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Extent of Information and Communication Technology Integration in the Teaching and Learning Process among Secondary School Teachers and Students in Nasarawa State

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Abstract

The study examined the extent of Information and Communication Technology integration in the teaching and learning process among secondary school teachers and students in Nasarawa State. A mixed-method research approach with a concurrent design was employed. The study's population comprised 4,560 senior secondary school teachers and 71,471 senior secondary school students. Participants were selected using a convenience sampling technique, resulting in a sample of 292 teachers and 414 students. The sample size was determined using Taro Yamane's formula, and the instruments for data collection were questionnaire and observation checklist. Two categories of questionnaires were developed: one for teachers (TICTIn)

and another for students (SICTInt). The instruments were validated by two experts in ICT from the Federal University of Lafia, Nasarawa State, and the reliability of the TICTIn and SICTIn were determined using Cronbach alpha, yielded 0.87 and 0.83 respectively. The reliability of the observation checklist (ObCList) was determined using Cohen's Kappa, yielding a Kappa value of 0.78. A pilot test was also conducted with 20 senior secondary school students and 10 teachers from two schools in Lafia. The questionnaires were administered using KoboCollect form while the checklist was conducted manually at various participating schools. Quantitative data were analyzed using descriptive statistics (frequency distribution and percentage count) while qualitative data were analyzed using thematic analysis. The findings revealed that ICT integration in the teaching and learning process among senior secondary school teachers and students in Nasarawa State is low; that teachers lack competence in ICT; and there exists critical lack of basic ICT infrastructure and resources for teaching and learning across secondary schools in the State. Based on these findings, the study recommended the provision of critical ICT infrastructure, such as well-equipped computer labs, provision of internet services and subject specific software; implementation of regular ICT training for teachers; and the inclusion of digital literacy as a criterion for teacher recruitment and promotion.

Key words: digital literacy, Integration, competence, infrastructure, resources.

Introduction

Background to the Study

The integration of ICT in education has become a cornerstone of modern educational practices. It involves the use of a variety of ICT tools, infrastructure, and services to enhance the teaching and learning process (Alsharif, Mohaidat, & Nasr, 2021). ICT encompasses a wide range of technologies, including computers, peripherals, software applications, and online platforms, all of which are essential for improving educational outcomes and fostering interactive learning environments (Hennessy, Ruthven, & Brindley, 2020). One of the primary benefits of ICT integration in education is the development of both teachers' and students' ICT skills and competencies. For teachers,

incorporating ICT into their instructional methods enhances their teaching strategies and pedagogical approaches. As noted by Alsharif, Mohaidat, and Nasr (2021), effective ICT integration in education refines teachers' teaching strategies and boosts their technological proficiency, which is essential in today's educational landscape. Similarly, Ertmer and Ottenbreit-Leftwich (2020) stated that as teachers integrate ICT into the teaching process they become more adept at using technology, gaining confidence and improving their pedagogical practices, which in turn leads to more engaging and interactive learning experiences for students. Furthermore, Zhang, Wang, and Wang (2020) noted that teachers who integrate ICT in education often develop a deeper understanding of how to leverage technology to enhance students' engagement and promote critical thinking skills of students. For students, integrating ICT into the learning process is crucial for developing essential skills that prepare them for future academic pursuits and career opportunities. According to Nwafor, Okonkwo, and Ibe (2021), students who engage with ICT build confidence in navigating digital environments, laying the groundwork for further skill development. Magedanz, Kummer, and Rademacher (2021) also noted that regular interaction with technology not only enhances digital literacy but also improves students' critical thinking skills. Students who engage with technology often demonstrate higher levels of problem-solving and analytical abilities, which contribute to their overall ICT competence and better prepare them for the complexities of the digital world.

Moreover, Seenivasan (2024) stated that the extensive benefits of ICT in education include increased access to resources, improved student engagement, and the facilitation of personalized learning experiences.

As Nigeria transitions toward more digitalized educational environments, the integration of ICT in education has become increasingly vital. In response, the Nigerian government has launched several policies and initiatives aimed at integrating ICT in education across all level of her educational system. One of such initiatives is the National Policy on ICT in Education, introduced in 2019, which aims to promote the implementation of ICT integration in education in Nigeria. Also, the National Information and Communication Technology Policy, established in 2022, which provides a robust framework for ICT integration in education and its implementation at all educational levels, focusing on infrastructure development, teacher training, and curriculum enhancement (National Information Technology Development Agency, 2022).

Despite these initiatives, there remains a growing concern about digital illiteracy among secondary school students in Nigeria (Bello & Ajao, 2024). This gap in digital literacy is particularly troubling as the education system and examination frameworks increasingly rely on digital tools. Students who lack basic ICT skills are ill-prepared for the demands of e-learning in higher education and for Computer-Based Testing (CBT) in exams like WAEC and JAMB. With CBT becoming more prevalent in these exams, students without basic ICT skills may struggle with simple tasks such as answering questions, navigating exam interfaces, or typing responses. This can result in lower scores, even for students who have mastered the academic contents. Moreover, as e-learning platforms, digital textbooks, and online study materials become central to modern education, students without digital literacy will miss out on these valuable resources, putting them at a disadvantage compared to their peers in more digitally advanced settings. Furthermore, as many universities and tertiary institutions now adopts e-learning platforms and require students to complete assignments and attend classes online, secondary school students who lack digital skills may find it difficult to adapt to the demands of tertiary/university-level education.

There is also a significant gap in empirical research regarding the extent of ICT integration in secondary schools in Nigeria. While national policies have laid the groundwork for technology adoption in educational settings, there is a noticeable lack of data on how these policies are being implemented at the grassroots level. The absence of empirical studies makes it difficult to assess the actual impact of ICT integration in education. Without comprehensive data, educational stakeholders cannot fully understand how effectively ICT is being integrated in the teaching and learning process particularly at secondary school level. This gap also hinders the identification of best practices, challenges, and areas for improvement hence, the success of any educational policy relies heavily on evidence-based practices, and without this foundational data, it is difficult to measure success or make informed adjustments to strategies. Therefore, this study aims to fill this gap and provide valuable insights into the current state of ICT integration in the teaching and learning process among secondary school teachers and students in Nasarawa State.

