustainable development by equipping students with essential analytical and problem-solving skills necessary for addressing complex global challenges. According to United Nations (1987), sustainable development was used far back as 1972 at United Nations (UN) conference on the human environment in Stockholm, Sweden. It was not until 1987, with a UN report entitled "our common future" that the term was fully defined and translated into policy options. The Brundtland report in 1987 (named after the Norwegian prime minister who chaired the UN commission authority the report) defined sustainable development as a "development that meets the needs of the presents without compromising the ability of future generation to meet their own needs" (Kyari, 2018).

The 2002 World Summit on Sustainable Development Report cited in Widiati and Juandi (2018) posits that sustainable development operates at three domains. They are economic domain, aims at reducing and seeking to eradicate poverty, achieving higher levels of prosperity and enabling continued gains in economic welfare; social domain-aims at reducing and seeking to eradicate other dimensions of poverty, improving the quality of education, health, housing, and other aspects of welfare of individuals and communities, and enhancing the quality of social interaction, engagement and empowerment; environmental domain-aims at reducing pollution and other negative impact on

environment, mitigating the effects of industrialization and human activity, and seeking to achieve sustainable use of resources in the interest of future generations (Azuka, 2015).

Despite the crucial role of Mathematics Education in preparing students for the future demands of a rapidly changing global economy, many Mathematics Education systems fail to provide students with the necessary skills and competencies to address sustainable development challenges, such as climate change, economic inequality and technological innovation. This gap in Mathematics Education hinders the development of a competent and innovative workforce, ultimately threatening sustainable economic growth and global prosperity. It is based on this premise that this paper explores Mathematics Education strategies to global economic challenges for sustainable development.

Conceptual Framework

This paper conceptualise how Mathematics Education strategies can reduce global economic challenges.

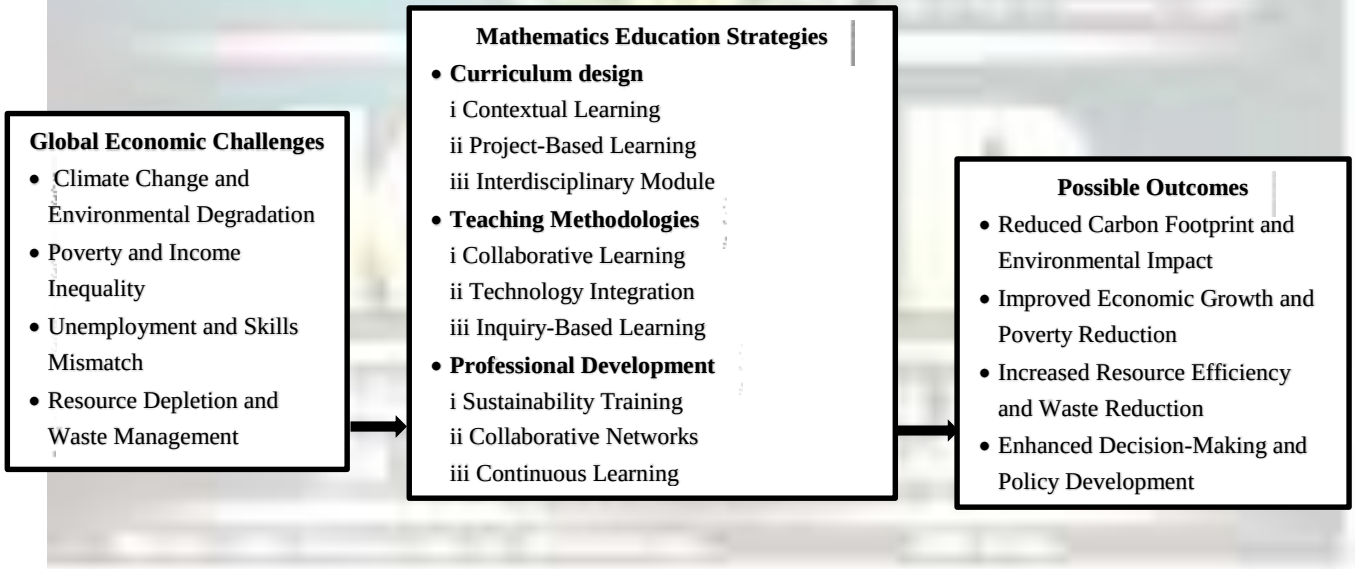

Figure 1: Mathematics Education Strategies for Global Economic Challenges Reduction

