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BRIDGING THE DIGITAL DIVIDE IN CURRICULUM DELIVERY: ASSESSMENT OF THE IMPACT OF TECHNOLOGY AVAILABILITY AND ACCESSIBILITY ON TEACHING AND LEARNING

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ABSTRACT

The study assessed the influence of educational technology on teaching and learning in basic schools in the Oti Region, with focus on availability, accessibility, and implementation challenges. Guided by the Technology Acceptance Model and Digital Divide theories, the study employed a concurrent mixed-methods approach. Data were collected from 231 respondents using structured questionnaires and semi-structured interviews. The respondents included 50 teachers, 25 head teachers, 150 students, 5 district education officers, and one regional official. The findings revealed a significant lack of ICT resources, especially in rural schools. Although some urban basic schools had a limited number of computers, they lacked internet access and adequate teacher training, which hindered effective integration of technology into teaching. It concluded that despite these challenges, both teachers and students recognized the potential of ICT to enhance engagement and improve learning outcomes and improvement on availability, accessibility and usage would improve curriculum delivery in the Oti Region. The study therefore recommends increased investment in ICT infrastructure, the training of ICT professionals for basic schools, and policy reforms by the Ghana Education Service to promote digital learning in the Oti Region.

Keywords: Digital Divide, Educational Technology, Information and Communication Technology (ICT), Availability, Accessibility, Curriculum

INTRODUCTION

BACKGROUND TO THE STUDY

Education is universally recognized as a cornerstone of human capital development and national advancement Obizue and Enomah (2025). In the digital age, the integration of Information and Communication Technology (ICT) into education is critical for transforming teaching and learning Grabe and Grabe (2007). ICT integration enhances learning experiences, fosters student engagement, and broadens access to educational resources Ahmad et al. (2023). It involves the implementation of infrastructure, digital tools, innovative pedagogy, assessment systems, research, administration, professional development, student support services, collaboration, and accessibility measures.

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Globally, educational technology has been linked to improved student engagement, enhanced knowledge retention, the development of 21st-century skills, and the creation of interactive learning environments Smaldino et al. (2005), Bitter and Pierson (2005), Bransford et al. (2006), Wiske et al. (2005). ICT has transformed teaching and learning by promoting interactive and collaborative educational settings Saravanakumar (2018), Shoraevna et al. (2021). However, despite its recognized benefits, ICT integration often encounters barriers, especially in resource-constrained environments, such as inadequate infrastructure, limited digital skills, and pedagogical challenges.

In 2019, Ghana introduced the Standards-Based Curriculum (SBC), marking a significant shift towards student-centered, technology-enhanced pedagogy at the basic education level Ministry of Education (2019). The SBC emphasizes Mathematics, English Language, Science, Creative Arts, and Computer Literacy Danquah and Poku (2024). Furthermore, the curriculum mandates the integration of ICT across all subjects to prepare students for participation in a globalized world and the future job market. It also promotes group work, lifelong learning, inclusive education, gender equality, and the preservation of Ghanaian cultural values Asante et al. (2024).

Despite these reforms, practical implementation remains a challenge. Many institutions, particularly in rural areas, struggle to meet ICT integration goals due to infrastructural deficits, insufficient teacher training, and systemic issues like inconsistent electricity supply Bice (2021), Asare et al. (2023), Enrique (2018), Singhavi and Basargekar (2019), Tondeur et al. (2018). Studies reveal a lack of comprehensive understanding of these challenges across different educational levels and regions Hennessy et al. (2010).

In Ghana's Oti Region, schools in rural districts face persistent obstacles, including limited access to digital resources, low teacher competencies in ICT, and ICT infrastructural weaknesses, often compounded by frequent power outages Bolaji and Adoye (2012), Ghana Statistical Service, 2021, Asabere and Enguah (2023). The COVID-19 pandemic further exposed these gaps in digital readiness, highlighting the disparities in access and preparedness across the educational sector UNESCO (2023).

The integration of ICT in education in rural Ghana is severely constrained by the high cost of technology and persistent economic disparities, despite government initiatives to promote inclusive access Ghana Education Service (2022b), Cruz (2022), McCarty (2024). Broader African challenges such as geographical inequalities, weak infrastructure, and limited cultural adaptation further exacerbate the situation World Bank (2023), Ezumah (2020), Bekele et al. (2023). In rural Ghana, only 35% of schools have functional computers and fewer than 25% of teachers are ICT literate, resulting in lower instructional quality and contributing to rural students consistently scoring 20% lower than urban peers in core subjects Ghana Education Service (2022b), Adarkwah (2021), UNICEF (2020), Banini (2019). Infrastructure failures, particularly unstable electricity and internet access, undermine digital initiatives that lack backup or offline solutions Mukari (2019), Ezumah (2020), Martens et al. (2020). Socioeconomic barriers, including household poverty and non-functional ICT labs, further restrict access Economic Research Service (2024), Ghana Statistical Service (2021), M. Kombat, personal communication, March 2025). Meanwhile, policy implementation suffers from urban-centric investments and fragmented NGO efforts that fail to yield sustainable outcomes Martens et al. (2020), Mukuni (2019). Ultimately, rural students are disadvantaged not by their potential but by structural inequalities in resource allocation, infrastructure, and policy execution, raising critical concerns of social justice Darling-Hammond (1998), Banini (2019).

This is echoed by comparative experiences in countries like Indonesia and Kenya, where infrastructural deficits and low investment hinder meaningful ICT adoption Almanthari et al. (2020), Rahiem (2020b), Rodríguez-Abitia et al. (2020), Soomro (2015), Suárez-Rodríguez et al. (2018), Van et al. (2020), Bariu (2020), Graham (2020).

Although educational technology is widely recognized for its potential to increase student engagement, improve learning outcomes, and foster dynamic classroom interaction Smaldino et al. (2005), Bitter and Pierson (2005), Bransford et al. (2006), Wiske et al. (2005), its implementation in Ghana is hindered by persistent infrastructural limitations, insufficient teacher training in digital pedagogy Asabere and Enguah (2012), and stark urban-rural resource disparities Buabeng-Andoh (2022). Moreover, the gap between national ICT policy aspirations and their practical application at the school level remains a critical concern Agyei and Voogt (2012).

Given these persistent challenges, a comprehensive assessment of ICT readiness at the basic school level in the region is timely and necessary. This study, therefore, focuses on three critical dimensions: (1) the availability and accessibility of ICT resources, (2) the impact of technology use on teaching and learning, and (3) the barriers to effective ICT implementation in basic education.

By focusing on this under-researched area, the study contributes to the broader conversation on technology integration in low-resource settings Baldezamo et al. (2024). It also offers evidence-based recommendations to inform policy reforms and practical strategies aimed at bridging the digital divide and improving educational outcomes in the Ghanaian basic education sector.