Theoretical Framework

This study adopted the Technological Pedagogical Content Knowledge (TPACK) framework, developed by Mishra and Koehler (2006), as cited in Luhamya et al.

(2017). The TPACK framework posits that a teacher's ability to integrate ICT effectively into teaching and learning is underpinned by three primary domains of knowledge: Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). These domains interact dynamically to support effective teaching with technology.

Content Knowledge (CK) refers to the teacher's mastery of the subject matter to be taught. It encompasses essential facts, concepts, theories, and methods within the discipline. For teachers to integrate technology meaningfully into instruction, they must have a solid and confident grasp of their subject area. A deep understanding of CK enables teachers to identify areas where technology can enhance content delivery or engagement. On the other hand, Pedagogical Knowledge (PK) is concerned with a teacher's expertise in the processes and strategies of teaching and learning. This includes lesson planning, classroom management, assessment methods, and the ability to tailor teaching strategies to the needs of diverse learners. Teachers with strong PK are more likely to adapt technology effectively, considering how students learn best in a specific classroom context. Also, Technological Knowledge (TK) involves understanding and using a range of technological tools, from basic resources like chalkboards and textbooks to advanced systems such as the internet, digital video, and specialized software. It also includes the ability to identify the potential of these tools in educational settings and apply them effectively to achieve learning outcomes.

These three core knowledge domains CK, PK, and TK interact to produce three intersecting areas of expertise including Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK) and Technological Pedagogical Knowledge (TPK). PCK integrates teaching strategies with content delivery, enabling teachers to select the most effective methods for presenting subject matter. Technological Content Knowledge (TCK) focuses on understanding how technology can be leveraged to represent or explore content in meaningful ways. Technological Pedagogical Knowledge (TPK) emphasizes how technology can transform teaching practices and enhance learning processes.

At the intersection of CK, PK, and TK lies Technological Pedagogical Content Knowledge (TPACK), which represents a comprehensive understanding of how to teach effectively using technology. Developing TPACK involves not only mastering individual knowledge domains but also understanding how they interrelate and inform one another. Teachers with strong TPACK can design and implement instructional strategies that integrate technology seamlessly, fostering a

dynamic and effective learning environment. The TPACK framework is essential for guiding educators in the thoughtful integration of technology into teaching. It highlights the importance of balancing knowledge of content, pedagogy, and technology while understanding the ways these domains intersect to create meaningful learning experiences.

Objectives of the Study

This study examined the extent of ICT integration in the teaching and learning process among secondary school teachers and students in Nasarawa State. Specifically, the study aimed to determine the:

i. perceptions of teachers and students regarding ICT in education;
ii. level of ICT competence among teachers and students;
iii. extent to which teachers and students integrate ICT into the teaching and learning process; and
iv. availability of ICT resources.

Research Questions

The following research questions were answered:

i. What are the perceptions of teachers and students regarding ICT education?
ii. What is the level of ICT competence among teachers and students?
iii. To what extent do teachers and students integrate ICT into the teaching and learning process?
iv. How available are ICT resources in the schools?

Methodology

The study employed a mixed-method research design with a concurrent approach to gather comprehensive data. The target population consisted of all secondary school students and teachers in Nasarawa State, specifically senior secondary school students (71,471) and teachers (4,560) from both public and private secondary schools (Nasarawa State Ministry of Education, 2023). For data collection, a convenience sampling method was used to select two secondary schools from each local government area (LGA), one public and one private resulting in a total of 26 schools. From these schools, a sample of 414 students and 292 teachers were sampled. The sample size was determined using Taro Yamane's formula: $n = N/(1+N(e)^2)$, where, n = sample sizes, N is the population total and e is the error term at 5% (0.05). Based on this, a minimum sample of 390

students and 260 teachers was obtained, though the study ultimately included 414 students and 292 teachers. A combination of data collection instruments were employed in the study, including two self-reporting questionnaires, and an observation checklist. The first questionnaire, titled TICTInt, was designed for teachers, while the second, SICTInt, was for students. The observation checklist was called ObCList. Both the TICTInt and SICTInt consisted of 5 sections: demographics, perceptions on ICT in education, ICT competence, ICT integration, and strategies for improvement. The TICTInt included 17 closed-ended questions and one open-ended question. The closed-ended items were in ordinal scale format such as Yes/No, Essential/Not Essential, and Strong Competence/Little Competence/No Competence. Also, the SICTInt involves 6 closed-ended questions and one open-ended question, using ordinal scale format also. The ObCList observation checklist contained eight items in a binary format (Yes/No). The instruments were validated by two experts in ICT from the Federal University of Lafia, Nasarawa State. The reliability of the questionnaires was confirmed through Cronbach's alpha, yielding values of 0.87 for the TICTInt and 0.83 for the SICTInt. The reliability of the ObCList was assessed using Cohen's Kappa, which yielded a Kappa value of 0.78, indicating substantial agreement. A pilot test was conducted with 20 senior secondary school students and 10 teachers from two secondary schools in Lafia, Nasarawa State. This was done to ensure the effectiveness of the instruments before the main data collection. The data collection process combined both face-to-face interactions with self-administration. In the face-to-face mode, enumerators guided the respondents through the questions and entered their responses using KoboCollect on a device. In the self-administration method, respondents completed the survey independently on their own device via a provided link. Thus, a mixed-mode data collection approach was employed. Both quantitative and qualitative data were gathered. The quantitative data were analyzed using descriptive statistics, including frequency distribution and percentage count. Qualitative data were analyzed through thematic analysis, identifying patterns and themes in the open-ended responses and observation notes. The results from both data types were integrated to provide a comprehensive understanding of the study.

