**AVAILABILITY, ACCESSIBILITY AND READINESS TO USE DIGITAL TECHNOLOGIES AMONGST SECONDARY SCHOOLS MATHEMATICS TEACHERS IN MINNA, METROPOLIS NIGER STATE**

**NUHU, Lemu Ibrahim, Dr. Bashir A. Usman and Abdulrahman Muhammad Alfa**

**Department of Science Education, Federal University of Technology Minna Niger State, Nigeria.**

**Corresponding Email:** **ibrahimlemunuhu@gmail.com** **phone- 07030058339**

**ABSTRACT**

This study examined the availability, accessibility and readiness to use digital technologies amongst secondary school mathematics teachers in Minna, Metropolis. The study adopted a descriptive survey research design. The target population of the study comprised 251 Mathematics teachers. Thesample size for the study is 152 mathematics teachers. A stratified sampling technique was employed in selecting the desired sample size from the various secondary schools under study. Theinstrument "entitled" Digital Technologies Availability, Accessibility and Readiness to use questionnaire (DITAARQ) was used to collect data on available, accessible, and readiness to digital technologies use amongst secondary school mathematics teachers. The data collected for this research study was analyzed and presented using the mean, standard deviation and t-test. The study's findings revealed the availability and accessibility of digital technologies inadequately to mathematics teachers in public schools and adequately available and accessible to mathematics teachers in private schools for teaching mathematics in Minna, Metropolis. The finding also showed a significant difference between male teachers and female teachers readiness to use digital technologies for teaching mathematics in secondary schools in Minna Metropolis. The study has also revealed that the level of use of Digital Technologies for teaching mathematics amongst public secondary teachers is relatively poor compared to the private secondary schools' teachers. Inadequate funding, inconsistent power supply, Inadequate ICT facilities, among others, are identified as major challenges. The study recommended that Stakeholders and partners in education industries such as the Federal Ministry of Education, State Ministries of Education, Parent Teachers Association (PTA), and Nigeria Union of Teachers (NUT), among others, should encourage teachers in secondary schools to acquire personal computers (P.C.s) through purchase, a monthly contribution or granting loan at a subsidized rate from their employees or bankers.

***Key words: availability, accessibility readiness, secondary school, mathematics teachers***

**Introduction**

Digital Technologies is making route into every facet of Nigeria, from the market economy, to social life and industrial enterprises as well as the educational sector. It is likewise obvious that for Nigeria to meet its economic vision for 2030, the country needs technology skills development, which is one of the central goals of the education sector (Nwosu et al., 2017). Though, the education system is facing challenges, including limited available funding to meet the changing technology demands in Nigeria schools (Awofala et al., 2020). In spite of these challenges, public and private schools in Nigeria needs to integrate digital technologies into teaching and learning process especially in their mathematics classrooms to achieve educational goals in the 21st century in Science, Technology and mathematics (STM).

Mathematics affects all aspects of human life, regardless of the profession of an individual or their career path, mathematics remains an essential tool that prepares the individual for effective work. Significantly, the study of mathematics has been found to improve the imaginative and cognitive capabilities of the mind of an individual (Etuk and Bello 2016). The desire to improve mathematics performance in schools across Nigeria is a collective responsibility of the teachers, policymakers, federal and state government, administrators, schools owners, and leaders. As a result of this, the Nigerian government is committed toward developing its people and therefore has made mathematics a compulsory subject from primary school to secondary school (FRN, 2014).

The importance of mathematics cannot be over emphasize, as it cut across all fields of learning such as engineering, medicine, architecture, agriculture and amongst other human profession. Kravitz (2013) states that mathematics is the one skill everyone need to master in life. According to him, even if it is the only one, one will at least be able to live without being cheated or abused. In his view, people need mathematics in their everyday lives and cannot survive without it, as just doing the basic essentials is dependent on one’s ability to do mathematics.

Despite the relative importance of mathematics, it is very disappointing to note that the academic performance of students in the subject is still low. The West African Examination Council (WAEC) regulated the WASSCE, have revealed that only 38.68% to 65.24% of the candidates who sat for the examination obtained a credit pass and above including mathematics (WAEC Head of National Office report, 2015-2020). A cluster of variables has been implicated as responsible for the dismal performance of students. These include, government related variables, and curriculum related variables, examination body related, teacher, student, home and text-book related variables. A part from these variables, Amazigbo, (2016) has identified poor primary school background in mathematics, lack of incentives for teachers, unqualified teachers in the system, and lack of learner’s interest, perception that mathematics is difficult, large classes and psychological fear of the subject as factors responsible for the failure of student performance in mathematics and teacher use of traditional method of teaching mathematics in their classroom.

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. To realize the goals of education 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 Imonivwerha et al., (2014) a quality teacher has to be knowledgeable and possess mastery of the topic of each lesson and have emotional and psychological competences. There are different teaching techniques today that mathematics teachers’ employ to make teaching meaningful. Techniques like problem solving, laboratory method, Heuristic methods and the host of other. These techniques will not yield positive result of teachers’ use of digital technology in mathematics, if the teachers are not interested and not ready to teach mathematics through the use of digital technology particular the use of computer.

It was observed that some studies have been conducted on uses of ICTs (technology) by teachers particularly on the issue of their level of readiness, skills, experiences and professional development. Most of these studies were carried out in developed countries where the use of ICTs has come of age, and where there are resources and facilities to maintain them. Though, the use of ICTs by teachers in Nigeria is just beginning to gain popularity and researches in the area have just started emerging. However, the use of ICTs by teachers to teach the students particularly mathematics is highly advantageous. This is because its enable them to demonstrate understanding of the opportunities and implications of the uses for learning and teaching in the curriculum context; plan, implement, and manage learning and teaching in open and flexible learning environment (UNESCO, 2014).

Teachers’ ability to use technology as a teaching and learning tool is one of the main limitations in education across Nigeria. The inability to effectively use technology to enhance instructional materials aligned to the learning objectives is a challenge when teachers cannot use computers, visual aids, electronic boards, and mobile devices as learning aids (Amanchukwu et al. 2015). This is because, the use of computer as instructional tool in any subject, particularly mathematics has made the progress of teaching and learning not only enjoyable, interesting and meaningful to the learners and teachers but also enable them to acquire wide range of skills and experiences in information and computer technology (Falode, et al., 2016).

