Journal of Mathematics Instruction, Social Research and Opinion
Vol. 1, No. 3, November 2022, pp. 143~152, https://doi.org/10.58421/misro.v1i3.40
ISSN 2962-7842

ICT and Learning of Mathematics in Nigeria

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Article Info

Keywords:

ICT
Learning
Mathematics
Learning of Mathematics

ABSTRACT

This study empirically reviews ICT and mathematics learning in Nigeria through a systematic literature review. Relevant articles and journals were identified to examine international students' teaching and learning experiences. Research shows that even if teachers believe that students need to understand mathematics or that the use of ICT improves students' development, students still need to solve problems. It may indicate that They do not incorporate her ICT into math classes or use it in traditional ways to impart knowledge. Her effective use of ICT in mathematics education may lead to more learner-centered classroom practices. These changes are widely believed to impact mathematics teaching and to learn positively. For example, ICT can enrich students' mathematics learning experience, increase their interest in mathematics, and change their attitudes toward mathematics. With the proliferation of online e-teaching, flipped classrooms are becoming a new trend in digital learning. The study recommends that ICT tools be made available by all parties to teachers and students with appropriate Internet access to achieve solid academic performance in mathematics. Governments at all levels need to increase their budgets for education and ensure that the money allocated for education is entirely spent.

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1. INTRODUCTION

It has been observed that all is not well in learning mathematics. Several factors have been identified: the quality of instructional teaching methods and strategies adopted. The place of mathematics in the national curriculum and its provisions inform that the subject must be taught well. Teaching mathematics is a task that needs to be accomplished no matter what, for its applications in other fields of study are numerous. Teaching mathematics requires content and pedagogical knowledge, and in some cases, content pedagogical knowledge [1]. There is necessary to utilize instructional materials where necessary and to be handled by those trained in the field.

Lack of problem-solving skills contributes to the difficulties encountered in basic general mathematics. The ability of future teachers to solve numerical problems does not match their conceptual understanding of molecular concepts. Moreover, teaching students to solve problems is not the same as teaching concepts [2]. Students have conceptual problems, but many students can successfully solve quantitative problems related to the domain. It relies on algorithms, especially for major and everyday problems. This makes it difficult for students to solve ill-defined problems without going through several steps. Therefore, students' problem-solving skills should be developed as a result of learning. Research studies have shown that educational methods facilitate the acquisition of problem-solving skills. Therefore, the teaching method used by the teacher is an essential factor to consider. Teacher-centered teaching methods that do not allow student involvement have been identified as a major cause of student learning difficulties in mathematics [3].

Integrating technology into the classroom has become essential to successful teaching and learning. Therefore, integrating information and communication technology (ICT) into education remains essential for teachers to teach effectively. Integrating ICT into teacher education and classroom practice is complex and challenging. In this regard, equipping schools with essential ICT tools alone will not improve the quality of education or create a more effective learning environment. As a result, the government attempted to improve mathematics performance in schools and implemented curriculum reforms focusing on ICT as a tool for teaching mathematics [4].

Adopting information and communication technology (ICT) has become an essential tool to support innovative education and improve the ongoing learning process of students. For example, Das [5] believes using technology in mathematics classes with appropriate pedagogy will improve students' academic performance. Das [5] We have reiterated that deep conceptual learning can become a reality when mathematics is viewed as problem-solving and thoughtfully combined with technology. ICT learning environments enable students to become fluent in various expression systems, provide opportunities to create and modify forms of expression, develop skills to create and explore virtual environments, and help them understand the world. Emphasize that it is a primary method. The National Council of Teachers of Education (NCTM) believes that technology is an essential tool for learning mathematics in the 21st century and that all schools are committed to helping all students harness the full potential of technology to advance their understanding. , should strive to stimulate student learning. Be interested and improve your academic performance. Mathematics proficiency with technology strategically deployed to make mathematics accessible to all students [5].

The Transforming Teacher Education and Learning Programme [6] aims to transform Further training of teachers by improving the quality of teaching and learning at all teacher training colleges. In order to use her ICT in the classroom, both college tutors and future teachers need to use her ICT in the classroom to develop teaching skills to engage students in the classroom [6].

Given the importance of ICT in society and perhaps in education in the future, identify possible perceptions of integrating these technologies into schools to improve the

quality of teaching and learning. In his January 2017 survey of needs and priorities conducted in the top 10 African countries by the Association of African Universities (AAU Africa), 77.9% of university students supported the integration of ICTs necessary for teaching and learning [7].

