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Mathematics Teachers' Readiness to Integrate ICT in the Classroom the Case of Primary Schools Teachers in Minna Metropolis

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ABSTRACT

ICT integration in mathematics education gives mathematics teachers access to integrative teaching strategies that boost students' interest in learning, encourage their self-directed study and active engagement in the exploration of mathematical ideas, and ultimately aid in their comprehension of the concepts. Therefore, because of the educational affordances of ICT, integrating ICT into mathematics instruction improves student achievement in the subject. ICT integration in the mathematics classroom is a promising practice because of these potentials, but its success depends on a number of factors, including teachers' perceptions of their own ICT proficiency, their attitudes toward the technology's contribution to their teaching of mathematics, their attitudes toward the technology's contribution to students' mathematical learning, their feelings toward the technology's use in the classroom, their feelings of control and self-worth when the technology is present in the classroom, and teachers' intentions to actually incorporate the technology into their instruction. The purpose of the current study was to confirm how prepared Nigeria teachers to integrate ICT into the classroom, which is why it was interested in the six. The research used a questionnaire that included statements related to each one of the above constructs. This questionnaire was administered to 220 Nigeria teachers in primary schools in Minna metropolis. According to the study's findings, 72% of the participating teachers thought highly of their ability to integrate technology into their lessons and use it effectively. In addition, they feel positively about this integration and have good views toward the use of ICT in teaching and learning as well as their self-esteem when using technology. Accordingly, the results show that teachers are prepared for integrating technology into their lessons. This preparedness is demonstrated by the teachers' intention to integrate technology into their lessons as well as by their attitudes and perceptions of doing so.

Keywords: ICT, teacher, integration, Classroom, teacher's intentions

1.0 Introduction

Advanced and user-friendly tools are made available to teachers by new technologies across all fields and educational technology specifically so that students can gain a deeper comprehension of the material. In addition, these technological advancements allow educators to collaborate with students while they immerse themselves in their education (Abdulrahaman *et al.*, 2020). The applications of technological tools make this educational situation possible because they promote students' independence and participation, let them see how scientific phenomena are investigated in a variety of ways, and help them gain a greater awareness of the material being studied (Wu, 2024). Because technology instruments offer different mathematical representations for mathematical concepts, procedures, and themes, these attributes are intended to motivate instructors in general, and mathematics teachers in particular, to employ ICT in their instruction (Thurm and Barzel, 2022). This study looks at several ICT integration strategies used by mathematics teachers in primary and secondary Nigeria schools. These aspects include how instructors view their own ICT proficiency, how they feel about the role that technology plays in their teaching of mathematics, how they feel about the role that technology plays in their student's learning of mathematics, how they feel about using technology in the classroom, how they feel about their control and self-worth when using technology, and how they intend to incorporate technology into their lessons.

1.1 Research Rationale and Goals

ICT integration in mathematics education would give math teachers access to integrative teaching strategies that inspire students to study, increase their level of activity and independence, and help them comprehend mathematical concepts and themes more deeply. Therefore, because of the educational affordances of ICT, integrating ICT into mathematics instruction improves student achievement in the subject. Because of these potentials, integrating ICT into mathematics classrooms is a recommended practice. However, as the previous summary of elements influencing ICT integration in the classroom implies, this practice will only be beneficial provided certain criteria are met.

To be more precise, the success of ICT integration in the classroom will rely on several factors, including teachers' attitudes toward the role that technology plays in teaching mathematics, how they feel about the role that technology plays in students' math learning, how they feel about using technology in the classroom, how confident and in control they feel when using it, and whether or not they intend to integrate technology into their lessons. The goal of the Ministry of Education's present research is to validate these claims about Nigerian teachers as it prepares to introduce an ICT integration program into every Nigerian school.

The current study's findings will provide a broad overview of the state of various aspects of mathematics teachers' preparation to integrate ICT in the classroom among Nigerian schools' administrators, supervisors, teachers, curriculum development teams, etc. This broad overview would assist the main figures in mathematics education in bringing about changes in the way that mathematics is taught and learned. In particular, it would assist them in creating workshops and programs that are suitable for the professional development of math instructors regarding the use of ICT in the classroom.

1,2 Research Questions

i.   What are mathematics teachers' perceptions of their ability in ICT?

- What are mathematics teachers' attitudes towards ICT contribution to the mathematics teaching?

- What are mathematics teachers' attitudes towards ICT contribution to students' mathematics learning?

