TEACHERS' PERCEPTION OF ICT INTEGRATION AND ITS INFLUENCE ON PUPILS' ACADEMIC PERFORMANCE: A CASE OF SELECTED PRIMARY SCHOOLS IN GHANA

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DEPARTMENT OF COMMUNICATION STUDIES

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DECLARATIONS

STUDENT'S DECLARATION

I, Vera Yayra Deh, declare that this dissertation, except quotations and references contained in published works, which have all been identified and duly acknowledged, is entirely my original work, and it has not been submitted, either in part or whole, for another degree elsewhere. Therefore, I bear the responsibility for any shortcomings.

…..……... DATE: 29 DECEMBER 2025

VERA YAYRA DEH

(Student)

SUPERVISOR'S DECLARATION

I, the undersigned supervisor, declare that I supervised the preparation and presentation of this work in accordance with the guidelines for the supervision of a Master's dissertation as laid down by the University of Media, Arts and Communication (UniMAC).

…… DATE: 30 DECEMBER 2025

PROF. MODESTUS FOSU

(Supervisor)

DEDICATION

I extend my deepest gratitude to my beloved siblings; Ms. Sheila Deh, Mr. Daniel Deh, Mr. Albert Deh, and Ms. Theresa Deh, whose unwavering love and constant presence meant the world to me. To them, I say *ayekoo* for your prayers; I am profoundly grateful from the heart. I also dedicate this work to my beloved, Mr. Daniel Yirenkyi, whose steadfast support and enduring presence have been my greatest strength. My heartfelt appreciation goes to Prof. Modestus Fosu, my exceptionally supportive supervisor, whose meticulous attention to detail shaped the very outcome of this dissertation. Finally, I dedicate this to my dear friends, whose loyal companionship has walked with me every step of the way.

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ABSTRACT

This study explored the integration of Information and Communication Technology (ICT) in literacy and numeracy instruction in public primary schools in Accra, Ghana. The research sought to understand how teachers perceive the impact of ICT on pupils' literacy and numeracy performance, as well as the institutional and contextual factors that enable or constrain ICT adoption. Using a qualitative approach, data were collected through semi-structured interviews with teachers and classroom observations. The study was guided by the Technology Acceptance Model (TAM) and the Diffusion of Innovations (DOI) theory to interpret teachers' perceptions and practices. Findings revealed that teachers generally view ICT as a valuable tool for enhancing literacy and numeracy learning, increasing pupil engagement, and supporting understanding. However, challenges such as limited access to functional devices, intermittent electricity and internet connectivity, and varying teacher competence affected the consistency and effectiveness of ICT integration. Enabling factors included supportive school leadership, peer collaboration, and incremental experimentation with ICT. The study concludes that while ICT holds significant potential for improving primary education outcomes, its impact depends on the interplay between teacher readiness, pedagogical strategies, and institutional support. Recommendations are made for targeted teacher training in ICT, improved resource allocation, and policy support to strengthen ICT integration in Ghanaian primary schools.

CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

The integration of Information and Communication Technology (ICT) in education has become a global necessity, recognized as a catalyst for transforming the teaching and learning processes in the twenty-first century (UNESCO, 2014; Pelgrum & Plomp, 1996). Educational systems across developed and developing nations increasingly rely on digital tools like computers, projectors, interactive whiteboards, tablets, educational software, and internet-based resources to enhance pedagogical practices, improve student engagement, and prepare learners for a technology-driven global economy (Pelgrum, 2001; Cuban, 1986). Beyond just providing access to technology, ICT in education has the ability to individualize instruction, promote collaborative knowledge creation, and close gaps between wealthy and underprivileged groups as well as between urban and rural areas (Watson, 1998; Crook, 1994).

However, the effectiveness of ICT integration is not automatic. Research consistently demonstrates that the mere presence of technology in schools does not guarantee improved learning outcomes (Norris et al., 2003; Woodrow, 1992). Rather, successful ICT adoption depends critically on teacher perceptions, attitudes, and pedagogical practices (Pajares, 1992; Davis, 1989). Teachers serve as gatekeepers of technology integration: their beliefs about the usefulness and ease of use of ICT tools, their confidence in employing technology for instruction, and their perceptions of how ICT affects student learning fundamentally shape whether and how technology is utilized in classrooms (Zhao & Cziko, 2001; Dupagne & Krendl, 1992). When teachers perceive ICT as enhancing instructional effectiveness and improving student academic performance, they are more likely to integrate it meaningfully

into their teaching practices (Ely, 1993; Bullock, 2004). Similarly, when they perceive it negatively, especially due to its ease of use, they are less likely to integrate it into their everyday classroom work.

In sub-Saharan Africa, ICT integration in education faces unique challenges rooted in infrastructural deficits, limited financial resources, inadequate teacher training quality, and systemic inequalities (Hennessy et al., 2010; Aduwa-Ogiegbaen & Iyamu, 2005). Despite these obstacles, African governments increasingly recognize ICT as essential for educational development and economic competitiveness. Ghana exemplifies this commitment through its national ICT for Accelerated Development (ICT4AD) policy, launched in 2003, which identified education as a priority sector for technology adoption (Government of Ghana, 2003). The policy envisioned widespread ICT integration across all educational levels, from basic education through tertiary institutions, to enhance teaching quality, improve learning outcomes, and prepare Ghanaian youth for participation in the global knowledge economy.

Nearly two decades after the implementation of the ICT4AD policy, Ghana's progress in ICT integration remains uneven. While tertiary and some secondary institutions have made notable advances, basic education, particularly at the primary level, lags significantly behind (Amenyedzi et al., 2011; Malcolm & Godwyll, 2008). Urban schools, though generally better resourced than their rural counterparts, still grapple with persistent challenges, including inadequate infrastructure, inconsistent electricity supply, limited internet connectivity, insufficient ICT equipment, and inadequate teacher training (Gyaase et al., 2020; Ampofo & Abrefi, 2020). These challenges create a paradoxical situation: urban public primary schools in cities like Accra, despite their geographical proximity to technological resources and policy-making centers, often struggle to translate national ICT policies into effective classroom practice (Nyarko, 2007; Ofosu-Asare, 2024).

An important factor that mediates the relationship between ICT availability and classroom integration is teacher perspectives. In Ghana, studies generally indicate positive attitudes among teachers toward ICT adoption, yet these positive attitudes frequently fail to translate into sustained, pedagogically meaningful technology use (Amenyedzi et al., 2011; Gyaase et al., 2020). This disconnect raises important questions: How do primary school teachers in urban Ghana perceive the impact of ICT on student academic performance? What factors shape these perceptions? How do teachers' beliefs about ICT's usefulness and ease of use influence their integration practices? And critically, do teachers perceive that ICT integration actually improves foundational academic skills, specifically literacy and numeracy among their students?

Understanding teachers' perceptions is particularly crucial at the primary school level, where foundational literacy and numeracy skills are established. Primary education represents the bedrock of lifelong learning; competencies acquired during these formative years significantly influence pupils' subsequent academic trajectories and future opportunities (De Hoop et al., 2023). If teachers perceive ICT as enhancing literacy and numeracy outcomes, they are more likely to prioritize technology integration in these critical subject areas. Conversely, if teachers doubt ICT's effectiveness or view it as peripheral to core instructional goals, technology may be underutilized or employed only superficially (Mahlo & Waghid, 2022; Graham, 2022).

1.1 ICT Integration in public schools in sub-Saharan Africa

The integration of information and communication technologies (ICT) in public schools across sub-Saharan Africa has gained prominence as part of broader efforts to improve educational quality and expand learning opportunities. ICT is widely regarded as a means of enhancing access to information, supporting innovative pedagogical practices, and

addressing persistent challenges such as large class sizes, limited instructional materials, and teacher shortages (UNESCO, 2019). As a result, many countries in the region have adopted ICT-related education policies aimed at embedding digital technologies within public school systems.

Despite these policy commitments, the extent of ICT integration in public schools remains uneven across and within countries. Studies suggest that while some schools have acquired basic ICT infrastructure such as computers and projectors, meaningful integration into the teaching and learning processes is often limited (Trucano, 2016). Rural and underserved schools, in particular, continue to face challenges related to inadequate electricity supply, limited internet connectivity, and insufficient ICT equipment, reinforcing existing educational inequalities (Gillwald, Mothobi & Rademan, 2018).