STATEMENT OF THE PROBLEM

The teaching profession in Ghana is navigating significant challenges amid a rapidly evolving educational landscape. In 2019, the Ghana Education Service (GES), in collaboration with the National Council for Curriculum and Assessment (NaCCA) and the Ministry of Education (MoE), introduced the Standards-Based Curriculum (SBC) for basic schools spanning from kindergarten to primary six Ghana Education Service (2019). This curriculum marked a significant policy shift, requiring a transition from traditional teacher-

centred approaches to student-centred and technology-enhanced learning. The aim was to promote active learner participation, critical thinking, and the integration of digital tools in teaching and learning processes. Although aligned with global best practices for digital-age education UNESCO (2022), a substantial gap persists between policy intentions and actual classroom practices, particularly in rural areas in Ghana.

Recent studies highlight critical barriers to effective technology integration in Ghana's basic schools. Infrastructure remains a major constraint, with 85% of schools lacking functional computer laboratories and only 23% having reliable internet access Ghana Education Service (GES) (2022). A report by Africa Education Watch further reveals severe ICT deficits, especially in deprived areas. Of 1,033 marginalized schools assessed, only 2% have functional ICT labs, despite Computing being part of the national curriculum. Yet, 49% still attempt to teach Computing without proper tools. In endowed schools, just 8% have ICT labs, though 52% teach Computing. The report also highlights a critical electricity gap where only 37% of deprived schools have power, compared to 77% in better-off areas hindering ICT use and undermining digital skills and STEM education nationwide Africa Education Watch (2024). The architecture design of Basic school classroom in Ghana does not have space for computer laboratory.

In this digital era, ICT use in the classroom is important for giving both students and teachers opportunities to learn and apply the required 21st century skills Asabere and Enguah (2012). Pedagogical limitations impede progress in teaching where some teachers still relying on chalk-and-talk methods due to insufficient training on the use digital tools for instruction in Ghana. Systemic issues such as frequent power outages affecting schools in the region compound Africa Education Watch (2024).

The consequences of no technology in the classroom are measurable, because research indicate that student performance in STEM subjects lags 22% behind national targets in technology-deprived schools West African Examinations Council (2022). Only 31% of teachers demonstrate proficiency in integrating ICT into their teaching (NTCE) (2023), and student engagement in learning is lower in classrooms without technology support Buabeng-Andoh (2015).

In this context, it is critical to examine the disconnection between Ghana's technology integration policies and their implementation at the basic school level. This study focuses on exploring three dimensions: the availability of ICT resources, their accessibility to teachers and students, and the challenges impeding effective use. This investigation addresses gaps highlighted in recent literature, including last-mile implementation issues Agyei and Voogt (2011), urban-rural digital divides World Bank (2023), and teacher preparedness for 21st-century pedagogy OECD (2022).

By focusing on these areas through the lens of the Standards-Based Curriculum, the study seeks to generate evidence-based insights to inform educational technology strategies in Ghanaian basic schools. The study is aimed to contribute to the global conversation on promoting equitable digital learning opportunities in low-resource learning environments. The study's research questions align directly with its purpose by examining the availability and accessibility of ICT resources, as well as the challenges affecting their use. Together, they provide a structured framework for assessing ICT readiness and identifying strategies to bridge the digital divide in basic education in the region.

PURPOSE OF THE RESEARCH

The purpose of the research is to assess the ICT readiness of basic schools in Oti Region by examining the availability and accessibility of educational technology resources, and the challenges affecting their implementation in teaching and learning.

RESEARCH QUESTIONS

This research is guided by the following questions:

1) What is the impact of the availability of educational technology resources on administration, teaching and learning in basic schools?
2) What is the effect of the accessibility of educational technology resources on administration, teaching and learning in basic schools?
3) What are the challenges in the implementation of educational technology in teaching and learning in basic schools?

SIGNIFICANCE OF THE STUDY

The research provides policymakers and education stakeholders with empirical data on the status of ICT readiness in rural basic schools, aiding in the formulation of targeted interventions to bridge digital divide in Ghana especially in Oti Region. It assists school administrators and teachers in identifying practical strategies to improve ICT integration, thereby enhancing student engagement and academic performance. Additionally, the research contributes to the global discourse on equitable digital learning, offering insights relevant for low-resource and rural education contexts. Finally, future researchers can build upon the findings to explore broader aspects of technology integration in basic education in Ghana.

SCOPE OF THE STUDY

The study is geographically limited to basic schools in Oti Region of Ghana. Thematically, the research focuses on three main areas: availability, accessibility, and challenges in the implementation of educational technology in teaching and learning. The study population includes headteachers and classroom teachers of public and private basic schools in the municipality. The seasonal scope covers the 2024 – 2025 academic year.

SELECTED REVIEW OF LITERATURE

THEORETICAL FRAMEWORK

Theoretical frameworks provide the foundation for understanding and interpreting research findings. For this study, two key theories guide the investigation into ICT readiness in basic schools: the Technology Acceptance Model (TAM) and the Digital Divide Theory. These theories help explain the patterns of technology adoption and access disparities in educational contexts, particularly within low-resource settings like Oti region.

TECHNOLOGY ACCEPTANCE MODEL (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), offers a foundational perspective on how individuals come to accept and use new technologies. According to TAM, two primary factors determine technology adoption: perceived usefulness (PU) and perceived ease of use (PEOU) Chuttur (2009), Erebakyere and Agyei (2022), Granic and Marangunic (2019), King and He (2006), Lee et al. (2003), Legris et al. (2003), Marangunic and Granic (2015). Perceived usefulness refers to the extent to which a person believes that using a particular system will enhance their performance, while perceived ease of use is the degree to which one believes that using the system will be free from effort Granic and Marangunic (2019), Marangunic and Granic (2015).

In the context of education, TAM suggests that teachers and students are more likely to integrate ICT tools into teaching and learning when they perceive these tools as beneficial and user-friendly Erebakyere and Agyei (2022), Granic and Marangunic (2019), Marangunic and Granic (2015). However, in environments with limited technological infrastructure, lack of training, and systemic constraints as seen in many basic schools in Ghana both perceived usefulness and ease of use may be adversely affected, thus impeding technology integration Asabere and Enguah (2012), Erebakyere and Agyei (2022).

Applying TAM to this study provides a lens through which the relationship between availability, accessibility, and the actual utilization of ICT resources in Oti region basic schools can be critically examined.

DIGITAL DIVIDE THEORY

The Digital Divide Theory (DDT) addresses the inequalities in access to and use of information and communication technologies among different populations Norris (2001). It recognizes that factors such as geographic location, income, education level, and infrastructural development significantly influence digital inclusion Akca et al. (2007), Van and Van (2017), Hadjar (2025), Rizza (2024).