Teachers' use of ICT in basic general mathematics requires qualified teachers and visionary school leadership. Teachers and school leaders need to recognize the potential of ICT in teaching and learning, especially in basic general mathematics. Lack of knowledge, government policy, and investment to introduce ICT in schools often misses opportunities to implement desirable school reforms. [8]–[11]. The use of ICT in Nigeria and African countries, in general, is growing and increasing dramatically. However, while there is much knowledge about the use of ICT in developed countries, there is not much information about the introduction of ICT in schools in developing countries.

It is very beneficial for teachers to use ICT to teach their students. This is because using ICT allows her to demonstrate her understanding of the possibilities and implications of ICT for learning and teaching in a curricular context. Plan, implement and manage learning and teaching in an open and flexible learning environment. ICT integration can significantly impact a teacher's work, especially if her ICT is conceived as a tool to support changes in educational approaches. Teachers will need to change their roles and the organization of their classrooms, but they will also need to invest energy in themselves and their students, especially in preparing them to introduce and manage new learning arrangements. According to Ching [12], ICT plays a unique but complementary role in each of these approaches, as new technologies require new teacher roles, new teaching methods, and new elements of teacher education.

The success of ICT integration will depend on teachers' ability to combine technology with new teaching methods. To achieve this, teachers need adequate preparation, time, and ongoing support to ensure they have the knowledge, skills, and confidence to teach using ICT. The need to provide teacher training programs and professional development facilities for current and future teachers cannot be overemphasized. Undoubtedly, the main challenges in integrating her ICT into the classroom are its educational impact, its impact on curriculum structure and content, classroom organization and practice, and the changing role of teachers [8], [11], [13], [14].

Teachers must continue integrating these new technologies into their classrooms as the world revolves around technology. Teachers must continue incorporating these new technologies into their students' lessons to achieve efficiency and effectiveness. Are teachers using this new technology in their classrooms, and how will the use of ICT impact student achievement?

2. METHOD

This study empirically reviews ICT and learning of Mathematics among Nigerian students by using a systematic literature review [15]. That was done by identifying relevant articles and journals to explore international students' teaching and learning experiences. The study used the five steps inspired by Pautasso [16]. These five steps are: to conduct initial searches and prepare search strings; to search electronically for relevant articles and

journals; to screen and then embark on add delete; to embark on a full reading of the relevant articles and journals, and then identify relevant articles and journals for teaching and learning experiences of international students.

Purpose of the Study

This study's general purpose is to examine ICT's effects on learning Mathematics in Nigeria.

Significance of the Study

The benefits of this review work are not limited to providing valuable tools in determining the contributions of ICT tools to understanding mathematics among Nigerian pupils alone but also increasing their soft, challenging, and professional skills. Another benefit of this review work is to equip Nigerian students with knowledge of the skills demanded by the professional in which they intend to work, and in line with this, they will adequately prepare themselves for the world of work. This review work also aims to provide a relevant tool for judging the contribution of ICT to Nigerian students' understanding of general mathematics, which can further facilitate their understanding of other core subjects. The results of this review work would provide relevant information to educational planners and policymakers to formulate policies that enhance a curriculum that matches the provision of required ICT tools to the understanding of not only general mathematics but also other compulsory subjects. Theoretically, this review work is expected to enrich the bank of knowledge through life-reliable findings on the effects of ICT on Nigerian pupils. That will help to monitor the progress of educational objectives and provide evidence for improving the teaching and learning of mathematics. Lastly, the empirical facts from this review work will be known to the public through academic journals and are expected to be of relevance to students and future researchers in any academic field who may wish to carry out research work on the effects of ICT on mathematics.

Scope of the Study

The geographical scope of this study is Nigeria as a whole. The conceptual scope of this study covers ICT tools. Therefore, this research reviews empirical work on the effects of ICT on learning Mathematics in Nigeria.

3. RESULTS AND DISCUSSION

ICT and Learning of General Mathematics

There are varying degrees of studies between ICT and learning of general mathematics. McCarney [17] reported a study on effective human resource development in ICT for teachers. A sample of Scottish primary school teachers was interviewed to examine the impact of different models of staff development in ICT on teachers and the knowledge and skills teachers acquired through staff development. Professionally, scientifically/substantially, and educationally. This result shows that ICT education needs

to be given more importance. This is of interest to everyone involved in teacher education and professional development.