Furthermore, ICT initiatives in public schools are frequently characterised by short-term projects and pilot programmes rather than sustained system-wide integration. Studies indicate that technologies are often introduced without sufficient alignment with curriculum objectives or assessment practices, resulting in sporadic and superficial use (Hennessy et al., 2010). Consequently, ICT remains peripheral to core instructional activities in many public-school contexts.

Overall, the sub-Saharan African experience demonstrates that ICT integration in public schools is shaped not only by access to technology but also by broader structural and institutional conditions. Understanding these dynamics provides an important foundation for examining how ICT is adopted and utilised at national and local levels within public education systems.

1.2 ICT Integration and Institutional Capacity in Public School Systems

It can be argued that institutional capacity plays a critical role in determining the effectiveness of ICT integration in public schools. Capacity in this context includes the availability of trained personnel, technical support mechanisms, financial resources, and organisational readiness to sustain technology use over time (UNESCO, 2018). Where such capacity is weak, ICT initiatives often struggle to move beyond initial implementation stages.

Research across developing contexts highlights the importance of teacher training and professional development in supporting ICT integration. According to Tondeur et al. (2017) teachers frequently report limited opportunities to acquire the skills necessary to use digital tools confidently and pedagogically. In public school systems, professional development programmes are often irregular, theoretically oriented, or disconnected from classroom realities, limiting their effectiveness in fostering sustained ICT use. In addition to human capacity, technical and logistical support structures are essential for maintaining ICT infrastructure in public schools. Trucan (2016) indicates that the absence of routine maintenance, technical assistance, and replacement plans contributes to high rates of equipment breakdown and obsolescence. As a result, even well-equipped schools may experience declining ICT usage over time. In addition, institutional capacity also affects how schools adapt ICT to their specific contexts. Schools with stronger internal coordination and resource management tend to demonstrate more consistent and innovative uses of technology (Heeks, 2018). This suggests that ICT integration is closely tied to the overall capacity of public-school systems to plan, support, and sustain educational innovations.

1.3 ICT Integration in Public Schools in Ghana

In Ghana, ICT integration in public schools has been a policy priority for over two decades, particularly following the introduction of the Information and Communication Technology

for Accelerated Development (ICT4AD) policy in 2003. The policy identified education as a key sector for ICT deployment, to enhance teaching and learning outcomes and prepare learners for participation in a digital economy (Government of Ghana, 2003). Subsequent education sector plans have reinforced the role of ICT in basic and secondary education.

Despite these efforts, studies suggest that ICT integration in Ghanaian public schools remains uneven, with significant disparities between urban and rural areas and across educational levels. While some progress has been recorded in secondary and tertiary institutions, public primary schools continue to face substantial challenges related to infrastructure, connectivity, and access to functional ICT equipment (Amenyedzi et al., 2011; Malcolm & Godwyll, 2008). More so, studies focusing on public primary schools highlight persistent constraints such as unreliable electricity supply, limited internet access, overcrowded classrooms, and insufficient teacher training (Ampofo & Abrefi, 2020; Gyaase et al., 2020). These conditions restrict the extent to which ICT can be integrated into everyday instructional practices, even in urban schools that are relatively better resourced.

Consequently, ICT use in Ghanaian public schools is often confined to basic computer literacy or administrative functions rather than integrated pedagogical applications. This gap between policy aspirations and classroom realities highlights the need for context-specific analyses that examine how ICT integration unfolds within public school environments and how teachers and schools navigate existing constraints.

1.4 Profile of Fire Armor Cluster of Schools- Madina

The Fire Armour Cluster of Schools is a group of public basic education institutions located in Madina, within the La-Nkwantanang-Madina Municipal District of the Greater Accra Region of Ghana. The cluster operates under the Ghana Education Service (GES) and is

organised within the municipal education circuit system, which groups public schools for administrative supervision, instructional monitoring, and professional support.

The schools within the Fire Armour Cluster provide basic education services at the kindergarten and primary levels and serve learners drawn largely from the surrounding Madina community. As an urban public-school cluster, it caters to pupils from diverse socio-economic backgrounds, reflecting the mixed residential and commercial character of Madina as a rapidly growing suburban area of Accra.

Like many public basic schools in urban Ghana, the Fire Armour Cluster functions within a context of high enrolment, shared facilities, and limited resources. Instruction is delivered by professionally trained teachers assigned by the Ghana Education Service, with school management structures comprising headteachers, circuit supervisors, and municipal education authorities who provide oversight and support.

The Fire Armour Cluster of Schools therefore represents a typical urban public primary school setting in Ghana, making it suitable for studies that seek to examine teaching practices, resource utilisation, and educational interventions within real-world public basic education environments.

1.5 Profile of Madina Estate M/A Primary School

Madina Estate M/A Primary School is a public basic education institution located within the Madina Estate area of Madina, in the La-Nkwantanang-Madina Municipal District of the Greater Accra Region of Ghana. The school operates under the Ghana Education Service (GES) and is managed as part of the Municipal Assembly (M/A) public school system, which provides basic education services to communities within the municipality.

The school serves pupils at the primary level and draws its student population primarily from the Madina Estate community and surrounding neighbourhoods. As an urban public primary school, Madina Estate M/A Primary caters to learners from varied socio-economic backgrounds, reflecting the diverse residential character of Madina as a rapidly urbanising suburb of Accra.

Instruction at Madina Estate M/A Primary School is delivered by professionally trained teachers posted by the Ghana Education Service, with school administration overseen by a headteacher and supported by circuit supervisors and the Municipal Education Directorate. Like many public primary schools in urban Ghana, the school operates within constraints related to class size, availability of teaching and learning materials, and shared infrastructure.

Madina Estate M/A Primary School represents a typical urban public primary school context in Ghana, providing a relevant setting for studies examining teaching practices, school resources, and instructional innovations within the public basic education system.

By examining teachers' perceptions at Fire Armor Cluster of schools and Madina Estate M/A Primary schools in Madina, this study seeks to shed light on the complex dynamics of ICT integration in urban public primary schools. The research employs the Technology Acceptance Model (TAM) and Diffusion of Innovations (DOI) theory as complementary theoretical frameworks to understand how individual teacher beliefs (perceived usefulness, perceived ease of use) and systemic factors (school culture, peer influence, institutional support, policy directives) interact to shape ICT adoption and teachers' evaluations of its impact on student academic performance in literacy and numeracy.

1.6 Statement of the Problem

Despite Ghana's national commitment to integrating information and communication technologies (ICT) in education through the ICT4AD policy (Government of Ghana, 2003) and initiatives such as the One Million Coders Programme, the effective use of ICT in public primary schools remains limited and uneven (Amenyedzi et al., 2011; Gyaase et al., 2020). While policy documents outline ambitious goals for technology-enhanced teaching and learning, classroom-level implementation lags considerably, particularly in urban public primary schools where infrastructural challenges and resource constraints persist (Nyarko, 2007; Ofosu-Asare, 2024). This discrepancy highlights a persistent policy–practice gap in Ghanaian basic education.

A critical factor contributing to this gap is the limited understanding of teachers' perceptions regarding ICT's influence on student learning, especially in foundational subjects such as literacy and numeracy (Ampofo & Abrefi, 2020). Although schools may possess computers, projectors, and other digital tools, these resources are frequently underutilized, often confined to computer laboratories or employed primarily for administrative purposes (Gyaase et al., 2020). Teachers may express positive attitudes toward technology, yet these beliefs do not always translate into meaningful classroom integration. Research examining how teachers perceive ICT's effectiveness for enhancing student learning remains scarce, particularly at the primary school level.

The urban context introduces additional complexities. Public primary schools in Accra, such as the Fire Armour Cluster and Madina Estate M/A Primary School, face large class sizes, diverse student populations with varying home access to technology, and high teacher workloads (Malcolm & Godwyll, 2008). Assumptions that urban schools automatically benefit from better infrastructure shadow the realities of aging equipment, intermittent

internet connectivity, insufficient technical support, and limited professional development opportunities (Gyaase et al., 2020). Consequently, understanding teacher perceptions in these schools is essential to bridging the gap between ICT availability and meaningful pedagogical use.

Existing research in Ghana often applies either the Technology Acceptance Model (TAM) or Diffusion of Innovations (DOI) theory in isolation, focusing on individual teacher beliefs or innovation characteristics, respectively (Amenyedzi et al., 2011; Malcolm & Godwyll, 2008; Davis, 1989; Rogers, 2003). An integrated TAM–DOI approach is necessary to capture both psychological determinants of teacher acceptance and the contextual factors that facilitate or constrain ICT adoption. By investigating teachers' perceptions of ICT's perceived effectiveness on literacy and numeracy within the Fire Armour Cluster and Madina Estate M/A Primary School, this study seeks to generate actionable insights to inform professional development, resource allocation, and evidence-based strategies for improving ICT integration in Ghanaian urban public primary schools.

