Assessment of Level of Digital Literacy among Science Teachers at the Junior Secondary Schools in Ibadan, Oyo State, Nigeria

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Abstract

The study assessed the level of digital literacy among science teachers at the Junior Secondary School in Ibadan, Oyo State, Nigeria. The study employed a descriptive survey design with a structured questionnaire administered to 200 Basic Science and Mathematics teachers in Ibadan Metropolis. The result: 164 (82%) respondents had < 5 computers with digital tools, while 36 (18%) had > 5 computers with digital tools; science teachers possess basic digital literacy skills with the highest internet usage (=3.445 and SD = 0.573); and the lowest in basic repairs and maintenance of computers (= 1.375 and SD = 0.562). Total average in all items: = 2.961; and SD = 0.856. Science teachers' utilisation of Information and Communication Technology (ICT) skills was moderate (2.72); and the level of ICT competencies possessed by science teachers was high (= 3.137). These findings underscore the need for equitable distribution of ICT facilities, coupled with a call for continuous professional development programmes among science educators to ensure adept utilisation of these resources.

***Keywords*:** *Assessment, science teacher, ICT, digital literacy, junior secondary school*

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Introduction

Teaching is one of the most challenging professions in today's society, where knowledge is expanding so rapidly that modern technologies demand the use of Digital Technology to aid the teaching process. Digital technology is one of the basic building

blocks of modern society, and many countries now understand its concepts and apply them to education (Akpabio & Ogiriki, 2017). Federal Republic of Nigeria (2013) notes that as the pace of technological development continues to grow, school children live in a world where ICT will be increasingly embedded in their daily lives. The use of digital tools in teaching and learning has been a new phenomenon since the 1980s when its promoters submitted that it would transform and preserve education. However, the late 1990s saw a growing shift towards digital integration, which emphasized the curriculum and not the tool (Fakeye, 2010). This school of thought opined that students would learn new skills as they needed them in order to make the skill work for them. The use of digital tools in the light of ICT could now be viewed more as a partner and not a competitor when treated more naturally. As the world grew, the 2000s saw a heightened focus on increasing the use of digital technology in the classroom, and not just by the industrialists (Fakeye, 2010). Growing attention and pressure to implement technology in education is coming from many directions, including homes, businesses, and every sphere of society. One of the most significant features of the technological or digital era with much relevance to education is the Internet. The Internet is defined technically and functionally as a worldwide network of computers and people interacting together (BasuMallick, 2023).

To enhance and streamline the developments in the ICT sector, a wide range of digital tools such as the projector, interactive board, electronic mail, online searching tools, electronic publishing, file transfer protocols, and the World Wide Web (www), among others, are incorporated into teaching and learning. The government of Nigeria approved the National Policy for Information Technology (IT) in 2000 to meet the challenges and harness the underlying potentials and opportunities of the system (Federal Republic of Nigeria, 2012). Furthermore, the Federal Government recognizes that ICT in the light of digital technology has a significant role to play in the stimulation of national development, and in particular, modernization and globalization of the economy. In recognition of the need for ICT in the development process, several initiatives were undertaken by the government to promote the development and application of ICT. The telecommunication sector was liberalized in 1999 by a policy framework which provided for the introduction of competition and licensing for multiple operators (Geoffrey, 2010). The liberalization of the acquisition, use, and application of ICT has led to a rapid expansion of the ICT industry in Nigeria over the last twenty years.

The introduction of ICT in secondary schools made it an integral part of science teaching, which plays a significant role in making the teaching and learning of science subjects ICT-inclined. Despite milestone steps taken to enhance ICT in Nigeria, there are severe shortages of ICT skills and personnel necessary for sustainable development and global competitiveness. The sector has the potential to generate more employment

and wealth creation, which various stakeholders can tap into. The development of human capital needs to be improved by a new set of knowledge, skills, and attitudes, and the learners need to be equipped to be globally competitive to meet the challenges of the evolving environment (Alsied & Pathan, 2015).