In educational contexts, the digital divide manifests in disparities between urban and rural schools, public and private institutions, and among students of varying socio-economic backgrounds Constancio (2025), Ragnedda and Muschert (2013), Olson et al. (2025), World Bank (2023). Rural schools, such as those in Oti region, often suffer from limited ICT infrastructure, inadequate internet connectivity, and fewer opportunities for teacher training compared to their urban counterparts Ghana Statistical Service. (2023).

By utilising the Digital Divide Theory, this paper explores how structural inequalities impact ICT readiness and highlights the specific barriers rural schools face in implementing technology-driven teaching and learning. It also frames the investigation into how policy interventions can bridge these gaps to promote equitable digital learning opportunities for all students.

In combination, the Technology Acceptance Model and Digital Divide Theory provide a robust theoretical foundation for analysing the availability, accessibility, and utilisation of ICT resources in Oti region basic schools.

CONCEPTUAL FRAMEWORK

The conceptual framework for this study outlines the key constructs and their interrelationships in assessing ICT readiness within basic schools in Oti Region. It provides a visual and explanatory guide to understanding how availability, accessibility, and challenges in ICT implementation influence the teaching and learning processes.

The framework posits that the availability of ICT resources is a necessary but insufficient condition for technology-driven learning improvement Manu et al. (2024), Nguon and Ali (2025). Accessibility mediates the relationship between availability and educational outcomes, even where resources exist, barriers such as skill gaps, cost, and infrastructure quality can limit their effective

use Nguon and Ali (2025), Sarpong et al. (2023), Soma et al. (2021). Furthermore, challenges in ICT implementation serve as critical moderators that either facilitate or impede the realisation of technology's potential impact on teaching and learning Soma et al. (2021).

Thus, improving ICT readiness requires a holistic approach that not only ensures resource availability but also enhances accessibility while systematically addressing the contextual challenges that basic schools face, especially in rural settings like Krachi-East.

Figure 1

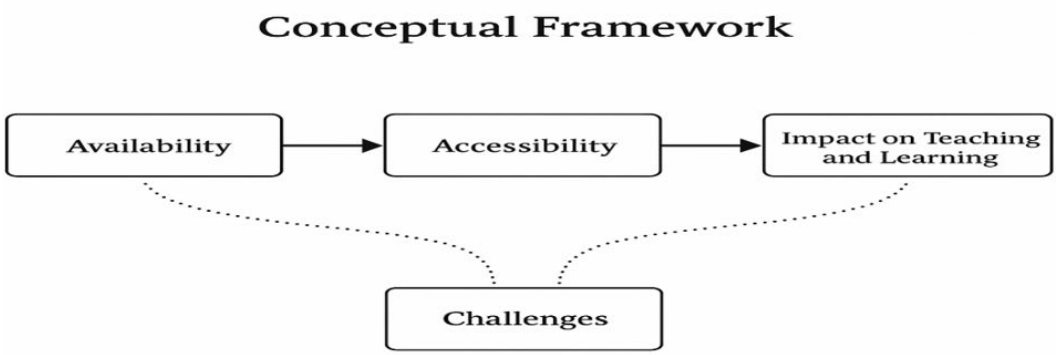

Figure 1 Conceptual Framework - Authors' Construct

EMPIRICAL REVIEW

ICT READINESS IN BASIC EDUCATION

ICT readiness in education refers to the preparedness of schools to effectively integrate digital technologies into teaching, learning, and administrative functions UNESCO (2015). Empirical research across global, African, and Ghanaian contexts reveals critical insights into how ICT readiness is influenced by infrastructure, teacher capacity, accessibility, and systemic support.

Globally, the transformative impact of ICT integration has been well documented. Kozma (2005), in a comparative analysis across 28 countries, demonstrated that technology integration significantly enhances student achievement when pedagogically aligned. Countries such as Finland and South Korea have embedded national ICT strategies involving infrastructure investment, teacher professional development, and curriculum reforms, resulting in improved educational outcomes OECD (2022). However, digital inequalities persist. Warschauer (2004) noted that even in well-resourced environments, students from disadvantaged backgrounds face limited access to quality digital learning, pointing to the need for equitable ICT access that goes beyond mere availability.

Within Africa, ICT adoption has accelerated, but infrastructural and human capacity limitations remain pressing. Hennessy et al. (2010), in Kenya, found that computer distribution was often underutilised due to lack of electricity, maintenance, and teacher ICT training. Similarly, Tiba and Condy (2016) highlighted that while urban South African schools are increasingly adopting e-learning, rural schools still struggle with poor internet and electricity supply. This aligns with Boateng et al. (2020), who warned that ICT efforts in Ghana and Nigeria could inadvertently widen educational disparities if systemic readiness is ignored. The African context calls for interventions that consider socio-economic realities and teacher professional capacity-building.

In Ghana, the Standards-Based Curriculum explicitly promotes ICT use to enhance creativity, collaboration, and critical thinking Ministry of Education (2019). Yet, studies show a significant gap between policy and practice. Asabere and Enguah (2012) revealed that 72% of rural basic schools lack functional computer labs and only 23% have stable internet access. Moreover, limited teacher digital literacy hampers ICT integration in lesson delivery. Buabeng-Andoh (2022) also found that urban schools demonstrate higher ICT readiness compared to rural counterparts like those in Oti region, largely due to infrastructural and resource disparities. Erebakyere and Agyei (2022) and Nguon and Ali (2025) noted that bureaucratic delays and poor policy monitoring hinder ICT implementation.

The COVID-19 pandemic further exposed these weaknesses. UNESCO (2023) reported that less than 35% of Ghanaian basic schools transitioned to online learning during closures, underscoring digital unpreparedness. This experience emphasised the urgent need for robust digital infrastructure, equitable resource distribution, and targeted teacher professional development.

The foregoing empirical evidence shows that effective ICT integration in education relies on contextual readiness, including infrastructure, teacher skills, reliable power, and supportive policies. In Ghana, rural areas in Oti region face persistent challenges in these areas. While national and regional studies exist, there is limited research focusing specifically on rural municipalities. This study addresses that gap by offering a localised analysis of ICT availability, accessibility, and usage in Oti region basic schools,

providing contextual evidence for policy and practice. It contributes to both national and global discussions on ICT in education, particularly in low-resource settings, and emphasises the need for targeted interventions to bridge the rural-urban digital divide.

METHODS

RESEARCH APPROACH AND DESIGN

The study adopted a mixed-methods approach, combining quantitative and qualitative methods. The quantitative component involved the administration of structured questionnaires to teachers, while the qualitative component consisted of semi-structured interviews with headteachers and classroom observations. This approach ensures a richer, more comprehensive understanding of ICT readiness by capturing both statistical trends and in-depth insights Tashakkori and Teddlie (2010).