Johnson (2012) stated that teacher education should include knowledge and understanding of relevant research that can support ICT usage for teaching. More also, the primary goal of teacher technology usage in education is to promote and enhance standard which have numerous advantages in the teaching processes which allows for the production of digital resources such as digital libraries, where students, teachers, and professionals can access study material and course material from anywhere at any time. Therefore, educators at the teaching profession (especially at the secondary level) needs to be able to exploit the potential of ICT to meet his or her teaching standard, teacher technology usage highlighted the need for an overhaul and review of current practices in teacher training to positively impact social change within the education sector, trickling down all other streams of learning (Aja, 2020).

ICT can be seen in the field of education as a collection of technologies for gathering, accessing and dissemination of data for enhanced learning (Miller and Akume, 2009). Johnson (2012) viewed ICT as the utilisation of digital equipment to all aspects of teaching. The utilisation of ICT for teaching particularly use of computer has made education easier through the application of electronic media, the internet and many others. The various ICT facilities that are available and could be used in education include radio, television, computers, fax machine, VCD machine, photocopying machine, scanner, CD Rom, electronic notice board, slides, digital multimedia, video machine, and many others (Johnson, 2012).

Availability is the level of accessible digital technology that can be used in teaching and learning specifically of mathematics by secondary school mathematics teachers in their classroom. The quality of education provided by an institute is of great concern that depends upon the availability of resources. Overall school facilities determine the teaching as well as learning environment. Quality education can only be attained when the educationalfacilities are properly available, functional and utilized properly. According to Soetan et al., (2014) in a study revealed that the level of availability of digital technology tools used in teaching were available in schools in Ilorin metropolis and were being used by teachers. It has also been noted that the percentages of computers and cell phone usage are high when compared to others in terms of availability of ICT tools in Ilorin (McKena, 2019). On the other hand,Fakeye, (2010) also found out in a study carried in Ibadan that in most of schools covered in the study do not have computers, hence are not connected to the internet. He added those who have computers do not use them for teaching but solely for administrative purposes. Okwudishu, (2015) state that the unavailability of some ICT components in schools hampers teachers’ use of ICTs. In addition, Lack of adequate search skills and of access points in the schools were reported as forces inhibiting the use of digital technology tools such as internet by secondary school teachers for the purpose of teaching and learning, specifically mathematics (Adomi and Kpangban, 2010).

 Hence, the focus on availability of digital technologies and its used in Nigerian Secondary schools particularly in secondary schools in Minna, Metropolis to meet the standard of education in the 21st century in teaching and learning of mathematics is vital, for successfulintegration of digital technologies in the school system depends largely on the level of availability of digital technology tools towards the role of modern technologies in teaching and learning mathematics. Additionally, the methods that will be used to deliver digital technologies through the teaching of mathematics with ICT by teachers within their classroom teaching should provide opportunities for them to use the latest technologies they will encounter in school and outside the school.

Accessibility is the ability to be able to reach out to digital technology (computer) in teaching particularly mathematics .While considering the access of digital technology by teachers, a lot of study have been conducted and noted that there is a disparity in the access of digital technologies between males and females teachers.Hafkin and Taggart (2012) have noted that factors which affect the use or non-use of ICTs by men may actually be different from those that affect use or non-use by women and that it is important to study gender differentials in ICT adoption and use because technology is not gender neutral.

It is the general belief that female mathematics teachers are lagging behind male mathematics teacher when it comes to the level of accessibility and usage of digital technology to teacher in their classroom. Hafkin and Taggart (2012) identified factors such as literacy and education, language, time, cost, and geographical location of facilities, social and cultural norms, as well as women’s computer information and dissemination skills as constraints against women’s access to information technology. The role of the ICT oriented educator is, therefore, to enable teachers to have access to the latest technologies and to give the teachers experience skills and training of ICT in a variety of contexts in respective of gender.

Undoubtedly, teaching of mathematics requires teachers readiness in terms of their technological knowledge, Their training in digital teaching tools, and their digital competence for teaching, but it also needs digital technology infrastructures and resources. According to Almanthari et al., (2020)ICT facilities are a significant mediatorin the relation between teachers’ readiness and ICT application in mathematics teaching and learning. However,Msila, (2015)affirms that, in general, teachers’ received low level of awareness, knowledge of use, perceptions, and attitudes toward their capabilities and skills for technology integration as well as gaining experience in the use of educational technology leaving the fact that digital technology are playing essential role in the system of education. Therefore, teachers need sufficient skills to integrate technology and to have high confident level to use it in a classroom setting. Besides, knowledge and skills to use technology to support mathematics teaching, the National Council for Accreditation of Teacher Education (NCATE) emphasized that teachers must take advantage of technology for instruction and be prepared to use technology effectively in their classroom teaching (Afshari et al., 2013). In order to be ready to integrate technology into teaching of mathematics, teachers must be provided with a solid foundation of knowledge and skills in digital media and develop new understandings, new approaches, new roles, new forms of professional development, and new attitudes about technology integration (Ruggiero et al., 2015). Teachers need to make a paradigm shift in their conception of digital technologies and move from printed traditional instructional tools to digital technologies tools in the teaching of mathematics.

The successful integration of digital technology into mathematics teaching depends heavily on teachers’ readiness and willingness to adopt technology (Singh et al., 2014).Hence, teachers can integrate digital technology to supplement and support teaching and learning of mathematics, facilitate teachers’ work, and encourage student-centred learning (Ertmer et al., 2012). To meet these demands, teachers need to acquire all the technical, pedagogical skills and experience that will enable them to integrate digital technology effectively and efficiently into teaching and learning of mathematics.

Beyond basic skill training, technical, pedagogical skills and experience, schools and government have to use a variety of strategies to provide further professional development for teachers’. According to Winzenried et al., (2010) teachers who have gone through ICT course are more effective in teaching by using technology tools as opposed to those that have no experience in such training. A school in Ireland reported that teachers who did not develop sufficient confidence avoided using ICT. Similar case happened in Canada, some teachers admitted they were reluctant ICT users because they worried they might get embarrassed that the students knew more about the technology than they did (Hennessy et al., 2015).

