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ICT RESOURCE UTILIZATION IN ENHANCING 21ST CENTURY CLASSROOM PRACTICES IN PUBLIC AND PRIVATE PRIMARY SCHOOLS IN GOMBE STATE

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ABSTRACT

This study examined ICT resource utilization in enhancing 21st century classroom practices in public and private primary schools in Gombe State. Two research questions guided the study while two null hypotheses were formulated. The study used a descriptive survey research design to survey 6,538 teachers in 11 Local Government Education Authorities of Gombe State. The sample size was 875 teachers, with 525 from public schools and 350 from private schools. The data was collected using a validated structured questionnaire called "Questionnaire on ICT Resource Utilization and Classroom Practices" (QICTRUCP). Cronbach Alpha was used to measure internal consistency, and reliability co-efficient values of 0.78 and 0.88 were obtained for both clusters. Mean and standard deviation was used to answer the research questions while independent sample t-test was used to test the null hypotheses at 0.05 alpha level. It was found that teachers in public primary schools to a low extent utilized hardware in enhancing 21st century classroom practices in public and private schools in Gombe State while teachers in private schools utilized it on a high extent. The finding also revealed that teachers in both public and private schools rated to a low extent software utilization for enhancing 21st century classroom practices in public and private schools in Gombe State. It was recommended amongst others that Governments and stakeholders in Gombe State should prioritize funding to provide both hardware and software resources for public schools. Adequate investment is needed to bridge the resource gap between public and private schools, ensuring equitable access to modern teaching tools.

Keywords: ICT, Resources, Resource utilization, Classroom Practice

Introduction

Information and communication technology (ICT) has become a vital component of 21st century education, transforming classroom practices from teacher-centred to more interactive and learner-centred approaches. ICT resources such as computers, tablets, internet facilities, and educational software support the development of critical thinking, creativity, collaboration, communication, and digital literacy, especially at the primary school level where foundational skills are formed. In Nigeria, ICT integration in education is a major policy focus aimed at improving the quality and relevance of teaching and learning. However, the availability and utilization of ICT resources differ between

public and private primary schools due to variations in funding, infrastructure, and teacher competence. In Gombe State, while some schools have adopted ICT to support modern classroom practices, challenges such as inadequate facilities, limited teacher training, unstable power supply, and poor internet access continue to affect effective utilization. Examining ICT resource utilization in enhancing 21st century classroom practices in public and private primary schools in Gombe State is important for understanding current practices, identifying gaps, and promoting effective ICT integration. This will help improve teaching quality and ensure that pupils acquire essential skills needed to function successfully in a digital society.

In Gombe State, primary education is provided through both public and private schools, each with unique characteristics in terms of ownership, administration, admission processes, and available resources. Adewale (2018) reiterated that public primary schools are typically funded and managed by the government, whether at the federal, state, or local level. In contrast, private primary schools are owned and operated by individuals, religious organizations, or private entities. This ownership difference often leads to variations in available resources, with private schools generally having more flexible funding mechanisms, allowing them to adopt innovative teaching methods and maintain well-equipped classrooms (Adewale, 2018). The administration of public schools follows standardized guidelines provided by government bodies, including the Ministry of Education. These guidelines dictate school policies, curriculum, and evaluation standards. Private schools, however, have more administrative autonomy and can adopt customized curricula or enhanced educational practices, as long as they align with the state's educational standards (Olagunju & Olatoye, 2015).

Notwithstanding their different ownership and administrative structures, public and private primary schools in Gombe State share several similarities. Both public and private primary schools generally adhere to the national curriculum set by the Nigerian educational authorities, which aims at fostering a balanced educational experience and that both types of schools are subject to oversight by the Ministry of Education, ensuring they meet certain educational standards (Olokoba, Abdullahi and Omosidi, 2018). By recognizing their similarities and addressing their differences, stakeholders in both sectors can collaboratively enhance 21st-century classroom practices, ultimately improving educational outcomes for all children.