1.7 Research Objectives

The specific objectives of this study were to:

i. Examine teachers' perceptions of the impact of information and communication technology (ICT) on the literacy performance of pupils in primary schools in Accra.
ii. Assess the implications of ICT-based instruction for the development of numeracy skills among primary school pupils
iii. Identify institutional and contextual factors that teachers perceive as facilitating or constraining the integration of ICT in literacy and numeracy instruction

1.8 Research Questions

This study is guided by the following research questions:

i. How do teachers perceive the impact of information and communication technology (ICT) on the literacy performance of pupils in primary schools in Accra?

ii. What are the implications of ICT-based instruction for the development of numeracy skills among primary school pupils?

iii. What institutional and contextual factors do teachers identify as facilitating or constraining the integration of ICT in literacy and numeracy instruction?

1.9 Significance of the Study

This study is significant in advancing understanding of ICT integration in public primary schools in Ghana, particularly in relation to literacy and numeracy instruction. While national policies emphasise the role of ICT in improving teaching and learning, there remains limited empirical evidence on how primary school teachers perceive the impact of ICT on pupils' foundational academic skills. By examining teachers' perceptions, this study provides insight into how ICT is understood, adopted, and utilised at the classroom level, where learning outcomes are ultimately shaped.

The findings of the study are expected to be useful to education policymakers and administrators, including the Ministry of Education and the Ghana Education Service. Evidence generated from urban public primary schools in Accra can inform policy implementation decisions, teacher training programmes, and resource allocation strategies aimed at strengthening ICT-supported instruction in basic education. The study's focus on

literacy and numeracy offers practical guidance on aligning ICT initiatives with core learning priorities rather than treating technology integration as an end in itself.

The study is also significant for teachers and school leaders, as it highlights institutional and contextual factors that facilitate or constrain ICT integration in everyday teaching practice. Understanding these factors can support the development of more responsive professional development interventions and school-based support mechanisms that address real classroom challenges.

From a scholarly perspective, the study contributes to the literature by applying an integrated Technology Acceptance Model and Diffusion of Innovations framework within the context of public primary education in Ghana. This integrated approach extends existing research, which often applies these theories in isolation or focuses on higher levels of education, and provides a more comprehensive explanation of ICT adoption dynamics in basic education settings.

1.10 Scope of the study

This study is geographically situated in Madina, a suburb of Accra in the Greater Accra Region of Ghana, focusing on Fire Armor Cluster of Schools and Madina Estate M/A Primary Schools, both in Madina, a suburb of Accra. The study is confined to public primary schools within an urban context and does not extend to rural schools, private institutions, or schools in other regions of the country. The urban public-school setting presents specific contextual characteristics that shape ICT integration practices. In terms of educational level, the study focuses on primary education, covering Classes 1 to 6 within the Ghanaian basic education system. Other levels of education, including junior high, senior high, and tertiary institutions, fall outside the scope of the study. The focus on primary education reflects the importance of foundational learning stages and the limited empirical attention given to ICT

integration at this level in Ghana. The study examines teachers' perceptions of ICT integration, with particular emphasis on its perceived impact on literacy and numeracy instruction. While ICT may be used across various subject areas, the study does not systematically investigate its application in subjects such as science, social studies, or creative arts. Data are drawn exclusively from teachers, and other stakeholders such as pupils, parents, and school administrators are not directly studied. The study seeks to provide an in-depth understanding of ICT integration within a specific context rather than to establish causal relationships or generate statistically generalisable findings.

1.11 Organization of the study

This paper is organized into five main chapters. Chapter One presents the introduction to the study. It provides the background to the research, outlines the problem statement, research objectives and research questions, and explains the significance of the study. The chapter also discusses the scope and delimitations of the study and provides operational definitions of key concepts to guide understanding.

Chapter Two reviews relevant literature related to the integration of ICT in education. It examines conceptual issues on ICT in teaching and learning, reviews empirical studies on ICT integration at the primary school level, and discusses the theoretical frameworks underpinning the study, namely the Technology Acceptance Model (TAM) and Diffusion of Innovations (DOI) theory. The chapter concludes with a synthesis of the literature and identification of gaps that justify the present study.

Chapter Three describes the research methodology employed in the study. It outlines the research design, study area, population and sampling procedures, data collection instruments, and methods of data collection. The chapter also explains the data analysis procedures, ethical considerations, and measures taken to ensure trustworthiness of the study.

Chapter Four presents and analyses the findings of the study. The chapter is organized around the research questions and presents teachers' perceptions of ICT integration and its perceived impact on pupils' literacy and numeracy performance, as well as institutional and contextual factors influencing ICT use in public primary schools.

Chapter Five discusses the findings in relation to the literature and theoretical frameworks. It summarizes the key findings, draws conclusions based on the research objectives, and presents implications for policy, practice, and future research. The chapter also provides recommendations for improving ICT integration in public primary schools in Ghana.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Information and Communication Technology (ICT) is widely recognized as a key driver of educational innovation, offering opportunities to enhance teaching practices, student engagement, and learning outcomes. However, the effectiveness of ICT is highly context-dependent, shaped by teacher perceptions, institutional support, infrastructure, and socio-economic factors (Pelgrum, 2001). Teachers' attitudes, in particular, are decisive: they determine the extent to which available technologies are integrated meaningfully into classroom instruction and whether they translate into improvements in academic performance (Pajares, 1992; Davis, 1989).

This chapter reviews relevant literature on ICT integration in education with a specific focus on teachers' perceptions and the implications of ICT use for literacy and numeracy instruction at the primary school level. The review draws on conceptual, theoretical, and empirical studies to provide a comprehensive understanding of how ICT has been adopted and utilised in educational contexts globally, within Sub-Saharan Africa, and in Ghana. In addition, the chapter examines the theoretical foundations underpinning the study, particularly the Technology Acceptance Model (TAM) and the Diffusion of Innovations (DOI) theory, and discusses their relevance to teachers' adoption and use of ICT in primary education.

Review of related literature

2.1 Conceptualizing Information Computer Technology (ICT) in Education

Pelgrum and Plomp (1996) observe that ICT encompasses digital tools and systems that facilitate communication, information processing, and learning, including computers, projectors, mobile devices, internet applications, and multimedia platforms. To Watson (1998) the integration of ICT in education extends beyond the provision of hardware, requiring pedagogical innovation, institutional support, and changes in traditional teacher-student interactions.

Globally, ICT has been linked to improved student engagement, individualized learning, and collaborative pedagogical approaches (Cuban, 1986; Crook, 1994). Yet, studies highlight that the effectiveness of ICT depends on context: teacher readiness, technological infrastructure, curriculum alignment, and socio-economic factors all mediate outcomes (Cox et al., 1999; Pelgrum, 2001). Notably, several studies reveal discrepancies between reported ICT usage and actual classroom integration, suggesting that mere access to technology is insufficient to improve learning outcomes (Woodrow, 1992; Norris et al., 2003).

While these conceptualizations establish ICT as a multidimensional pedagogical tool, much of the literature remains abstract and technology-focused, with limited attention to how teachers in specific contexts interpret and operationalise ICT in everyday classroom practice. In Ghanaian primary schools, particularly in urban public settings, research rarely interrogates how these broad definitions translate into practical instructional use, especially in foundational subjects such as literacy and numeracy. This limit understanding of ICT not

merely as an available resource, but as a lived pedagogical practice shaped by teacher perceptions and contextual constraints.

2.2 Global Perspectives on ICT Adoption

In developed contexts, ICT adoption has facilitated pedagogical innovations such as blended learning, flipped classrooms, and digital literacy programs. Teachers' beliefs about the usefulness of technology and ease of use are consistently shown to influence adoption (Abbasi et al., 2025; Feng et al., 2025; Panakaje et al., 2024). For example, Mintah et al. (2023) found that teachers who perceived ICT as enhancing instruction were more likely to integrate it meaningfully, whereas those sceptical of its benefits often underutilized it. Nevertheless, global studies also identify systemic barriers like insufficient professional development, institutional resistance, and inequitable access hinder effective adoption (Eltaiba et al., 2025). Methodologically, most studies employ surveys and self-reports, which provide insight into teacher attitudes but may overestimate actual usage (Kadluba & Obersteiner, 2025).

