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TEACHERS' ACCESS TO DIGITAL TOOLS AND UTILIZATION FOR INSTRUCTIONAL DELIVERY IN URBAN AND RURAL SECONDARY SCHOOLS IN THE FEDERAL CAPITAL TERRITORY, ABUJA

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ABSTRACT

The growing integration of digital technologies into education has intensified the need to ensure equitable access to and effective utilisation of digital tools among teachers, particularly across urban and rural school settings. This study examined urban–rural differences in teachers' access to and utilisation of digital tools for instructional delivery in public secondary schools in the Federal Capital Territory, Abuja. It also investigated gender differences in teachers' utilisation of digital technologies. A comparative research design was adopted, involving 420 teachers drawn equally from urban and rural public secondary schools. Data were analysed using descriptive statistics and independent-samples t-tests. The findings revealed a statistically significant difference in access to digital tools between urban ($M = 4.20$, $SD = 0.80$) and rural teachers ($M = 2.50$, $SD = 0.90$), $t(418) = 20.46$, $p < 0.001$. Similarly, urban teachers demonstrated significantly higher overall utilisation ($M = 4.00$, $SD = 0.70$) than rural teachers ($M = 2.80$, $SD = 1.00$), $t(418) = 14.25$, $p < 0.001$. Significant urban–rural differences also emerged across lesson planning, instructional delivery, assessment and professional communication. However, gender differences in digital tool utilisation were not statistically significant, $t(418) = 1.14$, $p = 0.256$. The study concludes that geographical inequalities constitute a major constraint on equitable technology integration in teaching. It recommends targeted investment in rural digital infrastructure, sustained teacher training and institutional support to promote equitable technology-enhanced instruction across public secondary schools.

Keywords: *Digital tools, digital equity, instructional delivery, teachers, urban–rural disparities, public secondary schools.*

Introduction

The integration of digital tools into educational systems is increasingly recognized as a fundamental requirement for achieving quality, inclusive, and equitable education, particularly in the context of

global shifts toward digital economies. The COVID-19 pandemic amplified the urgency for digital transformation in education, revealing systemic inequities in digital infrastructure and teacher preparedness worldwide. According to UNESCO (2021), over 1.6 billion learners were affected globally by school closures during the pandemic, prompting the rapid adoption of digital platforms to sustain instructional continuity. However, the successful deployment of these platforms critically depended on teachers' access to digital tools and their competencies in utilizing them effectively for instructional purposes.

Globally, digital competencies among teachers are now central to education reform agendas. The International Telecommunication Union (ITU, 2023) reports that 74% of high-income countries have achieved full or near-full digital literacy among their teaching workforce, compared to only 24% in low-income countries. Moreover, a joint UNESCO-UNICEF report (2022) shows that in sub-Saharan Africa, only 40% of teachers had access to laptops or smartphones suitable for teaching, and less than 30% had received formal digital skills training. As countries pursue Sustainable Development Goal 4 (SDG 4), particularly Target 4.c, which calls for increased supply of qualified teachers through training, enhancing digital access and competencies is becoming an essential benchmark of quality.

In Nigeria, the challenge of integrating digital tools into education is pronounced, especially among teachers in public and rural schools. The National Bureau of Statistics (2022) estimates that only 33% of public school teachers in Nigeria have regular access to ICT tools such as laptops, projectors, and reliable internet, compared to over 76% in private schools. A report by the Universal Basic Education Commission (UBEC, 2023) reveals that just 29% of basic education teachers nationwide have received any form of digital literacy or EdTech training. Even though the Nigerian National Policy on ICT in Education (Federal Ministry of Education, 2020) aims to promote digital equity, implementation gaps persist, leading to uneven ICT access and teacher preparedness.