Science subjects at the Junior Secondary School serve as bedrock to most science, engineering and medical fields of study. Physics, Chemistry, and Mathematics are vital subjects, among other sciences, which put lots of fear in the minds of students. The fear of this subject is generally termed "Science Phobia". Due to the current world trend, students are encouraged to be literate and versed in the use of all related technological devices in order to be able to thrive and be relevant in modern society. This is as a result of the significance of ICT across all spheres of the modern society. Teachers are expected to have sound knowledge of ICT to be able to cope with the modern world as well as to help in building up the students in this newly found knowledge. Therefore, there is a need to integrate ICT into teaching and learning via digital literacy and the competence of teachers. ICT is well recognized for having great potential for improving the teaching nature to motivate students to learn. Educationists believe that with the knowledge of ICT, there would be improvement in education among the students. An educationist highlighted types of ICT integration in schools to include classroom learning for effective teaching (Enyedy, 2014). Generally speaking, opportunities for collaborative learning provided through the use of ICT enable the easy integration of the internet for educational resource sharing and incorporating a learners-centred approach in education (UNESCO, 2023).

Digital literate teachers with internet access have higher chances of improving knowledge and skills for the benefit of their students (Enyedy, 2014). The efficiency of schools in ICT depends on the competency of teachers. This also influences the competence of the students. Digital literacy exhibited by the teachers measures the level of knowledge and skill, their professional training and development attained and their level of digital skills integration and usage (Okenyuri, 2016; Olatunji & Kolawole, 2008).

This study was based on the theory of constructivism, which focused on an individual's ability to understand the meaning and importance of something, usually the knowledge of something, by acquiring such knowledge to get things done via available information. The concept of constructivism is commonly associated with Jean Piaget, who propounded that learners internalize knowledge gained through learning in order to accommodate, assimilate and create fresh knowledge based on acquired experiences for practical applications and real-life situations to enhance relevance and transferability (Sulistyowati, 2019). Constructivist ideas posited that the teacher is responsible for structuring information to captivate students' curiosity as well as to aid students in cultivating fresh views in line with the knowledge they

acquired through learning. Many teachers and cognitive psychologists have applied constructivist principles to teaching and learning situations in order to ease their efforts in teaching and for better outcomes of classroom experiences (Rillo, Martínez-Carrillo, Castillo-Cardiel & Rementería-Salinas, 2020).

An effective teacher is expected to know how to use a variety of ICT facilities in their lesson. In this 21st century generation, students are born in the digital age, and they are well exposed to and aware of technological advancements more than the older generation. Teachers must acquire basic computer and ICT skills in order to be in tune with present educational circumstances. Most teachers have ICT gadgets such as mobile phones and other handheld devices like digital readers, as well as access to the internet to enhance their activities. These handheld devices have enabled users to access and retain incredible amounts of information for future reference. Indeed, the emergence of these technological tools has dramatically enhanced conveniences in the education system (Mbwesa, 2021).

In related studies on the effects of ICT usage on teaching and learning, there is evidence for both positive and negative effects. Results of studies positively correlate the academic performance of students when teachers inculcate the use of ICT tools to impart knowledge to students, which also complements teachers' efforts in teaching (UNESCO, 2002; 2023). In the same vein, ICT has been deployed and used to enhance teaching and learning, such as in teachers' use of digital skills to post and design lesson notes for offline and online classes whereby students gain through visual or audio-visual materials. Such contributions have been found to be more effective than those that occur in the traditional classes. Digital devices in teaching and learning are tools that enhance the transfer and inculcation of knowledge in today's classroom activities (National Policy on Science and Technology Education, 2020).

Digital technologies are very relevant in science teaching for simulation, drill and practice, tutorials, and many other teaching and learning activities. A study carried out by Achor, Kyado and Ityobee (2020) on the Survey of ICT Literacy Levels of Basic Science Teachers and Students in Upper Basic Schools in Benue State, Nigeria, revealed a positive correlation between ICT literacy skills and students' achievement. Thus, there is a need for science teachers in junior secondary schools to be literate and competent in the use of digital facilities in order to aid the achievement of their teaching objectives. Science in this context refers to basic science and mathematics since the latter is a tool used by all other sciences and the wheel that drives other sciences to carry out their functions. However, there have been constraints in the selection and utilization of appropriate digital tools for instructional materials in classroom teaching, which might not be convenient for teachers because there is a need to consider many factors before deciding on the type of instructional materials to be

used or not to be used. Teachers who are expected to decide the type of instructional materials ought to be equipped with relevant skills that can aid their subject delivery.