- What are mathematics teachers' emotions towards the use of ICT in the mathematics classroom?

- What are mathematics teachers' feelings of self-esteem and control in the presence of ICT in the mathematics classroom?

- What are mathematics teachers' intentions to actually integrate ICT in their teaching?

- What are the correlations of mathematics teachers' intentions to actually integrate ICT in their teaching with each of the following factors: perceptions of ability in ICT, attitudes towards ICT contribution to the mathematics teaching, attitudes towards ICT contribution to students' mathematics learning, emotions towards the use of ICT in the mathematics classroom, and feelings of self-esteem and control in the presence of ICT in the mathematics classroom?

2.0 Research Methods

2.1 Research Population and Sample

The research population consisted of the mathematics teachers in primary school in Minna metropolis, Niger State, Nigeria. The sample included 220 primary school teachers.

2.2 Research Instrument

The researchers created a questionnaire about teachers' views toward using ICT in the classroom based on two surveys that are often used in international research. There were three sections to the questionnaire. The first section asked for demographic information about the teachers, such as their age, gender, seniority, academic degree, school location, and the classes they teach. In the second section, there were questions about the degree of computerization in the school, the ICT competency of the teachers, and the school's preparedness for and use of ICT in mathematics instruction. The responding teacher was to indicate to each of the six tables of statements in the third section how much they were accepted.

The tables were associated with the following categories: instructors' opinions of their own ICT proficiency; instructors' attitudes toward the role that ICT plays in mathematics instruction; instructors' attitudes toward the role that ICT plays in students' mathematical learning; instructors' feelings regarding the use of ICT in the mathematics classroom; instructors' sense of control and self-worth when ICT is present in the classroom; and instructors' intentions to incorporate ICT into their teaching.

2.3 Method of Data Analysis

Using the SPSS software, the distribution of the participating teachers' degree of approval of the statements in each category about their willingness to incorporate ICT into teaching and learning was calculated. Furthermore, correlations were calculated between the category "teachers' intentions to integrate ICT in their teaching" and each of the next five categories.

3.0 Results and Discussion

The distribution of the participating teachers' perceptions of their ICT proficiency is shown in Table I, which highlights three issues: (1) the majority of teachers agree or strongly agree that they have the skills (almost 80%) and necessary efficiency (more than 80%) to use ICT in teaching mathematics; (2) almost two-thirds of the teachers do not believe that using ICT in mathematics instruction is particularly difficult, but nearly one third do believe it is

difficult; and (3) more than three-quarters of the participating teachers believe they can successfully engage with ICT at all levels, while nearly 70% of them believe they have the abilities to use appropriate ICT.

Table 1: Teachers' Perceptions of their ICT Ability

Item	I strongly disagree	I disagree	I do not know	I agree	I Strongly Agree
I have the necessary efficiency to deal with ICT in teaching mathematic (N = 220)	6	11	23	74	106
I have the necessary skills to use ICT in teaching mathematics (N = 220)	12	24	32	95	57
Engaging with ICT is so difficult (N = 220)	59	80	38	31	12
Engaging with ICT in teaching mathematics is not easy (N = 220)	21	62	45	70	22
If I want, I can engage successfully with ICT at all levels (N = 220)	3	18	32	111	56
I have the skills to use appropriate ICT tools in teaching different mathematical topics (N = 220)	4	35	34	106	41

These findings concur with those of Demissie, Labiso, and Thuo (2022), who discovered that teachers possessed the skills necessary for effective technology integration. Additionally, they agree with Ng *et al.* (2023), who found that teachers believed they were competent to incorporate language labs into their lessons and use a variety of computer tools to improve instruction. Additionally, to make the most of teachers' positive perceptions of their ICT proficiency and use it in the classroom, a few procedures need to be followed: (1) using computer labs, which allow teachers the flexibility and freedom to prepare course materials; (2) offering workshops on technology integration as a means of appropriate professional development; (3) aligning technology with curriculum goals to enhance teaching and learning; and (4) allowing teachers enough latitude in selecting and covering material so that quality rather than quantity is the primary focus.

Table 2 describes the distribution of the participating teachers' attitudes towards ICT contribution the mathematics teaching.