The study employed a descriptive survey design. This design allowed for the collection of detailed, factual information from a large population at a specific point in time Creswell and Creswell (2018). A descriptive survey is particularly appropriate for assessing the availability, accessibility, utilization, and challenges of ICT in schools, as it provides a snapshot of current conditions without manipulating any variables. The design enabled the researcher to describe the phenomena as it exists naturally, which made it suitable for investigating the existing gaps between policy intentions and actual ICT practices in basic schools in Oti region.

POPULATION, SAMPLE SIZE AND SAMPLING TECHNIQUES

This study focused on key stakeholders in Basic Schools across Ghana's Oti region, with targeted population of: 6,073 teachers, 750 head teachers, and 9 district education officials. These groups were selected due to their critical roles in policy implementation, school administration, and classroom instruction. To achieve a representative yet manageable sample, the study engaged 231 participants from 25 Basic schools in the region: 50 teachers, 25 head teachers, 150 students, and one official each from 5 districts and 1 regional education directorates.

The sample size was determined using Krejcie and Morgan (1970) scientifically validated method, which balances statistical reliability with practical data collection constraints. This approach minimizes sampling bias while ensuring findings remain generalizable to the broader population a particularly useful strategy for large-scale educational research.

A mixed sampling strategy was employed. For stratified sampling**,** schools were categorized into developing community and undeveloped community strata to account for disparities in ICT infrastructure and access. This ensured proportional representation from both settings. With the purposive sampling, head teachers and education officials were deliberately selected due to their administrative expertise and direct knowledge of ICT integration in schools.

This dual approach enhanced the study's validity by capturing diverse perspectives while maintaining focus on key informants most relevant to the research objectives.

INSTRUMENTS

Three instruments were used for data collection. The questionnaire, administered to teachers, gathered quantitative data on the availability and accessibility of educational technology resources (Research Questions 1 and 2). The interview guide targeted head teachers and district officials, eliciting in-depth responses on challenges in implementing educational technology (Research Question 3). An observation checklist was used to verify the actual presence and use of ICT resources in schools (Research Questions 1 and 2). To ensure validity and reliability, experts in educational technology and research methods reviewed all instruments. A pilot study conducted in the Nkwanta South District yielded a Cronbach's Alpha of 0.83 for the questionnaire, indicating a high level of internal consistency. Based on pilot feedback, questionnaire items were refined for clarity. The interview guide's validity was strengthened through expert review for relevance and clarity, ensuring it captured key challenges. The observation checklist's validity was confirmed by aligning items with study objectives, enhancing consistency in field data collection.

DATA COLLECTION PROCEDURE

Questionnaires were administered by the researcher and assistants provided to ensure clarity to respondents. Face-to-face interviews were audio-recorded with consent. Classroom observations occurred discreetly over two weeks. Ethical protocols, including informed consent, anonymity, and voluntary participation, were strictly observed throughout the data collection process.

DATA ANALYSIS

Data analysis used both quantitative and qualitative procedures. Descriptive and inferential statistics procedures were used to analyse the questionnaire data. Interview transcripts and observation notes were analysed to identify emerging patterns. This mixed-methods approach strengthened the study's credibility by providing deeper insights and helping to interpret differences in

ICT readiness between schools in developing communities and those in underdeveloped communities. Research objective one was answered with quantitative data using percentages, correlation and regression analysis. For objective two, quantitative data was used and also analysed using means and standard deviations, independent sample t – test and one – way analysis of variances. Finally, research objective three used quantitative data and results presented using means and standard deviations.

ETHICAL CONSIDERATIONS

The study upheld ethical standards by securing approval from authorities, obtaining informed consent, ensuring anonymity and confidentiality, using data solely for research, and informing participants of their right to withdraw at any time without consequence.

RESULTS AND DISCUSSIONS

DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS AND RESPONSE RATE

The demographics of the participants considered years of teaching experience, and school location (developing and undeveloped communities). Notably, 65% of teacher respondents were from undeveloped community basic schools, while 35% taught in developing community basic schools, aligning with the study's stratified sampling plan.

A total of 100 questionnaires were distributed in the field, and all were successfully retrieved. Among these, 50 were administered to teachers, all of which were returned. Additionally, 25 head teachers received and completed the questionnaires, with a 100% return rate with 80% of responses from public schools and 20% from private schools. For the student category, 150 students from 25 basic schools participated, with six students selected from each school. Out of these, 25 questionnaires were successfully retrieved from the students.

RESEARCH QUESTIONS

What is the impact of the availability of educational technology resources on administration, teaching and learning in the Basic Schools?

Table 1 presents data on the availability of ICT resources in basic schools. It shows the percentage of schools reporting either availability or non-availability of specific resources. This table sets the context for analysing accessibility and potential impact on teaching and learning.

Availability of ICT resources

Table 1

Table 1 Availability of ICT facilities in schools

ICT Resource	Available	Not Available
Computers	18%	82%
Internet Connectivity	3%	97%
Projectors	9%	91%
Printers or Scanners	5%	95%
Educational Software	13%	87%
Electricity Supply	17%	83%
N = 225		

Source: Field data (2025)

From Table 1, the results reveal a generally very low availability of ICT resources across the sample of 225 respondents. The results clearly depict a situation of widespread inadequacy in ICT resource availability within the studied context. Most of the basic essential digital tools and infrastructure needed for implementing the Standard Based Curriculum (SBC) in the Basic schools in Oti region of Ghana are largely missing. The only resource consistently identified by all respondents as available was the TM1 laptop computer, primarily used for administrative purposes. This indicate that the basic schools are operating in environments where the integration of technology are highly limited, severely constrained and under – resourced in terms of ICT infrastructure. It can be stated that the low availability of ICT resources across multiple categories indicates systemic challenges rather than isolated deficiencies.

Table 2 presents the correlation between ICT resource availability and academic performance**.** It aims to check whether increased availability of ICT resources is associated with better academic performance in basic schools.

Table 2

Table 2 Correlation Analysis of Resource Availability vs Academic Performance

Variables	Resource Availability	Academic Performance
Pearson Correlation (r)	1	0.15
Sig. (2-tailed)		0.001
N	**225**	**225**

Source Field data (2025)

A Pearson correlation analysis in Table 2 was conducted to examine the relationship between resource availability and academic performance among basic schools. Results indicated a positive but weak correlation, r (225) = 0.15, p = 0.001, suggesting that increased availability of educational resources is associated with slightly better administrative and academic performance.

Table 3 displays the observation made about enriching the understanding of how ICT resources were available and used.