Source: Researchers

Figure 1 describes conceptual understanding on how Mathematics Education strategies can be employed to reduce global economic challenges. Global economic challenges affecting the world all over are climate change and environmental degradation, poverty and income inequality, unemployment and skills mismatch and resource depletion and waste management. These challenges

could be addressed when Mathematics curriculum is designed to suit the purpose of this 21st century teaching and learning. In the area of curriculum design, Mathematics teachers should design lessons that address local environmental, social, and economic challenges, encouraging learners to relate global Sustainable Development Goals (SDGs) to their immediate contexts, implement projects like designing renewable energy models, developing sustainable business plans, or researching clean water initiatives and combine science, economics, and social studies in modules like "Climate Change and Global Policy," encouraging students to see the interconnected nature of SDGs.

Mathematics teachers should adopt modern teaching approaches by assigning group tasks focused on SDG topics such as developing sustainable urban designs or addressing local waste management issues, use virtual simulations, data visualization tools, and online platforms for studying global carbon footprints, biodiversity loss, or poverty statistics and encourages curiosity and critical questioning about sustainability issues.

Professional development is also paramount in solving global economic challenges. Equips Mathematics teachers with the knowledge and skills to integrate SDGs into teaching, develop partnerships between schools, Non-governmental Organisations (NGOs) and international organizations focused on SDG implementation in education and Provide access to online courses, webinars, and journals on sustainability education, fostering lifelong learning for teachers.

Global Economic Challenges

Globalization presents opportunities to increase prosperity and ensure better jobs. For consumers, it brings a wider product range to choose from and lower prices. For firms, it brings opportunities for higher efficiency gains and productivity growth. But globalization also poses challenges. In Europe and the other Organisation for Economic Co-operation and Development (OECD) countries, the demand for a highly educated workforce will be increasing, while the demand for some low skilled will be decreasing. A major challenge is therefore to ensure a higher level of education and make everyone able to keep pace with new demands. Research and development need to strengthened in order to make companies more innovative. The aim is to ensure that the globalization process is beneficial for all (Axmark, 2018).

Some global economic challenges some countries faced according to World Economic Forum (2022) are:

1. **Income Inequality:** Income inequality refers to the uneven distribution of income and wealth across different populations, which can lead to social and economic instability. According to the World Inequality Report 2022, the top 10% of the global population holds 76% of the total wealth, while the bottom 50% owns just 2%. High levels of inequality can stifle economic growth, as noted by the International Monetary Fund (IMF) in 2021, which highlights that unequal societies tend to have lower and less sustainable growth. Addressing income inequality requires targeted policies, such as progressive taxation and improved access to education and healthcare.

2. **Unemployment and Underemployment:** Unemployment and underemployment represent significant challenges, particularly for young people and marginalized groups. The International Labour Organization (ILO) in 2022, reports that youth unemployment rates are consistently higher than adult rates, with global youth unemployment at 13.6%. Automation and Artificial Intelligence (AI) are transforming industries, potentially displacing millions of workers. A McKinsey report (2018) suggests that up to 375 million workers may need to switch occupations by 2030 due to automation. Solutions include investing in education and training programs to equip workers with new skills and supporting industries that create jobs.

3. **Financial Instability:** Financial instability characterized by volatile markets and economic crises, poses significant risks to global economies. The 2008 financial crisis in the United States illustrated the devastating effects of financial crisis which led to the great recession with unemployment rates reaching 25%. The World Economic Forum (WEF) identifies several current risks, including high levels of global debt and geopolitical tensions, which could trigger new crisis. Strengthening regulatory frameworks, improving financial literacy, and ensuring transparency in financial markets are essential measures to mitigate these risks.