Research highlighted a complex pattern of interrelated factors that are expected to be determinants of the successful integration of technology in education (2012). These factors may facilitate or hinder teachers’ use of technology and appear from either the external environment or the personal characteristics of teachers. Buabeng-Andoh (2012) added other factors that hinder teachers from the integration of technology Player-Koro,in their classrooms, such as teacher technological skills, teacher confidence, pedagogical teacher training, insufficient access to ICT, structure of education systems. More also, Agbatogun (2012) states other factors beginning with policy, follows by the supplement of all the ICT hardware and software facilities and readiness of teacher to integrate it into pedagogical process.

Therefore, teachers need to ensure that they contribute to social change by embracing new initiatives across Nigeria to integrate technology (Koehler et al., 2012). Because technology can be a tool to enhance children's learning experience in mathematics. The focus on mathematics was particularly important because it is considered a gateway to engineering, medicine, and architecture careers, in developing countries particularly Nigeria. Teachers can improve children’s opportunities for socioeconomic well-being when the skills required to succeed are embedded in the mathematics classroom (Aja, 2020)

The role of ICT teachers is to enable learners to have access to the latest technologies and to give them experience of ICT in a variety of contexts during their lesson activity. The methods used to deliver ICT by teachers should enable learners to embrace ICT within their teaching and provide opportunities for them to use the technologies they will encounter in school and outside the school. Therefore, using technology effectively is determined by the teachers’ attitudes, principles, and views towards technology’s benefits (Awofala, 2017; Kola and Sunday, 2015). This study focus on availability, accessibility and readiness to use digital technologies amongst secondary school mathematics teachers’ in Minna, Metropolis, Niger State.

**Statement of the Research Problem**

The transformation agenda of the Nigeria government placed a premium on education as a vital tool towards the realization of the economic objective for vision 2030. Despite the effort that have been made by Nigeria government to equip secondary schools with the most advanced digital technologies tools to substitute traditional tools for teaching and learning process, yet, teachers level of readiness to incorporate digital technologies such as computer, projectors, graphic calculator for the purpose of teaching to change the narration of traditional method such as chalkboard and integrate technologies to suit into the 21st century system of education is limited. It appears the curricular orientor of secondary schools teachers does not adequately cater for this digital technologies proficiency, thereby, affecting their readiness to use them in their classroom.

In addition, in spite of the benefit of digital technologies, there are several factors hindering teachers’ readiness from integration of digital technology instructional tools into their classroom teaching of mathematics to meet up with standard of education in the 21st century. Buabeng-Andoh (2012) states factors such as teacher technological skills, teacher confidence, pedagogical teacher training, insufficient access to ICT and structure of education systems.

Though, the use of digital technologies by teachers in Nigeria schools particularly public and private schools is just beginning to gain popularity. Significantly, use of digital technologies by teachers to teach the students particularly mathematics is highly advantageous, this is because, the use of digital technologies specifically computer as instructional tool in teaching any subject, particularly mathematics has made the progress of teaching and learning not only enjoyable, interesting and meaningful to both learners and teachers but also enable them to acquire wide range of skills and experiences (UNESCO, 2014).

One way to bridge the gap and bring in teaching of mathematics into 21st century to compete with developed country is by incorporating technology into teaching and learning process as well as providing the teachers with the required skills, knowledge and professional development to use latest digital instructional tools as a substitute of traditional tools. This will be helpful in attempt to meet up with the standard of education in the 21st century. This study, therefore, examined the availability, accessibility and readiness to use of digital technologies amongst secondary schools mathematics teachers’ in Minna, Metropolis, Niger State.

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**Objectives of the Study**

Specifically the objectives of the study are to:

1. Investigate the availability of digital technologies for teaching mathematics in public and private secondary schools in Minna Metropolis, Niger State.
2. Examine the teachers’ accessibility to use digital technologies for teaching mathematics in public and private secondary schools in Minna Metropolis, Niger State.
3. Examine the teachers’ readiness to use digital technologies for teaching mathematics in public and private secondary schools in Minna Metropolis, Niger State.

**Research Question**

The following research questions were raised to guide the study:

1. What are the digital technologies available for teaching Mathematics in public and private secondary schools in Minna Metropolis, Niger State?
2. What are the teachers’ accessibility to use digital technologies for teaching mathematics in both public and private secondary schools in Minna Metropolis, Niger State?
3. What are the teachers’ readiness to use digital technologies for teaching mathematics in both public and private secondary schools in Minna Metropolis, Niger State?

**Hypotheses**

The following null research hypotheses were formulated and to be tested at 0.05 level of significance.

HO**1.** There is no significant difference on the level of availability of digital technologies based on school type for teaching Mathematics in secondary schools in Minna Metropolis, Niger State.

HO2. There is no significant difference on the level of teachers’ accessibility of digital technologies based on school type for teaching Mathematics in secondary schools in Minna Metropolis, Niger State.

HO**3.** There is no significant difference on the level of teachers’ readiness to use digital technologies based on school type for teaching Mathematics in secondary schools in Minna Metropolis, Niger State.

**Methodology**

A descriptive survey design was adopted for this study since the researcher intends to collect quantitative information based on Availability, Accessibility and Readiness to use digital technologies amongst secondary schools’ mathematics teachers in Minna, Metropolis, Niger State. This design was adopted since it involves collecting data to describe and interpret existing problems about a specific population, often using a questionnaire distributed to the respondents without any attempt to manipulate the variables.

The instrument "entitled" Digital Technologies Availability, Accessibility and Readiness to use questionnaire (DITAARQ) was used to collect data on available, accessible, and readiness to digital technologies use amongst secondary school mathematics teachers. However,the instrument, Digital Technologies Availability, Accessibility and Readiness to use questionnaire (DITAARQ) containing forty-two items, yielded an estimated value of 0.756 for reliability test.

 The data collected for this research study was analyzed and tested using the mean, standard deviation and t-test and hypothesis at 0.05 significant level.

**Result**

 **Research Question**

**Research Question One:** What is the level of availability of digital technologies for teaching Mathematics in public and private secondary schools in Minna Metropolis, Niger State? This research question was answered using mean and standard deviation and presented in table 4. 2 below.