Table 3

Table 3 Thematic Summary of Observation on ICT Availability and use

Theme	Observed Practice/Findings	Interpretation/Implication
Limited ICT Resource Presence	Most schools lacked computers, projectors, and internet access in classrooms.	Confirms data on low ICT availability, limits technology integration in lessons.
Improvised ICT Use	Some teachers attempted to use personal devices or improvised materials during lessons.	Despite poor availability, teachers showed creativity, aligning with attempts to teach Computing without proper resources.
Low Student Engagement with ICT	Minimal student interaction with ICT tools observed in lessons.	Lack of access directly affects student exposure and learning opportunities.
Electricity Challenges	Inconsistent or absent power supply in several observed schools.	Reinforces availability data, unreliable power hinders ICT use even when devices are present.
Positive Correlation in Practice	Schools with some ICT resources showed better-structured lessons and higher student interest.	Supports the observed positive correlation between resource availability and learning engagement or performance.

Sources: Field data, 2025

This thematic table links the quantitative correlation findings with real classroom observations, enriching the understanding of how ICT availability relates to academic outcomes in practice.

The results of the correlation analysis in Table 2 revealed a statistically significant but weak positive relationship between resource availability and academic performance (r = 0.150, p = 0.001). The study reveals a modest but statistically significant association between the availability of ICT resources such as computers, educational software, and electricity and improved student academic performance. While the data indicate that increased access to these resources correlates with better learning outcomes, the relatively weak strength of this relationship suggests that simply providing ICT infrastructure is not enough to drive meaningful improvements in student achievement.

Observations and follow-up interviews with teachers and students highlighted key complementary factors that enhance the impact of ICT integration.

Teacher in Private School said "as for me I am not good in ICT usage in teaching",

Teacher in Public School said *"because I have not been using it after school to teach, so I am forgetting the usage"*.

This means that some teachers do not have the experiences in using ICT tools for teaching.

First, the quality of teacher training emerged as critical, professional development equips teachers with the skills to effectively incorporate technology into their teaching. Second, innovative pedagogical practices such as active learning and problem-based instruction proved more influential than mere access to devices. Finally, effective student engagement strategies, especially interactive and learner-centred methods, were essential to maximizing the educational benefits of ICT.

These findings emphasize the need for comprehensive approaches that integrate infrastructure development, continuous teacher capacity building, and pedagogical innovation to realize ICT's full potential in basic education.

Table 4 presents the ANOVA results of a regression analysis, which tests the overall significance of the model predicting student learning outcomes based on ICT resource availability. The goal of this analysis is to assess whether the variation in ICT availability meaningfully explains differences in learning outcomes among students.

Table 4

Table 4 Regression Analysis Predicting Learning Outcomes Based on Resource Availability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.155	5	6.431	98.915	0.000[b]
	Residual	10.793	145	0.065		
	Total	42.948	150			

a. Dependent Variable: Students' academic performance has improved due to available technology.

b. Predictors: (Constant), Availability of ICT resources has improved lesson delivery, Our school has sufficient computers for teaching and learning, Projectors and smart boards are available for instructional use, There is a functional computer laboratory in the school, Teachers have access to educational software and digital content.

The regression model in Table 4 significantly predicts Students' Academic Performance. *ANOVA* showed that the model is significant: $F(5, 150) = 98.92$, $p < 0.001$, $R^2 = 0.749$) it means that about 74.9% of the variance in students' academic performance is explained by the availability of ICT resources and infrastructure. This is a very strong model (since R^2 is close to 1).

Table 5 presents the regression coefficients (predictor variables) from the model, showing the individual impact of each ICT resource on learning outcomes. Each predictor's Beta (β), t-value, and significance level (p) help assess its unique contribution, controlling for other variables.

Table 5

Table 5 Predictor Variables

Predictor	B	Beta (β)	t	p	Interpretation
(Constant)	0.481	–	2.722	0.007	Constant baseline
Sufficient Computers	0.127	0.117	2.825	0.005	Positive, significant predictor
Projectors/Smart Boards	-0.043	-0.047	-1.087	0.279	Not significant
Functional Lab	0.081	0.095	1.887	0.061	Marginal (p ~ 0.06), not strongly significant
Educational Software Access	-0.911	-1.376	-18.193	0.000	Strong negative effect (unexpected!)
ICT Resources Improve Delivery	1.508	1.539	21.247	0.000	Strong positive effect, most influential

Sources Field data, 2025

In Table 5 the availability of ICT resources to improve lesson delivery *($\beta = 1.539$, $p < 0.001$)* positively predicted academic performance, whereas access to educational software *($\beta = -1.376$, $p < 0.001$)* negatively predicted academic performance. Other predictors were either not significant or marginally significant. ICT resources improving lesson delivery is the strongest positive predictor.

The availability of educational technology resources in basic schools has a modest but positive impact on administration, teaching, and learning. The study showed that when ICT resources are available, they support better lesson delivery, enhance student engagement, and improve administrative efficiency. However, the overall availability of such resources was very low, limiting their potential impact. A weak but significant correlation suggests that ICT presence alone does not guarantee improved outcomes unless supported by teacher competence and effective use. Therefore, while ICT availability contributes positively, its true impact depends on combining access with teacher training and innovative instructional practices.

What is the effect of the accessibility of educational technology resources on administration, teaching and learning at the Basic Schools?

A comprehensive statistical analysis of ICT accessibility in Ghana's basic schools reveals critical insights into the digital learning landscape across both public and private institutions. Drawing from multiple statistical outputs (see Table 6, Table 7, Table 8, Table

9), the findings challenge commonly held assumptions and highlight systemic infrastructural challenges that transcend differences in school ownership.

Table 6 presents the group statistics comparing public and private schools on key ICT variables such as teachers' access to computers, students' ICT tool use, digital resource accessibility, internet reliability, teachers' difficulty accessing technology, and maintenance issues. The aim is to assess whether significant differences exist between public and private institutions regarding ICT access and usage challenges.

Table 6

Table 6 Group Statistics of Respondents in Private and Public Basic School Accessibility

Variables	School Type	N	Mean	Std. Deviation	Interpretation
Teachers' computer access	Public	180	2.0973	0.40010	no significant difference
	Private	45	2.1081	0.45849	
Students' ICT tool use	Public	180	2.0354	0.26489	no significant difference
	Private	45	2.0541	0.32880	
Digital resource accessibility	Public	180	1.9204	0.27195	no significant difference
	Private	45	1.9189	0.27672	
Internet/WiFi reliability	Public	180	1.1062	0.36260	no significant difference
	Private	45	1.1622	0.44181	
Teachers' tech access difficulties	Public	180	3.8850	0.37206	no significant difference
	Private	45	3.8649	0.41914	
Maintenance issues	Public	180	3.6814	0.79356	no significant difference
	Private	45	3.5946	0.89627	

Sources Field data, 2025

There is a universal infrastructure deficiency where Group statistics Table 6 show strikingly similar trends in ICT accessibility between public and private schools in the region. For example, teachers' computer access averages just 2.10 on a 3-point scale, where 3 signifies "Sometimes" a finding that suggests basic technology integration remains limited in both sectors. This undermines the widely held perception that private schools offer better technological resources. Perhaps most notably, both public and private schools recorded the same mean (1.92) for digital resource accessibility, illustrating a shared struggle in ensuring equitable access to core digital tools. The comparison of means and standard deviations shows no significant difference across all variables, suggesting that both public and private schools face similar conditions regarding ICT access and implementation. This finding highlights that challenges in ICT integration are systemic and not necessarily tied to school ownership or management type.