Classroom practices involve instructional methods and learning environments designed to develop critical skills required for today's workforce (Abazie, 2021). These practices prioritize critical thinking, collaboration, creativity, communication, and digital literacy, all of which are essential for success in a globalized society. Anderson and Krathwohl (2021) defined classroom practices as the pedagogical strategies and techniques used by teachers to facilitate learning, encourage pupil engagement, and promote knowledge retention. Operationally, classroom practices encompass the instructional strategies,

collaborative exercises, and technology integration used to promote critical thinking, communication, and teamwork among primary school pupils in Gombe State.

In spite this, both public and private primary schools in Gombe State face the challenges of integrating modern pedagogical approaches that emphasize critical thinking, collaboration, creativity, and technological fluency (Adewoye and Salau, 2021). Olokoba et al. (2018) remarked that private schools often have smaller class sizes and better facilities, making it easier to implement group activities and collaborative projects. Public schools may adopt similar methods, but larger class sizes can pose challenges to effective collaboration (Agbabi, Onyeike and Wali, 2016). While both types of schools aim to enhance critical thinking skills, private schools typically have more resources to introduce problem-solving activities, such as interactive simulations and project-based learning. Public schools may rely more on traditional methods due to limited resources (Martin and Sass, 2020). All these are made possible with the integration of Information and Communication Technology (ICT).

ICT resources encompass a broad array of digital tools, applications, and infrastructures that facilitate the management, processing, and communication of information. UNESCO (2022) defined ICT resources in education as diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information. In the opinion of Anderson and Weert (2020) described ICT resources in education as "all technologies, including the Internet, wireless networks, cell phones, and other communication mediums, that are combined to enable the teaching and learning process. In this study, ICT resources refer specifically to the digital tools and technological infrastructure, such as computers, projectors, internet facilities, educational software, and interactive whiteboards, used within Gombe State's primary schools to support teaching and learning processes and to promote digital literacy among pupils.

In Gombe State, the level of ICT utilization in primary schools is still evolving, with notable differences between public and private schools. Private schools tend to have better access to ICT resources due to higher funding, parental involvement, and administrative support (Ali, et al, 2019). These schools often incorporate basic computer literacy programs and, in some cases, online resources into their curriculum. Conversely, public primary schools in Gombe State generally experience lower levels of ICT utilization, primarily due to budget constraints, limited teacher training, and inadequate ICT facilities (Dauda, 2023).

While private schools may be better positioned to leverage technology effectively, there is a pressing need to enhance ICT access and training in public schools to ensure that all pupils can benefit from these crucial resources. This comprehensive approach to integrating ICT not only supports the development of 21st-century skills but also provides different dimensions of ICT resource utilization. These dimensions include hardware, software, internet access utilization, and digital communication resource utilization. These dimensions were in line with the study

of (Chukwu, 2020; Dauda, Danladi and Azubuike, 2024; Nweze, 2018). But for the purpose of this study, hardware and software was examined.

Hardware resources in primary schools include computers, projectors, interactive whiteboards, and tablets. In a primary school setting, hardware utilization can take the form of using computers for typing exercises, learning software applications, or displaying digital content during lessons. In Gombe State, private schools generally have a higher availability and utilization of these hardware resources compared to public schools. Some public schools, especially in rural areas, may lack access to even basic hardware, limiting the use of ICT in classroom practices (Ajayi, 2020).

Software resources include educational applications, learning management systems, and subject-specific software. Software utilization in primary schools can range from basic applications for reading and arithmetic to more advanced programs designed to foster critical thinking and creativity. Private primary schools in Gombe State are more likely to use these educational software applications to support classroom instruction. Public schools, however, often lack access to adequate software tools, with teachers primarily using minimal or free resources due to budget constraints (Dauda, et al., 2024).