**Table 4.2: Mean Score Summary Showing Respondents view on the level of Availability of Digital Technologies**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Items** | **Not Available** | **Fairly Available** | **Adequately Available** | **Weighted Sum** | **Mean** | **Std. Dev** | **Decision** |
| **1** | **2** | **3** |
| Personal computers | 37(24.3) | 65(42.8) | 50(32.9) | 317 | 2.09 | 0.75 | Available |
| Interactive whiteboards | 33(21.7) | 52(34.2) | 67(44.1) | 338 | 2.22 | 0.78 | Available |
| Video conferencing system | 90(59.2) | 33(21.7) | 29(19.1) | 243 | 1.59 | 0.79 | Fairly Available |
| Audio equipment | 72(47.4) | 46(30.3) | 34(22.4) | 266 | 1.75 | 0.79 | Fairly Available |
| Projector  | 58(38.2) | 65(42.8) | 29(19.1) | 275 | 1.81 | 0.73 | Fairly Available |
| Laptop computers | 35(23.0) | 56(36.8) | 61(40.1) | 330 | 2.17 | 0.78 | Available |
|   Internet cable | 75(49.3) | 49(32.2) | 28(18.4) | 257 | 1.69 | 0.77 | Fairly Available |
| Wireless internet | 64(42.1) | 34(22.4) | 54(35.5) | 294 | 1.93 | 0.88 | Fairly Available |
| Electronic visual resources | 57(37.5) | 64(42.1) | 31(20.4) | 278 | 1.83 | 0.74 | Fairly Available |
| Electronic books | 75(49.3) | 29(19.1) | 48(31.6) | 277 | 1.82 | 0.89 | Fairly Available |
| Desktop computers | 28(18.4) | 50(32.9) | 74(48.7) | 350 | 2.30 | 0.76 | Available |
| Audio visual (e.g television) | 65(42.8) | 44(28.9) | 43(28.3) | 282 | 1.86 | 0.83 | Fairly Available |
| Computer laboratory | 20(13.2) | 52(34.2) | 80(52.6) | 364 | 2.39 | 0.71 | Available |
| Mobile phones | 54(35.5) | 64(42.1) | 34(22.4) | 284 | 1.87 | 0.75 | Fairly Available |
| Audio media(radio etc) | 67(44.1) | 58(38.2) | 27(17.8) | 264 | 1.74 | 0.74 | Fairly Available |
| **Overall Mean** |  |  |  |  | **1.94** | 0.78 | Not Available |

**From the table, values in the parenthesis are percentages of the frequency counts. Decisions were made to each response based on decision mean of 2.0. (N= 152)**

Note:  *Decision Rule: mean values less than 2.0 are regarded as fairly available or not available, while those equal to2.0 or greater than 2.0 are adequately available.*

The result from table 4.2 shows the respondents view on the level of Availability of digital technologies for teaching mathematics in public and private schools in Minna Metropolis Niger State. From the table, the average overall mean score and standard deviation for the entire items in Table 4.2 is 1.94 and 0.78 respectively. This result shows that the level of availability of digital technologies for teaching mathematics in public and private schools is Not Available since the overall mean score is less than the decision mean of 2.0.

The researcher observed the following in each case of the items; 37 respondents representing (24.3%) had, Not Available response to personal computers, 65 representing (42.8%) are fairly Available, 50 representing (32.9%) are Adequately Available. 33 respondents representing (21.7%) had, not Available response to Interactive whiteboards, 52 representing (34.2%) Fairly Available, 67 representing (44.1%) are Adequately Available. 90 respondents representing (59.2%) had, not Available response to Video conferencing system, 33 representing (21.7%) are Fairly Available and 29 representing (19.1%) are Adequately Available. 72 respondents representing (47.4%) had, not Available response to Audio equipment, 46 representing (30.3%) are Fairly Available, 34 representing (22.4%) are Adequately Available. 58 respondents representing (38.2%) had, not Available response to Projector, 65 representing (42.8%) are fairly Available and 29 representing (19.1%)are Adequately Available. 35 respondents representing (23.0%) had, not Available response to laptop computers, 56 representing (36.8 %) are fairly Available and 61 representing (40.1%) are Adequately Available. 75 respondents representing (49.3%) had, not Available response to internet cable, 49 representing (32.2%) are fairly Available, 28 representing (18.4%) are Adequately Available. 64 respondents representing (42.1%) had, not Available response to Wireless internet, 34 representing (22.4%) are fairly Available and 54 representing (35.5%) are Adequately Available.  57 respondents representing (37.5%) had ,not Available response to Electronic visual resources, 64 representing (42.1%) are fairly Available and 31 representing (20.4%) are Adequately Available.75 respondents representing (49.3%) had, not Available response to Electronic books, 29 representing (19.1%) are fairly Available and 48 representing (31.6%) are Adequately Available. 28 respondents representing (18.4%) had, not Available response to Desktop computer and 50 representing (32.9%) are fairly accessible, 74 representing (48.7%) are Adequately Available. While 65 respondents representing (42.8%) had, not Available response to Audio visual (e.g television), 44 representing (28.9%) are fairly Available and 43 representing (28.3%) are Adequately Available. 20 respondents representing (13.2%) had, not Available response to Computer laboratory, 52 representing (34.2%) are fairly Available and 80 representing (52.6%) are Adequately Available. 54 respondents representing (35.5%) had, not Available response to mobile phones, 64 representing (42.1%) are Available and 34 representing (22.4%) are Adequately Available. 67 respondents representing (44.1%) had, not Available response to Audio media (radio etc), 58 representing (38.2%) are fairly accessible and 27 representing (17.8%) are Adequately Available.

**Research Question Two:** What are the levels of teachers’ accessibility to use digital technologies for teaching mathematics in public and private secondary schools in Minna Metropolis, Niger State? Summary of the analysis was presented in Table 4.3 below.