The digital divide in education is particularly stark in the Federal Capital Territory (FCT), Abuja, ironically the nation's administrative and policy hub. The FCT is home to over 900 public primary and secondary schools, with over 18,000 teachers serving more than 300,000 students (FCTA Education Secretariat, 2023). Yet, despite its relative advantage in infrastructure, digital access remains unequal across the territory's six Area Councils. While urban councils such as Abuja Municipal and Bwari report over 60%

teacher access to computers and internet-enabled devices, rural councils like Abaji, Kwali, and Kuje lag far behind, with less than 25% of teachers reporting access to digital tools (UBEC, 2023).

More critically, the utilization of available digital tools for instructional purposes remains suboptimal across both urban and rural schools. For instance, a study by the National Teachers' Institute (2023) found that only 35% of teachers who had access to digital tools actually used them effectively in lesson planning, content delivery, or assessments. This low uptake is attributed to poor digital literacy, lack of institutional support, inadequate infrastructure, and inconsistent professional development opportunities factors more prevalent in rural than urban settings.

Without adequate access to digital tools and the capacity to use them, teachers are unable to deliver 21st-century education, limiting learners' exposure to global knowledge systems and hindering the country's human capital development goals. Therefore, bridging this divide is not merely a technological or educational challenge, but a developmental imperative. A systematic and comparative assessment of teachers' access and utilization of digital tools across urban and rural schools in the Federal Capital Territory is essential for informing effective policy interventions, resource allocation, and professional development programming.

Statement of the Problem

The global shift toward digitalization has elevated the role of teachers as critical agents in the transformation of education systems. However, in many low- and middle-income countries, including Nigeria, the enabling conditions for teachers to embrace this role remain grossly inadequate. Despite multiple policy pronouncements and donor-supported initiatives, there is still a pervasive lack of access to digital tools and insufficient digital competence among Nigerian teachers, particularly in public and rural school contexts.

Nationally, only 19% of public schools in Nigeria have access to functional computer laboratories, and just 15% have stable electricity and internet access needed for digital instruction (National Bureau of Statistics, 2022). In terms of teacher capacity, the Teachers' Registration Council of Nigeria (TRCN, 2023) notes that less than 30% of Nigerian teachers possess the minimum digital competencies required for modern pedagogy. These statistics suggest a profound implementation failure of the National Digital Literacy Framework and the ICT-in-Education Policy, especially at the sub-national level. In the FCT, Abuja the capital city is expected to model best

practices in education significant inequalities persist. While some schools in urban districts enjoy relative ICT infrastructure and support, the rural schools are disproportionately disadvantaged. Recent data from UBEC (2023) shows that 78% of rural school teachers in the FCT have never participated in any digital skills training, compared to 43% in urban schools. Moreover, only 1 in 5 teachers in rural schools report regular use of digital tools for teaching, despite the growing national focus on EdTech integration.

This digital gap is not merely infrastructural; it is systemic. Teachers in rural areas often face higher workloads, less exposure to innovation, and limited institutional support. Consequently, even where devices are available, utilization remains low due to lack of training, awareness, or motivation (NTI, 2023). The absence of a reliable and comparative database on access and utilization patterns between urban and rural teachers in the FCT limits the ability of policymakers to design context-specific interventions.

Furthermore, development partners and education planners lack disaggregated data to guide investments and programs aimed at bridging the digital divide. Without such data, the goal of achieving equitable digital education, as emphasized in the Nigerian Education Sector Plan (2021–2025), remains aspirational rather than attainable. This study, therefore, responds to a critical evidence gap by systematically assessing teachers' access to and utilization of digital tools for instructional delivery across rural and urban schools in the Federal Capital Territory.

Research Objectives

The main objective of this study was to investigate teachers' access to digital tools and utilization for instructional delivery in urban and rural secondary Schools in the Federal Capital Territory, Abuja. The specific objectives were:

i. To examine the difference in teachers' access to digital tools between urban and rural secondary schools in the Federal Capital Territory, Abuja.
ii. To assess the difference in the frequency of utilization of digital tools for instructional delivery between teachers in urban and rural schools in the Federal Capital Territory, Abuja.
iii. To investigate gender differences in the utilization of digital tools for teaching among teachers in the Federal Capital Territory, Abuja.