The researcher's interest in this topic stems from a deep concern about the educational disparities within Gombe State's primary education system, particularly the gap in ICT adoption between public and private institutions. Observing the rapid technological advancements and the growing importance of digital literacy for pupils, the researcher recognized the need to evaluate how ICT resources are used to facilitate effective learning across school types. Studies have highlighted that while private schools in Nigeria may have access to better ICT resources, public schools are often under-resourced, limiting pupils exposure to essential digital tools and skills (Danladi and Jaimi, 2017). This disparity poses a risk of creating unequal learning outcomes and depriving pupils in under-resourced schools of opportunities to develop digital competencies crucial for their future education and career prospects.

The integration of ICT in primary education is essential for developing pupils' digital literacy, critical thinking, and problem-solving skills, which are foundational for success in the 21st century. In Gombe State, there exists a noticeable disparity between public and private primary schools regarding access to and utilization of ICT resources, which creates an uneven playing field for pupils. This study is needed to assess and understand the extent of ICT resource utilization across school types in Gombe State, providing a clear picture of how resources like hardware, software, internet access, and digital communication tools are used to enhance classroom practices. While there are studies on ICT adoption in primary and tertiary education within Nigeria, there is limited data focused on primary education, particularly comparing ICT resource utilization in public and private primary schools. It is therefore against these backdrops and research gaps that this study seeks to comparatively analyze the extent of

ICT resource utilization in enhancing 21st century classroom practices in public and private primary schools in Gombe State.

Statement of the Problem

The integration of information and communication technology (ICT) resources into classroom instruction is widely recognized as a key requirement for promoting effective 21st century classroom practices, particularly at the primary school level where foundational learning skills are developed. ICT resources are expected to enhance teaching and learning by supporting learner-centred approaches, active participation, collaboration, critical thinking, and digital literacy. In spite national policies and growing advocacy for ICT integration in Nigerian schools, effective utilization of these resources in many primary school classrooms remains a major challenge.

In Gombe State, there are observable disparities in the availability and utilization of ICT resources between public and private primary schools. Many public primary schools reportedly suffer from inadequate ICT facilities, insufficient funding, limited access to electricity and internet services, and a lack of trained teachers capable of integrating ICT into daily classroom practices. Although private primary schools may have relatively better access to ICT resources, concerns remain regarding the extent to which these resources are effectively used to support 21st century teaching practices rather than for administrative or basic instructional purposes only. As a result of these challenges, classroom practices in many primary schools in Gombe State continue to be dominated by traditional, teacher-centred methods that may not adequately prepare pupils with the skills required for learning and living in a digital age. The gap between policy expectations and actual classroom practice raises concerns about equity, quality, and effectiveness in primary education across public and private schools. Therefore, the problem this study seeks to address is the limited and uneven utilization of ICT resources in enhancing 21st century classroom practices in public and private primary schools in Gombe State.

Purpose of the Study

The purpose of this study is to determine ICT resource utilization in enhancing 21st century classroom practices in public and private primary schools in Gombe State. Specifically, the study seeks to determine:

1. hardware utilization in enhancing 21st century classroom practices in public and private schools in Gombe State.
2. software utilization in enhancing 21st century classroom practices in public and private schools in Gombe State.

Research Questions

The following research questions guided the study

1. What is the extent of hardware utilization in enhancing 21st century classroom practices in public and private schools in Gombe State?
2. What is the extent of software utilization in enhancing 21st century classroom practices in public and private schools in Gombe State?

Hypotheses

The following null hypotheses formulated were tested at 0.05 level of significance.

1. There is no significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize hardware resources in enhancing 21st century classroom practices.
2. There is no significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize software resources in enhancing 21st century classroom practices.