**Table 4.3: Mean Score Summary Showing Respondents viewon the level of Accessibility to use Digital Technologies**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Items** | **Not Accessible** | **Fairly Accessible** | **Adequately Accessible** | **Weighted Sum** | **Mean** | **Std. Dev** | **Decision** |
| **1** | **2** | **3** |
| Personal computers | 35(23.0) | 69(45.4) | 48(31.6) | 317 | 2.09 | 0.74 | Accessible |
| Interactive whiteboards | 35(23.0) | 57(37.5) | 60(39.5) | 329 | 2.16 | 0.78 | Accessible |
| Video conferencing system | 105(69.1) | 32(21.1) | 15(9.9) | 214 | 1.41 | 0.67 | Not Accessible |
| Audio equipment | 70(46.1) | 49(32.2) | 33(21.7) | 267 | 1.76 | 0.79 | Not Accessible |
| Projector  | 56(36.8) | 68(44.7) | 28(18.4) | 276 | 1.82 | 0.72 | Accessible |
| Laptop computers | 46(30.3) | 55(36.2) | 51(33.6) | 309 | 2.03 | 0.80 | Accessible |
|  Internet cable | 76(50.0) | 43(28.3) | 33(21.7) | 261 | 1.72 | 0.80 | Not Accessible |
| Wireless internet | 71(46.7) | 48(31.6) | 33(21.7) | 266 | 1.75 | 0.79 | Not Accessible |
| Electronic visual resources | 76(50.0) | 53(34.9) | 23(15.1) | 251 | 1.65 | 0.73 | Not Accessible |
| Electronic books | 84(55.3) | 33(21.7) | 35(23.0) | 255 | 1.68 | 0.83 | Not Accessible |
| Desktop computers | 46(30.3) | 48(31.6) | 58(38.2) | 316 | 2.08 | 0.83 | Accessible |
| Audio visual (e.g television) | 68(44.7) | 39(25.7) | 45(29.6) | 281 | 1.86 | 0.85 | Accessible |
| Computer laboratory | 26(17.1) | 64(42.1) | 62(40.8) | 340 | 2.24 | 0.73 | Accessible |
| Mobile phones | 65(42.8) | 50(32.9) | 37(24.3) | 276 | 1.82 | 0.80 | Accessible |
| Audio media(radio etc) | 57(37.5) | 67(44.1) | 28(18.4) | 275 | 1.81 | 0.73 | Accessible |
| **Overall Mean** |  |  |  |  | **1.86** | 0.77 | Not Accessible |

**From the table, values in the parenthesis are percentages of the frequency counts. Decisions were made to each response based on the overall mean of 2.0. (N= 152)**

Note:  *Decision Rule: mean values less than 2.0 are regarded as fairly Accessible or* Not Accessible*, while those equal to 2.0 or greater than 2.0 are adequately Accessible.*

The result from table 4.3 shows the respondents view on the level of Accessibility of digital technologies for teaching mathematics in public and private schools in Minna Niger State. From the table, the average overall mean score and standard deviation for the entire items in Table 4.3 is 1.86 and 0.77 respectively. This result shows that the level of accessibility of digital technologies for teaching mathematics in public and private schools is not accessible, since the overall mean score is less than the decision mean of 2.0.

The researcher observed the following in each case of the items; 35 respondents representing (23%) had, not accessible response to personal computers, 69 representing (45.4%) are fairly Accessible, 48 representing (31.6%) are Adequately Accessible. 35 respondents representing (23%) had, not accessible response to Interactive whiteboards, 57 representing (37.5%) are fairly Accessible, 60 representing (39.5%) are Adequately Accessible. 105 respondents representing (69.1%) had, not accessible response to Video conferencing system, 32 representing (21.1%) are fairly Accessible and 15 representing (9.9%) are Adequately Accessible. 70 respondents representing (46.1%) had, not accessible response to Audio equipment, 49 representing (32.2%) are fairly Accessible, 33 representing (21.7%) are Adequately Accessible. 56 respondents representing (36.8%) had, not accessible response to Projector, 68 representing (44.7%) are fairly Accessible and 28 representing (18.4%) are Adequately Accessible. 46 respondents representing (30.3%) had, not accessible response to laptop computers, 55 representing (36.2 %) are fairly Accessible and 51 representing (33.6%) are Adequately Accessible. 76 respondents representing (50.0%) had not accessible response to internet cable, 43 representing (28.3%) are fairly Accessible, 33 representing (21.7%) are Adequately Accessible. 71 respondents representing (46.7%) had, not accessible response to Wireless internet, 48 representing (31.6%) are fairly Accessible and 33 representing (21.7%) are Adequately Accessible.  76 respondents representing (50.0%) had not accessible response to Electronic visual resources, 53 representing (34.9%) are fairly Accessible and 23 representing (15.1%) are Adequately Accessible.84 respondents representing (55.3%) had, not accessible response to Electronic books, 33 representing (21.7%) are fairly accessible and 35 representing (23.0%) are Adequately Accessible. 46 respondents representing (30.3%) had, not accessible response to Desktop computer and 48 representing (31.6%) are fairly accessible, 58 representing (38.2%) are Adequately Accessible. While 68 respondents representing (44.7%) had, not accessible response to Audio visual (e.g. television), 39 representing (25.7%) are fairly accessible and 45 representing (29.6%) are Adequately Accessible. 26 respondents representing (17.1%) had, not accessible response to Computer laboratory, 64 representing (42.1%) are fairly accessible and 62 representing (40.8%) are Adequately Accessible. 65 respondents representing (42.8%) had, not accessible response to mobile phones, 50 representing (32.9%) are fairly accessible and 37 representing (24.3%) are Adequately Accessible. 57 respondents representing (37.5%) had, not accessible response to Audio media (radio etc), 67 representing (44.1%) are fairly accessible and 28 representing (18.4%) are Adequately Accessible.

**Research Question Three:** What are the extents of teachers’ readiness to use digital technologies for teaching mathematics in public secondary schools in Minna Metropolis, Niger State? Summary of the analysis was presented in Table 4.4 below.