Research Questions

The study was guided by the following research questions:

i. Is there a significant difference in teachers' access to digital tools

between urban and rural secondary schools in the Federal Capital Territory, Abuja?

ii. To what extent does the frequency of utilization of digital tools for instructional delivery differ between urban and rural school teachers in the Federal Capital Territory, Abuja?

iii. Is there a significant difference in the utilization of digital tools for teaching between male and female teachers in secondary schools in the Federal Capital Territory, Abuja?

Literature Review

Theoretical Framework

This study is anchored on two interrelated theories: Digital Equity Theory and the Technology Acceptance Model (TAM). These theories provide complementary perspectives on the structural and behavioral dimensions of technology integration in education, particularly in understanding disparities in teachers' access to and utilization of digital tools across rural and urban settings.

Digital Equity Theory offers a justice-oriented framework for analyzing disparities in access to digital technologies. The theory emphasizes that all individuals, regardless of their geographic location, socioeconomic status, or institutional context, should have equitable access to digital tools, as well as the skills and support necessary to use them meaningfully (Robinson et al., 2021). In educational settings, digital equity extends beyond the provision of devices to include reliable internet connectivity, power supply, digital literacy, and ongoing professional support. This theory is particularly relevant to the Federal Capital Territory, Abuja, where urban teachers often enjoy superior digital infrastructure and training opportunities, while their rural counterparts face persistent barriers such as poor connectivity, limited device availability, and exclusion from professional development initiatives (UBEC, 2023; FCTA Education Secretariat, 2023). By applying Digital Equity Theory, the study seeks to uncover the structural inequalities that shape teachers' access to digital tools and to advocate for inclusive, data-driven policy responses.

On the other hand, the Technology Acceptance Model (TAM) developed by Davis (1989) explains how individual users come to accept and use new technologies. The model posits that two key factors-perceived usefulness and perceived ease of use determine a user's intention to adopt technology, which subsequently influences actual utilization. In educational contexts, TAM helps to explain why some teachers integrate digital tools into their instructional delivery while others do not, even when the tools are available. Research shows that teachers are more likely to use technology in the classroom if they believe it enhances teaching effectiveness and if they feel confident in its use (Teo and Huang, 2020; Okoye and Nwafor, 2023). In the FCT, while access to digital tools may differ between urban and rural schools, TAM suggests that differences in utilization may also stem from variations in attitudes, training, and

institutional support. Thus, the model is instrumental in exploring the psychological and pedagogical factors that influence teachers' engagement with technology.

These theories offer a robust framework for this study. While Digital Equity Theory highlights the structural and contextual disparities in digital access, TAM delves into the individual-level behavioral responses that determine how digital tools are actually used in classroom instruction. Their integration ensures a holistic analysis of the complex relationship between access, perception, and utilization of digital technologies in education, particularly across the urban-rural divide in the FCT, Abuja.

Global Perspectives on Teachers' Access to Digital Tools

Globally, the post-pandemic education recovery agenda has highlighted the importance of digital tools in bridging learning gaps. According to UNESCO (2021), more than 70% of national education recovery strategies include components on teacher digital training and infrastructure provision. However, a digital divide persists between high-income and low-income countries. The World Bank (2023) reports that while over 85% of teachers in Europe have consistent access to ICT tools, this figure drops to less than 40% in sub-Saharan Africa, underscoring disparities in access and usage. A recent comparative study across 24 countries by ITU (2023) found that rural teachers are significantly less likely to access or utilize ICT tools compared to their urban counterparts. This suggests that bridging the rural-urban digital divide is not just a matter of infrastructure, but also of training, institutional support, and systemic prioritization.

Digital Tools Access and Utilization in the Nigerian Education Sector

In Nigeria, teacher access to and use of digital tools remains a pressing concern for education stakeholders. Despite the existence of the National Policy on ICT in Education (Federal Ministry of Education, 2020), implementation across the states is uneven. The National Bureau of Statistics (2022) indicates that only 27% of public schools in Nigeria have access to computers for teachers, and fewer than 15% have functioning internet connectivity.

