



Availability and Utilization of Information and Communication Technology for Teaching of Mathematics in Secondary Schools of Mopa-Moro Local Government

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ABSTRACT

This study investigated the availability and utilization of Information and Communication Technology (ICT) resources in the teaching and learning of Mathematics in senior secondary schools in Mopa-Moro Local Government Area of Kogi State, Nigeria. The study specifically examined the types of ICT resources available, the extent of their utilization by teachers, the perceived benefits of ICT integration in Mathematics instruction, and the constraints limiting their effective use. A descriptive survey design was employed, and a total of 80 Mathematics teachers were selected using a convenience sampling technique. Data were collected using a structured and validated questionnaire titled Availability and Utilization of Information and Communication Technology for Teaching and Learning of Mathematics Questionnaire (AUICTTLMQ). The reliability of the instrument was established through the test-retest method, yielding a coefficient of 0.85. Data analysis was conducted using descriptive statistics such as mean, standard deviation, and frequency counts. The findings revealed that ICT resources were poorly available in most senior secondary schools within the study area, with only computers, printers, photocopiers, and interactive radio sets being moderately available. The average availability rating indicated that over 52% of the required ICT resources were not accessible. Furthermore, the extent of utilization was found to be low, with an overall mean score of 2.33, suggesting limited integration of ICT into classroom instruction. The study also suggested further research on psychological and perceptual factors affecting ICT adoption and its impact on student learning outcomes in Mathematics. Recommendations were made in line with the findings of the study.

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INTRODUCTION

Mathematics can be defined as the science of numbers, quantity and space of which, arithmetic, algebra, trigonometry and geometry are branches. Mathematics serves as a bedrock for other science subjects and at the same time, strengthens and sharpens the intellectual skills of students (John, 2017). Sunday, et al (2017) remark that "mathematics is the backbone of knowledge". It is also described as the pivot of all civilizations and technological development. These descriptions point to the important position

accorded to mathematics as a key factor in the development of any nation.

The Nigeria educational system is geared towards rapid technological growth of the nation. In view of this, the National Policy on Education stipulates that mathematics should be one of the core subjects taught at all levels of education including secondary and primary schools, since the importance of mathematics cannot be over emphasized in the area of science and technology, Federal Republic of Nigeria (FRN, 2014). It is made a compulsory subject for

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all primary and post – primary schools in many countries of the world. The expectation is that, adequate exposure of students to the knowledge of mathematics will facilitate their achievement not only in mathematics but also in their areas of human endeavors. Therefore, the teaching of mathematics is very important in Kogi state

Teaching is the process of meeting the educational needs of society through the application of skills, knowledge and attributes desirable of the individuals in the society. According to Achimugu, etal (2023), teaching is a profession which involves giving lessons to individuals in schools, colleges of education and universities. It also involves showing learners how to do something. In the context of this study, it is the teaching of mathematics to students in senior secondary schools using relevant instructional materials. To realize the goals of education, the choice of learning activities must be properly done so that the teacher who is at the center stage would be properly guided in the implementation of the desired learning experiences.

A competent teacher is a lover of knowledge and will always desire to have the development of his students as one of his priorities. According to Samuel and Sunday (2024), a quality teacher has to be knowledgeable and possess mastery of the topic of each lesson and have emotional and psychological competencies. Mathematics teachers who are doing well have definite attributes that distinguish them. Mathematics is a subject that is generally dreaded by many students and for mathematics curriculum to be attained, a mathematics teacher has to exhibit the necessary competence to help the learners who have phobia and traditionally struggle with the subject to gain confidence to solve mathematics problems correctly. In realizing this, the qualification and exposure of the teacher must be considered.

Teachers who are highly qualified develop self confidence in teaching and become a source of inspiration to the students (Sunday etal, 2023). It is very true that poorly trained mathematics teachers make mathematics to suffer major setbacks that make it difficult for mathematics curriculum to be attained. Another

factor that may impede curriculum implementation and attainment is the fact that most Nigerian teachers are overburdened with large classes which affects classroom management and effective face-to-face contact with the learners. The resultant effect could lead to confusion and frustration in the mind of the teacher, thereby reducing his level of effectiveness, originality and creativity. In the present-day reality, Information and Communication Technology (ICT) has provided an effective platform for achieving the implementation of Mathematics curriculum. Information and communication technology is the creation, processing, storage, retrieval and transmission of data and information (Sunday, etal 2016). It entails the retrieval of information necessary for the teaching of mathematics.

