Faculty of Natural and Applied Sciences Journal of Mathematics and Science Education
Print ISSN: 2814-0885 e-ISSN: 2814-0931
www.fnasjournals.com
Volume 6; Issue 1; September 2024; Page No. 33-40.

Integrating Information and Communication Technology in Secondary Education in Oyo State, Nigeria

Ajadi, T. A.
University of Ibadan, Department of Science and Technology Education, Nigeria

Corresponding author email: adeoyeta@yahoo.com

Abstract
This study investigated the integration of Information Communication Technology (ICT) into teaching and learning in secondary schools. The ability of ICT to provide an active and dynamic environment for learning and teaching. Teachers must incorporate ICT into their regular lessons and replace antiquated techniques with more contemporary resources in order to keep up with the demands of the digital age. A descriptive survey design was used and the population consisted of secondary (public and private) school teachers in Oyo State. Two hundred respondents were selected using the multistage sampling technique. The instrument used is a questionnaire (Information Communication Technology in Teaching and Learning in Secondary Schools - ICTTLSS) (r=0.89). The data collected were analyzed using frequency count, simple percentage, and t-test at 0.05 level of significance. The study established that the teachers are exposed to ICT, the teachers are making use of ICT available in the school, and the teachers had a high percentage in the extent of ICT integration in classroom teaching. Also, there is no significant difference in the male and female teachers on the integration of ICT for teaching. According to this study, the majority of teachers are regular users of ICT, and many of them utilize it more regularly for work-related purposes in their classrooms as well as for teaching and learning. The study suggested that in order to give students ICT-based learning opportunities that will enhance the quality of their education, teachers should constantly be prepared, have a positive attitude, and be well-equipped with ICT competencies.

Keywords: Information communication technology (ICT), Integration, Education, Teaching and learning, Teachers, and Secondary schools

Introduction

The evolution and impact of information and communication technology (ICT) on people's lives, jobs, and ways of thinking have changed our civilization. ICT integration should be considered in the curriculum of schools and other educational institutions that are designed to equip students to live in a "knowledge society." Teachers play an essential role in utilizing ICT in the classroom and preparing students for the modern digital world (Bruniges, 2003; Lefebvre et al., 2006; Bingimlas, 2009; Hamidi et al., 2011; Hussain et al., 2011). ICT has been proven in studies around the world to improve student learning and instructional practices. All digital devices, tools, content, resources, forums, and services, as well as those that can be converted into or delivered through digital forms, that can be used to achieve the goals of teaching-learning, enhancing access to and reach of resources, capacity building, and educational system management, are defined as information and communication technologies. Interactive digital material, internet and other satellite communication devices, radio and television services, web-based content repositories, interactive forums, learning management systems, and management information systems will all be included.

ICT help learners to prepare for life in the twenty-first century. Learners who are proficient in ICT are more equipped to handle challenges in the future because they are more knowledgeable about them (Grimus, 2000). Using ICT can help students acquire the competencies needed for today's globalized world (Bransford et al., 2000). This is because ICT may help pupils improve their abilities, become more enthusiastic, and expand their knowledge and information (Grabe & Grabe, 2007; Hussain et al., 2011). ICT integration, according to Rosnaini et al. (2008), is the process of evaluating where and how technology fits into the teaching and learning setting. Technology is dynamic, which makes it challenging to integrate into the classroom. ICT integration in education is therefore viewed as a vital part of advancement and growth. ICT integration and implementation is a challenging process that requires thoughtful planning on the part of policymakers and decision-makers (Ghavifekr & Sufean, 2010).

Teachers and ICT

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.