Results

The results of the study are presented in Tables 1 through 7 below:

Table 1: Demographic Information

Teacher:	
Male	74.0% (216)
Female	26.0% (76)
Qualifications	
B.Sc/B.Ed	51.4% (150)
NCE	41.8% (122)
HND	6.2% (18)
Masters	0.7% (2)
Years of Teaching Experience	
1-5	63.7% (186)
6-10	17.1% (50)
11-15	11.0% (32)
16-20	6.8% (20)
Above 20	1.4% (4)
Student:	
Male	53.6% (222)
Female	46.4% (192)
Class	
SSII	81.8% (339)
SSIII	18.8% (78)

Table 1 provides an overview of the teacher and student populations in terms of gender, qualifications, years of teaching experience, and class levels. Among the teachers, 74.0% are male, while 26.0% are female, indicating a predominantly male teaching workforce. In terms of qualifications, the largest group of teachers holds a Bachelors' degree, comprising 51.4%, followed by those with an NCE at 41.8%. Smaller percentages have an HND (6.2%, or 18 teachers) or a Masters' degree (0.7%, or 2 teachers), suggesting that most teachers have undergraduate or diploma-level qualifications. Regarding teaching experience, the majority of teachers, 63.7%, have been teaching for 1-5 years, indicating a relatively young and newer teaching staff. Fewer teachers have longer experience: 17.1% have 6-10 years, 11.0% have 11-15 years, and just 1.4% has over 20 years of experience. In the student population, 53.6% are male and 46.4% are female, showing a slightly higher proportion of male students. As for class levels, the majority of students,

81.8%, are in SSII (Senior Secondary 2), while 18.8% is in SSIII (Senior Secondary 3). Overall, the data highlights a predominantly male teacher workforce with relatively low levels of experience, and a balanced gender distribution among students.

Table 2: Perceptions of Teachers and Students on ICT in education

Teachers-Teaching Process	
Essential	91.1% (266)
Not Essential	8.9% (26)
Students- Learning Process	
Essential	53.6% (222)
Not essential	46.3% (192

Table 2 presents the perceptions of teachers and students regarding the role of ICT in education, specifically in the teaching and learning processes. The data highlights how both groups view the importance of ICT in enhancing educational practices. Among the teachers, a significant majority, 91.1% (266), believe that ICT is essential for the teaching process. This indicates that most teachers recognize the value of integrating technology into their lessons, likely seeing it as a tool to make teaching more effective, engaging, and interactive. The use of digital platforms, computers, and the internet is seen as important for enriching the educational experience and improving student learning outcomes (Anderson, 2018). On the other hand, a smaller number of teachers, 8.9%, do not consider ICT to be essential in their teaching. This suggests that they may prefer traditional teaching methods or feel that ICT is not necessary for the subjects they teach or the teaching environment they work in. When it comes to students, 53.6% considered ICT to be essential for their learning process. This reflects the fact that more than half of the students view technology as an integral part of their education. However, 46.3% of students do not see ICT as essential, which indicates a more divided view among the students' population. This category may prefer more traditional forms of learning or may not fully appreciate the benefits that ICT can offer in terms of improving their educational experience.

Table 3: Level of ICT competence of Teachers in terms of Technological Competencies

Item	Strong CMP	Little CMP	NO CMP
General Computer Operation: starting a computer, loading applications, exploring windows, using keyboard and mouse, file management, and installation of software.	8.2% (24)	31.5% (92)	60.3% (176)
Use of Ms Excel: basic functions and formulas, data entry and formatting, creating and managing worksheets, data import and export, charts and graphs, data sorting and filtering.	4.1% (12)	30.1% (88)	65.1% (190)
Use of PowerPoint Package: creating presentations, slide design and layout, inserting and formatting text, using multimedia elements, creating charts and diagrams, animation and slide transition, presentation delivery, exporting and sharing presentations.	2.1% (6)	25.3% (74)	72.6% (212)
Use of Ms Word Application: reviewing and proofreading tools, using templates, paragraph and character styles, tables and charts, inserting and editing graphics, references and citations, document protection, document creation and formatting.	4.8% (14)	30.8% (90)	63.7% (186)
Browsing (effective search techniques, evaluating sources, navigating websites, utilizing online resources, bookmarking and organizing, staying current with trends, and digital literacy)	11.0% (32)	30.1% (88)	58.9% (172)
Use of Social media platforms for communication- whatsapp and Facebook	15.1% (44)	35.6% (104)	49.3% (144)
E-mail Communication: folder management, archiving and deleting, sending attachments, Use of Email features such as Cc and Bcc.	10.3% (30)	29.5% (86)	60.3% (176)
Average Percentage	7.3%	30.3%	62.4%

Key: CMP=Competence.

Table 3 presents the results of teachers' level of ICT competence across various tasks related to different software applications and digital tools. The table categorized the competence levels into three groups: Strong Competence, Little Competence, and No Competence. The percentages and frequencies provided show the teachers' self-report on their ability to perform various teaching related