Information and communication technology can have powerful impact in teaching and learning for the teacher and student interaction, because there is exchange of information which means both share their opinions and ideas. This is a healthy development in education. Information and communications technology (ICT) refers to all of the knowledge used to control telecommunications; these may include broadcast media, intelligent building management systems, network-based control and monitoring functions, and audio-visual processing and transmission systems (David, 2020). The scope of ICT is broad even though it is often regarded as an extended synonym for information technology (IT).

ICT has lately been used to explain the union of many technologies and the utilization of general transmission lines conveying various data and communication formats and types. Although there is no consensus or generally accepted definition of ICT, the term is commonly adopted to mean all the devices, systems, applications and networking components that are combined to allow people and firms (i.e., governments, non-profit agencies, businesses, and enterprises) to work together in the digital planet. Over the last twenty years, the utilization of ICT has become an essential theme in education.

Studies have revealed that ICT can improve teaching and learning outcomes. For



instance, in mathematics and science education discovered that the utilization of ICT can enhance students' conceptual understanding, team working skills and problem solving (Culp & Mandinach, 2017). To this end, nearly every curriculum document highlights the significance of ICT and encourages teachers to make good use of them. Nonetheless, teachers must be specially trained so that they can integrate ICT effectively in their practice. Consequently, students, student teachers and teachers in practice must acquire training that could enable them to utilize various software packages and applications most efficiently (Ololube, 2013).

The most important issue in teacher preparation and a fundamental variable is bringing potential teachers into real-life classroom settings early and placing them under mentor teachers. It is absolutely necessary to ensure that a future teacher truly learns how to teach and develop the capabilities to teach. It is not good enough to teach prospective teachers the content of their teaching subjects and send them to schools for teaching practice without the daily guidance of a committed mentor. Therefore, the professional development of mathematics teachers in the effective use of Information and Communication Technology in their own classes under the watch of an ICT specialist cannot be over emphasized.

Education is an essential instrument for every society and human development. Meaningful education can only be achieved when proper and adequate resources are used in teaching and learning process. Balogun (2017), stated that ICT resources are materials or equipments which help teachers to make lesson explicit to the learners (students). They are materials that help man to achieve his objectives or man's ability to find solutions to problems. They help man to handle difficult situations. Teaching and learning resources are those resources that facilitate the achievement of the goals of education. Igwe (2013), classified ICT resources into three as Human resources, material resources and Audio-visual aids while Ofoegbu (2019), classified them into two as: human and non-human resources. Human resources are all

individual potentials, talents and abilities which are used in combination with other resources to teach.

Meanwhile non-human or material resources are tools and devices through which stimuli can be passed on or obtained. Omiko (2011), observed that ICT instructional resources are those educational media or materials that can be used to record, store, preserve, transmit or retrieve information. They are also known as information delivery service which Information and Communication Technology (ICT) is among. Examples of human ICT resources are: ICT personnel and ICT experts while non-human ICT resources are: Personal computers, Projectors, modem and Flash Drives. Both forms of resources are very useful in the teaching of mathematics in secondary schools. Information and Communication Technology has become an important part of most organizations and businesses these days (Khalid 2019).

The availability of ICT resources plays a major role in provision of quality teaching. It is a known fact that an effective teaching stimulates intellectual curiosity and offer a sense of enjoyment that will move the students from the passive role of recipient of information to active role of builder of knowledge (Oki, 2014). The use of ICT tools has captured the attention of the education community to enhance teaching and learning of mathematics, but also has the capability not only of engaging students in instructional activities to increase their learning, but of helping them to solve complex problems in mathematics to enhance their cognitive skills (Jonassen & Reeves, 2018).

However, Wong and Choy (2016) suggested that, the integration of ICT into teaching Mathematics depends on individual teachers' confidence and competence. Research findings have indicated that lack of teachers' confidence prevents teachers from using ICT in their teaching (Sunday et al, 2016). Straub (2019) reported that for the use of ICT tools in teaching and learning to remain sustained, personal factors such as teacher's skills, knowledge, competencies, readiness characteristics of the love for innovations and the influences of individuals



context should never be ignored as part of the planning process.

STATEMENT OF THE PROBLEM

Mathematics holds significant importance as a core subject at the senior secondary school level, contributing to the overall development of individuals and nations. However, despite its importance, students' performance in Mathematics has remained persistently poor over the years (Eze, 2015). Various teaching strategies have been developed by experts to address the issue of poor student performance in Mathematics. One such strategy is the integration of Information and Communication Technology (ICT) (Adeyemo, 2016). However, the effective use of ICT in teaching Mathematics has been hindered by several challenges, including limited access to computer hardware and software, inadequate time in the school timetable for students to engage with ICT for learning, lack of ICT training for teachers, and insufficient knowledge on how to integrate ICT into teaching and learning to improve performance and foster innovation in curriculum development.