Teachers are the main agents of change in the academic workplace; they carry out educational innovations. Teachers' opinions about using technology in the classroom: easily accessible and user-friendly digital resources, encouragement to adapt and backing from peers and administrators, comprehensible and clear school and federal regulations, and formal computer training background (Mumtaz, 2000). Pelgrum (2001) rated three issues as the most significant impediments to ICT integration in teaching: (a) a lack of computers, (b) teachers who are not proficient in ICT and (c) challenges in integrating ICT in a meaningful way. Instructors' use of ICT in the classroom cannot be limited to technological elements alone: "Integration of educational computer use with professional capabilities of teachers necessitates a more sophisticated approach" (Tondeur et al., 2008). Teachers' perspectives on teaching and learning with ICT are critical and must be thoroughly considered (Mumtaz, 2000). Encouraging teachers to try new things and providing them with pedagogy-oriented ICT skills can be powerful factors in ICT adoption in the classroom (Kreijns et al., 2013). Depending on the subject presented and the pedagogical purpose, teachers will need to acquire different knowledge and abilities. This could involve anything from boosting the efficiency of instruction in academic programs to promoting the growth of particular abilities like learning how to learn and continuing education throughout one's life.

Pedagogical Issues

ICT does not improve teaching by itself; rather, it is how ICT is integrated into diverse learning activities that are significant (Ajadi, 2019). This will be determined by the teacher's pedagogical approach to content knowledge presentation. The mixing of content and pedagogy into a comprehension of how certain topics, problems, or challenges are organized, represented, and suited to the different interests and skills of learners, and presented for instruction, is referred to as pedagogical content knowledge (Shulman, 1987). Behaviourism, cognitivism, and constructivism are three well-known theories. These three courses had the same knowledge goal and content but were constructed differently pedagogically. The first (Behaviourism) was divided into three modules that students had to complete in order. Traditional behaviourist assessment tools, such as multiple-choice questions, were used to gauge the students' progress. The second (Cognitivism) course was divided into two parts: first, three groups of four students worked on the course's objectives; second, the groups (distributed in different ways) had to restructure the first phase's results and synthesize the content in a Wiki environment. The third course (Constructivism) was designed to encourage students to collaborate in the creation of knowledge content.

There is a fundamental difficulty that arises when it comes to pedagogical approaches to ICT integration in education: is it teaching 'with ICT' or teaching 'about ICT'? When it comes to teaching. We need to teach ICT skills in a way that allows students to see the benefits and possibilities of using computers to help them with their work. Integration of ICT in teaching methods is still a tough concept for instructors to grasp. Teachers must gain a greater understanding of how ICT might be introduced into the classroom and what skills are required.

Learners and ICT

Student consent is essential while using ICT in the classroom. It will be decided by two interconnected factors: the learner's personal experience using ICT for educational purposes; the role of ICT in the educational process and how it contributes, directly or indirectly, to enhanced performance. The prior experiences of students with downloading, storing, and utilizing digital media, including audio and video, will also have an impact on their perceptions. The researcher explores how acceptable e-learning is for all pupils and how effective it is for providing instruction on a regular basis. The adoption of e-learning was influenced by the student's general computer skills and attitude, as well as by peer pressure, instructor support, and awareness of online resources (Concannon et al., 2005). Although students worldwide "saw a substantial improvement in the quality of their educational experience" and saw ICT as a beneficial learning instrument.

ICT-supported a vast array of strategies, instruments, materials, and content are included in teaching and learning with the goal of improving the calibre and effectiveness of the educational process. There is a range of alternatives accessible to the teacher to use various ICT resources for effective pedagogy, ranging from projecting media to complement a class to multimedia self-learning modules, simulations, and virtual learning environments. Each of these devices or strategies entails modifications in the classroom environment, which have an impact on effectiveness. The availability of a wide range of these instructional resources will contribute to the transformation of classrooms into ICT-enabled environments.

Integration of ICT into the Educational System

Information and communication technology (ICT) has quickly risen to the top of the industrial society hierarchy in the modern era. Understanding fundamental ICT concepts and abilities is becoming more and more important in many countries (Rampersad, 2011).

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.