One of the reasons why many teachers in schools and colleges do not use some available ICT instructional media in terms of digital tools could be a result of a lack of necessary skills to operate them. Lack of skills by teachers in operating any instructional media compared with some of their students who are even ahead in the use of ICT can be traced to the fact that most Junior Secondary School teachers were not exposed adequately to these instructional media during their pre-service training programmes and are not competent for the integration of technologies in classroom lessons. Considering the position of Basic Science and Mathematics as core subjects in Junior Secondary Schools, there is a need to ask whether Basic Science and Mathematics teachers in Junior Secondary Schools possess adequate skills for integrating ICT skills in their teaching (National Policy on Science and Technology Education, 2020).

As a foundational level subject for all science subjects being taught in Senior Secondary Schools, Science at the Junior Secondary School requires teachers' competencies due to the prerequisite roles played for better performance on all other science subjects. On this premise, the study Assessed the level of digital literacy among science teachers at the Junior Secondary Schools in Ibadan, Oyo State, Nigeria.

Statement of the Problem

The world's system of education today is being programmed to catch up with modern technology. A digital outlook on different phenomena is being witnessed on a daily basis, with much information being sourced online with the use of various ICT facilities ranging from different gadgets and online applications to access the needed information. Digital literacy among science teachers at the Junior Secondary School needs to be given adequate attention in order to get the needed information for effective teaching. The usefulness and application of computer literacy in a teaching and learning situation, however, depends on the ability of the teacher to operate it effectively. Most science teachers at the Junior Secondary Schools need to update their knowledge on recent trends in teaching and learning processes and to develop and improve their teaching skills for science subjects. These necessary exercises needed to foster the ultimate goal of national development cannot be overstressed. The applications of digital skills in secondary school science teaching draw the concern of educational stakeholders to the competencies of teachers, which also influence the competencies of the students. This could be determined by the level of knowledge and skills possessed by science teachers. For effective teaching and learning of Science in Junior Secondary schools, digital literacy needs to be demonstrated through computer utilization, as well as through teachers' effectiveness in the areas of record keeping,

online library material, information dissemination and getting feedback from students' activities and performance (Achor, Kyado & Ityobee, 2020). It is on this note that this study was motivated to carry out the Assessment of Level of Digital Literacy among Science Teachers at the Junior Secondary Schools in Ibadan, Oyo State, Nigeria.

Aim and Objectives of the study

This study aimed to assess the Level of Digital Literacy among Science Teachers at the Junior Secondary Schools in Ibadan, Oyo State, Nigeria.

Specifically, the objectives of this study were to:

1. Assess the digital tools available for teaching science in Ibadan, Oyo State.
2. Examine the extent of digital literacy skills possessed by Science Teachers in Ibadan, Oyo State.
3. Investigate the extent to which science teachers utilize their digital literacy skills in teaching science at the Junior Secondary Schools in Ibadan, Oyo State, and
4. Investigate the level of digital literacy competencies possessed by science teachers in Ibadan, Oyo State.

Research Questions

1. What are the digital tools available for teaching science in Ibadan, Oyo State?
2. What is the extent of digital literacy skills possessed by Science Teachers in Ibadan, Oyo State?
3. To what extent do science teachers utilize their digital literacy skills in teaching science at the Junior Secondary Schools in Ibadan, Oyo State?
4. What is the level of digital literacy competencies possessed by science teachers in Ibadan, Oyo State?

Methodology

A descriptive survey research design was employed to carry out this study. The targeted population for this study consisted of all Mathematics and Basic Science teachers who teach at the Junior secondary schools (JSS) in Ibadan, Oyo State. The sample for the study consisted of two hundred (200) respondents selected through multi-stage and non-proportionate stratified random sampling technique to arrive at ten respondents each from 20 schools, making a total of 200 teachers from five (5) Local Government Areas (LGAs) within Ibadan, Oyo State. The choice of 10 respondents from each of the participating schools was based on the fact that the schools with the least numbers of Mathematics and Basic Science teachers had ten teachers and were used as the benchmark for selection, while other schools had more than ten teachers. This led to the selection of a maximum of 10 teachers from every participating school for uniformity. Also, a purposive sampling technique was used to select four schools

from each LGA within Ibadan City. These are schools which have been presenting students for the Basic Education Certificate Examination (BECE) for more than fifteen (15) years consecutively.