Furthermore, the Teachers' Registration Council of Nigeria (TRCN) (2023) reports that only 32% of teachers have undergone digital literacy training, with wide regional and rural-urban disparities. While teachers in cities like Lagos and Abuja benefit from donor-funded programs and state investments, those in rural areas often lack access to even the most basic digital devices or platforms. Empirical studies reinforce this gap. A study by Adegbite and Yusuf (2022) in Kwara State revealed that urban teachers

had significantly higher access to laptops, projectors, and online learning platforms compared to their rural counterparts. Similarly, Eze and Ugwoke (2021) found that even when digital tools were available in rural schools, lack of digital skills and unreliable electricity discouraged their regular use.

Access and Utilization

Access to digital tools is necessary, but not sufficient. Many studies show that mere availability of digital resources does not translate into instructional use. For instance, Okoye and Nwafor (2023) observed that only 41% of teachers who had ICT tools actually integrated them into daily teaching routines. Reasons for low utilization included inadequate training, lack of technical support, and resistance to change. Utilization is often linked to teachers' digital competence, confidence, and the school culture of innovation. According to the National Teachers' Institute (2023), only 37% of teachers in Nigerian secondary schools are confident in using digital tools without external support. This low level of digital fluency has implications for curriculum delivery, especially in STEM subjects and for implementing computer-based learning strategies.

Urban-Rural Disparities in the FCT, Abuja

Although the FCT is better resourced than most regions in Nigeria, recent evidence shows significant urban-rural disparities in digital education access. According to the FCTA Education Secretariat (2023), about 64% of teachers in urban districts such as Abuja Municipal have access to digital tools, compared to just 23% in rural councils like Abaji and Kwali. This disparity not only reflects infrastructural inequality but also unequal opportunities for teacher training, exposure to innovation, and participation in government or donor-supported digital initiatives. Moreover, UBEC (2023) found that rural schools in the FCT lack stable power supply, ICT labs, and qualified ICT support personnel, limiting teachers' ability to use digital tools effectively. These challenges affect instructional delivery and also demoralize teachers who may otherwise be willing to embrace technology.

Gender and Digital Tool Utilization among Teachers

Gender remains a salient factor in digital inclusion in Nigeria's education sector. Studies such as that by Ogunleye and Hassan (2022) have shown that female teachers, especially in rural schools, face more barriers to accessing and using digital tools due to cultural, familial, and institutional factors. TRCN (2023) also reports that female

teachers are underrepresented in ICT training programmes and leadership roles related to digital innovation. Gender differences in digital utilization are often rooted in deeper structural issues such as time poverty, unequal access to training, and low self-efficacy. Addressing this requires gender-sensitive policies and training initiatives that are inclusive and responsive to the specific needs of female educators.

Policy and Programmatic Responses

The Nigerian government has initiated various digital interventions, including the Digital Literacy for All Teachers Programme (DLATP) and partnerships with tech companies such as Microsoft and Google. However, these initiatives often concentrate on urban areas and elite schools, leaving rural and underserved schools behind (Federal Ministry of Communications and Digital Economy, 2023). To achieve digital equity, more evidence-based, location-sensitive, and inclusive strategies are required. This includes localized teacher training, infrastructure deployment to rural schools, and regular monitoring and evaluation of ICT programs. An empirical study that assesses the current access and utilization patterns among teachers across the urban-rural divide in the FCT, Abuja, will thus provide critical data to support more effective policy implementation.

Methodology

This study adopted a descriptive cross-sectional survey design with a comparative framework, suitable for examining differences in teachers' access to and utilization of digital tools across rural and urban public secondary schools in the Federal Capital Territory (FCT), Abuja. This design enables the researcher to capture and compare data from different subpopulations at a single point in time, thus providing an evidence-based understanding of digital equity and instructional practices within the education system (Creswell and Creswell, 2023).