ICT development is a global issue that has historically been of great significance to all of humanity. In the modern world, these technologies have become essential. Whether on the phone, sending emails or Gmail, going to the bank, going to the library, watching sports on TV, working in an office or out in the field, seeing the doctor, driving a car, or on a plane, one is utilizing it. The term "information and communications technology" (ICT) describes the computers, networks, satellite links, and other devices that allow people to create, access, analyze, share, and use knowledge and data in almost any way they can think of. The widespread use of ICTs and their rapid development have shifted human society from the information technology to the knowledge era. According to Kirschner and Davis (2003), instructors must possess the following skills when using ICT in the classroom. Proficiency in using ICT as a teaching tool, proficiency in grasping various educational paradigms incorporating ICT in instruction, adequate proficiency in using ICTs as cognitive aids, proficiency in utilizing ICT in instruction as a teaching tool, proficiency in grasping multiple assessment paradigms incorporating ICT in instruction, and proficiency in comprehending the policy aspects of ICT use in instruction for teaching and learning. ICTs have the ability to ensure not just efficacy and efficiency in these two areas of teaching and learning, but also to eliminate administrative tasks.

According to Jones and Preece (2006), to improve technical performance, boost acceptance, and lower resistance to technology, educators and students alike must learn to trust it. For instructors to gain students' faith in technology, they need to be competent and self-assured users of a range of ICT resources. Without teachers' proficiency in ICT integration that is appropriate for their needs, ICT could not be used to deliver teaching in an effective manner. ICT may help with teaching and learning in a variety of ways. Teachers should make use of ICT to help students develop into creative thinkers and cooperative problem solvers, according to UNESCO (2011), so that they can become productive citizens and members of the workforce. Academic success on tests is not the only advantage of incorporating ICT into teaching and learning. Knowledge Deepening aims to help students gain an in-depth understanding of their academic subjects and apply it in challenging real-world situations; Technology Literacy aims to help students use ICT for learning; and Knowledge Creation aims to help students create new knowledge that is necessary for a more peaceful, contented, and prosperous life, according to UNESCO. The goal of the three teacher development levels is to improve educators' ability to integrate ICT into their lesson plans.

UNESCO (2011) states that teachers should be able to use ICT to support students in becoming cooperative, innovative, and critical thinkers, rather than only teaching ICT skills. It is predicted that these students will grow up to be law-abiding citizens and productive labourers who will contribute to the long-term growth of their nation. In addition, according to the National Research Council (2000), employing ICT in teaching and learning processes is crucial for orienting instruction toward meaningful learning, which is required in today's knowledge-based society.ICT can be utilized by both teachers and students for communication, education, and information retrieval, according to Qualter (2011). To attain these goals, both instructors and students should be well-versed in ICT knowledge, skills, and information literacy, allowing them to comprehend and question the reality of the vast amount of data made available by technology. They should also be able to communicate both in person and virtually, as well as think critically and speak and understand the language.

Teachers' responsibilities as ICT users include: modelling effective ICT use, obtaining and using information, connecting with others, planning lessons, and increasing their knowledge and abilities in ICT use (Qualter, 2011). These are necessary abilities for effective ICT integration in teaching and learning. Needham (2011) identifies audio, websites, wikis, weblogs (blogs), podcasts, video clips, and social media as examples of ICT resources that could be utilized for teaching and learning. The long list of ICT technologies continues to increase, illustrating the technology's dynamic character. As a result, teachers should keep up to date on new ICT tools for teaching and learning and become familiar with how to use them. This necessitates periodic teacher professional development.

Although ICT has enormous potential for providing learners with a variety of learning experiences, the teacher's role as a facilitator of learning remains crucial. The hoopla around the use of ICT in teaching and learning should not be misinterpreted as implying that ICT will replace instructors (Morris, 2018). The teacher's function as a facilitator of learning is still important, and teachers should connect their pedagogies with ICT tools.

Statement of the Problem

Integration of ICT in various economic sectors resulted in improved service delivery effectiveness and efficiency. According to research, ICT has educational benefits that teachers should investigate. ICT has the potential to address the educational system's access, quality, and relevance issues. The use of information and communication technology (ICT) is a critical component in topic content delivery. This means that teachers are expected to use ICT in the

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.

classroom. All instructors had to be ICT literate in order to implement the policy, and pre-service teacher candidates had to pick up the skills at the same time. Secondary school teachers have been slow to accept ICT, despite government directives that they use it for teaching and learning. This raises questions about their willingness to use the technology in the classroom. The acceptance of any technology is contingent on instructor acceptance. As a result, the purpose of this study is to look into the impact of ICT on teaching and learning in secondary schools in Oyo State, Nigeria.