The instrument for this study was a structured questionnaire titled "Science Teachers' Levels of Digital Literacy Questionnaire (STLDLQ), which consisted of two sections. Section A consisted of teachers' digital skills, which surveyed the extent to which Mathematics and Basic science teachers possess digital literacy skills. In contrast, Section B sought information on how Mathematics and Basic science teachers utilize digital literacy skills in teaching at the Junior Secondary School. Sections A and B were made up of a 4-point Likert scale for the determination of the extent of the respondents' levels of digital literacy and competencies possessed by science teachers in Ibadan, Oyo State.

The instrument was validated for both face and content validity by experts in related disciplines at the Department of Science Education and the Department of Computer Science, Lead City University, Ibadan. The reliability of the instrument was carried out using Cronbach Alpha statistics to determine its reliability coefficient of 0.86. The researchers, with four (4) research assistants, administered the questionnaire and collected the responses on completion. Frequency counts, percentages, and mean and standard deviations were employed for the research questions raised for the study.

Results

Research Question 1: What are the digital tools available for teaching science in Ibadan, Oyo State?

Table 1

Number of Digital Tools Available in Schools

	Available Computers		Available Printers		LCD Projector		Internet Servers		ICT Tools	
Group of Items	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
None	-	-	70	35	128	76	164	82	–	–
Less than 5	110	55	87	44	72	24	36	18	164	82
5-10	17	9	28	14	–	–	–	–	36	18
11 and above	73	36	15	7	–	–	–	–	–	–
Total	**200**	**100**	**200**	**100**	**200**	**100**	**200**	**100**	**200**	**100**

Table 1 displays the digital tools available for teaching Science in Junior Secondary Schools in Ibadan, Oyo State, other than the digital tools found generally in homes. Many of the schools visited had television and radio sets in principals' offices, not for teaching and learning purposes but for receiving updates and news from the

information media. It was based on the fact that television and radio sets were not included in the list of tools considered for the study. It was evident that the majority of the school had less than five computers, indicating 110 (55%) teachers, followed by 17 (9%) teachers indicating that they have 5 to 10 computers in the school and 73 (36%) teachers indicated that they have 11 and above computers. This can be deduced to mean that computers were not available in most schools in the study area. In the case of printers, only a few teachers indicated that they did not have printers in their schools, whereas 70 (35%) indicated that they had no printers. In comparison, 87 (44%) showed that less than five printers were available, 28 (14%) had between 5 to 10 printers, and 15 (7%) had 11 and above number of printers in their schools.

Equall, the majority, 128 (76%) of the science teachers indicated that their schools did not have any LCD Projectors, while 72 (24%) had less than 5. For an internet server, 164 (82%) of the Junior Secondary Schools do not have internet servers connected with routers, which are used to connect computers to a local area network. Other teachers totalling 36, (18%), have a single server in their schools. In the availability of ICT tools, data revealed that 164 (82%) of the junior secondary schools have less than five computers with ICT tools, while 36 (18%) had between 5 and 10 computers with ICT tools. However, it is crucial that integrating computer facilities into teaching and learning depends on the extent to which various accessories are available for the functionality of the systems in classroom science teaching.

Research Question 2: What is the extent of digital literacy skills possessed by Science Teachers in Ibadan, Oyo State?

Table 2

Extent of Digital Literacy Skills Possessed by Science Teachers in Ibadan, Oyo State

Digital Tools Areas	N	$\overline{x}$	Std Dev	Remark
1. Basic Repair and maintenance	200	1.375	0.562	LE
2. Teachers Record keeping	200	2.320	1.155	LE
3. Class Attendance Registration	200	2.565	0.995	ME
4. Scheme of work formulation	200	2.600	1.156	ME
5. Data Base Report form	200	2.890	0.955	ME

6. Emailing usage	200	2.945	1.157	ME
7. Online library skills	200	3.055	0.659	HE
8. Power Points in illustrations	200	3.165	0.788	HE
9. Development of Web pages	200	3.285	0.829	HE
10. Teaching with Projector	200	3.295	0.966	HE
11. Online Progress Reports	200	3.305	0.834	HE
12. Word Processing usage	200	3.330	0.764	HE
13. Data Base Access	200	3.415	0.752	HE
14. Spread Sheet Excess	200	3.425	0.698	HE
15. Internet Usage	200	3.445	0.573	HE
Average Total	**200**	**2.961**	**0.856**	**ME**

Key: *VHE: Very High Extent (3.50 – above); HE: High Extent (3.00-3.49); ME: Moderate Extent (2.50-2.99); LE: Low Extent (Below 2.50)*