**Table 4.4: Mean Scores Summary on extents of Teachers’ Readiness to Use Digital Technologies**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **STATEMENT** | **Not Ready** | **Fairly Ready** | **Ready** | **Weighted Sum** | **Mean** | **Std. Deviation** | **Decision** |
|  | **1** | **2** | **3** |
| 1 | I am not ready to use digital technologies because of insufficient knowledge of appropriate software and hardware. | 18(11.8) | 48(31.6) | 86(56.6) | 372 | 2.44 | 0.69 | Ready |
| 2 | I am no ready to use digital technologies due to the  lack   of knowledge on how to evaluate the use and role of digital technologies in teaching  mathematics | 25(16.4) | 56(36.8) | 71(46.7) | 350 | 2.30 | 0.74 | Ready |
| 3 |  I am discourage from using digital technologies  because of fear of equipment failure | 31(20.4) | 44(28.9) | 77(50.7) | 350 | 2.30 | 0.78 | Ready |
| 4 | I am not ready to use digital technologies because of my limited experience | 29(19.1) | 44(28.9) | 79(52.0) | 354 | 2.33 | 0.78 | Ready |
| 5 | I am not ready to teach mathematics using digital technologies due to my  level of  qualification | 24(15.8) | 46(30.3) | 82(53.9) | 362 | 2.38 | 0.75 | Ready |
| 6 | I am discourage from using digital technologies  to teach mathematics due to my limited training and professional development | 29(19.1) | 55(36.2) | 68(44.7) | 343 | 2.26 | 0.76 | Ready |
| 7 | I am not ready to use digital technologies to teach mathematics as a result of insufficient supply of electricity | 35(23.0) | 57(37.5) | 60(39.5) | 329 | 2.16 | 0.78 | Not Ready |
| 8 | I am not ready to use digital technologies to teach mathematics due to lack of technical support from the school management | 27(17.8) | 56(36.8) | 69(45.4) | 346 | 2.28 | 0.75 | Ready |
| 9 | I am discourage from using digital technologies to teach mathematics because of the unlimited time given to me in teaching mathematics in my school | 22(14.5) | 68(44.7) | 62(40.8) | 344 | 2.26 | 0.69 | Ready |
| 10 | I am not  ready to use digital technologies because  I am  not given the freedom to design my own teaching with the help of digital technology in teaching mathematics in my school | 29(19.1) | 60(39.5) | 63(41.4) | 338 | 2.22 | 0.75 | Ready |
|  | **Overall Mean** |  |  |  |  | **2.29** | **0.75** | **Ready** |

**From the table, values in the parenthesis are percentages of the frequency counts. Decisions were made to each response based on the decision mean of 2.0. (N= 152)**

Note:  *Decision Rule: mean values less than 2.0 are regarded as fairly ready or Not Ready, while those equal to 2.0 or greater than 2.0 are ready.*

The result from table 4.4 shows the respondents view on Readiness of Mathematics teachers to use Digital Technologies in public and private schools in Minna Niger State. From the table, the average overall mean score and standard deviation for the entire items in Table 4.4 is 2.29 and 0.75 respectively. This result indicates that Mathematics teachers are ready to use Digital Technologies in teaching mathematics in public and private schools in Minna, metropolis, Niger State.

 The researcher observed the following in each case of the items; 18 respondents representing (11.8%) of the response had, not ready to *I am not ready to use digital technologies because of insufficient knowledge of appropriate software and hardware*, 48 representing (31.6%) are fairly ready, 86 representing (56.6%) are ready. 25 respondents representing (16.4%) had not ready response to *I am no ready to use digital technologies due to the  lack   of knowledge on how to evaluate the use and role of digital technologies in teaching  mathematics*, 56 representing (36.8%) are fairly ready and 71 representing (46.7%) are ready. 31 respondents representing (20.4%) are not ready response to *I am discourage from using digital technologies  because of fear of equipment failure*, 44 representing (28.9%) Fairly ready and 77 representing (50.7%) ready. 29 respondents representing (19.1%) not ready response to *I am not ready to use digital technologies because of my limited experience*, 44 representing (28.9%) Fairly ready, 79 representing (52.0%) ready. 24 respondents representing (15.8%) had not ready response to *I am not ready to teach mathematics using digital technologies due to my level of qualification*, 46 representing (30.3%) Fairly ready and 82 representing (53.9%) are ready. 29 respondents representing (19.1%) are not ready response to *I am discourage from using digital technologies  to teach mathematics due to my limited training and professional development*, 55 representing (36.2 %) are fairly ready and 68 representing (44.7%) are ready. 35 respondents representing (23.0%) had not ready response to *I am not ready to use digital technologies to teach mathematics as a result of insufficient supply of electricity*, 57 representing (37.5%) had Fairly ready, 60 representing (39.5%) are ready. 27 respondents representing (17.8%) had not ready response to *I am not ready to use digital technologies to teach mathematics due to lack of technical support from the school management*, 56 representing (36.8%) are Fairly ready and 69 representing (45.4%) are ready.  22 respondents representing (14.5%) had not ready response to *I am discouraged from using digital technologies to teach mathematics because of the unlimited time given to me in teaching mathematics in my school*, 68 representing (44.7%) are Fairly ready and 62 representing (40.8%) are ready.29 respondents representing (19.1%) had not ready response to *I am not  ready to use digital technologies because  I am  not given the freedom to design my own teaching with the help of digital technology in teaching mathematics in my school*, 60 representing (39.5%) are fairly ready and 63 representing (41.4%) are ready.

**Hypotheses**

**Hypothesis One (HO1):** There is no significant difference on the level of availability of digital technologies based on school type for teaching Mathematics in secondary schools in Minna Metropolis, Niger State.To determine the level of availability of digital technologies for teaching mathematics between the public and private secondary schools in Minna Metropolis. The data was analyzed using Two- Sample t-test as illustrated in Table 4.10 below.

**Table 4.10 Summary of Two-sample T-test for Availability of digital technologies based on school type**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **School Type** | **N** | **Mean** | **Std. Deviation** | **Std. Error Mean** | **DF** | **T-Value** | **P-value.** |
| Availability digital technologies based on school type | Public | 82 | 1.86 | 0.41 | 0.04 | 150 | 1.92 | 0.06 |
| Private | 70 | 2.02 | 0.59 | 0.07 |  |  |  |

**Not Significant at p > 0.05**

Table 4.10 shows that a t-value of 1.92 has a corresponding p-value of 0.06 at 150 degree of freedom. From the table, though we observed that public schools in the study area have mean score of 1.86 with standard deviation of 0.41 and mean score of 2.02 with standard deviation of 0.59 for private schools on Availability of digital technologies. Therefore, the null hypothesis (HO1)was accepted since P-Value of 0.06 is greater than 0.05 alpha level. This meant that there was no statistically significant difference on the level of availability of digital technologies based on school type for teaching Mathematics in secondary schools in Minna, metropolis, Niger State.