Research Questions

i. What is the extent of teacher's exposure to ICT integration in teaching and learning in secondary schools in Oyo State?
ii. What is the availability of ICT for teaching and learning in secondary schools in Oyo State?
iii. What is the extent of the integration of ICT into teaching and learning in secondary schools in Oyo State?

Research Hypothesis

The 0.05 level of significance was used to test the study hypothesis:
H_{O1}: There is no significance between male and female teachers' integration of ICT into teaching and learning.

Methodology

This study adopted the survey research design. Kerlinger (1979) described simple survey research as research that involves large and small populations where samples are selected and studied to discover relative incidence distribution and interrelation of sociological and psychological variables and considered to be representative of the entire group. The target population for the study comprised secondary school teachers in Oyo State, Nigeria. A multistage sampling technique was adopted in the study. The first stage involved a purposive selection (Secondary School with ICT facilities) of ten (10) local government areas from the State. The second stage involved a selection of two (2) private and two (2) public secondary schools in each local government area selected. The third stage involved a selection of five (5) teachers each in the selected secondary schools using simple random sampling making a total number of two hundred (200) teachers that participated in the study.

The instrument for data collection was a questionnaire (Information Communication Technology in Teaching and Learning in Secondary Schools - ICTTLSS) designed by the researcher. The instrument comprised of 18 items divided into three segments with each of the segments tapping information based on the identified variable of interest. The questionnaire adopted a four-point Likert scale format to assess teachers' responses (Strongly Agree = SA, Agree = A, Disagree = D, and Strongly Disagree = SD). It comprised four sections. Section A contained the demographic characteristics of the respondents which constituted the name of the school, sex, age, highest qualification, years of teaching experience, local government area, and teaching subject. Section B contained six items relating to the teachers' exposure to ICT in teaching students in secondary schools. Section C contained six items relating to the availability of ICT in teaching and learning in secondary schools. Section D contained six items relating to the extent of integrating ICT into teaching and learning in secondary schools in the State. The researcher validated the instrument and a reliability coefficient of 0.89 was obtained. The researcher and three research assistants administered the questionnaires and collected them on the spot. In order to address research issues, frequency counts and straightforward percentages were employed in the analysis of the gathered data. A t-test was then employed to evaluate the hypothesis at the 0.05 level of significance.

Results

Research Question 1: What is the extent of teacher's exposure to ICT integration in teaching and learning in secondary schools in Oyo State?

Table 1: Teachers' exposure to ICT integration into teaching and learning in Secondary Schools

ITEMS	SA(%)	A(%)	D(%)	SD(%)	Total(%)
Computers	160 (80)	30 (15)	8 (4)	2 (1)	200 (100)
Internet/Web Environment	142 (71)	50 (25)	6 (3)	2 (1)	200 (100)
Video/Television	123 (61.5)	52 (26)	10 (5)	15(7.5)	200 (100)
Overhead Projector	111 (55.5)	69 (34.5)	10 (5)	10 (5)	200 (100)
Radio Cassette Recorder	60 (30)	52 (26)	40 (20)	48 (24)	200 (100)
Printers & Photocopiers	115 (57.5)	57 (28.5)	20 (10%)	8 (4)	200 (100)

Table 1 shows responses from respondents concerning the exposure of teachers to ICT integration into teaching and learning in secondary schools. It shows that teachers are exposed to computers 190 (95%), internet/web environment 192 (96%), video/Television 175 (87.5%), overhead projector 180 (90%), Radio Cassette recorder 112 (56%), and

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.

Printers and Photocopiers 172 (86%).

Research Question 2: What is the availability of ICT for teaching and learning in secondary schools in Oyo State?