More so, theoretical frameworks like Technology Acceptance Model (TAM) and Diffusion of Innovations (DOI) have been instrumental in explaining ICT adoption. TAM emphasizes perceived usefulness (PU) and perceived ease of use (PEOU) as predictors of technology acceptance (Al-Adwan et al., 2023). For instance, studies such as David and Aruta (2022) surveyed 402 Filipino teachers and found that perceived ease of use, perceived usefulness, and attitude significantly influenced behavioural intention to use technology. Similarly, Peng et al. (2023) studied 685 Chinese in-service teachers using structural equation modelling and demonstrated that TAM constructs, combined with self-efficacy and digital competence, significantly influence ICT integration.

DOI highlights innovation characteristics; relative advantage, compatibility, complexity, trialability, and observability, and situates adoption within social and institutional networks (Zondo & Ndoro, 2023). Çakiroğlu et al. (2022) applied DOI theory to examine 307 academics' adoption of online teaching during COVID-19, finding that support, functionality, and guidance influenced diffusion patterns. The integrated application of TAM and DOI provides a more comprehensive understanding, capturing both individual and systemic determinants of adoption (Lee et al., 2025).

Despite extensive global evidence on ICT adoption, much of this research is situated in well-resourced educational systems and relies heavily on self-reported survey data. These approaches, while useful for identifying general trends, offer limited insight into how contextual factors shape actual classroom practices, particularly in developing-country primary education. Moreover, findings from secondary and tertiary institutions are often generalized to primary schools without sufficient empirical justification. This raises questions about the applicability of global ICT adoption models to urban public primary schools in Ghana, where resource availability and institutional support may differ markedly from assumed global norms.

2.3 ICT in African Educational Contexts

ICT adoption in African schools is often constrained by systemic inequalities, including limited infrastructure, inadequate teacher training, and unequal access (Baako & Abroampa, 2024; Oubibi et al., 2024). For instance, Nigerian schools struggle with poor technological resources and weak professional development, reducing the potential impact on student outcomes (Oubibi et al., 2024). Similar patterns are observed in South Africa and other sub-Saharan African countries, where infrastructural gaps and insufficient institutional support hinder adoption (Mahlo & Waghid, 2022; Zreik et al., 2024).

Mahlo and Waghid (2022) examined ICT use in South African public primary schools from a capability approach perspective, interviewing 10 educators. They found that conversion factors, including age, policies, infrastructure, and training, either enable or impede teachers' ICT capabilities. Communities of practice and university training helped some teachers attain ICT skills, but systemic barriers persisted.

Graham (2022) investigated barriers to e-textbook implementation in rural and township schools in South Africa using a TAM-framed mixed-methods approach. Teachers found e-resources easy to navigate but faced limited e-book availability, inadequate training, and time constraints. These findings underscore the gap between perceived ease of use and actual implementation capacity.

In Eastern Cape, South Africa, Mapisa and Makena (2024) conducted qualitative research across three primary schools, finding that teachers were willing to adopt ICT but lacked competencies and faced infrastructure shortages. They recommended expanded teacher training and ICT policy frameworks to support meaningful integration. Despite these challenges, ICT is increasingly recognized as vital for bridging educational disparities and preparing students for knowledge-based economies (Abedi, 2024; UNESCO, 2014). Teachers' perceptions remain pivotal regarding enthusiasm without appropriate training often resulting in underutilization or superficial application of technology (Abid et al., 2023; Novoa-Echaurren et al., 2025).

Subsequently, although African scholarship has extensively documented infrastructural and capacity-related challenges to ICT adoption, much of this work emphasizes constraints rather than examining how teachers actively negotiate these limitations in classroom practice. In addition, several studies focus on rural or peri-urban contexts, leaving urban public primary schools comparatively under examined. As a result, there is limited empirical insight into

how teacher perceptions interact with systemic constraints in seemingly better-resourced urban settings, where expectations of ICT integration are often higher.

2.4 ICT in Ghanaian Education

Ghana's ICT integration policy, ICT4AD (Government of Ghana, 2003), established education as a primary sector for technology adoption. However, implementation has been uneven across schools. Urban areas, while better resourced than rural counterparts, still experience barriers including limited training, inadequate support, and infrastructural deficits (Sepadi, 2025).

Gyaase et al. (2020) conducted a mixed-methods study using principal component analysis to examine ICT integration in Ghana's pre-university education. They reported existing ICT literacy education but identified inadequate infrastructure, skills gaps, lack of support, and inappropriate content as persistent barriers to effective integration. Their findings highlight the disconnect between policy intentions and classroom realities.

Ampofo and Abrefi (2020) surveyed 40 basic school teachers in the Adansi South District of Ghana and found that teachers lacked core ICT resources including computers, laboratories, and internet connectivity. Factors influencing ICT use included teacher readiness, technical support, reliable power supply, and intention to use technology. This study underscores that even in contexts where teachers express willingness to use ICT, infrastructural deficits constrain actual implementation. Similarly, Ofosu-Asare (2024) developed a literature-based framework addressing infrastructure, finance, human, and socio-cultural barriers in rural Ghana. The framework proposes low-cost technology solutions, teacher professional development, localized content, and community participation as essential components for sustainable ICT integration in resource-constrained settings. Again, studies on Ghanaian primary schools indicate enthusiasm among teachers but also highlights challenges in

translating policy into practice (Okyere, 2025; Tseer et al., 2024). This underscores the need for context-specific research, particularly in urban public schools where resource disparities coexist with high policy expectations.

Conclusively, whilst Ghanaian studies provide valuable insights into policy intentions, access, and infrastructural challenges, fewer studies examine how teachers perceive the pedagogical value of ICT or how these perceptions influence classroom integration. Existing research largely treats ICT availability as a proxy for use, with limited exploration of how teacher attitudes, confidence, and instructional choices shape learning experiences. This gap is particularly evident at the primary school level, where foundational learning outcomes such as literacy and numeracy receive limited empirical attention.

2.5 Teachers' Perceptions and ICT Integration

Teachers' perceptions are central to ICT adoption. Positive beliefs regarding usefulness, ease of use, and alignment with curricular goals enhance integration, while negative perceptions inhibit it even when resources are available (Adu-Marfo et al., 2024; Naaz, 2025). In Ghana, systemic factors such as large class sizes, inconsistent internet connectivity, and limited institutional support shape these perceptions (Amenyedzi et al., 2011).

Empirical studies across diverse contexts confirm the critical role of teacher perceptions. Koutromanos et al. (2023) developed the Mobile Augmented Reality Acceptance Model (MARAM) and surveyed 306 teachers (137 pre-service, 169 in-service) in Greece. Using structural equation modelling, they found that intention to use Mobile Augmented Reality was influenced by attitude, perceived usefulness, and facilitating conditions. Perceived enjoyment and relative advantage predicted usefulness, suggesting that teacher perceptions of pedagogical value directly influence adoption decisions.

Ko and Shin (2023) also compared teachers' intentions to integrate online instruction and augmented reality and virtual reality instruction. Their findings that teacher self-efficacy and motivational support significantly influence perceived ease of use across both instructional modes. However, Technological Pedagogical Content Knowledge (TPACK) was more strongly associated with the adoption of augmented and virtual reality tools, while constructivist pedagogical beliefs were more influential in shaping intentions to use online instruction. These results suggest that professional development should be differentiated to address the distinct pedagogical and technical demands of different forms of information and communication technology. Also, Tang and Zainal (2023) surveyed 400 early childhood educators in Guangdong Province, China, demonstrating that perceived usefulness and perceived ease of use determine multimedia adoption and educators' effectiveness. This reinforces the TAM framework's applicability across educational levels and contexts.

Although international studies consistently affirm the centrality of teacher perceptions in ICT adoption, Ghanaian research rarely links these perceptions to instructional practice and student learning outcomes. Most studies focus on intention to use or frequency of use rather than examining how teachers' beliefs about usefulness and ease of use shape pedagogical decisions in literacy and numeracy instruction. Consequently, the relationship between teacher perceptions of ICT and perceived student academic performance at the primary level remains insufficiently explored.

2.6 ICT Impact on Learning Outcomes

A critical question in ICT-in-education research concerns the relationship between technology integration and student academic performance, particularly in foundational skills such as literacy and numeracy. While substantial research documents teacher attitudes and

infrastructure challenges, fewer studies directly measure ICT's impact on learning outcomes in developing country contexts.