Aina (2017) emphasized that when ICT is effectively integrated into the mathematics classroom, it can significantly enhance students' academic performance. Additionally, studies have shown that the use of new technologies can provide numerous benefits to students' learning experiences. Despite the proven advantages of ICT tools in the teaching Mathematics, observations from visits schools Kogi State, revealed a lack of adequate ICT resources, such as computers and relevant software. In some schools, even when ICT resources are available, they are underutilized due to factors such as unreliable power supply and teachers' inadequate ICT skills. Therefore, this study seeks to assess the availability and utilization of ICT facilities in teaching Mathematics in senior secondary schools in Mopa-Moro Local Government Area, Kogi State, Nigeria.

Research Questions

The following research questions will be raised to guide the study

1. What are the ICT Resources available in senior Secondary Schools for teaching Mathematics in Mopa-Moro local government area of Kogi state?
2. What is the extent of utilization of ICT Resources for teaching Mathematics in senior Secondary Schools

METHODOLOGY

In this study, a survey research design was adopted. This design was particularly suitable for gathering opinions and perspectives from individuals. According to Alex & Johnson (2017), survey research could utilize quantitative methods. Surveys were commonly used in social and psychological research to describe and explore human behavior. A study population referred to a group of individuals or elements sharing similar characteristics such as location, gender, or specific interests. For this study, the population consisted of mathematics teachers from selected secondary schools in Mopa-Moro Local Government Area, Kogi State. A sample was a smaller, representative group selected from the study population to infer results for the entire population. In this study, the researcher used the convenience sampling method to determine the sample size. A total of 80 mathematics teachers from the selected secondary schools were chosen to participate in the study. The primary instrument for data collection was a questionnaire, which was administered to the selected respondents.

The questionnaire consisted of two sections: the first section collected demographic information, while the second section contained questions aligned with the study's objectives. The instrument underwent a validation process to ensure its content and face validity in assessing the availability and utilization of Information and Communication Technology (ICT) facilities in the teaching of Mathematics in Senior Secondary Schools in Mopa-Moro Local Government Area, Kogi State. Content validity was determined by ensuring that the test items adequately represented key aspects of ICT facilities and their role in Mathematics instruction, such as the types of ICT resources and their usage in teaching.



The reliability of the instrument was assessed using the Pearson Correlation Coefficient. A coefficient value of 0.68 was considered to indicate that the instrument was relatively reliable. According to Thomas, etal (2026), a reasonable reliability range fell between 0.67 and 0.87, suggesting that the instrument was reliable for this study Data were collected primarily through the administration of structured questionnaires to the selected participants. These questionnaires were designed to gather first-hand information relevant to the research questions. By

directly engaging with participants, this method ensured that the data collected was specific, relevant, and tailored to the study's objectives. The responses were analyzed to provide a deeper understanding of the research topic.

RESULTS

Research Question One

What are the ICT Resources available in senior Secondary Schools for teaching Mathematics in Mopa-Moro local government area of Kogi state?

Table 1. Frequencies and percentage responses of students and teachers on the available ICT resources in senior secondary schools for teaching mathematics

Item NO	Items	Available F (%)	Not available F (%)	Remarks
1	Personal computer systems are available	178 (85)	32 (15)	Available
2	Projectors are available	43(20)	167 (80)	Not Available
3	Internet connectivity is available	56 (27)	154(73)	Not Available
4	Interactive Radio sets are available	171(81)	39(19)	Available
5	Printers are available	179(85)	31(15)	Available
6	Photocopiers are available	167(80)	43(20)	Not Available
7	Teleconferencing is available	56(27)	154(73)	Not Available
8	Video charts are available	51(24)	159(76)	Not Available
9	Television	54(26)	156(74)	Not Available
10	video records or cassettes	42(20)	168(80)	Not Available
Average percentage score		100(48%)	110(52%)	Not Available

Data in Table 1 show that items 1, 4, 5 and 6 had percentage score above the acceptable percentage score of 50%; it implies that the respondents agreed that Personal computer system, Interactive Radio sets, Printers and Photocopiers are the available ICT Resources in senior secondary schools for teaching Mathematics. On the other hand, items 2, 3, 7, 8, 9 and 10 had percentage score below the acceptance percentage score of 50%; It implies that the respondents agreed that Projectors, Internet connectivity, Teleconferencing, Video charts, television and video records or cassettes, are the ICT Resources that are not available

teaching Mathematics. However, from the responses of the respondent one can deduct that there are poor availability of ICT Resources for teaching Mathematics in senior secondary schools, as shown in the Average percentage Score of 52% (Not available) against 48% (Available).