Table 2: Availability of ICT in teaching and learning in Secondary Schools

ITEMS	SA(%)	A(%)	D(%)	SD(%)	Total(%)
Computers	140 (70)	40(20)	15 (7.5)	5 (2.5)	200 (100)
Internet/Web Environment	100 (50)	80(40)	12 (6)	8(4)	200 (100)
Video/Television	50 (25)	87 (43.5)	40(20)	23(11.5)	200 (100)
Overhead Projector	160 (80)	25 (12.5)	10(5)	5 (2.5)	200 (100)
Radio Cassette Recorder	15 (7.5)	40 (20)	45 (22.5)	100 (50)	200 (100)
Printers & Photocopiers	167 (83.5)	20 (10)	7 (3.5)	6 (3)	200 (100)

Table 2 reveals the availability of ICT in teaching and learning in secondary schools. The results revealed by respondents on the available of computers 180 (90%), internet/web environment 180 (90%), video/Television 137 (68.5%), overhead projector 185 (92.5%), and Printers and Photocopiers 187 (93.5%).

Research Question 3: What is the extent of the integration of ICT into teaching and learning in secondary schools in Oyo State?

Table 3: Extent of Integration of ICT into Teaching and Learning in Secondary Schools

ITEMS	SA(%)	A(%)	D(%)	SD(%)	Total(%)
Computers	138 (69)	60 (30)	2 (1)	-	200 (100)
Internet/Web Environment	140 (70)	52 (26)	8 (4)	-	200 (100)
Video/Television	120 (60)	60 (30)	12 (6)	8(4)	200 (100)
Overhead Projector	160 (80)	30 (15)	8 (4)	2 (1)	200 (100)
Radio Cassette Recorder	5 (2.5)	15 (7.5)	40 (20)	140 (70)	200 (100)
Printers & Photocopiers	100 (50)	80 (40)	10 (5)	10 (5)	200 (100)

Table 3 reveals that ICT has been integrated into teaching and learning in secondary schools. Those technologies include computers 198 (99%), internet/web environment 192 (96%), video/Television 180 (90%), overhead projector 190 (95%), and Printers and Photocopiers 180 (90%).

H_{O1}: There is no significance between male and female teachers' integration of ICT into teaching and learning

Table 4: T-Test Analysis of Male and Female Teachers' Integration of ICT into Teaching and Learning

Teacher Gender	N	Mean	SD	DF	t-cal	t-crit	Decision
Male	142	2.85	1.02	198	1.541	1.853	Accepted
Female	58	1.45	1.26				

*Not Significant: (P>0.05)

Table 4 shows that the calculated t-test value of 1.541 is less than the criterion value of 1.853 at 0.05 level of significance. This implies that the integration of ICT into the teaching and learning of both male and female teachers did not differ. Therefore, the hypothesis is hereby accepted.

Discussion

The process of incorporating technology into the educational system to enhance teaching and learning is known as ICT integration. Its effectiveness depends on both the instructional design and the availability of technology. Innovative teachers at all educational levels have always devised creative ways to include instructional resources and strategies in their lessons, even if there is no set formula for determining the proper level of ICT integration in the educational system. ICTs should, however, be utilized in conjunction with carefully thought-out classroom training at this time. The introduction and integration of ICTs into the educational system is one of the foundations of the global education reform movement (Jhurree, 2005). Careful planning is required for the successful integration of ICTs into the classroom, and policymakers' comprehension and grasp of the dynamics of this kind of integration are critical. The use of ICTs in education has been a point of contention (Jhurree, 2005). Some contend that technology will fundamentally change education and significantly improve student performance (Papert, 1997).

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.

The outcomes of this study show that throughout the teaching and learning process, most teachers are more likely to use ICT applications and resources for educational objectives, such as the internet, computers, projectors, PowerPoint presentations, or word processing programs. Advanced ICT, such as educational games, looks to be underutilized in the teaching and learning process, as well as in educational preparation (Hussain et al., 2011). This is why teachers who understand how computers work and have above-average ICT skills and knowledge do not need to build a learning website as part of their preparation for teaching, and teachers are free to obtain any appropriate learning materials on their own. One of the most essential aspects in children's academic success is their teachers. Teachers' beliefs will have an impact on their ability to integrate ICT into their teaching methods (Hatlevik, & Arnseth 2012). The results of this study show that teachers who possess ICT knowledge and skills are more likely to incorporate ICT into the teaching and learning process, which enhances learning outcomes for students.