Table 2 demonstrates the positive general and specific views of the participating instructors toward the use of ICT in mathematics teaching. For instance, the participating teachers believe that the use of ICT in mathematics education has a positive impact on the subject (nearly 80% of them believe it is essential for effective mathematics instruction, and over 70% believe it simplifies and expedites the teaching process). These results are consistent with earlier studies that discovered an overall positive attitude among teachers or pre-service teachers toward the use of ICT in mathematics instruction. For instance, Peng, Abdulrazak, and Hajar (2023) discovered that in-service EFL teachers had a positive attitude toward the integration of computer technology in their instruction.

Simultaneously, nearly 50% of the participants believe that the use of ICT in mathematics education could impede the completion of the course material. This mindset may be explained by the instructors' belief that they are highly skilled ICT users but their lack of experience using the technology in the classroom could be another factor. Teachers may not be able to see how using ICT can ultimately reduce class time if they have not had much experience with it. Studies that have examined this impact of ICT use are consistent with this influence. For instance, Luo *et al* (2023). discovered significant differences related to primary school teachers' use of interactive whiteboards and their opinions of the boards' value to teaching and learning.

Table 3 describes the distribution of the participating teachers' attitudes towards ICT contribution to students' mathematics learning.
Table 3 further demonstrates the positive sentiments of participating teachers toward the role that ICT plays in students' learning. In general, over 70% of the participating teachers said that ICT use helps students learn in a variety of ways, which in turn helps them, comprehend the material better by showing mathematical ideas.

Table 2: Distribution of the participating teachers' attitudes towards ICT contribution the mathematics teaching

Item	I strongly disagree	I disagree	I do not know	I agree	I strongly agree
I can get mathematical information from the internet more than from books (N = 220)	10	36	52	90	32
Using ICT is important for good teaching of mathematics (N = 220)	8	16	40	108	48
Using ICT in teaching mathematics speeds up the process of teaching (N = 220)	8	21	35	114	42

The high level of ICT skills makes the mathematics teaching easier (N = 220) 7	16	33	103	61
Using ICT in teaching mathematics hinders the completing of the learning materials (N = 220) 12	21	73	79	35

Table 3: Teachers' Attitudes towards ICT Contribution to Students' Mathematics Learning

Item	I strongly disagree	I disagree	I do not know	I agree	I strongly agree
Using ICT makes the students understand More (N = 220)	6	15	96	60	43
Using ICT in teaching mathematics enhances learning (N = 220)	7	12	42	112	47
Using ICT in teaching mathematics is helpful for students (N = 220)	10	20	29	108	53
Using ICT in teaching mathematics encourages students self-learning (N = 220)	7	22	36	102	53
Using ICT in teaching mathematics demonstrates the mathematical concepts to students (N = 220)	6	24	31	105	54

The capacity to illustrate mathematical ideas also promotes students' independent study. These upbeat views suggest that the participating teachers are aware of the benefits that information and communication technology can provide for students' learning. These beneficial effects are also documented in the literature; for instance, studies have shown that integrating ICT into instruction can have a variety of beneficial effects on students' learning (Machost and Stains, 2023).   Table 4 describes the distribution of the participating teachers' emotions towards the use of ICT in the mathematics classroom.

Table 4 shows that, on the whole, the participating teachers felt positively about using ICT in the mathematics classroom. While nearly 20% of participating teachers, or less in most cases, agreed or strongly agreed that using ICT in the classroom makes them feel bad, more than 85% of participating teachers had positive feelings toward the use of ICT in mathematics instruction. Examining the feelings that teachers have about their work is crucial to understanding and raising the caliber of instruction (Hu, 2023). Here, examining teachers' feelings informs decisions about how best to support them in utilizing ICT in the classroom.

In other words, the positive attitudes of the participating instructors regarding the use of ICT in the mathematics classroom suggested that, given the right circumstances—such as well-equipped workshops and modern technology—they would employ ICT in their actual instruction. In order to prevent teachers from feeling that "engaging with ICT makes them feel tired and exhausted," these workshops should include sessions on how to design appropriate classes (see the item in the above table). The ministry of education could also strive to avoid instructors from becoming weary and stressed by promoting the creation of textbooks and activities that are acceptable for ICT use in mathematics classrooms.

Table 5 describes the distribution of the participating teachers' feelings of self-esteem and control in the presence of ICT in the mathematics classroom.

In general, Table 5 indicates that the presence of technology in the mathematics classroom would improve the participating teachers' sense of control and self-esteem (perceived competence and accomplishment), though self-esteem would improve even more. The earlier results, in which the teachers expressed gratitude for the use of ICT in the arithmetic classroom, may help to explain this. The benefits of using ICT in the mathematics classroom that have been previously discussed and shown by the research would increase teacher effectiveness and student achievement, most likely by boosting the understanding and performance of their pupils. On the other hand, having the right resources would provide the instructor with a greater sense of control over their instruction.