Source: **Field Work, 2022**

In Table 2, it was displayed that teachers were, on average, found to be literate in basic digital skills, with the highest in internet usage having mean and standard deviations of 3.445 and 0.573, respectively, while the lowest skills being in basic repairs and maintenance of computer with the mean and standard deviations of 1.375 and 0.562 respectively. However, the average total of the mean and the standard deviations of the responses from science teachers were 2.961 and 0.856, respectively. This result was based on the threshold captioned in the key used in scoring teachers' responses to the STLICTLCQ, as indicated in Table 2 for more apparent perspectives on the outcome of the data gathered. This implies that science teachers possess basic digital literacy skills to a moderate extent in Ibadan, Oyo State.

Research Question 3: To what extent do science teachers utilize their digital literacy skills in teaching science at the Junior Secondary Schools in Ibadan, Oyo State?

Table 3
Extent of Utilization of Digital Literacy Skills in Teaching Science

Items	N	$\overline{x}$	SD	Remark
1. I can use the projector to display the Science lesson to my students	200	2.520	0.763	ME
2. I have preferences for computer media teaching and learning Science	200	2.525	0.770	ME

3. I can use Zoom, Google Meet and any other Conferencing apps to teach my students lessons on Science	200	2.535	0.763	ME
4. I can use computer software to teach Science to any student	200	2.580	0.759	ME
5. I can use the email to send messages to my students on Science	200	2.590	0.771	ME
6. I can use other computer applications such as Facebook, WhatsApp and Telegram to communicate Science information to my students	200	2.615	0.721	ME
7. I sometimes make use of a computer to teach some topics in Science	200	3.015	0.999	HE
8. I usually teach science with the use of a computer instructional materials	200	3.030	0.641	HE
9. I can do graphic illustrations of science topics using the computer	200	3.115	0.803	HE
Average Total	**200**	**2.725**	**0.777**	**ME**

Key: *VHE: Very High Extent (3.50 – above); HE: High Extent (3.00-3.49); ME: Moderate Extent (2.50-2.99); LE: Low Extent (Below 2.50)*

Source: **Field Work, 2022**

Table 3 showed that each of the items 1 to 9 on utilization of digital literacy skills in teaching science obtained a mean rating of above 2.50. This result implied that the respondents rated teachers' utilization of digital literacy skills as moderate. The grand mean score was 2.725, which was above the criterion of 2.50 set for the study. The score of 2.725, which fell within the mean range of above 2.50, was to a moderate extent (ME), while the average standard deviation of 0.777 indicated that the respondents were not far from the mean and each of their responses. Also, the table above revealed that item 10 had the highest mean of 3.115, while the lowest mean was that of item 1, with a mean value of 2.520. This result implies that teachers' utilization of digital literacy skills in teaching science at the Junior Secondary School in Ibadan, Oyo State, is low. Therefore, the extent of science teachers' utilization of digital

literacy skills in teaching science at the Junior Secondary Schools in Ibadan is moderate, with a grand mean score of 2.725.

Research Question 4: What is the level of digital literacy competencies possessed by science teachers in Ibadan, Oyo State?

Table 4

Level of Digital Literacy Competencies Possessed by Science Teachers

Computer areas	N	$\overline{x}$	SD	Remark
1. I can send information to my students through computer	200	2.565	0.818	ML
2. I can use my handset to do any computer skill	200	2.610	0.844	ML
3. I can send information to my students through computer	200	2.670	0.809	ML
4. I can upload articles onto the internet using the computer	200	2.955	0.835	ML
5. I have an understanding of the essential functions of Computer hardware components	200	3.075	0.708	HL
6. I can search for information online using a Web Search engine	200	3.085	0.991	HL
7. The students understand concepts better when I make use of a computer to teach	200	3.115	0.941	HL
8. I make use of a computer connected to the Internet at school	200	3.150	0.981	HL
9. I can save and retrieve information using the computer	200	3.255	0.673	HL
10. I have no interest in the use of computers because Its use is ambiguous	200	3.295	0.794	HL
11. I can identify all the components of the computer	200	3.415	0.494	HL
12. I can operate the computer	200	3.505	0.610	VHL
13. I can set up the computer desktop with all the accessories	200	3.590	0.569	VHL

14. I can connect to the internet	200	3.630	0.484	VHL
Average Total	**200**	**3.137**	**0.754**	**HL**

Key: *VHL: Very High Level (3.50 – above); HL: High Level (3.00-3.49); ML: Moderate Level (2.50-2.99); LL: Low Level (Below 2.50)*