**Hypothesis Two (HO2):** There is no significant difference on the level of teachers’ accessibility of digital technologies based on school type for teaching Mathematics in secondary schools in Minna Metropolis, Niger State.

**Table 4.11 Summary of Two-sample T-test for Accessibility of digital technologies based on school type**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **School Type** | **N** | **Mean** | **Std. Deviation** | **Std. Error** | **DF** | **T-Value** | **P-value.** |
| Accessibility of digital technologies | Private | 70 | 1.96 | 0.58 | 0.06 | 150 | 2.56 | 0.01 |
| Public | 82 | 1.75 | 0.38 | 0.04 |  |  |  |

**Significant at p<0.05**

Table 4.11 demonstrated that a t-value of 2.56 has a corresponding p-value of 0.01 at 150 degree of freedom. From the table, though we observed that public schools in the study area have mean score of 1.75 with standard deviation of 0.38 and mean score of 1.096 with standard deviation of 0.58 for private schools on Accessibility of digital technologies. Therefore, the null hypothesis (HO2)was rejected since P-Value of 0.01 is less than 0.05 alpha level. This indicates that there was statistically significant difference on the level of Accessibility of digital technologies based on school type for teaching Mathematics in secondary schools in Minna, metropolis, Niger State.

**Hypothesis Three (HO3) :**There is no significant difference on the extent of teacher’s readiness to use digital technologies for teaching Mathematics between public secondary schools in Minna Metropolis, Niger State.

**Table 4.12 Summary of Two-sample T-test for extent of teacher’s readiness to use digital technologies for teaching Mathematics**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Sch\_Type** | **N** | **Mean** | **Std. Deviation** | **Std. Error** | **DF** | **T-Value** | **P-value.** |
| Readiness to use of digital technologies | Private | 70 | 2.41 | 0.44 | 0.05 | 150 | 3.04 | 0.00 |
| Public | 82 | 2.19 | 0.43 | 0.04 |  |  |  |

**Significant at p<0.05**

Table 4.12 revealed that a t-value of 2.56 has a corresponding p-value of 0.00 at 150 degree of freedom. From the table, though we observed that public schools in the study area have mean score of 2.19 with standard deviation of 0.43 and mean score of 2.41 with standard deviation of 0.44 for private schools on extent of teacher’s readiness to use digital technologies for teaching Mathematics. Therefore, the null hypothesis (HO3) was rejected since P-Value of 0.00 is less than 0.05 alpha level. This indicates that there was statistically significant difference on the extent of teacher’s readiness to use digital technologies for teaching Mathematics in secondary schools in Minna, metropolis, Niger State.

**Discussion of Results**

The result of this study is discussed based on the following findings.

Table 2 revealed that the level of availability of digital technologies for teaching Mathematics is not available in both public and private secondary schools. The finding agrees with Bitok (2014), which revealed that public and private secondary schools lacked necessary information and communication technology resources for teaching and learning biology. This finding gains further support from the work of Nwana et al. (2017) on the Availability and Utilization of ICT Resources in Teaching Computer Education in Secondary Schools. The finding revealed that many of the ICT resources needed to teach computer education are not available. Contrary to this study, Onah et al. (2020) revealed little or less availability of Information and Communication Technology (ICT) in secondary schools for teaching and learning Cultural and Creative Arts.

Table 3 revealed that teachers' access to digital technologies for teaching mathematics is not accessible in public secondary schools. This finding is in harmony with Adelabu and Adu (2014). Their finding revealed that teachers in secondary schools less accessed ICT facilities. This study also agrees with the work of Nathaniel (2021), who disclosed that a considerable number of teachers have less access to Tablet PC and the internet; possess skills frequently accesses and utilizes their tablet PC for fun, entertainment non-academic related functions. The above study is in total disagreement with Sofowora and Egbedokun (2010) findings, who observed that 55% of Geography teachers had access to computers but did not have the pre-requisite ICT skills. Out of the modern technologies available for teaching Geography, the most commonly used are: instructional television (54%), instruction radio (59%) and video (59%).

Table 4 revealed that Teachers are ready to Use Digital Technologies for teaching mathematics in public secondary schools. This finding disagrees with that of Luis et al. (2021), who suggested that given the use of many digital resources and the high percentage of self-developed materials using educational software, secondary mathematics teachers reflected adequate digital competence and TPCK for teaching mathematics. The sudden transition to ERT forced teachers to slow down the pace of teaching and reduce the content taught. Significant differences were observed based on gender and age in teachers' perception of their adaptation to ERT. Despite the positive influence of previous training on their perception of ERT readiness, teachers generally recognized that they needed more training. This finding concurs with Naresh et al. (2008) in a study on Teachers Readiness to Use Technology in the Classroom. The finding revealed that the AUC among MSE secondary school teachers was moderate.

Meanwhile, the constructs of attitude, perceived usefulness, ease of use, job relevance, and computer compatibility showed a significant positive relationship with AUC. Furthermore, the finding is inconsistent with that of Lukman (2021) study, which revealed a high level of readiness among pre-service teachers to use digital storytelling for classroom instruction. Pre-service teachers' perceived relevance also played a significant role in their readiness to use digital storytelling for instructional delivery.

Tables 5 and 10 revealed a significant difference between public schools and private schools on the availability of digital technologies for teaching mathematics in secondary schools in Minna Metropolis, Niger state. The significant difference favours private schools in terms of the availability of digital technologies, as revealed in their mean score and p-value. This finding agrees with Muhammad et al. (2020), who in his study Inequities of Digital Skills and Innovation between Public and Private Schools in Punjab. The finding revealed that public and private institutes mainly vary regarding digital skills. This study also agreed with the findings of Onasanya et al. (2011), who in their separate studies on teacher's awareness and extent of utilization of ICT for effective science and health education in Nigeria revealed that the level of utilization of ICT resources is shallow due to lack of availability of ICT resources in secondary schools in ten (10) local government area in Oyo state. In addition, Amuchie (2015) opines that the extent of utilization of ICT resources such as desktop computers, laptops, television, video players, radio, digital camera, printers, multimedia projectors, scanners, photocopying machines, satellite disc, Internet, Interactive whiteboard, and electronic notice board for teaching and learning in secondary schools in Nigeria is at a shallow extent, which is caused by the lack of ICT resources in the secondary schools. Furthermore, the finding of this study is also in disagreement with that of John and Shallimar (2020), who in their studies disclosed that in terms of school readiness on distance learning, the schools were not yet ready to implement a distance learning scheme for teaching and learning process.