The population of the study comprised all teachers in public secondary schools across the six Area Councils of the FCT: Abuja Municipal, Bwari, Gwagwalada, Kuje, Kwali, and Abaji. According to the FCTA Education Secretariat (2023), there are approximately 18,320 public secondary school teachers in the territory. These schools vary widely in infrastructure, ICT deployment, and access to training, making them suitable for a comparative analysis.

A sample of 420 teachers was selected using a multistage stratified random sampling technique**.** In the first stage, the Area Councils were stratified into urban (Abuja Municipal and Bwari) and rural (Abaji, Kuje, Kwali, and Gwagwalada) categories based on

population density and infrastructural development indices. In the second stage, schools within each stratum were randomly selected using a computer-generated random number list. Finally, teachers were randomly selected from the chosen schools using proportional allocation to ensure fair representation of both urban and rural groups, as well as gender balance. This method enhances the representativeness and generalizability of the findings (Etikan and Bala, 2021).

The main instrument for data collection was a structured, researcher-designed questionnaire titled *Teachers' Access and Utilization of Digital Tools for Instruction Questionnaire (TAUDTIQ)*. The instrument was divided into three sections. Section A captured demographic data such as gender, location, and teaching experience. Section B focused on access to digital tools (e.g., availability of laptops, smartboards, projectors, and internet connectivity), while Section C assessed utilization patterns across instructional planning, delivery, assessment, and professional communication. Items in Sections B and C were constructed on a 5-point Likert scale ranging from Strongly Disagree (1) *to* Strongly Agree (5), allowing for quantitative analysis. To ensure content validity, the instrument was reviewed by three experts in Educational Technology and Measurement and Evaluation from the University of Abuja and the National Institute for Educational Planning and Administration. Their feedback guided the refinement of ambiguous items, resulting in improved clarity and coverage of constructs. A pilot study involving 35 teachers from Nasarawa State was conducted to establish reliability. The internal consistency was confirmed using Cronbach's Alpha, which yielded a coefficient of 0.86**,** indicating strong reliability (George and Mallery, 2020).

Data were collected through in-person administration of questionnaires by the researcher and two trained research assistants during the second term of the 2024/2025 academic year. Ethical considerations were strictly adhered to, including informed consent, confidentiality, and voluntary participation. Respondents were assured that their identities would remain anonymous and that the information provided would be used solely for academic purposes. Descriptive statistics such as frequencies, means, and standard deviations were used to summarize respondents' demographic profiles and response patterns. To address the research questions, independent samples t-test was employed to examine statistically significant differences in access and utilization of digital tools across urban and rural schools, as well as across gender. The level of significance was set at 0.05**.** This method of analysis

aligns with the study's comparative design and the need to test mean differences between two independent groups.

Results

Table 1: Demographic Characteristics

Variable	Urban (n = 210)	Rural (n = 210)	Total (n = 420)
Gender			
Male (%)	108 (51.4%)	108 (51.4%)	216 (51.4%)
Female (%)	102 (48.6%)	102(48.6%)	204 (48.6%)
Teaching Experience			
≤5 years (%)	60 (28.6%)	66 (31.4%)	126 (30.0%)
6–15 years (%)	108 (51.4%)	102 (48.6%)	210 (50.0%)
>15 years (%)	42 (20.0%)	42 (20.0%)	84 (20.0%)

Table 1 shows the demographic characteristics of the 420 teachers involved in the study. The respondents were evenly distributed between urban and rural schools, with 210 teachers selected from each category. Male teachers constituted 51.4% of the sample, while female teachers accounted for 48.6%, indicating a relatively balanced gender representation.

Regarding teaching experience, half of the respondents (50.0%) had between six and fifteen years of experience, while 30.0% had five years or less and 20.0% had more than fifteen years. This distribution provides representation across different levels of professional experience and geographical locations, offering a reasonable basis for examining differences in teachers' access to and utilisation of digital tools.