Moseley et al. [18] found that an Examination of primary school teachers known to achieve average or above average performance in measures of relative student achievement focused on pedagogy using ICT. Observations show that the most successful teachers used examples and counterexamples and involved students in explaining and modeling in class. A teacher who preferred ICT was likely to have well-developed her ICT skills and viewed ICT as an essential tool for learning and teaching. They also seemed to appreciate student collaboration, inquiry, and decision-making. In turn, a teacher's pedagogical approach is influenced by several important factors. First, they are influenced by subject knowledge [19]. There is a stark difference between a teacher who selects her ICT resources that fit a particular topic and a teacher who selects resources that present students' work in new ways that do not directly apply to the topics they follow. I have. There is evidence to show that when teachers use subject knowledge and students understand the subject when using ICT, there is a more direct impact on student performance.

Gray and Souter [20], A study of the use of ICT by American science teachers, focuses on data on one aspect of ICT use in secondary school subjects and teacher perceptions in these areas. Compare science teachers' perceptions with other subject teachers. Although we could analyze teacher responses, the overall number of studies was relatively small, resulting in general observations across three scientific disciplines: biology, chemistry, and physics. Examining the data, we found that science teachers scored favorably on ICT use and confidence compared to teachers of other subjects. Computing facility availability is reported to be reasonably high in absolute terms, but actual utilization is relatively low. The high usage was for a relatively narrow range of applications, especially word processing.

Moreover, little has been reported about her use of ICT by students in science education. Although the potential of ICT in science seemed well known, teachers indicated that they did not believe the introduction of ICT would fundamentally change teaching methods and teacher-student relationships. The science teacher was reasonably confident in her use of ICT but felt she needed more support and professional development to maximize her use of ICT in the classroom [20].

The Robert Gordon University Aberdeen [21], A study of teachers' ICT skills and knowledge needs to be conducted in Scotland, reported that ICT use was relatively low and concentrated in a reasonably narrow ICT spectrum. Word processing is the main use of ICT in primary and secondary schools. Externally produced learning software is used to some extent in both fields, with secondary school teachers tending to use standard packages such as spreadsheets more extensively than elementary school teachers. Most secondary schools have access to the Internet, but both elementary and secondary school teachers rarely use the Internet and her WWW or email. Resources including video conferencing and community laptop conferencing are hardly ever used. The study also found that primary school teachers use ICT primarily to support classroom practice. Secondary school teachers use it for professional development and personal use at least as much as in the classroom. The teacher uses her ICT throughout the curriculum, but in

secondary school, the usage and attitudes vary depending on the subject. Mathematics and Science teachers rarely use her ICT, while among non-computer teachers, business and management teachers use ICT most frequently [21].

According to Sam [22], Using technology in the classroom requires teachers to have ICT knowledge and skills, integrate it into the curriculum, align it with student learning goals, and engage learners in the pursuit of meaningful academic development. I have. This study was a survey aimed at including in-service teachers from selected universities in the South-South geopolitical zone of Nigeria in their self-assessment of their core technical competencies. Her 238 participants, including 108 male and female teachers, completed her 61-item Likert questionnaire. The survey also aims to identify the professional development needs of in-service teachers and the forms of professional development they prefer. The results show that most active teachers lack skills in critical technical areas and all lack extensive professional development in their ICT 17 skill areas and training in 10 skill areas. Showed that it was necessary. Incumbent teachers preferred conference/seminar attendance, university courses, and mentoring as basic forms of ICT skills training.

Peralta and Costa [23] investigated teachers' ICT-use competence and confidence in Greece, Italy, Spain, and the Netherlands through a multi-objective, quantitative case study. A survey of primary school teachers in these countries found that ICT "plays a complementary role in primary teacher practice and is used as a complement to other materials." They pointed out that there are not many concrete examples of lasting and meaningful learning activities supported by ICT, except for references to projects in Greece and Portugal. According to Peralta and Costa, most experienced teachers in these countries said ICT was not part of their preparatory training. In contrast, prospective teachers showed poor preparation for ICT, while some teachers in Portugal and Spain had credits in new technologies. Peralta and Costa concluded that few primary school teachers could use ICT in the classroom.

Ayas [24] explained that communication technologies in the classroom provide helpful feedback on how well students and teachers understand concepts and whether they can apply them in new contexts. A study commissioned by the Software and Information Industry Association reviewed 311 research studies on the impact of technology on student performance and found that students had more positive and consistent patterns of rice fields. B. Victory and Success. They improve preschool performance, improve attitudes towards learning and increase self-esteem through high school performance in regular and special needs students. Ayas [24] We have found that introducing technology in educational settings in line with constructivist pedagogy, especially in social studies, can inspire new ways of teaching and learning.

Papanastasiou, Zemblyas & Vrasidas [25] We researched ways to integrate standards-based video clips into classroom-designed classroom instruction and found that it improved student performance. A study examined the association between computer use and students' science performance based on standardized assessment data. Papanastasiou, Zemblyas & Vrasidas [25] It has been found that it is not the use of the computer itself that has a positive or negative impact on student performance, but how the computer is used.