Tables 6 and 11 revealed a significant difference between public schools teachers and private school teachers’ level of accessibility of digital technologies for teaching mathematics in secondary schools in Minna Metropolis, Niger state. The significant difference is also in favour of private school teachers in terms of accessibility of digital technologies, as revealed in their mean score and p-value. The finding is also in line with the study of Muhammad et al. (2020), which showed that private school teachers were more innovative in accessing digital skills. Therefore, initiatives should be taken to develop an interest in public sector teachers regarding technology practice. Moreover, the government can also collaborate with the private sector to learn from their digital experiences and train teachers from the public sector. Furthermore, the finding is in harmony with Adenike et al. (2021) on Correlational Studies between Secondary School Teachers’ Access to and Utilization of Internet Facilities for Instruction in Ilorin, Nigeria. The finding revealed a significant positive relationship between teachers' access to and utilization of Internet facilities for instruction. This implies that teachers who access Internet facilities use Internet facilities for classroom instruction more than their counterparts.

Tables 7 and 12 revealed a significant difference between public school teachers and private school teachers’ readiness to use digital technologies for teaching mathematics in secondary schools in Minna Metropolis, Niger. The finding supports Naresh et al. (2008), who, in his study on Teachers’ Readiness to Use Technology in the Classroom, revealed that the AUC among MSE secondary school teachers was at a moderate level. Meanwhile, the constructs of attitude, perceived usefulness, ease of use, job relevance, and computer compatibility showed a significant positive relationship with AUC.

Tables 8 and 13 revealed a significant difference between male teachers and female teachers’ accessibility of digital technologies for teaching mathematics in secondary schools in Minna Metropolis, Niger state. The significant difference favours male teachers in terms of accessibility of digital technologies, as revealed in their mean score and p-value. Sometimes collateral cultural factors and other cultural attitudes based on gender bias and not the immediate gender identification of technology use prevent young girls and female teachers from accessing and using digital technologies in teaching and learning. Research shows disparities in education between genders, especially in Africa, where more emphasis is put on boy-child than girl-child. The finding is in line with the EFA Global Monitoring Report (2012) in his study showed that girls face enormous obstacles to entering school than boys and that majority of 150 (68.2%) of respondents were males while 70 (31.8%) were females.

Further, it revealed that most of the teachers in Kenya involved in ICT in schools were males than females. Similarly, the finding supports Jimoyiannis and Komis (2007), who in his study revealed that male teachers are more optimistic about ICT in school while female teachers are neutral or negative. However, the finding is also inconsistent with that of Adenike et al. (2021), who research Correlational Studies between Secondary School Teachers' Access to and Utilization of Internet Facilities for Instruction in Ilorin, Nigeria. The study findings revealed a significant positive relationship between teachers' access to and utilization of Internet facilities for instruction. This implies that teachers who access Internet facilities use Internet facilities for classroom instruction more than their counterparts.

Tables 9 and 14 revealed a significant difference between male teachers and female teachers’ readiness to use digital technologies for teaching mathematics in secondary schools in Minna Metropolis, Niger state. The finding is in agreement with Almanthari et al. (2020). The finding revealed that digital technologies facilities are a significant mediator between male and female teachers’ readiness and digital technologies applications in mathematics teaching and learning. The study is also in line with that of Rahim and Shamsiah (2018), who research a study Teaching Using Information Communication Technology. The findings showed that male teachers are more confident than female teachers in using ICT integration in teaching.

**Conclusion and Recommendations**

**Conclusions**

Based on the study's findings, it is a truism to conclude that the level of digital technologies tools is not adequately available and accessible for teaching and learning of mathematics in public secondary schools compared to private secondary schools in Minna Metropolis Niger State. Furthermore, the inadequate availability and accessibility affected the extent of digital technologies, which was also identified as poor by public school teachers. It is worthy of note that the availability, accessibility and readiness to use Digital Technologies amongst secondary schools mathematics teachers for teaching and learning mathematics in Minna, Metropolis Niger State are faced by many several attributes which include; Inadequate funding, inconsistency of power supply, Inadequate ICT facilities, Lack of sponsorship to both national and international conference, seminar, workshop, etc.; Over dependency on donor support; Technophobia; Inadequate ICT training of staff, Low internet and among others.

To curtail these challenges, some strategies were employed, some of which include; Independence on In-house funding by schools; provision of Adequate funding by the government; Constant power supply; Adequate ICT training of staff; Sponsorship of staff to both national and international conferences, seminar, workshop, etc. Adequate ICT facilities in the schools, Standard Internet infrastructure and among others. Conclusively, it will be valid to affirm that public secondary school in Minna, Metropolis Niger State, lacks adequate digital technologies facilities for teaching and learning Mathematics. Hence the level of use is inferior as compared to private schools. However, Digital Technologies has many perceived benefits among teachers and students.

**5.3 Recommendations**

Based on the findings and conclusion from this study, the following recommendations were made.

1. The governments should make efforts at all levels and other stakeholders in education such as curriculum planners, parents, non-governmental agencies, and others to make adequate provision for computers and other necessary ac­cessories required for teaching mathematics at the secondary schools level. This would form the basis for upgraded digital technologies tools such as radio, T.V., Internet, computer, laptop, tablets, and many other hardware and software applications at the tertiary level of education in Nigeria.
2. Government should encourage both the teachers and students to incorporate digital technologies tools in teaching and learning mathematics, as well as organizing seminars, national and international conferences and workshops for the teachers to provide them with the required skills, knowledge and professional development to use the latest instructional tools such as computer, projector etc. This will be helpful on the need to use available digital technologies in second­ary schools maximally.
3. Stakeholders in education, such as the Ministry of Education and non-governmental agencies, should formulate and implement specific information and communication technology (ICT) policies on digital technologies instructional tools for the Nige­rian secondary educational system to meet up with the demand on the socio-economic transformation of Nigeria as en­capsulated in the Vision 20:30 Document.

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