In addition to ICT knowledge and abilities, teachers' attitudes play a significant role in the integration of ICT in the classroom. Numerous studies have found that the attitudes of instructors toward ICT affect how well ICT is integrated into teaching and learning (Albirini, 2004; Hatlevik & Arnseth, 2012). Teachers' attitudes and abilities will shape their views on education and influence their teaching approach (Summers, 1990). Integration of didactic concepts in teachers' education and in-service training for secondary school teachers were required to ensure the successful integration of ICT into secondary schools (Grimus, 2000). ICT benefits students by boosting their competency and confidence in using it, which will help them succeed in the high-tech world of the future (Panangalage & Pasqual, 2008). Many studies also suggest that ICT has a good impact on student learning achievement in topics like math, science, and English (Ahmadi et al., 2011; Chaamwe, 2010; Hussain et al., 2011). According to the findings, there is no substantial difference in how male and female teachers integrate ICT into their teaching and learning. This finding is consistent with the findings of Adu et al.(2014), who found no differences in the perspectives of male and female instructors on the integration of ICT facilities in the teaching of biological science in secondary schools. The study also discovered that there is a link between the availability of technology in the classroom and its use. It also indicated that only a small portion of the available ICT is being used.

Conclusion

The majority of public and private secondary schools had more exposure to ICT integration in teaching and learning, according to the survey. The use of ICT in teaching and learning is determined to have the potential to alter education by enhancing teaching and learning and assisting students in becoming collaborative problem solvers and creative learners. It can also help students communicate, learn, search for, and retrieve information more efficiently. This will also stimulate students, who deserve a more positive attitude toward their regular academic pursuits.

Recommendations

- In light of the results, the study recommends that in order to favourably influence instructors' views regarding ICT use, they should receive training and support on subject-specific ICT technologies and how to use them in teaching and learning.
- Second, both teachers and students should have access to computers and laptops.
- Finally, the Ministry of Education should prioritize school electrification programs for schools without electricity, introduce and make mandatory a course on ICT integration in every secondary school topic taught, and provide facilities that are now lacking, such as the internet, in schools.

References

Adu, E. O., Adelabu, O., & Anjorin, S. J. (2014). Information and communication technology (ICT): The implications for sustainable development in Nigeria. In EdMedia+ Innovate Learning, 50-58. Association for the Advancement of Computing in Education (AACE).

Ahmadi, S., Keshavarzi, A., & Foroutan, M. (2011). The application of information and communication technologies (ICT) and their relationship with improvement in teaching and learning. Procedia-Social and Behavioral Sciences, 28, 475-480.

Ajadi, T. A. (2019). Impact of ICT utilisation on teaching and learning of physics in senior secondary schools in Oyo State, Nigeria. *Ibadan Journal of Educational Studies*, 16(2), 109-115.

Albirini, A. (2004). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Journal of Computers and Education*, 47(4), 373-398.

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science and Technology Education*, 5(3), 235-245.

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.

Bransford, J., Brown, A. L., & Cocking, R. R. (2000). How people learn: Brain, mind experience and school (Eds.), Washington, DC: National Academy Press.

Bruniges, M. (2003). Developing performance indicators for ICT use in education: Australia's experience. Retrieved from: http://www2.unescobkk.org/education/ict/v2/info.asp?id=13249

Chaamwe, N. (2010). Integrating ICTs in the teaching and learning of Mathematics: An overview. Education Technology and Computer Science (ETCS), Second International Workshop (IEEE), 1(1), 397-400.

Concannon, F., Flynn, A., & Campbell, M. (2005). What campus-based students think about the quality and benefits of e-learning. *British Journal of Educational Technology*, 36(3), 501-512.

Ghavifekr, S., & Sufean, H. (2010). Management as visionary planning for dealing with systemic change: A case of Malaysian Open Distance Learning Institution. *International Journal of Sustainable Development*, 1(4), 79-85.

Grabe, M., & Grabe, C. (2007). Integrating technology for meaningful learning (Eds.), Boston, MA: Houghton Mifflin.

Grimus, M. (2000). ICT and multimedia in the primary school. In 6th conference on educational uses of information and communication technologies, Beijing, China.

Hamidi, F., Meshkat, M., Rezaee, M., & Jafari, M. (2011). Information technology in education. *Procedia Computer Science*, 3, 369-373.