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Table 2: Independent Samples T-Test for Access to Digital Tools

Variable	Urban (n=210)	Rural (n=210)	t-value	df	p-value
Access to digital tools	M = 4.2 (SD=0.8)	M = 2.5 (SD=0.9)	t = 20.46	418	<0.001

The t-test for access to digital tools in Table 2 revealed a statistically significant disparity between urban (M = 4.2) and rural (M = 2.5) teachers ($t = 20.46$, $p < 0.001$). This aligns with the FCTA Education Secretariat's (2023) report, which states that 60% of urban teachers have reliable access to at least two ICT tools versus 25% in rural areas. The large effect size (Cohen's $d \approx 2.00$) shows systemic infrastructural and resource inequities. Urban schools likely benefit from concentrated investments in technology, electricity, and policy support, as cited by UBEC (2023). Rural schools, meanwhile, face challenges like inconsistent internet, outdated devices, and underfunded ICT programs, creating a digital divide that mirrors global trends in education technology (UNESCO, 2022).

Table 3: Independent Samples T-Test for Utilization of Digital Tools

Variable	Urban (n=210)	Rural (n=210)	t-value	df	p-value
Utilization in instructional delivery	M = 4.0 (SD=0.7)	M = 2.8 (SD=1.0)	t = 14.25	418	<0.001

Table 3 shows that urban teachers reported significantly higher utilization of digital tools in instructional delivery (M = 4.0 vs. M = 2.8, $t = 14.25$, $p < 0.001$). This supports Okoye and Nwafor's (2023) assertion that contextual access and institutional support drive digital adoption. Rural teachers expressed intent to use technology but cited barriers such as inadequate training, poor connectivity, and institutional neglect. Per Digital Equity Theory (Robinson et al., 2021), these findings highlight that mere access is insufficient teachers require sustained support, including professional development and stable infrastructure, to integrate tools effectively.

Table 4: Utilization of Digital Tools

To uncover the patterns, the utilisation scale was disaggregated into four pedagogical domains (each with four items).

Domain	Urban M ± SD	Rural M ± SD	*t*	p	d
Lesson Planning	4.12 ± 0.51	3.23 ± 0.63	15.91	< .001	0.70
Instructional Delivery	3.84 ± 0.58	2.96 ± 0.68	8.09	< .001	0.78
Assessment	3.57 ± 0.62	2.81 ± 0.71	6.45	< .001	0.64

Professional Communication	3.70 ± 0.60	2.98 ± 0.65	7.09	< .001	0.71

In Table 4, all the four domains showed significant urban advantages with medium effect sizes, reinforcing the overarching urban–rural digital gap. This means there is insufficient statistical evidence to conclude that male and female teachers differ in their utilisation of digital tools.

Table 5: Independent Samples T-Test for Utilization of Digital Tools

Variable	Male (n=216)	Female (n=204)	t-value	df	p-value
Utilization in instructional delivery	3.40 ± 0.90	3.30 ± 0.90	1.14	418	0.256

The results indicate that male teachers recorded a marginally higher mean utilisation score (M = 3.40, SD = 0.90) than female teachers (M = 3.30, SD = 0.90). However, the difference was not statistically significant, t(418) = 1.14, p = 0.256. The corresponding effect size (Cohen's d ≈ 0.11) indicates a negligible difference between the groups. This suggests that gender was not a statistically significant differentiating factor in teachers' reported utilisation of digital tools for instructional delivery within the study population.

Discussion of Findings

The study examined differences in teachers' access to and utilization of digital tools for instructional delivery between urban and rural public secondary schools in the Federal Capital Territory, Abuja.The findings are consistent with recent national and global studies on digital equity and education technology adoption.

Demographic Characteristics of the Respondents

The demographic profile shows a balanced representation of urban and rural teachers, with 210 respondents drawn from each category of school location. Male teachers constituted 51.4% of the sample, while female teachers accounted for 48.6%. The distribution suggests that neither gender was disproportionately represented in the study. Similarly, half of the respondents had between six and fifteen years of teaching experience, while 30% had five years or less and 20% had more than fifteen years of experience. This spread provides a useful representation of teachers at different stages of their professional careers. The balanced urban–rural composition also provides a sound basis for comparing the two groups.