In their recent study, Li, Zheng, and Yang [23] concluded that the proliferation of online e-teaching, especially with the help of MOOCs, has turned flipped classrooms into a new trend in digital learning. With changes in information technology, multimedia digital education is constantly influencing its teaching style. Much knowledge is presented through clear audio accompanied by text, images, and sound and light effects. Learning environments and materials are simulated to stimulate students' interest in learning and enhance educational effectiveness.

Wu & Tai [26] found a strong relationship between ICT-related attitudes and classroom use for educational purposes. Her many studies in the field of ICT in education show that attitudes toward ICT influence whether teachers accept her ICT's usefulness in the classroom and whether teachers incorporate her ICT into their lessons. The mathematics education community believes that proper ICT integration impacts all aspects of mathematics education. What kind of mathematics should be presented and how mathematics is taught and learned [27]–[30]. Effective use of ICT in mathematics education can lead to more learner-centered classroom practices. The integration of ICT fundamentally changes the way teachers and students interact and how mathematical content is presented to students. These changes are widely believed to impact mathematics teaching and to learn positively. For example, ICT can enrich students' mathematics learning experience, increase their interest in mathematics, and change their attitudes towards mathematics [26]–[30].

ICT is thought to affect mathematics education positively, but in practice, teachers may not use it at all or use it in a very traditional way. B. Use of ICT to support direct education. A teacher's attitudes and beliefs about the use of ICT are cited as significant obstacles to a teacher's practical adoption and effective use of her ICT [30], [31]. More importantly, effective ICT integration makes mathematics (such as abstract concepts) more accessible to students, enhances students' understanding of mathematical concepts, and enhances students' problem-solving skills. , improve higher levels of students' mathematical thinking and math performance in general [31].

Researchers found that teachers' attitudes toward ICT were much more predictive of their intentions to use technology than their beliefs about self-efficacy [31]. In general, more positive attitudes towards ICT promote ICT integration in the classroom, while negative attitudes discourage its use. In mathematics education, teachers should only consider the use of technology If you believe that your students will be better at learning mathematics, or that your students will be more motivated, entertained, or confident when compared to other approaches [32]. Suppose a teacher believes that students must be able to solve problems without ICT support in order to demonstrate mathematical understanding, or that the use of ICT facilitates student skill development. The ability to calculate is disabled. In this case, they do not integrate ICT into their math lessons or use it in traditional ways of imparting knowledge [32].

Regarding gender, researchers examining differences in ICT use between male and female students focus on the role of gender in the relationship between ICT and mathematics performance [33], Technological Pedagogical Content Knowledge (TPACK), and ICT use based on gender [34], resistance to digital means of communication [35],

frequency of ICT use [36] and Types of activities using ICT and work history by gender of teachers who worked at higher education institutions in Malaysia [37].

4. CONCLUSION

In this paper, we conducted an empirical review and uncovered additional research on ICT and general mathematics learning. In this study, technical content knowledge (TPACK) and ICT use were significantly affected by gender, resistance to digital communication, frequency of ICT use, type of ICT activity including ICT by gender, and mathematics teacher's professional occupation. shown to be affected. It shows that it is based on experience. Suppose a teacher thinks that they are demonstrating an understanding of mathematics. In this case, the student must be able to solve the problem without her ICT support. Alternatively, they may believe that the use of ICT enhances the development of students' skills. B. Mathematics, he does not integrate his ICT into his math lessons or use it in a very traditional way of teaching knowledge. Effective use of ICT in mathematics education can lead to more learner-centered teaching practices. The integration of ICT fundamentally changes the way teachers and students interact and how mathematical content is presented to students. These changes are widely believed to impact mathematics teaching and to learn positively. For example, ICT can enrich students' mathematics learning experience, increase their interest in mathematics, and change their attitudes toward mathematics. Flipped classrooms are becoming a new trend in digital learning as online e-teaching becomes more popular.

5. RECOMMENDATION

Based on the literature review, the theory of occupational fitness, and the results of this study, teachers, and students with adequate access to the Internet should ensure that all relevant interests are involved in achieving solid academic performance in mathematics. It is recommended that ICT tools be made available to stakeholders. Governments at all levels need to increase their budgets for education and ensure that the money allocated for education is entirely spent. All stakeholders specifically concerned with mathematics and education, in general, should be involved in providing the ICT tools needed to facilitate mathematics teaching and learning. Governments, parents, and private organizations should join forces to make these ICT tools effective for teaching and learning mathematics to all Nigerian students.

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