Methods

The study adopted the descriptive survey research design. The population of the study consisted of all the (6,538 teachers) 4,384 teachers in public primary schools and 2154 teachers in private primary teachers in the 11 Local Government Education Authorities of Gombe State. The sample size comprised 875 teachers (525 teachers from public schools and 350 teachers from private schools) using the multi-stage sampling technique. Data for this study was a validated structured questionnaire titled "Questionnaire on ICT Resource Utilization and Classroom Practices" (QICTRUCP). The QICTRUCP is divided into two sections A and B. Section A elicits demographic profile of the respondents. Section B is sub-divided into two clusters. Cluster I covered items on the extent of hardware utilization in enhancing classroom practices; cluster II addressed concerns on the extent of software utilization in enhancing classroom practices. The rating scale of QICTRUCP is structured on a 5-point scale of Very Great Extent (VGE); Great Extent (GE); Moderate Extent (ME); Low Extent (LE); and Very Low Extent (VLE) on a weighted scale of 5, 4, 3, 2 and 1 respectively. The data collected were analyzed using Cronbach Alpha to measure the internal consistency of the instrument and reliability co-efficient values of 0.78 and 0.88 were obtained for the two clusters. The overall co-efficient value of 0.82 was obtained. Mean and standard deviation was used to answer the research questions while independent sample t-test was used to test the null hypotheses at 0.05 alpha level.

Results

Research Question 1: What is the extent of hardware utilization in enhancing 21st century classroom practices in public and private schools in Gombe State.

Table 1: Respondents' ratings on the extent of hardware utilization in enhancing 21st century classroom practices in public and private schools in Gombe State.

S/N	To what extent	Public x̄	SD	Decision	Private x̄	SD	Decision
1.	do you use desktop computers in teaching classroom lessons	2.60	0.95	High Extent	3.15	0.98	High Extent
2.	are projectors utilized to present instructional materials to pupils	2.27	1.11	Low Extent	2.75	1.23	High Extent
3.	do you use interactive whiteboards in delivering lessons	1.93	1.01	Low Extent	2.27	1.15	Low Extent
4.	are printers and scanners used for instructional materials preparation	2.16	1.07	Low Extent	2.32	1.08	Low Extent
5.	are tablets or digital pads provided and used by pupils during lessons	2.47	1.02	Low Extent	3.40	1.19	High Extent
6.	do you use audio systems (e.g., microphones, speakers) in classroom teaching	2.32	0.98	Low Extent	3.15	1.03	High Extent
7.	are laptops utilized by teachers for lesson preparation and delivery	2.43	0.93	Low Extent	3.61	1.17	High Extent
8.	do classrooms have functioning internet-enabled hardware (e.g., modems, routers)	2.33	1.04	Low Extent	2.49	1.28	Low Extent
9.	are digital cameras or webcams used for recording or interactive sessions	2.12	0.65	Low Extent	2.30	0.73	Low Extent
	Cluster Mean	**2.29**		**Low Extent**	**2.83**		**High Extent**

The analysis in Table one revealed that teachers in both public and private schools rated to a high extent item 1 with mean scores 2.60 and 3.15. On the other hand, teachers in both public and private primary schools rated to a low extent item 3 with mean scores 1.93 and 2.27; item 4 with mean scores 2.16 and 2.32; item 8 with mean scores 2.49 and 2.12 and item 9 with mean scores 2.12 and 2.30. The cluster mean of 2.29 summarized that, teachers in public primary schools to a low extent utilized hardware in enhancing 21st century classroom practices in public and private schools in Gombe State. More so, the cluster mean of 2.83 summarized that, teachers in private primary schools to a high extent utilized hardware in enhancing 21st century classroom practices in public and private schools in Gombe State. The standard deviation of 0.65 – 1.11 and 0.73 – 1.23 show that teachers do not vary too much in their ratings on hardware utilization in enhancing 21st century classroom practices.

Research Question 2: What is the extent of software utilization in enhancing 21st century classroom practices in public and private schools in Gombe State?

Table 2: Respondents' ratings on the extent of software utilization in enhancing 21st century classroom practices in public and private schools in Gombe State.