tasks using ICTs. In the General Computer Operation category, 8.2% of teachers reported strong competence in tasks such as starting a computer, using the keyboard, mouse, managing files, and installing software. 31.5% have little competence, while a majority of 60.3% reported no competence. This indicates that most teachers struggle with basic computer operations, a crucial skill for the modern classroom. When it comes to Use of MS Excel, only 4.1% of teachers reported strong competences in tasks such as basic excel formulas, data entry, formatting, and creating charts. 30.1% reported little competence, and 65.1% have no competence. This highlights a significant gap in teachers' ability to effectively use Excel, which is a powerful tool for managing student data and creating other educational materials. In terms of Use of PowerPoint, 2.1% of teachers reported strong competence in skills like slide design, multimedia integration, and presentation delivery. 25.3% reported little competence, while a substantial majority of 72.6% has no competence in using PowerPoint. This suggests that many teachers are not utilizing presentation software to its full potential in their teaching practices. For the Use of MS Word, 4.8% of teachers reported strong competence in using tools for proofreading, formatting, and document creation. 30.8% have little competence, and 63.7% (186) reported no competence. This indicates that a large portion of teachers may not be utilizing MS Word effectively for creating lesson plans, assignments, and other teaching materials. The Browsing section shows that 11.0% of teachers have strong competence in online tasks such as evaluating sources, navigating websites, and utilizing online resources. 30.1% reported little competence, while 58.9% have no competence. This suggests that many teachers are not fully equipped to use the internet for educational purposes and research, which is essential in today's digital learning environment. Regarding the educational Use of Social Media platforms such as WhatsApp and Facebook, 15.1% of teachers reported strong competence in using these platforms for communication. 35.6% have little competence, and 49.3% have no competence. While some teachers are comfortable using social media for communication, a significant number still lack these skills, which could be useful for both teaching and collaborating with students. In the area of E-mail Communication, 10.3% of teachers reported strong competence in tasks such as folder management, sending attachments, and using email features like Cc and Bcc. 29.5% reported little competence, and 60.3% (176) have no competence. This highlights that many teachers are not fully utilizing email for communication, a vital tool for both professional and classroom use. The average percentage across all categories

shows that 7.3% of teachers have strong competence, 30.3% have little competence, and 62.4% have no competence in ICT. This suggests that while some teachers possess a basic level of ICT skills, there is a widespread need for professional development to improve teachers' digital literacy and their ability to use ICT tools effectively in their teaching.

Table 4: level of students' ICT competences in terms of Technological Competencies

Items	Strong CMP	Little CMP	No CMP
Operating System Navigation:			
Booting up and shutting down a computer.	(8)1.9%	(55)13.3%	(351)84.8%
Navigating through the desktop environment.	(15)3.6%	(54)13.0%	(345)83.3%
Using system settings to customize the computer (e.g., display settings, sound settings).	(8)1.9%	(27)6.5%	(379)91.5%
Accessing the control panel or system preferences.	(10)2.4%	(22)5.3%	(382)92.3%
File Management:			
Creating, renaming, and organizing files and folders.	(6)1.4%	(20)4.8%	(388)93.7%
Moving, copying, and deleting files.	(14)3.4%	(25)6.0%	(375)90.6%
Using file explorer to search and manage files.	(12)2.9%	(22)5.3%	(380)91.8%
Saving documents in different formats and locations.	(17)4.1%	(28)6.8%	(369)89.1%
Using Basic Software Applications:			
Creating and editing documents in word processing software such as Microsoft Word,	(18)4.3%	(38)9.2%	(358)86.5%
Using spreadsheet software such as Microsoft Excel for basic tasks like entering data, creating tables, and performing simple calculations.	(10)2.4%	(29)7.0%	(375)90.6%
Creating and editing presentations using Microsoft PowerPoint.	(10)2.7%	(31)7.5%	(372)89.9%
Using web browsers such as Google Chrome, Firefox for internet browsing.	(12)2.9%	(36)8.7%	(366)88.4%
Percentage Average	2.8%	7.8%	89.4%

Table 4 presents information on students' level of ICT competence based on self-reported competence on various tasks related to operating systems, file management, basic software applications, and web browsing.

In the Operating System Navigation category, a very low percentage of students reported strong competence in basic tasks such as booting up and shutting down a computer (1.9%) or navigating through the desktop environment (3.6%). The majority of students, however, reported no competence in these tasks, with 84.8% for booting up and 83.3% for desktop navigation. Also, tasks like customizing system settings (e.g., display or sound settings) and accessing the control panel had similarly low competence levels, with 91.5% and 92.3% of students reporting no competence in these areas, respectively. In the File Management category, many students also showed limited competence. For example, creating, renaming, and organizing files and folders saw 93.7% of students reporting no competence. Other file management tasks, such as moving, copying, and deleting files, also had a low percentage of strong competence (3.4%), with a significant portion of students (90.6%) indicating no competence. Similarly, the ability to search and manage files using file explorer and saving documents in different formats was largely

unachieved, with 89.1% of students reporting no competence in the latter. Regarding Basic Software Applications, the survey results revealed similarly low levels of proficiency. Only 4.3% of students reported strong competence in using Microsoft Word for creating and editing documents. The competence in using Microsoft Excel for basic tasks was even lower, with 2.4% of students reporting strong competence. Similarly, 2.7% of students were proficient in creating and editing presentations in PowerPoint, and 2.9% demonstrated strong competence in using web browsers for internet browsing. In each of these areas, the majority of students reported no competence, with rates ranging from 89.1% for Word processing to 90.6% for Excel and PowerPoint. The overall average percentage across all categories shows that only 2.8% of students possess strong competence, 7.8% have little competence, and a staggering 89.4% have no competence in ICT. This highlights a significant gap in digital literacy, with most students lacking the basic ICT skills needed to perform essential tasks such as file management, document creation, and using software tools like Excel and PowerPoint.

Table 5: Level of ICT competence of teachers and students in terms of Pedagogical Competencies

Item	**Response**	
Teachers – Use ICT for:	No	Yes
Research	80.8% (236)	19.2% (56)
Lesson note development	89.7% (262)	10.3% (30)
Lesson delivery	95.2% (278)	4.8% (14)
Record keeping	93.8% (274)	6.2% (18)
Result processing	82.2% (240)	17.8% (52)
Assessment and feedback	97.3% (284)	2.7% (8)
Communication via email messaging, whatsapp and Facebook.	90.4% (264)	9.6% (28)
Professional development	97.3% (284)	2.7% (8)
Average Percentage	86.7%	13.3%
Students –Use ICT for:		
Researching assignment or home work	94.9% (393)	5.1% (21)
Online learning/tutorial (MOOCs, and Interactive Tutorials and Lessons	94.2% (390)	5.8% (24)
Accessing Educational Resources(e-books, articles and e-libraries)	97.8% (405)	2.2% (9)
Communication (email messaging, whatsapp and Facebook)	96.4% (399)	3.6% (15)
Average Percentage	95.6%	4.4%