The effects of technology on students' self-esteem and sense of control are explained in detail in Li, Chen and Deng (2024), with particular reference to computer games: "Having a feeling of control over a quasi-reality, being in the thick of the action, and the ability to raise self-esteem by achieving goals, power, and success in the through-the-screen world is part of the attractiveness of computer games." In this case, the objectives achieved through the use of technology are primarily the improvements in students' understanding and achievement, which is a sign of the effectiveness of the instruction, as Table 6 demonstrates.

Table 4: Teachers' Emotions towards ICT use in the Mathematics Classroom

Item	I strongly disagree	I disagree	I do not know	I agree	I strongly agree
Interacting with ICT is pleasant (N = 220)	9	17	38	89	67
Using ICT in teaching mathematics is pleasant (N = 220)	6	11	40	107	56
Engaging with ICT makes me feel tired and exhausted (N = 220)	26	40	80	58	16
Engaging with ICT makes me feel frustrated (N = 220)	35	55	82	36	12
Engaging with ICT makes me feel angry (N = 220)	28	40	103	32	17
Engaging with ICT scares me (N = 220)	33	83	65	28	11

Table 5: Teachers' Self-Esteem and Control in the Presence of ICT in the Mathematics Classroom

Item	I strongly disagree	I disagree	I do not know	I agree	I strongly agree
If I engage with ICT I would feel a sense of competence in the classroom (N=473)	5	23	33	100	59
If I engage with ICT I would feel in control of my teaching (N=472)	10	20	74	93	23
If I engage with ICT I would feel a sense of achievement (N=469)	4	13	24	124	55
If I engage with ICT my work would be more effective (N=472)	5	15	24	137	39

Table 6: Teachers' Intention to use the ICT in the Mathematics Classroom

Item	I strongly disagree	I disagree	I do not know	I agree	I strongly
I have the willingness to use ICT in teaching mathematics (N = 220)	12	20	27	114	47
I have the intention to use ICT in teaching Mathematics (N = 220)	17	25	30	108	40
I plan to use ICT in teaching mathematics (N = 220)	20	23	30	111	36

Table 7: Correlations with Teachers' Intention to use ICT in their Actual Teaching

Perception of ICT ability	Pearson Correlation	0.570**
	Sig. (2 - tailed)	0.000
	N	220
Attitudes towards using ICT in teaching	Pearson Correlation	0.457**
	Sig. (2 - tailed)	0.000
	N	220
Attitudes towards using ICT in learning	Pearson Correlation	0.500**
	Sig. (2 - tailed)	0.000
	N	220
Emotions towards using ICT in the mathematics classroom	Pearson Correlation	0.446**

	Sig. (2 - tailed)	0.000
	N	220
Self-esteem in the presence of ICT in the classroom	Pearson Correlation	0.435**
	Sig. (2 - tailed)	0.000
	N	220

Table 7 displays the correlations between the following constructs: teachers' self-esteem in the mathematics classroom, teachers' attitudes toward using the ICT in teaching, teachers' attitudes toward using the ICT in learning, teachers' perceptions of their ICT ability, and, the other hand, teachers' intention to use the ICT in their actual mathematics teaching. There are moderate to significant relationships between all the dimensions and instructors' intentions to use ICT in their lessons. These noteworthy links were discussed previously. Furthermore, it has been demonstrated that attitudes, feelings, and perceptions affect behaviour in general and teaching in particular (Telli, Maulana and Helms-Lorenz, 2021).

4.0 Conclusions

Despite their lack of experience, most participating teachers recognized the value and promise of ICT for teaching and learning, according to Fahm *et al.* (2022). According to the results of the current study, over 70% of the participating teachers have good opinions about their technological proficiency and ability to integrate technology into their lessons. Additionally, in addition to having positive feelings toward this integration, students also have positive views regarding the use of ICT in teaching and learning and toward their self-esteem in the presence of technology.

Accordingly, the results show that teachers are prepared for integrating technology into their lessons. This preparedness is demonstrated by the teachers' intention to integrate technology into their lessons as well as by their attitudes and perceptions of doing so. According to earlier studies, when educators incorporate technology into their lessons, they should also hold workshops that provide them the appropriate real-world experience and paradigms to help them comprehend their new position in the age of technology.

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