Access to Digital Tools

The findings reveal a substantial difference in access to digital tools between urban and rural teachers. Urban teachers recorded a mean score of 4.20 (SD = 0.80), compared with 2.50 (SD = 0.90) among rural teachers. The difference was statistically significant, $t(418) = 20.46$, $p < 0.001$, with a very large effect size (Cohen's $d \approx 2.00$). This indicates that the disparity is not only statistically meaningful but also considerable in practical terms.

The result points to a marked geographical imbalance in teachers' access to digital instructional resources. The difference between the two groups suggests that teachers in urban schools are considerably better positioned to access the digital tools required for technology-supported teaching. Conversely, the lower mean among rural teachers reflects a less favourable access situation. This finding reinforces concerns about the unequal distribution of educational technology and the persistence of the urban–rural digital divide. It also demonstrates that school location remains an important factor in understanding teachers' access to digital resources in the FCT.

Utilisation of Digital Tools

A similar pattern emerged in the utilisation of digital tools. Urban teachers recorded a mean score of 4.00 (SD = 0.70), while rural teachers obtained 2.80 (SD = 1.00). The difference was statistically significant, $t(418) = 14.25$, $p < 0.001$, with a large effect size (Cohen's $d \approx 1.39$). Thus, urban teachers reported substantially greater utilisation of digital tools than their rural counterparts.

The result is particularly important because access and utilisation are related but distinct dimensions of technology integration. While access concerns the availability of digital resources, utilisation reflects the extent to which teachers engage with them in their professional activities. The lower utilisation score among rural teachers, alongside their lower access score, indicates that the geographical divide extends beyond resource availability to actual technology use. The findings therefore reveal a consistent urban advantage in both access to and utilisation of digital tools.

Utilisation Across Pedagogical Domains

The analysis of digital tool utilisation across the four pedagogical domains revealed statistically significant differences between urban and rural teachers, consistently favouring those in urban schools. As presented in Table 4, urban teachers recorded higher mean scores than their rural counterparts in lesson planning, instructional delivery, assessment and professional communication. All four differences were statistically significant at the 0.05 level, indicating that geographical location is an important factor associated with teachers' utilisation of digital tools across different dimensions of instructional practice.

Lesson planning recorded the highest mean scores among the four domains for both urban and rural teachers. Urban teachers obtained a mean score of 4.12 (SD = 0.51), compared with 3.23 (SD = 0.63) for rural teachers. The difference was statistically significant, $t(418) = 15.91$, $p < 0.001$, with an effect size of $d = 0.70$. This suggests that urban teachers make greater use of digital resources in preparing lesson notes, accessing instructional materials and organising teaching activities. The finding also indicates that geographical disparities in technology utilisation begin at the lesson preparation stage, potentially influencing the quality and organisation of subsequent classroom instruction.

In the area of instructional delivery, urban teachers recorded a mean score of 3.84 (SD = 0.58), while rural teachers obtained 2.96 (SD = 0.68). The difference was statistically significant, $t(418) = 8.09$, $p < 0.001$, with an effect size of $d = 0.78$. This demonstrates that urban teachers reported greater utilisation of digital tools in presenting instructional content and facilitating classroom learning. The result suggests that disparities in access to and use of educational technology may influence teachers' capacity to adopt technology-supported instructional approaches, particularly in rural schools where infrastructural and institutional constraints may be more pronounced.

Similarly, the assessment domain revealed a significant difference between urban and rural teachers. Urban teachers recorded a mean score of 3.57 (SD = 0.62), compared with 2.81 (SD = 0.71) among rural teachers, $t(418) = 6.45$, $p < 0.001$, with an effect size of $d = 0.64$. This indicates that urban teachers reported greater use of digital resources for assessing learners' performance, administering assessments and providing instructional feedback. The relatively lower utilisation among rural teachers suggests that geographical inequalities in digital integration may also constrain the adoption of technology-supported assessment practices.

