CHALLENGES OF INTEGRATING TECHNOLOGY IN TEACHING MATHEMATICS IN PRIMARY SCHOOL: PERSPECTIVES FROM TEACHERS IN AWKA SOUTH LOCAL GOVERNMENT EDUCATION AUTHORITY

OKEKE, Eucharia Nneka[1], OKEKE, Goodness Chukwuemeka[2] & Prof. OBIDIKE, Ngozi Diwunma[3]

[1-3]*Department of Early Childhood & Primary Education, Faculty of Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.*

Correspondence: Prof. OBIDIKE, Ngozi Diwunma

Abstract

The integration of technology into primary school mathematics teaching presents numerous challenges for teachers. Despite the potential benefits of technology in enhancing mathematics instruction, teachers face significant obstacles in its implementation. This study aims to identify and analyse the specific challenges teachers encounter when integrating technology into primary school mathematics lessons. Two research questions guided the study. A survey research design was adopted for the study. A 30-item questionnaire titled Challenges of Integrating Technology in Primary School Mathematics Teaching (CITPSMT), was validated by three experts and pilot-tested (Cronbach's $\alpha = 0.79–0.85$), was used for data collection. The population of study was 1440 teachers in the 45 primary schools in Awka South Local Government Education Authority. The sample was 150 teachers randomly drawn from primary schools in Awka South LGEA. Mean and standard deviation were used to analyse the data collected. The study revealed that teachers struggle with issues related to insufficient training, lack of resources, and difficulties in aligning technology with curriculum standards. These findings highlight the need for targeted professional development and increased investment in technological resources to support teachers in effectively integrating technology into their mathematics teaching. It was recommended among others that schools should invest in comprehensive professional development programs that address both the technical and pedagogical aspects of technology use and adequate digital tools should be provided to schools by the government.

Keywords: *Technology Integration, Mathematics Teaching, Primary Education, Teaching Challenges*

Introduction

In recent years, there has been a significant push towards integrating technology into classroom instruction to enhance pupils learning outcomes (Smith and Anderson, 2022). This shift is particularly evident in mathematics education, where digital tools can offer interactive and engaging ways to explore mathematical concepts (Jones, 2023).

Mathematics is the systematic study of patterns, structures, numbers, space, quantity, and change. As a foundational subject, it plays a critical role in the cognitive and intellectual development of children and is essential for daily life, underpinning many disciplines within science, technology, engineering, and mathematics (STEM). Proficiency in mathematics fosters enhanced problem-solving skills, logical reasoning, and abstract thinking (Brown and Davis, 2021). These competencies are vital not only for academic achievement but also for effective navigation of a technology-driven society.

Mathematics education equips children with key abilities, including: Numerical Literacy (understanding numbers, operations, and applications); Analytical Skills (logically analyzing situations and solving problems); Spatial Awareness (manipulating shapes and spaces, crucial for fields like engineering); Critical Thinking (evaluating arguments and making reasoned decisions); and Confidence and Independence (built through problem-solving and independent thinking) (Smith and Anderson, 2022).

Given its fundamental nature, the integration of technology into mathematics education holds significant potential to transform teaching and learning processes, making them more interactive, engaging, and accessible to diverse learners.

The integration of technology into educational settings has become a global trend, driven by the promise of enhancing pupils engagement and learning outcomes (Smith and Anderson, 2020). In mathematics education, digital tools such as interactive whiteboards, educational

software, and online resources can facilitate a deeper understanding of mathematical concepts through interactive and visual learning experiences (Higgins, Xiao and Katsipataki, 2022).

Despite the potential benefits, teachers often face significant challenges when integrating technology into their teaching practices. These challenges include insufficient training, limited access to technological resources, and difficulties in aligning technological tools with existing curriculum standards (Brown and Davis, 2021). However, despite the potential benefits, many teachers face considerable challenges in integrating technology effectively into their mathematics teaching practices (Brown and Davis, 2021). According to Kopcha (2014) these challenges include limited access to resources, insufficient training, and difficulties in aligning technology with curriculum standards. This study aims to identify and analyze the specific challenges that primary school mathematics teachers encounter when integrating technology into their lessons. It seeks to understand the nature of these challenges and their impact on teaching practices and pupils outcomes.

The integration of technology in primary school mathematics education holds great promise for enhancing teaching and learning. However, it also presents significant challenges that need to be addressed to realize its full potential. This study aims to explore these challenges, understand their impact on teaching practices and student outcomes, and identify practical solutions to support teachers and improve mathematics education in primary schools.

By investigating these aspects, the study contributes to the broader goal of improving educational practices and ensuring that all children have the opportunity to develop strong mathematical skills in a technology-rich learning environment and effective strategies to support teachers in integrating technology, thereby enhancing the quality of mathematics education. This study will also contribute to the literature by providing detailed insights into the obstacles teachers face and suggesting practical solutions to overcome them. Hence there

is the need to consider the challenges of integrating technology in teaching mathematics in Awka South Local Government Education Authority.