Table 7 presents the results of the t-test, comparing means of key ICT variables between public and private schools. The test checks if observed differences in teachers' computer access, students' ICT tool use, digital resource accessibility, internet reliability, teachers' access difficulties, and maintenance issues are statistically significant.

Table 7

Table 7 Independent Sample t-Test

Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Teachers' computer access	-0.137	229	0.891	-0.01076	0.07862	-0.16612	0.14459
Students' ICT tool use	-0.350	229	0.727	-0.01866	0.05337	-0.12412	0.08681
Digital resource accessibility	0.028	229	0.978	0.00144	0.05173	-0.10079	0.10366
Internet/WiFi reliability	-0.771	229	0.442	-0.05597	0.07262	-0.19947	0.08753
Teachers' tech access difficulties	0.276	229	0.783	0.02009	0.07274	-0.12366	0.16384
Maintenance issues	0.559	229	0.577	0.08682	0.15527	-0.22000	0.39365

Sources Field data, 2025

The p-values in Table 7 (sig. 2-tailed) for all variables exceed the 0.05 threshold, indicating no statistically significant differences between public and private schools. This confirms that ICT access and implementation challenges are common across both sectors, reinforcing the need for systemic interventions rather than sector-specific strategies. These findings are robust, even when considering the varying funding models, governance structures, and fee regimes between public and private schools.

Levene's test results Table 8 confirm homogeneity of variances, reinforcing the validity of these comparisons and supporting the reliability of the null hypothesis across all items.

Table 8

Table 8 Levene's test, p-value > 0.05

Variable	Levene's p-value	Interpretation
Teachers' computer access	0.591	Equal variances assumed
Students' ICT use	0.295	Equal variances assumed
Digital resource access	0.956	Equal variances assumed
Internet reliability	0.146	Equal variances assumed
Teacher tech difficulties	0.578	Equal variances assumed
Maintenance issues	0.295	Equal variances assumed

Sources: field data, 2025

The variables in Table 8 tested included teachers' computer access, students' ICT use, access to digital resources, internet reliability, teacher technological difficulties, and maintenance issues. All p-values were greater than 0.05, indicating that the assumption of equal variances was met for each variable. This means the variability in responses between groups was statistically similar, allowing for valid comparisons using parametric tests like ANOVA. The results confirm that differences observed in subsequent analyses are not due to unequal variances among the groups compared

Table 9 presents the results of a one-way ANOVA analysis conducted to compare the accessibility of ICT resources across different school types (public and private).

Table 9

Table 9 One-way ANOVA – Comparing Accessibility by School Type

Variable	SSb	SSw	dfb	dfw	MSb	MSw	F	P
Teachers' computer access	0.008	9.257	1	229	0.008	0.063	0.137	0.891
Students' ICT tool use	0.007	2.419	1	229	0.007	0.016	0.350	0.727
Digital resource accessibility	0.0001	2.027	1	229	0.0001	0.014	0.028	0.978
Internet/WiFi reliability	0.104	3.893	1	229	0.104	0.026	0.771	0.442

SSb = Sum of Squares Between, SSw = Sum of Squares Within, df = Degrees of Freedom, MS = Mean Square, F = F-Statistic, p = Significance Level

The variables in Table 7 analysed included teachers' access to computers, students' use of ICT tools, accessibility of digital resources, and reliability of internet/Wi-Fi. The results showed no statistically significant differences in ICT accessibility between public and private schools across all variables, as indicated by the low *F-values* and high *p-values* (all $p > 0.05$). This suggests that both school types face similar challenges in accessing ICT resources for administration, teaching, and learning.

Classroom observations in selected public and private basic schools confirmed the survey findings on ICT accessibility. Most schools lacked essential digital tools like projectors, computers, and tablets, or had them locked away due to fears of theft or misuse. In some cases, the devices were present but non-functional because of neglect and poor maintenance. Teachers often relied on traditional teaching methods like the chalkboards and few with marker boards, even in schools with ICT equipment. Internet access was unreliable or completely absent, making it difficult to use online learning platforms or digital content. Students showed interest in technology but had little to no hands-on experience with ICT tools. Internet services, when available, were often paid for by teachers themselves rather than provided by the school. Teachers also expressed frustration with the frequent breakdown of devices,

lack of timely repairs, and inadequate technical support. These issues were common in both public and private schools, pointing to a systemic problem rather than isolated cases. The observations confirm that poor accessibility, weak maintenance systems, and lack of reliable internet significantly hinder the effective integration of ICT in teaching and learning. As a result, the potential benefits of educational technology are not being realized in many basic schools. This situation calls for coordinated efforts to improve infrastructure, technical support, and ICT training for teachers across the education sector.

The study explored the effect of accessibility of educational technology on teaching and learning in basic schools across public and private institutions in Ghana. Statistical analyses Table 6, Table 7, Table 8, Table 9 revealed no significant difference between public and private schools in teachers' computer access, students' ICT tool use, and access to digital resources, internet reliability, and maintenance challenges. Both sectors face similar systemic constraints, including poor infrastructure, limited access to functional ICT tools, and unreliable internet connectivity. Classroom observations confirmed these findings ICT tools were often absent, locked away, or non-functional due to neglect and lack of maintenance. Teachers mainly relied on traditional methods like chalkboards, with minimal use of digital resources. Where internet was available, it was often unreliable and paid for by teachers themselves. Students showed interest in technology but lacked practical exposure. Teachers expressed frustration over equipment breakdowns and delayed repairs. The study highlights that ICT access barriers are a widespread, systemic issue, not confined to school ownership or management type. Addressing these challenges requires coordinated national efforts focused on infrastructure improvement, maintenance support, reliable internet provision, and teacher training. Without such interventions, the potential of educational technology to enhance teaching and learning in Ghanaian basic schools remains largely unrealized.

What are the challenges in the implementation of modern teaching technology in teaching and learning at the Basic Schools?

Table 10 presents the mean rankings of key ICT-related challenges identified by teachers in basic schools, based on responses from 231 participants.