Source: **Fieldwork, 2022**

Table 4 showed that each of the items 1 to 14 on the level of digital literacy competencies possessed by science teachers obtained a mean score above 2.50. The above results implied that the respondents rated the level of digital literacy competencies as high. The grand mean score was 3.136, which was above the criterion of 2.50 set for the study. The score of 3.136, which fell within the mean range of 2.50 and 3.49, was a high level (HL), while the average standard deviation of 0.754 indicated that the respondents were not far from the mean and from one another in their responses. Also, the table above revealed that item 10 had the highest mean of 3.630, while the lowest mean was that of item 1, with a mean score of 2.562. This result implies that the level of digital literacy competencies possessed by science teachers in Junior Secondary Schools is high, having a grand mean score of 3.137.

Discussion of the findings

The findings from this study depicted that 82% of the Junior secondary schools in Ibadan have less than five computers with ICT tools, and the remaining 18% have more than five computers with ICT tools. These findings are in line with the submission of Fakeye (2010) that the prerequisite background to the knowledge and competence use of digital tools is their availability and usability. This is also in line with the assertion of Geoffrey (2010) that when the needed facility to learn is available, it will motivate the need to learn new skills.

The study also found that science teachers possess basic literacy skills to a moderate extent in digital tools but are deficient in maintenance skills in handling the available facilities. This submission is also in line with the earlier submission of Geoffrey (2010), where it was asserted that basic knowledge of a phenomenon can be acquired when there are available resources to aid the acquisition of such knowledge within the reach of such individuals expected to gain the expected knowledge.

The outcome of the study also indicated that the extent of science teachers' utilization of digital literacy skills in teaching science at the Junior Secondary Schools in Ibadan was moderate to an extent. This outcome also aligned with the study carried out by Akpabio and Ogiriki (2017) on Teachers' use of Information and Communication Technology (ICT) in teaching the English Language in Secondary Schools in Akwa Ibom State, where teachers who adopted the use of ICT in their display of classroom

teaching were able to achieve a better outcome in their efforts compared with their counterparts who did not use ICT to teach. Moreover, the availability and use of ICT facilities in terms of digital tools can help students explore enormous possibilities for acquiring information for schooling purposes and can increase learning through Information and Communication Technology (Mbwesa, 2021).

This study also showed that the level of digital literacy competencies possessed by science teachers in Junior Secondary Schools in Ibadan is high, which is in line with another submission by Castro and Aleman (2011), where it was expressed that when computers and related technology are made available in schools and institutions, students are compelled to use databases, spreadsheets, multimedia, e-mail, and network search engines to complete their take-home assignments and projects. Such processes provide more significant potential to promote cognitive development (UNESCO, 2023). Also, studies submitted that ICT in terms of digital literacy raises the potential to equip students with higher-order skills such as inquiry, reasoning, problem-solving and decision-making abilities, critical and creative thinking and learning how to learn (Castro & Aleman, 2011; Okenyuri, 2016). Research showed that using computers has positive effects on students' achievement compared to conventional teaching methods (Enyedy, 2014). It is also interesting to note that the adoption of digital tools in teaching complements teachers' efforts in effective lesson delivery.

Conclusion

The study concludes that digital tools for teaching and learning science at the Junior Secondary Schools in Ibadan, Oyo State, are available but inadequate and unevenly distributed. Likewise, science teachers possess basic digital literacy skills to a high extent, and science teachers' utilization of digital skills in teaching science was to a moderate extent. In the same vein, the study disclosed that the level of digital literacy competencies possessed by science teachers is high for the teaching of Junior Secondary Schools in Ibadan, Oyo State, Nigeria.

Recommendations

Based on the findings of this study, the following recommendations are made with implications that:

1. Available digital tools such as computers, printers, projectors, internet servers, and other ICT tools should be evenly distributed to cater to the teaching and learning of sciences.
2. Science teachers should update their knowledge in the recent use of digital facilities beyond the average extent to be able to meet up with the growing trend in modern-day technology for meaningful delivery of their teachings of science.
3. Science teachers should make use of digital tools consistently in teaching science for more skilfulness in usage.

4. Science teachers should increase their competencies in the use of digital tools through regular practices and by trying new digital applications for teaching sciences.

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