4. **Sustainable Development:** Sustainable development aims to balance economic growth with environmental protection and social inclusion. Climate change is a critical challenge, with economic impacts such as damage to infrastructure and loss of productivity. The

Intergovernmental Panel on Climate Change (IPCC) warns that without significant action, global temperatures could rise by more than 1.5°C by 2040. Efficient use of resources and transitioning to renewable energy are vital for sustainable development. According to the International Energy Agency (IEA), achieving net-zero emissions by 2050 requires substantial investments in clean energy technologies (World Economic Forum, 2022). The United Nations Sustainable Development Goals (SDGs) provide a blueprint for addressing these challenges, with targets for reducing poverty, improving health and education, and promoting environmental sustainability.

5. **Global Trade and Supply Chain Disruptions:** Global trade and supply chain disruptions can have widespread economic effects, particularly highlighted by events that happened in 2020 like the COVID-19 pandemic. The COVID-19 pandemic disrupted global supply chains, leading to shortages and increased costs. The World Trade Organization (WTO) noted a 5.3% drop in global trade in 2020 due to the pandemic. Building more resilient supply chains through diversification and technology adoption is crucial. A report by the World Bank emphasizes the importance of international cooperation and investment in digital infrastructure.

Solving Global Economic Challenges through Mathematics Education

Mathematics education can play a significant role in addressing global economic challenges by equipping students with the skills and knowledge necessary to understand and solve complex economic problems. The following are ways by which Mathematics education can be used in addressing global economic challenges:

1. **Data Analysis and Statistical Skills**

Mathematics education should emphasize on data analysis and statistical skills, which are crucial for economic forecasting, policy analysis, and decision-making. Students can be taught to collect, analyse, and interpret data related to global economic indicators such as Gross Domestic Product (GDP), unemployment rates, inflation, and trade balances. Incorporating elements of data science, including big data analytics and machine learning, can help students understand and predict economic trends.

2. **Financial Literacy and Modelling**

Building financial literacy through mathematical education can empower individuals to make informed economic decisions, both personally and professionally. Include modules on budgeting, investing, interest rates, loans, and savings to prepare students for personal financial management. Teach students how to create and use mathematical models to simulate economic scenarios and predict outcomes. This can include supply and demand models, cost-benefit analysis, and risk assessment.

3. **Optimization and Resource Allocation**

Mathematics can provide tools for optimizing resources and improving efficiency, which are vital for addressing economic challenges. Introduce concepts of linear programming and optimization to solve problems related to resource allocation, production planning, and logistics. Teach game theory to help students understand competitive and cooperative strategies in economics, which can be applied to market behaviour, trade negotiations, and policy-making.

4. **Mathematical Foundations and Economic Theories**

A solid understanding of the mathematical foundations underlying economic theories can enhance students' comprehension of economic principles. Integrate mathematical concepts into the study of micro-economics and macro-economics, such as utility functions, cost curves, and equilibrium analysis. Develop courses that focus specifically on mathematical economics, covering topics like differential equations, dynamic systems, and stochastic processes. This can widen students' knowledge on global economic principles.

5. **Global and Sustainable Economic Practices**

Mathematics education should incorporate the principles of sustainability and global economic practices. Align curriculum with the United Nations Sustainable Development Goals (SDGs), particularly those related to economic growth, industry, innovation, and infrastructure. Teach mathematical methods used in environmental economics to address issues like carbon pricing, resource management, and the economics of climate change.

6. Interdisciplinary Approaches

Mathematics teachers should encourage interdisciplinary learning to connect mathematics with economics, fostering a comprehensive understanding of global economic challenges. Facilitate projects that require collaboration between mathematics, economics, and other disciplines such as environmental science and political science. Incorporate internships, fieldwork, and partnerships with businesses and economic research institutions to provide practical experience for the students.

Conclusion

Global economic challenges requires a comprehensive and coordinated approach, integrating policy measures, education, technological innovation, and international collaboration. By understanding the complexities of these issues and implementing targeted solutions, we can work towards a more stable and equitable global economy. The need for enhanced training for mathematics educators and the adoption of practical, resource-oriented teaching methodologies to achieve educational objectives. Through these measures, mathematics education can play a transformative role in resolving global economic challenges and promoting sustainable development. In addition, integrating elements such as data analysis and statistical skills, financial literacy and modelling, optimization and resource allocation, mathematical foundations and economic theories, global sustainable economic practices and interdisciplinary approaches into the mathematics curriculum, education systems can better prepare students to tackle global economic challenges. This approach not only enhances mathematical proficiency but also equips students with the critical thinking and analytical skills necessary to navigate and solve complex economic issues.