Table 10

Table 10 Mean Rankings of ICT Challenges (*N = 231*)

Challenge in the Basic Schools	Mean	Standard Deviation	Rank
Inadequate ICT infrastructure	4.21	0.77	1
Unreliable electricity/power supply	4.09	0.84	2
Poor internet connectivity	3.96	0.89	3
Insufficient teacher training	3.88	0.90	4
Lack of technical support	3.72	0.91	5
High cost of maintenance	3.55	0.88	6
Limited time for tech integration	3.42	1.02	7
Resistance to technology adoption	3.24	0.95	8

Sources Field Data, 2025

The ranking in Table 10 reflects the severity of each challenge as perceived by respondents, with higher mean scores indicating more pressing issues. The table highlights eight major barriers affecting the effective integration of educational technology in teaching and learning of the standard based curriculum. These challenges range from infrastructural deficits and unreliable power supply to poor internet connectivity, insufficient teacher training, and lack of technical support. The ranking helps prioritize areas that require urgent attention for improving ICT access and use in Ghanaian basic schools.

Table 11 presents the results of Spearman's rank-order correlation analysis conducted to examine the relationships among eight key ICT challenges identified in basic schools.

Table 11

Table 11 Spearman's Correlation Coefficients Among ICT Challenges (N = 231)

Variables	1	2	3	4	5	6	7	8
1. Inadequate ICT infrastructure	1.00	0.58	0.61	0.45	0.52	0.49	0.43	0.39
2. Unreliable electricity supply		1.00	0.53	0.41	0.44	0.46	0.38	0.36
3. Poor internet connectivity			1.00	0.47	0.50	0.48	0.42	0.40
4. Insufficient teacher training				1.00	0.57	0.45	0.41	0.39
5. Lack of technical support					1.00	0.53	0.46	0.44

6. High cost of maintenance	1.00	0.40	0.38
7. Limited time for tech integration		1.00	0.35
8. Resistance to technology adoption			1.00

Correlation is Significant at the 0.01 Level (2-Tailed).

The analysis in Table 11 reveals significant positive correlations between most variables, indicating that these challenges are interrelated. For instance, inadequate ICT infrastructure showed a strong positive correlation with poor internet connectivity ($\rho = 0.61$, $p < 0.01$) and unreliable electricity supply ($\rho = 0.58$, $p < 0.01$). Similarly, insufficient teacher training was strongly associated with lack of technical support ($\rho = 0.57$, $p < 0.01$). These findings suggest that when schools face one ICT-related challenge, they are more likely to encounter other related challenges, highlighting a systemic pattern of interdependence among infrastructural, technical, and human resource issues. The consistent significance of these correlations underscores the need for comprehensive and integrated interventions in addressing ICT challenges in basic education.

Table 12 summarizes the results of the Kruskal-Wallis H tests conducted to examine whether perceptions of ICT challenges differ significantly between public and private basic schools.

Table 12

Table 12 Kruskal-Wallis H-Test Comparing ICT Challenges by School Type (N = 231)

ICT Challenge	χ^2 (df = 1)	p-value	Interpretation
Inadequate ICT infrastructure	1.78	0.182	Not Significant
Unreliable electricity supply	0.93	0.335	Not Significant
Poor internet connectivity	1.24	0.265	Not Significant
Insufficient teacher training	0.68	0.410	Not Significant
Lack of technical support	1.05	0.306	Not Significant
High cost of maintenance	0.79	0.374	Not Significant
Limited time for tech integration	0.52	0.470	Not Significant
Resistance to technology adoption	0.86	0.354	Not Significant

Sources Field Data, 2025

The analysis in Table 12 assessed eight identified ICT challenges, comparing responses based on school ownership. The findings reveal that none of the ICT challenges showed statistically significant differences across the two school types (all p-values > 0.05). For example, the challenge of poor internet connectivity yielded a chi-square value of 1.24 with a p-value of 0.265, indicating no significant difference in perceptions between public and private school respondents in the region. These results suggest that the severity and nature of ICT-related challenges are consistently experienced across both sectors. This uniformity highlights systemic issues within the broader educational landscape, underscoring the need for sector-wide interventions rather than ownership-specific strategies.

The interviews conducted revealed several key challenges affecting the implementation of modern teaching technology in basic schools. Participants highlighted critical issues such as inadequate ICT infrastructure, frequent electricity outages, and poor or no internet connectivity, which hinder the effective use of technology in classrooms. Teachers also expressed concerns over insufficient training and lack of technical support, making it difficult to integrate ICT tools confidently. Additionally, they pointed out the high cost of maintenance and limited time for technology integration due to heavy workloads. Some respondents noted resistance among teachers who felt unprepared or viewed technology as an additional burden. These insights underscore the multifaceted nature of the challenges, reflecting both systemic and individual barriers to successful technology adoption in the implementation basic education standard-based curriculum.

Interview Response 1 – Infrastructure and Equipment

"We don't have enough computers or projectors in our school. Even when we manage to get a few, they are either outdated or faulty. This makes it hard for us to plan any technology-based lessons. The few devices we have are often shared among many teachers, which discourages regular use." (Teacher, Rural Public School)

Interview Response 2 – Electricity Supply

"Power outages are a constant problem here. Sometimes, when you prepare a lesson that involves technology, there's no electricity on the day. It discourages both teachers and students because you can't depend on it. You end up abandoning the idea altogether." (Teacher, Urban Public School)

Interview Response 3 – Internet Connectivity

"The internet connection in our school is either too slow or completely unavailable. Even if you want to use online teaching resources or educational platforms, you are forced to use your own mobile data and that is expensive. Without reliable internet, we cannot effectively use modern teaching tools." (Teacher, Private Basic School)

Interview Response 4 – Teacher Training and Support

"Most of us have never received formal training in using ICT tools for teaching. The workshops are either too short or too general. Sometimes, even when you try to learn on your own, there's no one to support you when things go wrong. You just give up and go back to the traditional way of teaching." (Teacher, Public Basic School)

Interview Response 5 – Time and Resistance to Change

"The workload is already too much with large class sizes and tight timetables. Integrating technology into lessons takes extra preparation time, and honestly, some teachers see it as more of a burden than a help. They fear making mistakes in front of students or facing technical issues they can't fix." (Teacher, Private Basic School)

The study revealed several interrelated challenges hindering the effective implementation of modern teaching technology in Ghanaian basic schools. Quantitative data identified inadequate ICT infrastructure, unreliable electricity supply, and poor internet connectivity as the most pressing issues, followed by insufficient teacher training, lack of technical support, and the high cost of maintenance. Limited time for technology integration and resistance to adoption also emerged as notable barriers. The strong correlations among these challenges suggest a systemic pattern of infrastructural, technical, and human resource constraints. Further analysis showed no significant difference between public and private schools regarding these challenges, highlighting the sector-wide nature of the problem.