De Hoop et al. (2023) conducted a cluster randomized trial across 63 community schools in rural Zambia, evaluating a multi-faceted technology-aided activity-based learning program combined with teacher training. Results showed significant improvements in reading and mathematics signalling that technology-aided instruction can improve literacy and numeracy outcomes in rural sub-Saharan African contexts when combined with appropriate teacher support.

Despite growing experimental evidence from other sub-Saharan African contexts demonstrating ICT's potential to improve literacy and numeracy, comparable evidence from Ghanaian primary schools is scarce. Most Ghana-based studies infer educational benefits from teacher perceptions or policy alignment rather than from explicit consideration of learning outcomes. This methodological gap limits evidence-based decision-making regarding ICT investments in primary education.

2.7 Methodological Trends and Critiques

Across global, African, and Ghanaian scholarship, quantitative survey designs remain the dominant methodological approach to studying teachers' attitudes toward ICT, largely due to their ability to generate measurable patterns at scale (Amenyedzi et al., 2011; Okyere, 2025). While these studies provide useful baseline indicators of access, frequency of use, and teacher readiness, they often yield surface-level insights that do not fully account for the complexities of classroom practice or the socio-cultural contexts shaping ICT adoption (Hennessy et al., 2010; Kermanidis et al., 2025).

Recent studies have adopted advanced analytical methods to examine the complex and interrelated factors influencing ICT integration in teaching. Using structural equation modelling, Peng, et al. (2023) demonstrated how teachers' attitudes, confidence, digital skills, and actual technology jointly shape ICT integration, while also revealing the moderating influence of personal characteristics such as age, gender, and teaching experience. Similarly, employing a Multiple Indicators Multiple Causes (MIMIC) model, David and Aruta (2022) found that demographic variables significantly affect teachers' technology acceptance by shaping latent constructs such as perceived usefulness and ease of use. Extending this line of inquiry, Altan, et al. (2024) applied post-pandemic acceptance models to show that teachers' beliefs, self-efficacy, and contextual factors interact dynamically in predicting sustained technology use. Compared to earlier correlation-based studies, these modelling approaches provide a more nuanced understanding of the underlying mechanisms driving teachers' ICT adoption and integration.

2.8 Theoretical Framework

2.8.1 Technology Acceptance Model (1989)

Technology Acceptance Model (TAM), developed by Davis (1989), is one of the most widely applied frameworks for understanding users' adoption of technology. The model posits that the intention to use a technology is primarily influenced by two factors which include perceived usefulness (PU), the degree to which a person believes that using a particular system enhances their performance, and perceived ease of use (PEOU), the extent to which a person believes that using the system will be free of effort. These beliefs shape users' attitudes toward technology, which in turn determine behavioural intentions and actual usage.

The Technology Acceptance Model is widely regarded as a seminal framework in information systems and technology adoption research. Since its introduction by Davis

(1989), TAM has been extensively tested, validated, and extended across diverse sectors, including education, health, and public administration. Key proponents and contributors to the development and refinement of the model include Davis, Bagozzi, and Warshaw (1989), as well as Venkatesh and Davis (2000), whose work led to the extension of TAM into TAM2, incorporating social influence and cognitive instrumental processes. Subsequent models, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), further demonstrate TAM's foundational influence on contemporary technology adoption research (Venkatesh et al., 2003).

TAM is particularly suitable for this study because it provides a structured lens to examine teachers' perceptions of ICT integration in primary school classrooms. Since the effectiveness of ICT depends not just on its availability but on how teachers perceive and utilize it, TAM helps to explain the cognitive and attitudinal processes that influence whether teachers adopt digital tools in literacy and numeracy instruction (Venkatesh & Davis, 2000). By focusing on perceived usefulness and ease of use, the model allows this study to explore whether teachers view ICT as enhancing student learning outcomes, how confident they feel in employing these tools, and the potential barriers that may limit adoption. Moreover, TAM aligns with the interpretivist paradigm of this study, which recognizes that technology adoption is influenced by individual experiences, beliefs, and contextual factors. It provides a robust foundation to guide both data collection and analysis, as the model's constructs can be linked to teachers' reported experiences and attitudes, offering insight into the factors that facilitate or constrain meaningful ICT integration in urban public primary schools.

2.8.2 Diffusion of Innovations Theory (1962, 2003)

The Diffusion of Innovations (DOI) theory, developed by Rogers (1962, 2003), explains how new ideas, practices, or technologies are communicated and adopted over time within a

social system. Unlike models that focus primarily on individual attitudes, DOI emphasises the social processes and contextual factors that influence adoption, making it particularly relevant to educational settings where teachers operate within institutional and peer networks.

Rogers identifies five attributes of innovations that are considered in adoption processes which are relative advantage, compatibility, complexity, trialability, and observability. In studies of ICT use in education, these attributes have been used as analytical lenses to examine how teachers perceive educational technologies in relation to existing teaching practices, professional norms, and classroom demands, without assuming uniform responses to ICT. In addition, DOI categorises adopters into five groups including innovators, early adopters, early majority, late majority, and laggards, highlighting differences in teachers' readiness and willingness to embrace ICT. This categorisation is useful for understanding variations in ICT uptake among teachers within the same school system and for explaining uneven patterns of integration across classrooms.

The theory further underscores the role of communication channels, leadership, and organisational culture in shaping adoption decisions. In public primary schools, factors such as peer influence, headteacher support, professional development opportunities, and policy directives can significantly affect how ICT innovations spread and are sustained.

Consequently, DOI is suitable for this study because it provides a macro-level lens that complements individual-level models such as TAM. While TAM explains teachers' acceptance of ICT based on perceived usefulness and ease of use, DOI situates these perceptions within broader social and institutional contexts. Together, the two frameworks offer a more comprehensive understanding of teachers' ICT integration practices in urban public primary schools in Accra.

2.9 Conclusion

This chapter reviewed existing literature on ICT integration in primary education, focusing on its impact on literacy and numeracy, as well as the institutional and contextual factors influencing its adoption. The review highlighted that ICT can enhance learning outcomes by improving engagement, supporting differentiated instruction, and facilitating interactive and collaborative pedagogies. However, it also revealed persistent challenges, including limited access to devices, inadequate teacher training, and infrastructural constraints, particularly in resource-limited contexts such as Ghana. The chapter further established the relevance of the Technology Acceptance Model (TAM) and Diffusion of Innovations (DOI) theory in understanding teachers' perceptions, adoption, and use of ICT in classrooms. Overall, the literature highlights that while ICT has significant potential to improve primary education, its effectiveness depends on the combination of teacher readiness, pedagogical strategies, and institutional support. This blend provides the theoretical and empirical foundation for the present study, justifying the need to explore teachers' perspectives and experiences with ICT integration in public primary schools in Accra.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methodological procedures adopted to explore teachers' perceptions of the impact of Information and Communication Technology (ICT) on pupils' literacy and numeracy performance in public primary schools in Madina, Accra. The chapter outlines the research paradigm, design, study setting, population, sampling procedures, data collection methods, data analysis process, trustworthiness strategies, and ethical considerations guiding the study.

The study is grounded in an interpretivist research paradigm, which assumes that reality is socially constructed and that meaning is derived from participants' lived experiences. This paradigm is appropriate for the study because it enables an in-depth exploration of how teachers interpret, experience, and make sense of ICT integration within their instructional contexts, rather than measuring outcomes through predetermined variables.

Methodologically, the study adopts a qualitative case study design, informed conceptually by the Technology Acceptance Model (TAM) and Diffusion of Innovations (DOI) theory. While TAM provides insight into teachers' perceptions of usefulness and ease of use of ICT, DOI offers a broader understanding of how institutional, social, and contextual factors influence adoption processes. Together, these frameworks guided the development of the interview guide and informed the interpretation of the findings. The qualitative case study approach allows for a nuanced examination of teachers' sense-making processes and the contextual realities shaping ICT integration in literacy and numeracy instruction within urban public primary schools.

3.1 Research Paradigm

This study is situated within the interpretivist paradigm, which holds that reality is socially constructed and understood through the subjective interpretations of individuals within specific social and cultural contexts (Schwandt, 1994; Crotty, 1998). Rather than assuming the existence of a single objective truth, interpretivism recognises multiple realities shaped by participants' experiences, interactions, and meaning-making processes (Lincoln & Guba, 1985; Denzin & Lincoln, 2011). This paradigm is particularly appropriate for the study, as teachers' perceptions of ICT integration are influenced by their professional backgrounds, levels of ICT competence, training experiences, and the institutional environments in which they operate.