Recommendations

Based on the conclusion, the following recommendations are put forward:

i. Governments and international organizations should prioritize funding for education systems that integrate mathematics and economic applications.

ii. Establish policies that incentivize educational institutions to adopt interdisciplinary approaches in their curriculum.

iii. Update mathematics curricula to include topics such as financial literacy, optimization, resource allocation, and economic modelling.

iv. Incorporate global sustainable economic practices and interdisciplinary connections between mathematics and economics.

v. Provide mathematics teachers with enhanced training focused on resource-oriented and practical teaching methodologies.

vi. Offer professional development programs emphasizing the integration of economic and statistical applications in teaching.

vii. Promote the use of simulations and software that demonstrate the real-world impact of mathematical applications on economic challenges.

References

Abakpa, B.O. & Agbo-Egwu, C. (2014). Teaching Mathematics for Wealth Creation: Problems and Prospects. *Proceedings of September 2014 Annual National Conference of Mathematical Association of Nigeria (MAN)*, 372-379.

Axmark, F. (2018). *Government strategy for Denmark in the global economy. Factsheet Denmark*. Published by the Ministry of Foreign Affairs of Denmark, ISBN 87-7667-504-1.

Azuka, F.B. (2015). Mathematics Education for Sustainable Development: Implication to the Production and Retention of Maths Teachers in Nigerian School. *British Journal of Education*, 3(1), 45-51.

Bature, I. M. (2012). The role of Mathematics in the Development of Nigerian Economy. *A Paper Presented at the 31st Annual Conference of the Nigerian Mathematical Society (NMS) Held at Department of Mathematics, Ahmadu Bello University, Zaria-Nigeria between 2nd Oct.- 5th Oct., 2012*.

International Labour Organisation (2022). Global Employment Trends for Youth 2022: Investing in Transforming Futures for Young People. ILO Publisher.

International Monetary Fund (2021). "IMF sees heightened risks sapping slower global recovery", available at: www.imf. org/external/pubs/ft/survey/so/2021/res100812a.htm (accessed June 21, 2024).

Kyari, S.S. (2018). Mathematics Education for Accountability and Sustainable Development.

World Journal of Finance and Investment Research, 3(2), 27-33.

McKinsey Global Institute Report (2018). Artificial Intelligent, Automation and the Future of Work: Ten Things to Solve For. Available at https://www.mckinsey.com/featured-insights/future-of-work/ai-automation

Sam-Kayode, C.O. (2017). Mathematics Education: A panacea for Sustainable Development. *Journal of Capital Development in Behavioural Sciences*, 5(1), 177-187.

Sunita, Y. (2019). Role of Mathematics in the Development of Society. *International Journal of Research and Analytical Reviews (IJRAR)*, *6*(4). Retrieved from https://ijrar.org/papers/IJRAR19S1037.pdf

Tsafe, A. K. (2012). Effective Learning of Mathematics: From Theory to Practice. *Sokoto Educational Review*, 13(2), 82-96.

Ugwuda, A.O. (2014). The Mathematics Teachers: A Basic Fundamental Unit for Sustainable Development. *Proceedings of September 2014 Annual National Conference of Mathematical Association of Nigeria (MAN)*, 144-150.

Wahab, S.K. (2019). Prospective Mathematics Teachers' Knowledge of Fraction. *International Journal of Research and Innovation in Social Science (IJRISS)*, *3*(11), 451-455.

Widiati, I. & Juandi, D. (2018). Philosophy of mathematics education for sustainable development. *International Conference on Mathematics and Science Education*, 1-7.

World Economic Forum (2022). Global Agenda Outlook 2022, available at: www.weforum.org/ reports/global-agenda-outlook-2022 (accessed June 22, 2024).