S/N	Items	Public $\bar{x}$	SD	Decision	Private $\bar{x}$	SD	Decision
10.	do you use word processing software (e.g., Microsoft Word) for preparing lesson notes?	2.45	0.62	Low Extent	3.26	0.75	High Extent
11.	is presentation software (e.g., PowerPoint, Google Slides) used during classroom teaching?	2.19	0.74	Low Extent	2.32	0.69	Low Extent
12.	are educational games or software applications used to enhance pupils' learning?	2.07	1.02	Low Extent	2.03	0.94	Low Extent
13.	do you use spreadsheet software (e.g., Microsoft Excel) for tracking pupils' progress?	2.03	0.92	Low Extent	2.06	0.88	Low Extent
14.	do you use digital learning platforms (e.g., Google Classroom) for classroom activities?	2.18	0.89	Low Extent	2.15	0.86	Low Extent
15.	is multimedia software (e.g., video editing tools) used for creating engaging lessons?	2.05	0.90	Low Extent	2.09	0.84	Low Extent
16.	do you use subject-specific software (e.g., math or science apps) in teaching?	2.06	0.99	Low Extent	2.07	1.08	Low Extent
17.	do you use assessment tools (e.g., Kahoot, Quizizz) for evaluating pupils' performance?	2.13	0.76	Low Extent	2.44	0.92	Low Extent
18.	is collaboration software (e.g., Google Docs) used for group projects or activities?	2.31	1.06	Low Extent	2.26	1.13	Low Extent
19.	is classroom management software (e.g., ClassDojo) utilized to manage pupil behavior?	1.84	1.02	Low Extent	2.20	1.01	Low Extent
	Cluster Mean	**2.13**		**Low Extent**	**2.08**		**Low Extent**

The result in Table 2 reveals that teachers in public primary schools to a low extent rated item 10 with mean score 2.45 while teachers in private schools to a high extent rated item 10 with mean score of 3.26. More so, teachers in both public and private schools to a low extent rated item 11 (with mean scores 2.19 and 2.32), item 12 (with mean scores 2.07 and 2.03), item 13 (with mean scores 2.03 and 2.06), item 14 (with mean scores 2.18 and 2.15), item 15 (with mean scores 2.05 and 2.09), item 16 (with mean scores 2.06 and 2.07), item 17 (with mean scores 2.13 and 2.44), item 18 (with mean scores 2.31 and 2.26) and item 19 (with mean scores 1.84 and 2.20). The cluster means of 2.13 and 2.08 summarized that, teachers in public and private schools rated to a low extent hardware utilization for enhancing 21st century classroom practices in public and private schools in Gombe State. The standard deviation of 0.62 – 1.06 and 0.65 – 1.13 show that teachers do not vary too much in their ratings on software utilization in enhancing 21st century classroom practices.

Table 3: t-test analysis on the significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize hardware resources in enhancing 21st century classroom practices

Variables	N	$\overline{X}$	SD	df	t-cal	p-value	α-value	Remark
Public	525	18.21	4.22					
				873	4.34	0.00	0.05	Significant
Private	350	19.25	4.55					

From Table 3, at 873 degree of freedom and t-cal value of 4.34; the p-value is less than 0.05 (df = 873; p < 0.05). This means that the null hypothesis is rejected therefore there is a significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize hardware resources in enhancing 21st century classroom practices

Table 4: t-test analysis on the significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize software resources in enhancing 21st century classroom practices

Variables	N	$\overline{X}$	SD	df	t-cal	p-value	α-value	Remark
Public	525	18.57	5.21					
				873	9.62	0.56	0.05	Not significant
Private	350	20.86	4.99					

From Table 3, at 873 degree of freedom and t-cal value of 9.62; the p-value is greater than 0.05 (df = 873; p > 0.05). This means that the null hypothesis is not rejected therefore there is no significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize software resources in enhancing 21st century classroom practices