The interpretivist stance informed key methodological choices in the study, including the use of semi-structured interviews, which allow participants to articulate their experiences in their own terms while enabling the researcher to probe emerging issues relevant to ICT integration in literacy and numeracy instruction (Kvale & Brinkmann, 2009). Data analysis was conducted using thematic analysis, a method consistent with interpretivist assumptions that meaning is not discovered as an objective fact but co-constructed through interaction between the researcher and participants (Braun & Clarke, 2006; Guest, MacQueen, & Namey, 2012).

Reflexivity formed an integral part of the research process, requiring continuous awareness of the researcher's positionality and its potential influence on data generation and interpretation (Finlay, 2002; Berger, 2015). By foregrounding teachers' voices and situating findings within their specific institutional and contextual realities, the interpretivist paradigm provided a coherent philosophical foundation for generating nuanced, contextually grounded understandings of ICT integration in public primary education (Creswell & Poth, 2018).

3.2 Research Approach

Creswell (2014) explains research approach as the general strategy or direction that directs data collecting and analysis in a study, deciding whether to use mixed, qualitative, or quantitative methodologies to meet the research problem. Bryman (2016) and Creswell and Poth (2018) also observe that to provide consistency between theory, data, and interpretation, a research strategy serves as the strategic framework that connects a researcher's philosophical perspective to particular research designs, techniques, and analytical procedures

The aim of the study is to understand teachers' perceptions, beliefs, motivations, and experiences with ICT integration necessitates an approach that prioritises depth of insight, contextual meaning, and interpretive richness. Hence this study is anchored on a qualitative research approach, which seeks to provide rich insights, stories, and contextual subtleties that provides a thorough understanding of a specific phenomenon (Hovey, 2022).

3.3 Research Design

According to Creswell (2014) research design refers to the general plan or blueprint that outlines the methods for gathering, measuring, and analysing data to address a research question and guarantee the validity and reliability (or trustworthiness) of the study. It is the logical framework that links the research questions to the empirical data and the methods for analysing that data, directing the organization and practical application of the study (Yin, 2018; Bryman, 2016).

In qualitative study, the researcher might choose from a variety of research designs, including grounded theory, case studies, ethnography, phenomenology, and narrative research (Creswell, 2008). However, the researcher must make an appropriate decision based on the

requirements of the study questions. The study adopted and applied a case study design. A case study is a type of research methodology where a program, procedure, activity, or one or more people are thoroughly examined (Stake, 1995). Case study entails a thorough examination of a bounded system (such a town, school, or program) in its actual setting. In qualitative research, it is frequently employed to investigate complicated phenomena when contextual factors are crucial to understanding the problem (Yin, 2018). Given the study's focus on understanding teachers' perceptions and experiences within clearly defined institutional settings, a case study design was considered most appropriate. The two public primary schools selected represent bounded systems, making the case study design suitable for capturing the contextual dynamics shaping ICT integration.

3.4 Study Setting

The study was conducted in Madina, a rapidly urbanising suburb in the La Nkwantanang-Madina Municipality in the Greater Accra Region. Madina is characterised by a large, diverse population, mixed-income communities, and a blend of informal and formal economic activities. The area presents a unique educational context where public primary schools face resource inequalities despite their proximity to urban administrative centres.

The study focused on two schools including the Fire Armour Cluster of Schools and Madina Estate M/A Primary School. These schools exhibit features common in many urban public basic schools in Ghana, including but not limited to high pupil-teacher ratios, inconsistent access to ICT devices, intermittent power supply, limited digital literacy among teachers, varied levels of parental involvement and home digital exposure.

Consequently, these schools were appropriate cases for a qualitative study because they are bounded systems. In line with the interpretivist and case study orientation of the research, a

contextualized knowledge of teachers' perspectives and experiences was made possible by examining ICT integration within these particular institutional settings.

3.5 Sampling strategy

Qualitative research employs sampling strategies that are driven by the need for depth of understanding rather than statistical representativeness. As such, participant selection is guided by their relevance to the phenomenon under investigation and their capacity to provide rich, meaningful data. Creswell (2014) argues that qualitative inquiry relies on the deliberate selection of individuals or sites that can best illuminate the research problem.

In line with this position, this study adopted purposive sampling, which enabled the researcher to intentionally select participants who were directly involved in, and knowledgeable about, the integration of ICT in classroom instruction. Purposive sampling was considered appropriate because the study sought to explore teachers' perceptions, beliefs, motivations, and experiences regarding ICT integration, which could only be adequately addressed by engaging teachers with first-hand instructional responsibilities.

Accordingly, participants were selected based on their roles in the delivery of literacy, numeracy, and ICT-related content across Primary 1 to 6, as well as their involvement in instructional leadership within the selected schools. This approach ensured that the data generated were information-rich, contextually grounded, and aligned with the study's qualitative case study design.

3.6 Sample

In qualitative research, the selection of participants aims to generate in-depth, contextually rich insights rather than statistical generalizability (Daymon & Holloway, 2001; Moser & Korstjens, 2017). Boddy (2016) further observes that sample size in qualitative inquiry is

guided by the study context and the underlying scientific paradigm. Accordingly, this study employed purposive sampling to recruit teachers who were directly involved in the teaching of literacy, numeracy, or ICT-related subjects in the selected schools and who could provide detailed perspectives on ICT integration.

Participants were selected based on the following criteria: a minimum of one year of teaching experience in the school, direct involvement in literacy, numeracy, or ICT instruction, self-reported basic or advanced experience with ICT tools, and willingness and availability to participate. Using these criteria, a total of 20 teachers were recruited, with 10 participants drawn from each school. The sample comprised 11 female and 9 male teachers, including 8 lower primary (Basic 1–3) and 12 upper primary (Basic 4–6) teachers. Participants' self-reported ICT competence levels ranged from low (7), medium (8), to high (5).

3.7 Data Collection Method

Data collection, according to Fornaro et al. (2021), is the act of obtaining, measuring, collecting, and capturing information or data from different sources or people for the aim of study, analysis, decision-making, or documentation. Several data collection instruments are commonly employed in qualitative research, including interviews, observations, surveys, and experiments. For this study, semi-structured interviews were chosen as the primary method of data collection (Thille et al., 2022), as they provide a means of gaining rich, detailed insights into participants' perceptions and experiences.

3.7.1 Interviews

Interviews provide researchers with an opportunity to gather detailed information about participants' experiences, perceptions, and beliefs concerning a specific phenomenon (Lambert & Loiselle, 2007). They are typically one-to-one conversations between the

researcher and participant, aimed at achieving an in-depth understanding of the subject under investigation (Grill et al., 2008). Interviews can be structured, semi-structured, or unstructured (Braun & Clarke, 2011). Given that this study sought to explore teachers' perceptions and experiences of ICT integration in literacy and numeracy instruction, semi-structured interviews were employed. This format allowed for guided yet flexible conversations, enabling participants to articulate their views in detail while allowing the researcher to probe emerging themes and clarify responses (Kvale, 2007).

3.7.2 Document analysis

In addition to interviews, document analysis was employed to complement and triangulate interview data. Document analysis allows researchers to examine existing records in order to gain contextual and institutional insights that may not be fully captured through interviews alone (Bowen, 2009).

For this study, documents reviewed included school ICT policies, lesson notes, teaching timetables, professional development records, and curriculum-related materials relevant to literacy, numeracy, and ICT instruction. These documents provided background information on institutional expectations, instructional practices, and the extent to which ICT integration was formally embedded within school routines. Hence, data from documents were analysed alongside interview transcripts to identify convergences and divergences between reported practices and documented evidence, thereby enhancing the credibility of the findings.

3.8 Data collection procedure

Data were collected through a carefully planned, step-by-step process to ensure both ethical compliance and research rigour. Ethical approval for the study was obtained from the UNIMAC-IJ Department of Communication Studies followed by formal permission from the

school leadership at the selected sites. Participant recruitment occurred during scheduled staff meetings, where the study's purpose, procedures, and ethical safeguards were explained. Teachers who expressed interest were approached individually, and informed consent was obtained after a clear explanation of participants' rights, the voluntary nature of participation, and measures for confidentiality and anonymity.

Interviews were conducted in private, convenient locations within the school environment, including staffrooms and administrative offices, to minimise interruptions and promote open dialogue. Each interview lasted approximately 30 to 45 minutes, and the primary language of communication was English, with brief clarifications in Twi where necessary to ensure accurate expression of participants' views. All interviews were audio-recorded with participants' consent, and detailed field notes were maintained to capture non-verbal cues, contextual observations, and situational factors not conveyed through audio alone. Reflective notes were also documented post-interview to support reflexivity and inform subsequent analysis.