Research Question Two

What is the extent of utilization of ICT Resources for teaching Mathematics in senior Secondary Schools? The results of these analyses are presented in Table 4.3.



Table 2: Mean responses of students and teachers on the utilizations of the available instructional materials in the classroom for teaching of mathematics

Item NO	Item statement	Mean Score	SD	Decision
11	Computer is utilized in my school	2.50	0.58	HE
12	There are power point slides and projectors use to teach in school always	2.35	0.53	LE
13	Internet connectivity is utilized in my school	2.05	0.43	LE
14	Video records or cassettes re utilized in my school	2.39	0.55	LE
15	Television sets are utilized in my school	2.25	0.50	LE
16	Interactive Radio sets are utilized in my school	2.03	0.42	LE
17	Printers are utilized in my school	2.57	0.60	HE
18	Photocopiers are utilized in my school	2.64	0.62	HE
19	Teleconferencing is utilized in my school	2.26	0.50	LE
20	Video charts are utilized in my school	2.22	0.49	LE
Averages Mean		2.33	0.53	LE

Key: HE= High Extent, LE= Low Extent

Data in Table 4.3 showed that items 11, 17 and 18 had mean score above the acceptable mean of 2.50, it implies that the respondents agreed that Computer, Printers and Photocopiers are utilized in their schools to high extent. More so, items 12, 13, 14, 15, 16, 19 and 20 had mean score below the acceptance mean of 2.50, it implies that the respondent did not agree that Projectors, Internet connectivity, Teleconferencing, Video charts, television and video records or cassettes are utilized in their school and did not agree that Teachers know very well how to use the resources in teaching of Mathematics. However, from the responses of the respondents, one can find that there are low extents of utilization of ICT Resources by Mathematics teachers in teaching-learning process as indicated by the average mean score of 2.33 and standard deviation of 0.53.

DISCUSSION OF THE FINDINGS

The study showed that there are poor availability of ICT Resources for teaching Mathematics in senior secondary schools, This suggest that among all the ICT Resources studied only Personal computer system, Interactive Radio sets, Printers and Photocopiers are the available ICT Resources for teaching Mathematics in senior secondary schools in Mopa-Moro local government area of Kogi state. This is shown in

Table 4.1, which is the Table showing the required ICT resources for teaching and learning specified by NCCE (2012). This is in agreement with. Oyediji, Saliu, and Oluwolola, (2018), who stated that there is inadequate provision of technological equipment and laboratory facilities to impart adequately on students' knowledge. This non-availability had made it impossible for teachers to effectively utilize or implement ICT resources in teaching-learning process. The finding is in line with the findings of Idoko and Ademu (2020) who found that ICT facilities were not available in secondary schools.

In Table 2 the respondents accepted that there are low extents of utilization of ICT Resources by Mathematics teachers in teaching-learning process as indicated by the average mean score of 2.33 and standard deviation of 0.53, that is only Computer, Printers and Photocopiers are utilized in their schools. This finding is in agreement with Fakeye (2019) who found that availability of computers and their connectivity to the internet was non-existent in virtually all the school studied and utilization, which is dependent on availability, and because availability is poor, thus, usability was also found to be poor.

CONCLUSION

From the findings, the researcher can deduce and conclude that there is poor availability

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of ICT resources in secondary schools in Mopa-Moro local government area of Kogi state. Moreover, computer system, interactive radio sets, photocopiers and printers among others are available. Information and Communication Technology resource has not been effectively utilized in teaching and learning of Mathematics in Senior Secondary Schools. Irregular power, Few ICT technical supports and difficulty in accessing lesson materials, Inadequate softwares for teaching, learning and research, Poor maintenance and frequent breakdowns of ICT facilities, Time-constraint and inflexible time schedule for training are the constraints that hinder the effective use of ICT resources in teaching and learning of Mathematics in Senior Secondary Schools.

There are little availability and ineffective utilizations of ICT resources in teaching and learning. However, the students' ICT resources utilization is less, this is because most of the other resources in the item statements are for teacher/students interaction and all have low extent of utilization. This calls for urgent attention and assistance to intensify the utilization of ICT in teaching-learning process for Mathematics teachers and students in the secondary schools so as to be able to compete favorably with their counterparts, as we all know; the whole Education system is turning into ICT based system.

RECOMMENDATIONS

Based on the findings, discussions and conclusion, the following recommendations are made:

1. Provision of adequate fund for procurement and maintenance of ICT resources.
2. Functional computer laboratories should be provided in almost all the secondary schools in Mopa-Moro local government area of Kogi state
3. Steady and alternate power supply should be provided by the authorities concerned for effective utilization ICT in the secondary schools.

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