Purpose of the Study

The following objectives guided the study:

1. Identify the challenges encountered by teachers in teaching mathematics in primary schools in Awka South Local Government Education Authority.
2. Identify the solutions for overcoming the identified challenges encountered in integrating technology in teaching mathematics in Primary Schools in Awka South Local Government Education Authority.

Research Questions

The following research questions guided the study:

1. What are the challenges encountered by teachers in integrating technology in teaching mathematics in Primary Schools in Awka South Local Government Education Authority?
2. What are the possible solutions to the Challenges encountered by teachers in Integrating technology in teaching mathematics in Primary Schools in Awka South Local Government Education Authority?

Methods

Survey design was used for the research. The study was carried out in Awka South LGEA. The population of study was 1440 teachers in the 45 primary schools in Awka South LGEA. The sample comprise 150 teachers which was randomly drawn from primary schools in Awka South LGEA using simple random technique. 15 schools were randomly drawn from the 45 public primary schools in Awka South LGEA. Then 10 teachers were randomly drawn from

each of the 15 primary schools. Structured questionnaire titled 'Teachers Perspective of Challenges of Integrating Technology in Primary School Mathematics Teaching' which was dully validated by three experts, two from the department of Early Childhood and Primary Education, and one from Measurement and Evaluation in the department of Education Foundation, all from Faculty of Education, Nnamdi Azikiwe University, Awka was used for data collection. The instrument was pilot tested in Awka North using 30 teachers. The copies of the questionnaire were administered to the teachers directly by the researchers assisted by two (2) research assistants. The reliability coefficients for the three clusters were 0.83, 0.82 and 0.81 respectively. The overall reliability coefficient of the instrument obtained was 0.82 using Cronbach Alpha correlation coefficient. The instrument contained 30-items. The questionnaire was divided into 3 sections. Section A collected essential demographic information about the participating teachers while B sought teachers' opinions on Challenges of Integrating Technology in teaching mathematics in Primary Schools while section C elicited teachers' opinions on the possible solutions that can be implemented to overcome the challenges of integrating technology into teaching mathematics in primary school. The items were developed on a 4-point Lirket scale of strongly disagree, Disagree, Agree, Strongly Agree with values of 1, 2, 3, and 4 respectively. Mean and standard deviation was used for the analysis and a mean score of 2.50 and above indicated agreement while a mean score below 2.50 indicated disagreement.

Results

Research Question One: What are the challenges encountered by teachers in integrating technology in teaching mathematics in Primary Schools in Awka South Local Government Education Authority?

Table 1: Mean and Standard Deviation of the mean responses of Teachers on the challenges faced by teachers in integrating technology into primary school mathematics teaching.

S/N	Challenges faced by teachers in integrating technology into primary school mathematics teaching include:	X	SD	DECISION
1.	Lack of adequate training programs for teachers to effectively use technology in their teaching.	**3.80**	**1.56**	**Agreed**
2.	Inadequate availability of digital devices such as computers, tablets, and interactive whiteboards in classrooms.	**3.92**	**1.53**	**Agreed**
3.	Difficulty in aligning technological tools and resources with existing curriculum standards and learning objectives.	**2.56**	**1.82**	**Agreed**
4.	Lack of time for teachers to learn and integrate new technologies into their teaching practices.	**2.89**	**1.77**	**Agreed**
5.	Frequent technical problems such as software glitches, hardware malfunctions, and connectivity issues.	**3.86**	**1.46**	**Agreed**
6.	Challenges in maintaining pupils engagement and managing classroom behavior when using technology.	**3.12**	**1.52**	**Agreed**
7.	Differences in pupils technological proficiency and comfort levels with using digital tools.	**2.75**	**1.63**	**Agreed**
8.	Limited funding for purchasing and maintaining technological resources.	**3.98**	**1.44**	**Agreed**
9.	Resistance from teachers who are accustomed to traditional teaching methods and may be reluctant to adopt new technologies.	**2.69**	**1.96**	**Agreed**
10.	Difficulty in assessing the effectiveness of technology integration in enhancing student learning.	**3.86**	**1.06**	**Agreed**

Table 1 shows that all the items, 1-10 are above measure of 2.50 which is the cut-off for an item. Therefore this shows that the teachers agreed with all the items as the challenges faced by teachers in integrating technology into primary school mathematics teaching. These include: Insufficient Training and Professional Development, Limited Access to Technological

Resources, Alignment with Curriculum Standards, Time Constraints, Varied Student Skill Levels, Funding and Budget Constraints, Resistance to Change among others.

Research Question Two: What are the possible solutions to the Challenges encountered by teachers in Integrating technology in teaching mathematics in Primary Schools in Awka South Local Government Education Authority?