Discussion of Findings

The finding in research question one revealed that teachers in public primary schools to a low extent utilized hardware in enhancing 21st century classroom practices in public and private schools in Gombe State while teachers in private schools utilized it on a high extent. This finding disagreed with the finding of George and Fomsi (2024) that teachers in public primary schools in Rivers State possessed the perceived computer skills such as Microsoft Word skill; Excel skill and PowerPoint skill at the basic level. More so, this finding aligns with that of Warschauer (2011) that private schools often have better funding and access to resources, enabling them to adopt advanced hardware tools such as interactive whiteboards, projectors, and laptops. Public schools, on the other hand, face budget constraints, leading to limited access to such resources. While disparities exist, some public schools have demonstrated effective hardware utilization when adequately supported. Hwang and Wu (2014) highlighted cases where public school teachers adopted hardware tools creatively despite limited resources, often relying on

innovative teaching strategies and community support. It is obvious that the difference in both findings was as a result of varying opinions of respondents based on geographical location.

The corresponding hypothesis revealed that there is a significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize hardware resources in enhancing 21st century classroom practices. The study indicates that there's a measurable difference between teachers in public schools and those in private schools regarding their use of hardware resources (like computers, projectors, tablets, etc.) for improving classroom practices that align with 21st-century learning (which emphasizes skills like collaboration, critical thinking, and technology integration). No study to the best of the researcher's knowledge established similar or related findings on this subject. This is a gap this finding therefore filled.

The finding in research question two revealed that teachers in both public and private schools rated to a low extent software utilization for enhancing 21st century classroom practices in public and private schools in Gombe State. Both public and private school teachers are reporting limited use of software resources (such as educational applications, learning management systems, or other digital tools) to support their teaching. This suggests a lack of integration of technology in facilitating modern learning experiences. This finding agreed with the findings of Danladi (2023) and Frumkin and El-Hussein (2016) that many teachers face challenges related to inadequate access to technology and lack of professional development. Their study found that teachers in developing regions often lack the skills needed to utilize educational software effectively, which aligns with the findings in Gombe State. The authors emphasize that without proper training and resources, teachers may struggle to incorporate technology into their lesson plans, resulting in low utilization rates.

The corresponding hypothesis revealed that there is no significant difference in the mean ratings of teachers in public and private schools in Gombe State on the extent they utilize software resources in enhancing 21st century classroom practices. This finding means that teachers in both public and private schools report similar levels of using software resources (like educational applications, learning management systems, or digital tools) to enhance their teaching practices aimed at fostering skills necessary for the 21st century. No findings to the best of the researcher's knowledge established similar or related findings on this subject. This is a gap this finding therefore filled.

Conclusion

The findings of this study reveal critical gaps in the utilization of hardware and software resources for enhancing 21st-century classroom practices in public and private schools in Gombe State. The low extent of hardware utilization in public schools underscores persistent challenges related to resource allocation, infrastructure, and teacher training. Meanwhile, the high utilization of hardware in private schools highlights the advantages of better funding and support mechanisms in the private sector. However, the low extent of software

utilization in both public and private schools signals a broader systemic issue, indicating a lack of emphasis on integrating software tools in teaching and learning processes. These disparities and shortcomings threaten the realization of equitable and transformative education, which is crucial for preparing students for the demands of the 21st century.

Recommendations

Based on the findings, the following recommendations were made:

1. Governments and stakeholders in Gombe State should prioritize funding to provide both hardware and software resources for public schools. Adequate investment is needed to bridge the resource gap between public and private schools, ensuring equitable access to modern teaching tools.
2. Regular and specialized training programs should be introduced to equip teachers in both public and private schools in Gombe State with the skills to integrate hardware and software effectively into classroom practices. These programs should focus on practical, hands-on experience with educational technologies.
3. Collaboration between government agencies and private organizations can facilitate the provision of technological resources, infrastructure, and capacity-building programs. Such partnerships can help improve resource availability in public schools.
4. Education policymakers should design and enforce policies that mandate the integration of both hardware and software resources into teaching and learning processes across all schools. Clear guidelines on the use of technology in classrooms should be developed and monitored

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