Verbatim transcription of the interviews was completed promptly to preserve accuracy and contextual detail. Transcripts were anonymised using pseudonyms to protect participants' identities. To enhance credibility, member checking was conducted whereby five participants reviewed their transcripts for accuracy and clarity, and minor corrections were incorporated into the final dataset.

3.9 Data Handling

All data generated in the course of this study were handled in strict accordance with UNIMAC-IJ Department of Communication Studies data protection and research governance guidelines. Audio recordings and interview transcripts were securely stored in encrypted digital folders, with backup copies maintained on a secure, access-controlled flash drive.

Access to the data was restricted exclusively to the researcher and the academic supervisor, thereby ensuring confidentiality, data integrity, and responsible handling throughout the research lifecycle.

3.10 Analytical framework

The study employed thematic analysis as proposed by Braun and Clarke (2006), which involves identifying, analysing, and reporting patterns or themes within qualitative data. This approach was considered appropriate because it allows for in-depth interpretation of participants' views and supports the exploration of meanings constructed from their experiences (Creswell, 2013).

Data analysis began with repeated reading of interview transcripts and listening to the audio recordings to achieve familiarity with the data. Initial codes were generated from the data, after which related codes were grouped into broader themes. These themes were reviewed and refined to ensure they accurately reflected participants' accounts and addressed the research questions.

The final themes were presented through narrative interpretation supported by direct quotations from participants to illustrate key points and enhance transparency. To ensure trustworthiness, the study was guided by Lincoln and Guba's (1985) four criteria: credibility, transferability, dependability, and confirmability.

3.11 Ethical Considerations

As observed by Braun and Clarke (2013), ethics are important to all stages of qualitative research and include obtaining informed consent, ensuring confidentiality and anonymity, respecting participants' right to withdraw, minimising risk, and reporting findings honestly. These principles guided the conduct of this study. Hence, ethical approval for this study was

obtained from the University of Media, Arts and Communication (UNIMAC) School of Graduate Studies, in accordance with the university's research ethics guidelines. The study adhered to established qualitative research ethical principles to protect participants' rights, dignity, and well-being throughout the research process.

Before data collection, participants were informed about the purpose of the study, the nature of their involvement, and the voluntary nature of participation. Informed consent was obtained before interviews commenced, and participants were informed of their right to withdraw at any stage. Also, in line with Halai (2006), measures were taken to ensure that the study did not expose participants to ethical or professional risk. Participants' identities were protected through the use of pseudonyms, and all audio recordings and transcripts were securely stored and accessible only to the researcher.

3.12 Chapter Summary

This chapter outlined the procedures and processes employed in generating data for the study. A qualitative research approach, situated within a case study design, was adopted to obtain in-depth insights into teachers' perceptions of ICT integration in literacy and numeracy instruction in public primary schools in Madina, Accra. Data were collected primarily through semi-structured interviews. The chapter discussed the research approach and design, sampling strategy and sample size, data collection methods and procedures, data analysis approach, and ethical considerations guiding the study. The next chapter presents the study's findings, analysis, and discussion.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.0 Introduction

This chapter presents and discusses findings from the data collected through interviews exploring teachers' perceptions of the impact of ICT on literacy and numeracy performance among public primary school pupils in Madina, Accra. Data used to answer the research questions were derived from 20 teachers from Fire Armour Cluster of Schools and Madina Estate M/A Primary School.

Specifically, the study sought to address the following research questions:

1. How do teachers perceive the impact of information and communication technology (ICT) on the literacy performance of pupils in primary schools in Accra?

2. What are the implications of ICT-based instruction for the development of numeracy skills among primary school pupils?

3. What institutional and contextual factors do teachers identify as facilitating or constraining the integration of ICT in literacy and numeracy instruction?

Table 4.1 Participant Characteristics and Contextual Profile

Characteristics	**Category**	**Number of teacher (20)**
School	Fire Armour Cluster of School	10
	Madina Estate M/A Primary School	10
Sex	Female	11

	Male	9
Teaching Level	Lower Primary (Basic 1–3)	8
	Upper Primary (Basic 4–6)	12
Teaching Experience	Early-career (1–5 years)	6
	Mid-career (6–15 years)	8
	Veteran (16–25 years)	6
Self-assessed ICT Competence	Low	6
	Medium	8
	High	6
Recent ICT Training (Past 3 Years)	Attended formal training	9
	No formal training	11

Table 4.1 presents the demographic and professional profile of the study participants. The 20 teachers were evenly drawn from the two selected public primary schools, ensuring institutional balance. The gender distribution was relatively even, providing diverse perspectives, although gender was not treated as an analytical variable. Participants taught across both lower and upper primary levels, allowing the analysis to capture teachers' perceptions of ICT integration at different stages of pupils' literacy and numeracy development. Teaching experience ranged widely, from early-career to veteran teachers, highlighting variations in pedagogical exposure and professional maturity. Similarly, self-assessed ICT competence varied from low to high, suggesting differing levels of confidence and capacity in using digital tools for instruction. Notably, more than half of the teachers had not participated in formal ICT training within the past three years, pointing to uneven professional development opportunities. Together, these characteristics provide

important context for understanding the patterns of ICT use and the perceptions discussed in the subsequent analysis.

RQ 1. How do primary school teachers in Accra perceive the impact of ICT integration on pupils' literacy performance?

Research Question One examines teachers' perceptions of the impact of ICT integration on pupils' literacy performance in public primary schools in Madina, Accra. This question focuses on how teachers experience and interpret the use of digital technologies in supporting pupils' reading, writing, spelling, and comprehension skills. The theme *"ICT and Improved Literacy Learning"* is used to guide the analysis. This theme refers to teachers' views that the use of ICT in literacy instruction enhances pupils' engagement, understanding, and overall learning outcomes by making lessons more interactive, visually supported, and easier to follow.

4.2 ICT and Improved Literacy Learning

The data showed that teachers in the study consistently perceived ICT as a valuable tool for enhancing literacy instruction, with its impact varying according to pupils' developmental stages, reiterating findings from previous studies that highlight ICT's role in supporting foundational literacy (Hennessy et al., 2010; Nyarko, 2007). In lower primary classrooms, ICT was primarily employed to support emergent literacy skills such as phonics, letter-sound correspondence, and oral reading fluency. Audio-visual resources allowed pupils to associate sounds with symbols more effectively than traditional methods, while repeated exposure through videos and animated storybooks reinforced learning. As one teacher explained,

> *"At that stage, they learn better when they see and hear at the same time. ICT makes that possible every lesson"* (T05).

Classroom observations also confirmed that ICT-supported lessons elicited higher choral participation, sustained attention, and active mimicry of sounds compared to non-ICT lessons. These findings align with prior research showing that multimodal resources can improve phonemic awareness and engagement in early learners (De Jong & Bus, 2002).

In upper primary classrooms, teachers reported that ICT facilitated higher-order literacy skills, including reading comprehension, vocabulary expansion, and contextual understanding. Digital texts, projected passages, and educational videos provided content enrichment and encouraged independent or guided exploration. One teacher noted,

> *"The videos help them understand the background of the text before we read. It makes comprehension easier"* (T11).

This led to more discussion-based interaction and greater learner independence, supporting literature that emphasizes ICT's role in promoting critical thinking and content comprehension in older pupils (Hennessy et al., 2010). Across both levels, teachers viewed ICT not merely as a technological novelty but as a pedagogical tool that meaningfully enhanced instruction, reflecting the Technology Acceptance Model's emphasis on perceived usefulness (Davis, 1989).

ICT also played a key role in increasing pupil engagement, motivation, and participation. Teachers noted that shy or low-performing pupils became more involved during interactive ICT activities such as quizzes, storytelling, and group tasks. One teacher observed,

> *"Even pupils who rarely contribute become interested once videos or quizzes are introduced. They want to answer, they want to try"* (T05).

Observational data corroborated these accounts, showing longer periods of sustained attention, more voluntary responses, and increased peer collaboration during ICT-enhanced lessons. However, teachers emphasized that engagement gains were contingent on how ICT

was deployed. When technology was used solely for teacher-led demonstrations, the initial excitement often waned, suggesting that pedagogical design, rather than technology alone, determined the effectiveness of ICT in fostering engagement. As another teacher explained,

> *"If it's just the teacher showing slides, the pupils still get bored. They enjoy it more when they are allowed to interact"* (T18).

These observations reinforce prior claims that interactive, learner-centred approaches maximize ICT's educational value (Kozma, 2003).