Qualitative interviews reinforced these findings. Teachers reported a lack of adequate and functional ICT equipment, frequent power outages, and unreliable internet connectivity, which undermine the integration of technology in teaching. They also cited insufficient training and a lack of technical support as factors that diminish their confidence in using ICT tools. Additionally, time constraints and resistance from some teachers who perceive technology use as burdensome further complicate adoption efforts. These findings underscore the need for comprehensive interventions addressing both infrastructural and capacity-building needs to enhance the integration of educational technology in basic education.

DISCUSSIONS

This study explored how the availability, accessibility, and implementation challenges of ICT influence teaching and learning in Ghanaian basic schools. Guided by the Technology Acceptance Model (TAM) and the Digital Divide Theory, the findings highlight systemic gaps that undermine the effective integration of technology, especially in the context of Ghana's Standards-Based Curriculum.

THE IMPACT OF AVAILABILITY ON ADMINISTRATION, TEACHING AND LEARNING

The study confirms that while availability of ICT resources is critical, it alone does not guarantee improved teaching outcomes. Consistent with TAM, the perceived usefulness of ICT depends on its presence in the learning environment. However, only 18% of surveyed schools possessed computers, severely limiting both exposure and utilization. This scarcity not only diminishes the potential for positive user experiences but also reinforces disparities, as explained by the Digital Divide Theory, with undeveloped community schools bearing the brunt of infrastructural deficits.

The study's regression analysis revealed that while the availability of ICT tools ($\beta = 1.539$) positively influenced lesson delivery, access to educational software paradoxically had a negative impact ($\beta = -1.376$). This suggests a misalignment between available digital tools and curricular needs, echoing global findings Kozma (2005), OECD (2022) that technology must complement pedagogical goals. In Ghana, similar gaps were highlighted by Asabere and Enguah (2012) and Buabeng-Andoh (2022), with the COVID-19 pandemic UNESCO (2023) exposing the systemic neglect of ICT readiness in schools.

THE EFFECT OF ACCESSIBILITY ON ADMINISTRATION, TEACHING AND LEARNING

While availability provides the foundation, accessibility the practical ability to use available resources proves to be an even greater challenge. According to TAM, accessibility is mediated by perceived ease of use, yet this study found no significant accessibility differences between public and private schools, indicating that barriers are systemic. Despite the presence of ICT tools in some schools, unreliable electricity, lack of maintenance, and limited technical support rendered many resources inaccessible.

Observations revealed that teachers often resorted to using personal devices, a practice that proved unsustainable. Internet reliability was alarmingly low (mean = 1.10), while lack of technical support (mean = 3.72) further restricted access. These findings align with prior studies in Kenya, Nigeria, and Ghana Hennessy et al. (2010), Boateng et al. (2020), Africa Education Watch (2024), which reported underutilized ICT infrastructure due to maintenance and support challenges.

CHALLENGES IN IMPLEMENTATION OF ICT IN TEACHING AND LEARNING

The successful integration of ICT is moderated by persistent implementation challenges. The study identified inadequate infrastructure (mean = 4.21), insufficient teacher training (mean = 3.88), and lack of technical support (mean = 3.72) as the most significant barriers. These factors directly influence TAM's ease of use dimension, while the Digital Divide Theory frames them as systemic inequities, particularly in rural contexts.

Spearman's correlation analysis demonstrated strong interconnections among challenges, poor internet connectivity was linked to inadequate infrastructure ($\rho = 0.61$), and insufficient training was correlated with lack of technical support ($\rho = 0.57$). Interview data underscored teacher frustrations with outdated devices, inconsistent electricity, and bureaucratic inefficiencies in addressing technical issues.

These findings reflect global trends identified by Warschauer (2004) and OECD (2022), emphasizing that teacher readiness and systemic support are vital. In Ghana, Agyei and Voogt (2012) and Buabeng-Andoh (2022) have similarly pointed to the failure of policies to tackle last-mile implementation challenges. The COVID-19 pandemic further exacerbated these shortcomings, exposing the absence of digital contingency plans in many schools UNESCO (2023).

SYNTHESIS OF FINDINGS

The findings reflect a vicious cycle where limited availability leads to poor accessibility, which in turn amplifies implementation challenges, ultimately hindering adoption. This cyclical problem resonates with both TAM and Digital Divide Theory, highlighting the need for coordinated, systemic interventions that address technological, pedagogical, and policy-level gaps.

Empirical evidence from both Ghana and other developing contexts underscores the urgency for context-sensitive and sustainable solutions. Interventions should prioritize localized ICT hubs, foster community partnerships, and enforce educational policy reforms to ensure equitable access and meaningful integration of technology into teaching and learning as required by the Standard based curriculum.

CONCLUSIONS

The effective use of ICT in Ghanaian basic schools cannot be achieved through isolated efforts. Addressing the deeply interconnected issues of availability, accessibility, and implementation challenges requires a unified approach combining infrastructure development, continuous teacher capacity building, and robust policy frameworks.

RECOMMENDATIONS

Effective ICT integration in basic schools requires a multi-stakeholder approach involving the Ministry of Education, the Ghana Education Service (GES), and other key actors. Based on the study findings, the following recommendations outline how each stakeholder can contribute to bridging the digital divide and enhancing teaching and learning outcomes in Oti region of Ghana.

The Ministry of Education should spearhead the creation of community ICT hubs in underserved areas by partnering with NGOs, private sectors, and local authorities. Investment in solar-powered centres will ensure reliable access. A national monitoring framework must track usage and impact, while aligning ICT hub activities with school curricula and community digital literacy programs for broader educational benefits.

The Ghana Education Service should mandate continuous ICT pedagogy training through Professional Learning Communities (PLCs), promoting collaboration and peer mentoring. Training must align with in-service and CPD requirements, supporting teacher appraisal and career growth. District-level workshops and partnerships with colleges of education and ICT experts will ensure practical, relevant training that enhances teachers' confidence and competence in ICT integration.

The Ghana Education Service should enforce ICT policies by establishing monitoring units at district, conducting regular audits, and offering targeted support for schools with ICT deficits. Tailored interventions like technical support, maintenance, and teacher coaching are essential. Feedback mechanisms will help refine policies, ensuring effective ICT integration and continuous improvement in teaching and learning.

By aligning the efforts of the Ministry of Education and the Ghana Education Service with best global practices, Oti region for that matter Ghana's basic education sector can break the cycle of low ICT availability, poor accessibility, and persistent

implementation challenges. These coordinated actions will enhance digital equity, empower teachers, and improve learning outcomes across the country, particularly in marginalized communities.

ETHICAL STATEMENT

Written consent was obtained from the participants before commencement of the data collection. The headteachers, classroom teachers and the students were allowed to voluntarily participate in the study which ensured ethical adherence.

GENERATIVE AI STATEMENT

In this research, the AI tool ChatGPt was minimally used for summarisation. All contents summarised by the AI tool was rephrased to reflect the original ideas. We, as the authors take full responsibility for the content of our published work.

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