Table 5 provides an overview of the level of ICT integration in the teaching and learning process, as reported by both teachers and students. For teachers, the use of ICT is generally low across most educational activities. A large majority of teachers do not use ICT for tasks like research (80.8%), lesson note development

(89.7%), lesson delivery (95.2%), record keeping (93.8%), and result processing (82.2%). While a small percentage of teachers incorporate ICT into assessment and feedback (2.7%), the use of ICT for professional development is also minimal, with only 2.7% of teachers engaging in this area. Communication via email and social media platforms like WhatsApp and Facebook is similarly underused, with 90.4% of teachers not utilizing these tools for communication. On average, 86.7% of teachers do not use ICT for these activities, indicating a significant gap in ICT integration in their teaching practices. For students, the integration of ICT in learning process is low. Most students do not use ICT for researching assignments or homework (94.9%) or online learning and tutorials (94.2%). A large number of students also do not use ICT for accessing educational resources such as e-books and articles (97.8%) or for communication through email and social media platforms (96.4%). However, a small percentage of students do engage with ICT for these purposes, with 5.1% using it for research, 5.8% for online learning, and 2.2% for accessing educational resources. The average percentage of ICT usage among students is 4.4%, which is too low. The data indicates that ICT use in education is still in the early stages of adoption among secondary school teachers and students in Nasarawa state.

Table 6: Strategies for enhancing ICT integration in teaching and learning process

Teachers' Perspectives:	
Provision of well-equipped computer labs, internet facilities, digital classrooms and e-library across all secondary schools in Nasarawa State	41.0% (60)
Regular ICT capacity building programmes for teachers such as workshops, seminars and conferences.	39.6% (58)
Use of digital literacy as one of the criteria for recruitment and promotion of teachers	33.2% (48)
Provision of subject specific software, programming and networking simulators for practical	32.0% (46)
Partnerships with private organisations, NGOs, and government agencies for funding, expertise, and resources for ICT initiatives in schools.	27.4% (40)
Provision of reward system for teachers that demonstrate high effort in ICT integration in teaching process	26.8% (40)
Students' Perspectives:	
Provision of well-equipped computer labs and free internet services for students	28.4% (177)
Provision of software for learning	97.8% (135)
Frequent use of ICTs in teaching by teachers	73.8% (102)

Table 6 presents strategies for enhancing ICT integration in the teaching and learning process, reflecting the perspectives of both secondary school teachers and students in Nasarawa State. Teachers prioritize the provision of well-equipped

computer labs, internet facilities, digital classrooms, and e-libraries across all secondary schools, with 41.0% respondents supporting this strategy. Also, they emphasized the need for regular ICT capacity building programs, such as workshops and seminars, to help teachers improve their ICT skills (39.6%, respondents). Another significant strategy is using digital literacy as a criterion for teacher recruitment and promotion (33.2%, respondents), ensuring that teachers are digitally competent from the outset. Teachers also suggested the provision of subject-specific software and networking simulators (32.0%, respondents) as crucial for practical learning. Furthermore, they suggested forming partnerships with private organizations, NGOs, and government agencies for resources and funding (27.4%, respondents) and implementing reward systems for teachers who demonstrate significant effort in ICT integration (26.8%, respondents). From the students' perspective, the most important strategy is the provision of well-equipped computer labs and free internet services, with 28.4% highlighting this need. Another key priority is providing learning software, which is supported by a large percentage of students (97.8%). Lastly, students strongly favor the frequent use of ICTs by teachers in the classroom, with 73.8% respondents recognizing the value of consistent digital tool integration in their learning experience. Overall, the findings showed that both teachers and students agree on the importance of improving ICT infrastructure and increasing digital literacy. Teachers focus on professional development and systemic changes, while students emphasize access to technology and its consistent use in teaching. These insights suggest that improving ICT integration in the teaching and learning process at secondary school in Nasarawa State requires both resource allocation and capacity building to meet the needs of both teachers and students.

Table 7: Availability of ICT Resources

Items	Yes	No
Availability of Computer laboratory	34.6%(9)	65.4%(17)
Availability of functional Computers up to 20 and above.	22.2%(2)	77.8%(7)
Availability of Internet connectivity for teachers and students	19.2%(5)	80.8%(21)
Availability of Qualified ICT teachers	34.6%(9)	65.4%(17)
Availability of Subject specific software	7.7%(2)	92.3%(24)
Availability of School Website/Portal	11.5%(3)	88.5%(23)
Availability of digital classroom equipped with multimedia technologies like interactive whiteboards and projectors	7.7%(2)	92.3%(24)
Availability of Training programs for teachers on ICT integration in teaching process	7.7%(2)	92.3%(24)

Table 7 reveals significant gaps in the availability of ICT resources in secondary schools in Nasarawa State. A majority of schools, 65.4% (17 schools), do not have a computer laboratory, while only 34.6% (9 schools) have, indicating a lack of dedicated spaces for computer-based learning. In terms of functional computers, out of the 9 schools that has computer laboratory, only 2 representing 22.2 % have functional 20 computers while the rest do not, highlighting a substantial deficit in the availability of computers for educational use in secondary schools in Nasarawa State. Similarly, 80.8% (21 schools) of the schools do not have internet connectivity, further limiting access to online resources and digital tools. Regarding teaching resources, 65.4% (17 schools) do not have qualified ICT teachers, while 34.6% (9 schools) do, pointing to a shortage of skilled personnel in the field of ICT education in secondary schools in Nasarawa State. The availability of subject-specific software is also very limited, with 92.3% (24 schools) reporting a lack of such resources, while only 7.7% (2 schools) have them. Also, 88.5% (23 schools) of the schools do not have school website, which suggests a lack of digital communication infrastructure. Moreover, 92.3% (24 schools) do not have digital classrooms equipped with modern multimedia technologies like interactive whiteboards and projectors, and similarly, 92.3% (24 schools) do not offer training programs for teachers on ICT integration in teaching, highlighting a gap in professional development. Only a small percentage, 7.7% (2 schools), provide these facilities and opportunities.