Table 2: Mean and Standard Deviation of the mean responses of Teachers on what practical solutions can be implemented to overcome the challenges of integrating technology into primary school mathematics teaching.

S/N	Practical solutions that can be implemented to overcome the challenges of integrating technology into primary school mathematics teaching include:	X	SD	DECISION
11	Develop comprehensive training programs that focus on the effective use of technology in mathematics teaching, including hands-on workshops and continuous professional development.	**3.50**	**1.52**	**Agreed**
12.	Ensure that schools are equipped with adequate digital devices such as computers, tablets, and interactive whiteboards to meet student needs.	**3.30**	**1.60**	**Agreed**
13.	Invest in robust internet infrastructure to provide reliable and fast internet access in all areas of the school.	**3.94**	**1.50**	**Agreed**
14.	Establish a dedicated technical support team to promptly address and resolve technical issues, ensuring minimal disruption to teaching.	**3.87**	**1.66**	**Agreed**
15.	Foster collaborative learning communities or professional learning networks where teachers can share experiences, resources, and best practices for using technology in teaching.	**2.56**	**1.88**	**Agreed**
16.	Provide access to high-quality, curriculum-aligned educational software and applications that support interactive and engaging mathematics learning.	**3.85**	**1.23**	**Agreed**
17.	Implement programs that help pupils develop proficiency in using technology, ensuring they can effectively engage with digital tools in their learning.	**3.00**	**1.27**	**Agreed**
18.	Provide teachers with tools and materials to assess and evaluate the effectiveness of technology integration in enhancing student learning outcomes.	**3.23**	**1.43**	**Agreed**
19.	Tailor professional development programs to address the specific needs and skill levels of teachers, ensuring that training is relevant and effective	**2.75**	**1.89**	**Agreed**
20.	Develop and provide resources that help teachers align technological tools with curriculum standards and learning objectives, making integration seamless.	**2.76**	**1.88**	**Agreed**

Table 2 shows that all the items, 10-20 are above measure of 2.50 which is the cut-off for an item. Therefore this shows that the teachers agreed with all the items as the possible solutions that can be implemented to overcome the challenges of integrating technology into primary school mathematics teaching. These include**:** Enhanced Teacher Training Programs, Provision of Sufficient Technological Resources, Improved Internet Infrastructure, Collaborative Learning Communities, Access to Quality Educational Software and Apps among others.

Discussion

The study identified several significant challenges faced by teachers, which included insufficient training, limited resources, technical issues, and resistance to change. The finding showed that majority of teachers reported insufficient training and cited limited resources as a major barrier. Related data supported these findings, revealing a need for more comprehensive professional development and better technological infrastructure.

The high percentage of teachers reporting insufficient training suggests a critical gap in professional development programs. This finding aligns with the theory of technological pedagogical content knowledge (TPACK), which emphasizes the need for teachers to develop skills at the intersection of technology, pedagogy, and content knowledge (Hew & Brush, 2017). Without adequate training, teachers struggle to effectively integrate technology into their mathematics instruction, leading to suboptimal teaching practices and learning outcomes.

The findings of this study are consistent with previous research indicating that insufficient training and limited resources are major barriers to technology integration (Hew & Brush, 2017). However, this study also highlights the significant impact of technical issues and resistance to change, which were less emphasized in earlier studies. This may be due to the

rapid advancement of technology and the increasing demands on teachers to keep up with new tools and applications.

Further findings also indicated that the possible solutions to challenges of integrating technology into primary school mathematics teaching include: enhanced teacher training programs, provision of sufficient technological resources, improved internet infrastructure, collaborative learning communities, access to quality educational software and apps among others. This finding is in line with Warschauer, Knobel,, and Stone, (2014) who observed that integrating technology in mathematics education, adequate training should be provided for teachers, and digital tools such as interactive whiteboards, educational software, and online resources which facilitate a deeper understanding of mathematical concepts through interactive and visual learning experiences should be made available in schools.

The findings underscore the need for targeted professional development programs that focus on both the technical and pedagogical aspects of technology integration.

Conclusion

This study identified several challenges faced by primary school mathematics teachers in integrating technology into their teaching. Insufficient training, limited resources, technical issues, and resistance to change emerged as significant barriers. The findings showed that a majority of teachers reported inadequate training and limited resources as major obstacles. This further highlighted the need for targeted professional development and better technological infrastructure.

Recommendations

Based on the findings, the following recommendations were made

1. Schools should invest in comprehensive professional development programs that address both the technical and pedagogical aspects of technology use. Increasing investments in technological resources is crucial to ensure teachers have the necessary tools to enhance their teaching.
2. Adequate digital tools should be provided to schools by the Government.
3. Policymakers should allocate more funds to improve technological infrastructure in schools and support initiatives that promote innovative teaching practices.

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