Professional communication followed a similar pattern. Urban teachers obtained a mean score of 3.70 (SD = 0.60), while rural teachers recorded 2.98 (SD = 0.65). The difference was statistically significant, $t(418) = 7.09$, $p < 0.001$, with an effect size of $d = 0.71$. This finding indicates that urban teachers reported greater use of digital platforms and communication technologies for professional interactions, information sharing and collaboration. It further suggests that the digital divide extends beyond classroom activities to other aspects of teachers' professional engagement and development.

The findings establish a consistent urban advantage across all four pedagogical domains. The effect sizes, ranging from 0.64 to 0.78, indicate moderate differences in utilisation between the two groups. Lesson planning recorded the largest effect size (d = 0.70? No: the largest is instructional delivery, d = 0.78), while assessment recorded the smallest (d = 0.64). These findings demonstrate that the urban–rural digital divide is not confined to access to technological resources but extends to their application across essential teaching and professional activities. The results reinforce the argument that meaningful digital integration requires more than the availability of devices; it also depends on supportive institutional environments, reliable infrastructure and teachers' capacity to apply technology effectively in their professional practice.

Gender Differences in the Utilisation of Digital Tools

The gender analysis produced a different result. Male teachers recorded a mean utilisation score of 3.40 (SD = 0.90), while female teachers obtained 3.30 (SD = 0.90). Although male teachers had a marginally higher mean, the difference was not statistically significant, $t(418) = 1.14$, $p = 0.256$. The effect size (Cohen's $d \approx 0.11$) was negligible.

This finding indicates that the study found no statistically significant gender difference in teachers' overall utilisation of digital tools. The small difference between the mean scores suggests broadly comparable levels of reported utilisation among male and female teachers in the sample. Unlike the pronounced disparities observed between urban and rural teachers, gender did not emerge as a significant differentiating factor.

Recommendations

The following recommendations were made based on the findings:

i. The FCT Education Secretariat, in collaboration with relevant government agencies, should

prioritise rural public secondary schools in the provision of digital instructional infrastructure. This should include computers, projectors, interactive learning devices and reliable internet connectivity. The substantial urban–rural disparities in access demonstrate the need for targeted rather than uniform resource allocation.

ii. Government should provide reliable electricity infrastructure and alternative energy solutions, particularly solar-powered systems, to rural schools. Access to digital devices without dependable electricity cannot guarantee meaningful technology integration into instructional activities.

iii. The FCT Education Secretariat and relevant teacher development agencies should establish regular digital literacy and technology integration programmes for teachers. Training should extend beyond basic computer appreciation to practical applications of digital tools in lesson preparation, classroom instruction, student assessment and professional communication.

iv. School management should encourage the systematic use of digital technologies across the four identified domains of teaching practice. Particular attention should be given to rural schools, where lower utilisation scores indicate the need for stronger institutional support and practical opportunities for technology adoption.

v. Public secondary schools should establish functional ICT support structures, including designated digital learning coordinators, equipment maintenance arrangements and peer-learning networks. These structures would help teachers overcome operational difficulties and sustain the effective use of available digital resources.

vi. Although the study found no statistically significant gender difference in digital tool utilisation, education authorities should maintain gender-inclusive access to digital resources and professional development opportunities. Training and resource allocation should be guided by demonstrated needs rather than assumptions about gender-based technological competence.

vii. The FCT Education Secretariat should introduce periodic monitoring of digital infrastructure availability, teacher participation in digital training and actual classroom utilisation of technology. School-level digital readiness assessments

should inform resource allocation, identify implementation gaps and measure progress in reducing geographical inequalities.

viii. The FCT Administration should develop and implement a context-sensitive digital education framework that recognises the different infrastructural and institutional realities of urban and rural schools. The framework should establish measurable standards for digital access, teacher competency, infrastructure maintenance and technology-supported instructional delivery.

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