Findings

The following findings were made:

1. Teacher and Student Demographics: Teacher Gender and Qualifications: The teacher workforce is predominantly male (74%), with a majority holding a Bachelor's degree (51.4%). A significant proportion also holds an NCE (41.8%), while few have HND (6.2%) or a Master's degree (0.7%).

Teaching Experience: The majority of teachers (63.7%) have been teaching for 1-5 years, indicating a relatively young workforce. Only a small percentage has over 20 years of experience (1.4%).

Student Gender and Class Levels: The student population is almost evenly split between male (53.6%) and female (46.4%). Most students are in SSII (81.8%), with fewer in SSIII (18.8%).

2. Perceptions of ICT in Education: Teachers' Views on ICT: Most teachers (91.1%) believe ICT is essential for the teaching process, recognizing its value in

making lessons more effective and engaging. However, a small group (8.9%) does not see ICT as essential.

Students' Views on ICT: 53.6% of students consider ICT essential for their learning, while 46.3% do not, indicating a more divided opinion among students about the role of ICT in their education.

3. Teachers' ICT Competence; *General Competence*: A large percentage of teachers report low levels of competence in various ICT tasks. For instance, 60.3% of teachers lack basic computer operation skills, and 65.1% are not competent in using MS Excel, PowerPoint, or MS Word effectively.

Internet and Social Media Use: Many teachers (58.9%) lack competence in using the internet for educational purposes, and a significant number (49.3%) are not proficient in using social media platforms for communication.

Average Competence: On average, 7.3% of teachers reported strong ICT competence, while 30.3% have little competence, and 62.4% have no competence in ICT.

4. Students' ICT competence; *General competence:* A large percentage of the students reported low competence in various ICT tasks. For instance, 84.8% reported no competence for booting the computer, 83.3% reported no competence for desktop navigation, 91.5% and 92.3% also reported no competence for tasks such as customizing system settings and accessing the control. Similarly, 93.7% reported no competence for tasks such as creating, renaming, and organizing files and folders.

Average competence: on average 2.8% of students reported strong competence, while 7.8% have little competence, and 89.4% have no competence in ICT.

5. ICT Integration in Teaching and Learning; *Teacher Use of ICT*: The integration of ICT in teaching activities is low. A majority of teachers do not use ICT for tasks like research (80.8%), lesson planning (89.7%), lesson delivery (95.2%), record-keeping (93.8%), and result processing (82.2%). Only 2.7% use ICT for assessment and feedback, and communication via email and social media is similarly underused.

Student Use of ICT: Similarly, students also show low ICT engagement, with 94.9% not using ICT for research or online learning, and 97.8% do not use ICT to access educational resources. The average student ICT usage is only 4.4%.

6. ICT Resource Availability: *Lack of ICT Infrastructure*: A significant gap exists in the availability of ICT resources across secondary schools in Nasarawa State.

Computer Labs: 65.4% of schools do not have a computer lab, and among those with labs, only 22.2% have functional computers.
Internet Connectivity: 80.8% of schools lack internet access.
Qualified ICT Teachers: 65.4% of schools do not have qualified ICT teachers.
Subject-Specific Software: 92.3% of schools lack subject-specific software.
School Websites and Digital Classrooms: 88.5% of schools do not have a school website, and 92.3% do not have digital classrooms equipped with modern multimedia technologies.
7. Strategies for Enhancing ICT Integration: *Teachers' Priorities*: Teachers suggest strategies such as providing well-equipped computer labs (41.0%), regular ICT training for teachers (39.6%), and using digital literacy as a criterion for teachers' recruitment (33.2%).
Students' Priorities: Students emphasize the need for well-equipped labs and free internet access (28.4%) and frequent use of ICT by teachers in the classroom (73.8%).

Discussion of Findings

The demographic characteristics of both teachers and students reveal some common trends observed in educational systems across developing nations. The male-dominated teaching workforce (74%) and the relatively low levels of experience among teachers, with most having only 1-5 years of teaching experience, reflect the broader challenges faced by the education sector in many developing countries. This finding is in line with Chaudhary and Kaur (2023), who reported that the teaching force in many developing nations consists largely of younger, less experienced teachers. Also, the predominance of undergraduate qualifications among teachers aligns with findings from Sharma, Thomas and Patel (2022), who found that many teachers in developing countries have only basic qualifications. This suggests that while teachers may have foundational knowledge, they may lack the advanced skills required for effective ICT integration, which could hinder the adoption of digital tools in the classroom.

The study also revealed that although a large majority of teachers (91.1%) recognize ICT as an important tool for teaching, only 53.6% of students perceived ICT as critical to their learning process. This gap is consistent with Anderson (2018), who found that teachers are more likely to appreciate the potential of ICT in enhancing their teaching process, while students' perceptions often vary depending on their exposure and access to digital resources. The divergence

between teachers' enthusiasm and students' perceptions may stem from the limited access to ICT resources, as reported by the study, where many students lack consistent access to digital tools at school or home. This finding mirrors the research of Aminu, Nuhu and Salihu (2023), who found that while teachers in similar contexts recognize the importance of ICT, students may not fully understand its value due to inconsistent access to technology, which diminishes their learning experiences.

Moreover, the low levels of ICT competence among teachers in the study, with the majority demonstrating minimal skills in using common software such as MS Excel and PowerPoint, reflect a significant barrier to ICT integration. Only 7.3% of teachers were highly competent in ICT tasks, pointing to a lack of adequate training and professional development. This is consistent with findings by Oladokun (2022), who highlighted the widespread lack of ICT skills among teachers in many developing countries, which hinders the effective use of ICT in the classroom. The insufficient ICT competence among teachers is further corroborated by Bawa, Ojo and Musa (2023), who noted that teachers' digital skills are a critical factor in the successful integration of ICT in education. Without proper training, teachers are unlikely to utilize ICT tools effectively, thus impeding students' ability to benefit from digital learning opportunities.