Hatlevik, O. E., & Arnseth, H. C. (2012). ICT, teaching and leadership: How do teachers experience the importance of ICT – supportive school leaders? *Nordic Journal of Digital Literacy*, 7(1), 55-69.

Hussain, A. J., Morgan, S., & Al-Jumeily, D. (2011). How does ICT affect teachings and learning within school education? *In Developments in E-systems Engineering (DeSE)*, 2011, 250-254.

Kerlinger, F. N. (1979). Foundation of behavioural research (Eds.), New York, Holt, Richard and Winston.

Kitschner, P., & Davis, N. (2003). Pedagogic benchmarks for information and communication technology in teacher education. *Technology Pedagogy Education*, 1, 125-147.

Kreijns, K., Van Acker, F., Vermeulen, M., & Van Buuren, H. (2013). What stimulates teachers to integrate ICT in their pedagogical practices? The use of digital learning materials in education. *Computers in Human Behaviour*, 29(1), 217-225.

Lefebvre, S., Deaudelin, D., & Loiselle, J. (2006). ICT implementation stages of primary school teachers: The practices and conceptions of teaching and learning. [Conference session] Australian Association for Research in Education, Australia.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communication technology: a review of the literature. *Journal of Information Technology for Teacher Education*, 9(3), 319-342.

Morris, S. (2018). Critical instructional design. In S. Morris & J. Stommel (Eds.), An urgency of teachers: The work of critical digital pedagogy (Online). Government Printers. https://criticaldigitalpedagogy.pressbooks.com/chapter/critical-pedagogy-and-learning-online/

National Research Council. (2000). How people learn: Brain, mind, experience, and school (Eds.), Washington, DC: The National Academies Press. Retrieved from https://doi.org/10.17226/9853

Needham, R. (2011). Enhancing science learning with ICT. In M. Hollins (Eds.), Association of science education: ASE guide to secondary science education (pp. 66-77). Hampshire: Ashford Colour Press Ltd.

Jones, A., & Preece, J. (2006). Online communities for teachers and lifelong learners: A framework for comparing similarities and identifying differences in communities of practice and communities of interest. *International Journal of Learning Technology*, 2(2), 112-137.

Jhurree, V. (2005). Technology integration in education in developing countries: Guidelines to policymakers. *International Education Journal*, 6(4), 467-483. http://ehlt.flinders.edu.au/education/iej/articles/v6n4/jhurree/paper.pdf

Panangalage, R., & Pasqual, A. (2008). Impact of ICT on teaching and learning. In Technology and Society, ISTAS. *IEEE International Symposium*, 1-10.

Papert, S. (1997). The connected family, bridging the digital generation gap. London: Long Street Press.

Pelgrum, W. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers and Education*, 37(2), 163-178.

Qualter, A. (2011). Using ICT in teaching and learning science. In W. Harlan (Eds.), Association of Science Education: ASE Guide to Primary Science Education, 61-68. Hampshire: Ashford Colour Press Ltd.

Rampersad, C. A. (2011). Teachers' perceptions of the contribution of information and communication technology to the teaching of modern studies, using an integrated system in an urban secondary school [Doctoral dissertation, University of the West Indies]. ProQuest Dissertation and Theses Global.

Rosnaini Mahmud, & Mohd Arif. Hj. Ismail. (2008). Factors influencing ICT integration in the classroom: Implication to teacher education. EABR & TLC [Conference session]. Austria.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard educational review*, 57(1), 1-23.

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.

Summers, M. (1990). New student teachers and computers: An investigation of experiences and feelings. *Educational Review*, 42(3), 261-271.

Tondeur, J., Hermans, R., Van Braak, J., & Valcke, M. (2008). Exploring the link between teachers' educational belief profiles and different types of computer use in the classroom. Computers in Human Behaviour, 24(6), 2541-2553.

United Nations Educational, Scientific and Cultural Organisation (UNESCO) (2011). UNESCO ICT competency framework for teachers. Paris: UNESCO.

Cite this article as:
Ajadi, T. A. (2024). Integrating information and communication technology in secondary education in Oyo State, Nigeria. *FNAS Journal of Mathematics and Science Education, 6*(1), 33-40.