Furthermore, the low levels of ICT integration in teaching and learning activities, with many teachers not using ICT for research, lesson delivery, or students' assessment, echo the challenges identified in the literature on ICT adoption in African schools. Agboola (2021) noted that ICT integration in secondary schools is often minimal, especially in resource-constrained environments. The lack of ICT integration is likely a result of several factors, including insufficient infrastructure, inadequate teacher training, and limited students' access to technology. The finding that many students also do not use ICT for homework, online learning, or accessing educational resources further underscores the challenge of integrating digital tools effectively in classrooms where resources are limited. These findings highlight the urgent need for investment in ICT infrastructure and the development of digital literacy among both teachers and students to bridge this gap.

The study found significant gaps in the availability of ICT resources in secondary schools in Nasarawa State, including the absence of computer laboratories, internet connectivity, qualified ICT teachers, and subject-specific software. These findings align with Nduka, Nwachukwu and Usman (2022), who found that secondary schools in Nigeria lack basic ICT facilities such computer labs and internet

connectivity. The lack of internet connectivity, which affects 80.8% of the schools in this study, further limits access to digital tools and online resources, which are increasingly important in modern education. The shortage of qualified ICT teachers (65.4% of schools) is another critical challenge, as it directly impacts the ability of schools to provide effective ICT instruction. This is consistent with the findings of Muriithi and Okello (2022), who noted that a shortage of skilled personnel in ICT education is a widespread issue in sub-Saharan Africa.

The strategies proposed by both teachers and students to enhance ICT integration reflect a shared understanding of the need for improved ICT infrastructure and professional development. Teachers emphasized the importance of providing well-equipped computer labs, internet facilities, and regular ICT training programs, with 41.0% of respondents supporting these measures. This echoes the recommendations of recent scholars like Alemu (2023) and Kano, Umar and Ibraheem (2023), who advocated for the provision of better resources and ongoing training to ensure teachers can effectively integrate ICT into their classroom activities. Students, on the other hand, prioritized access to computer labs, and free internet connectivity. This is in tandem with Ahmed, Ali and Adewale (2022), who stated that consistent access to ICT tools for both teachers and students, is crucial for successful ICT integration in education. This study notes that ICT integration in teaching and learning process among secondary school teachers and students in Nasarawa state can be improved through targeted efforts focused on infrastructure development and teacher training.

Recommendations

Based on the study's findings, the following recommendations are made:

1. Provision of ICT Infrastructure: to support effective ICT integration, there is an urgent need to enhance the ICT infrastructure in secondary schools across Nasarawa State. A majority of the schools lack essential ICT resources, including computer laboratories, internet connectivity, and subject-specific software.
2. Teacher Training and Professional Development: one of the major barriers to ICT integration identified in the study is the lack of ICT competence among teachers. Teachers need to acquire more advanced ICT skills to effectively incorporate technology into their teaching. Regular professional development programs such as workshops, seminars, and ICT training courses should be introduced to improve teachers' digital literacy.

3. Integration of ICT in Teacher Recruitment and Promotion Process: the study suggests that digital competence should be a criterion for both teacher recruitment and promotion. In line with this, teacher recruitment policies should emphasize the necessity of ICT proficiency in candidates. As part of the hiring process, candidates should demonstrate their ICT skills to ensure that newly hired teachers are equipped with the necessary tools to engage with digital technologies.
4. Establishment of Digital Learning Platforms: the study highlights the need for the creation of digital learning platforms within schools, such as e-libraries and online educational resources. Schools should consider partnering with national and international educational platforms to provide students and teachers with access to eBooks, research databases, video tutorials, and other online resources.
5. Provision of Internet Connectivity: the availability of internet connectivity in secondary schools is essential for ICT integration, yet the study found that many schools lack access to the internet. It is recommended that local and state governments invest in expanding internet infrastructure across secondary schools in Nasarawa State. The use of affordable, reliable internet connectivity is crucial to ensuring that both teachers and students can access a broad range of online educational resources, communicate with peers and instructors, and participate in digital learning activities.
6. Promotion of Students'-centered ICT Learning: students should be encouraged to use ICT for self-directed learning and to take greater ownership of their educational journeys. The study reveals that while a small percentage of students use ICT for research and learning, the majority do not. Schools should create opportunities for students to use ICT in a more interactive and self-guided manner. For example, schools can introduce blended learning models, where ICT is used to supplement traditional teaching methods. This approach allows students to learn at their pace and explore subjects in greater depth using digital tools.

Conclusion

Improving the integration of ICT in the teaching and learning process in secondary schools in Nasarawa State requires a concerted effort from both educational authorities and stakeholders. By addressing the infrastructural, technical, and training gaps identified in this study, it is possible to foster a more digitally literate teaching and learning environment, ultimately enhancing the educational outcomes for both secondary school teachers and students in Nigeria.

References

Adebayo, F. (2020). Teachers' ICT competencies and their impact on students' academic performance in Nigerian secondary schools. *International Journal of Education, Learning and Development*, 8(2), 12-22.

Adebayo, F. (2021). The role of teachers' ICT competence in promoting effective teaching and learning in Nigeria. *Journal of Educational Research and Practice*, 9(1), 34-45.

Agboola, J. (2021). ICT integration in African classrooms: Challenges and solutions. International Journal of Educational Technology, 17(3), 209-224.

Ahmed, M., Ali, S., & Adewale, O. (2022). Bridging the digital divide in secondary schools: The role of ICT infrastructure and teacher competence. Educational Research Review, 14(4), 361-374.

Alemu, D. (2023). Addressing the challenges of ICT adoption in education in sub-Saharan Africa. Journal of Educational Technology Development, 12(1), 45-58.

Alsharif, M. H., Mohaidat, J., & Nasr, M. (2021). The impact of interactive technologies on student engagement in higher education. *International Journal of Educational Technology in Higher Education*, 18(1), 5.

Aminu, M., Nuhu, D., & Salihu, H. (2023). Perceptions of ICT use in education: A comparative analysis of teachers and students in Nigeria. Journal of Educational Research and Practice, 13(2), 135-149.

Anderson, R. (2018). The role of ICT in education: A critical review. Education and Information Technologies, 23(1), 25-39.

Anderson, T. (2018). *The theory and practice of online learning* (2nd ed.). Athabasca University Press.

Bawa, J., Ojo, A., & Musa, J. (2023). Exploring the barriers to ICT integration in Nigerian secondary schools: A case study approach. Educational Technology and Society, 26(1), 42-54.

Bawaneh, A. (2021). The role of ICT in enhancing students' learning experience: Evidence from the Jordanian context. *Journal of Educational Computing Research*, 59(4), 745-762. https://doi.org/10.1177/0735633120955532

Bello, O., & Ajao, A. O. (2024). Digital Literacy and Skills Development in Nigeria: Policies, Barriers and Recommendations. Journal of African Innovation and Advanced Studies.

Ertmer, P. A., & Ottenbreit-Leftwich, A. (2019). Teacher technology use: What do we know and what do we need to know? *Journal of Research on Technology in Education*, 51(4), 341-358. https://doi.org/10.1080/15391523.2019.1626413

Ertmer, P. A., & Ottenbreit-Leftwich, A. (2020). Teacher beliefs and technology integration practices: A developmental model. *Computers & Education*, 144, 103667.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., & York, C. S. (2020). Teacher beliefs and technology integration practices: A developmental approach. *Computers & Education*, 140, 103599.

Hennessy, S., Ruthven, K., & Brindley, S. (2020). Teacher perspectives on integrating ICT into subject teaching: Commitment, constraints, and change. *Journal of Computer Assisted Learning*, 36(5), 542-556.

Hew, K. F., & Brush, T. (2021). Integrating technology in K-12 classrooms: An overview of the current research. *Educational Technology Research and Development*, 69(3), 967-986.

Kano, M., Umar, M., & Ibraheem, T. (2023). Improving teachers' ICT skills in developing countries: A case study of teacher professional development in West Africa. Journal of Technology in Teacher Education, 31(1), 80-95.

Luhamya, L., et al. (2017). Exploring the use of the TPACK framework in teacher professional development. Journal of Educational Technology, 25(3), 45-56. https://doi.org/10.1016/j.jedutech.2017.06.001

Magedanz, T., Kummer, S., & Rademacher, S. (2021). Enhancing student motivation through the use of educational technology. *Educational Research Review*, 32, 100362.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teaching and Teacher Education, 22(1), 231-246. https://doi.org/10.1016/j.tate.2005.11.013

Mtebe, J. S., & Raisamo, R. (2019). Challenges and opportunities of integrating ICT in higher education in Tanzania: A case of the University of Dar es Salaam. *Education and Information Technologies*, 24(3), 1977-1997. https://doi.org/10.1007/s10639-018-9791-3

Muriithi, M., & Okello, A. (2022). ICT infrastructure and its impact on teaching and learning in secondary schools in Kenya. African Journal of Educational Technology, 10(3), 112-128.

National Information Technology Development Agency (NITDA). (2022). *National IT policy*. Abuja: Government of Nigeria.

Nduka, I., Nwachukwu, C., & Usman, Z. (2022). ICT resources and their impact on secondary school education in Nigeria. Journal of Educational Research, 22(4), 301-318.

Nwafor, C., Okonkwo, E., & Ibe, C. (2021). The role of ICT in enhancing students' digital literacy and critical thinking skills in secondary education. *Journal of Educational Technology*, 18(2), 102-115.

Ogunlade, A. M., & Ojo, M. (2021). Assessing the impact of ICT training on teachers' performance in Nigerian secondary schools. *Journal of Educational Technology Systems*, 50(2), 137-152. https://doi.org/10.1177/0047239520928550

Oladokun, M. (2022). Addressing ICT competence challenges in African classrooms: A review of policies and practices. Journal of African Education, 9(2), 45-60.

Olatokun, W. M., & Adebayo, O. S. (2019). Barriers to the effective integration of ICT in education: A case study of Nigerian teachers. *Journal of Educational Technology Systems*, 47(2), 153-174. https://doi.org/10.1177/0047239518796762

Olayiwola, F., Olaniyan, A., & Shittu, O. (2023). Best practices for ICT integration in secondary education: Lessons from successful schools in Africa. Educational Innovation, 10(3), 132-147.

Ololube, N. P. (2022). ICT and education: The importance of digital literacy in African secondary schools. International Journal of Educational Policy, 15(1), 56-72.

Olufunmilayo, T., & Adebayo, O. (2019). Barriers to the effective integration of ICT in Nigerian schools: Implications for teachers and students. *International Journal of Education and Development using Information and Communication Technology*, 15(2), 5-20.

Seenivasan, R. (2024). ICT in Education: A Critical Literature Review and Its Implications. International Journal of Finance, Insurance and Risk Management, 14(1), 12-27.

Sharma, N., Thomas, P., & Patel, S. (2022). The digital divide in education: Teacher qualifications and ICT integration in developing countries. Journal of Education and Development, 21(2), 79-92.

Udo, E. E., & Afolabi, A. O. (2020). The challenges of ICT integration in the Nigerian educational system: Perspectives from teachers. *Journal of Educational Technology and Online Learning*, 3(1), 15-23.

Zhang, D., Wang, Y., & Wang, X. (2020). The role of teachers' ICT competence in the development of students' learning strategies: A systematic review. *Educational Technology Research and Development*, 68(1), 43-66.