While teachers recognized the pedagogical benefits of ICT, their confidence and perceived ease of use significantly influenced actual classroom integration. Teachers with higher self-reported competence integrated ICT more frequently and innovatively, whereas those with lower competence experienced anxiety, technical difficulties, and occasional lesson interruptions. One teacher admitted,

> *"Sometimes I avoid using ICT because I'm afraid something will go wrong and I won't know what to do"* (T04).

These dynamics align with TAM's construct of perceived ease of use, highlighting that even when technology is deemed useful, adoption depends on teachers' skills, confidence, and professional identity (Venkatesh & Davis, 2000).

More so, structural and institutional factors further shaped ICT adoption. Teachers reported limited access to functional devices, high device-to-pupil ratios, and intermittent electricity and internet connectivity, which constrained hands-on learning and reduced the opportunity for pupils to engage actively with ICT. One participant remarked,

> *"Most of the time, pupils only watch because there aren't enough computers. Only a few can interact, and the rest lose focus"* (T02).

Such barriers illustrate Diffusion of Innovations principles, showing how environmental compatibility, trialability, and complexity affect the rate and quality of innovation uptake (Rogers, 2003). Despite these challenges, enabling conditions, including supportive leadership, peer networks, informal mentoring, and incremental experimentation, facilitated ICT integration. As a teacher emphasized,

> *"When management supports you, you're willing to try, even if everything isn't perfect"* (T18).

In schools where headteachers actively encouraged experimentation and peers shared knowledge, teachers were more willing to implement interactive ICT strategies, maintain lesson continuity, and explore digital tools, illustrating how social and organizational factors can enhance the diffusion and sustainability of technological innovations.

Overall, teachers perceived ICT as highly beneficial for literacy development, with its impact shaped by pupils' developmental needs, teacher competence, engagement strategies, and institutional support. These findings confirm previous research on the importance of ICT in fostering literacy (Hennessy et al., 2010; Nyarko, 2007) and highlight how TAM and DOI frameworks together explain both individual and systemic influences on ICT adoption and integration in primary classrooms.

RQ2. How do teachers perceive the role of ICT-based instruction in shaping the numeracy ability of primary school pupils?

Research Question Two explores teachers' perceptions of the role of ICT-based instruction in shaping the numeracy abilities of primary school pupils in public schools in Madina, Accra. This question focuses on how teachers understand the contribution of digital tools to pupils' learning of basic mathematical concepts such as counting, number recognition, problem-solving, and calculation. The theme **"***ICT Supporting Understanding in Numeracy"* is used to guide the analysis. This theme refers to teachers' views that ICT-based instruction

helps pupils to better grasp numerical concepts by making abstract ideas more concrete, visual, and interactive, thereby improving comprehension and reducing learning difficulties in numeracy.

4.3 ICT Supporting Understanding in Numeracy

According to the data, teachers in the study perceived ICT as an important enabler for developing pupils' numeracy skills, particularly for abstract concepts that are often challenging to grasp through traditional instruction. At the upper primary level, ICT was reported to support understanding of fractions, decimals, and problem-solving strategies, with interactive simulations, educational software, and quizzes providing visual and dynamic representations of mathematical ideas. One teacher explained,

> *"The software helps pupils visualise fractions. They can actually see parts of a whole instead of imagining it"* (T03).

Observations confirmed these claims, with pupils engaging more actively in group discussions, peer explanations, and problem-solving tasks during ICT-enhanced numeracy lessons. These findings resonate with earlier studies that emphasize the role of ICT in improving conceptual understanding and promoting active learning in mathematics (Li & Ma, 2010; Hennessy et al., 2010).

Teachers consistently highlighted that ICT made abstract concepts more tangible, allowing learners to manipulate visual models and interact with virtual exercises. This aligns with the idea that concrete, manipulable representations support numeracy development by bridging the gap between symbolic notation and conceptual understanding (Carbonneau, Marley, & Selig, 2013). For example, interactive fraction software enabled pupils to experiment with dividing shapes or combining parts, leading to immediate feedback and self-correction,

which teachers perceived as reducing anxiety and building confidence in problem-solving. As one participant noted,

> *"When they see the parts moving and changing, they actually get the concept. They're not just memorizing numbers"* (T11).

However, teachers also emphasized that the effectiveness of ICT depended on instructional design and the extent to which lessons encouraged interaction rather than passive observation. Lessons where pupils merely watched slides or demonstrations produced lower engagement and limited conceptual gains, whereas activities that allowed hands-on manipulation, collaborative problem-solving, and immediate feedback resulted in deeper understanding. As T19 remarked,

> *"It's not the computer itself, it's how we use it. When they can click, drag, and check answers, they understand faster"*.

These insights resonate with the Technology Acceptance Model's notion that perceived usefulness drives adoption, but actual impact depends on the alignment of ICT tools with pedagogical goals (Davis, 1989; Venkatesh & Davis, 2000).

Teachers further noted that their own confidence and ease of use affected the quality of ICT-supported numeracy instruction. More competent teachers integrated software and interactive activities confidently, while those less familiar with digital tools reported hesitation, longer setup times, and occasional lesson interruptions. One teacher admitted,

> *"I know it helps, but sometimes I get stuck and can't show it properly, so I just skip it"* (T04).

This supports TAM's emphasis on perceived ease of use as a critical factor influencing consistent adoption and effectiveness in classroom practice.

Systemic and contextual factors also shaped ICT-mediated numeracy instruction. Device shortages, high device-to-pupil ratios, and unstable electricity or internet connectivity limited opportunities for individual or small-group interaction, often reducing lessons to teacher-led demonstrations. As T02 observed,

> *"Only a few pupils get to try the exercises. The rest just watch and lose interest".*

From a Diffusion of Innovations perspective, such constraints affect trialability, observability, and compatibility, ultimately slowing the adoption and impact of ICT innovations in mathematics instruction (Rogers, 2003). Nevertheless, enabling conditions such as supportive leadership, collaborative peer networks, and incremental experimentation allowed teachers to overcome some limitations, gradually building confidence and encouraging wider use of interactive digital tools. T18 highlighted,

> *"Even with few computers, we try small exercises first and then expand. Seeing it work encourages others to try".*

Overall, teachers viewed ICT as a critical tool for enhancing numeracy understanding, particularly for abstract concepts, with its effectiveness mediated by instructional design, teacher competence, engagement strategies, and institutional support. TAM explains how perceived usefulness and ease of use influence adoption, while DOI situates these perceptions within broader systemic and social conditions that either facilitate or constrain the integration of ICT in numeracy instruction. The findings emphasise the importance of aligning ICT tools with pedagogical strategies and developmental needs to maximize learning outcomes.

RQ3. **What institutional and contextual factors do teachers identify as enabling or constraining the integration of ICT in literacy and numeracy instruction in public primary schools?**

Research Question Three sought to examine the institutional and contextual factors that teachers identify as either enabling or constraining the integration of ICT in literacy and numeracy instruction in public primary schools in Madina, Accra. This question shifts attention from classroom practices to the broader school environment, focusing on how organisational conditions, resources, and support systems shape teachers' ability to adopt and sustain ICT use in teaching. The theme *"Challenges and Supports for ICT Integration"* is used to frame the analysis. This theme captures teachers' accounts of both the barriers and the enabling conditions within their schools, such as access to ICT infrastructure, availability of training, leadership support, time constraints, and peer collaboration, that influence whether ICT is effectively incorporated into literacy and numeracy lessons.

4.4 Challenges and Supports for ICT Integration

From the data, teachers identified a complex interplay of institutional, infrastructural, and social factors that either enabled or constrained the integration of ICT in literacy and numeracy instruction. Among the most prominent constraints were limited access to functional devices, high device-to-pupil ratios, intermittent electricity, and unreliable internet connectivity. One teacher described the situation succinctly:

> *"Most of the time, pupils only watch because there aren't enough computers. Only a few can interact, and the rest lose focus"* (T02).

Observations corroborated these accounts, showing classrooms where pupils crowded around single devices, rotated in groups, or remained largely passive due to logistical limitations. These infrastructural challenges align with the Diffusion of Innovations principle of

compatibility, illustrating how environmental constraints impede trialability and observability of technological practices, thereby slowing adoption (Rogers, 2003).

Teachers also highlighted the impact of curriculum pacing and timetable rigidity. Limited periods allocated for ICT lessons, combined with the perceived time required to set up devices, often discouraged teachers from experimenting with interactive activities. As one participant explained,

> *"Even when we plan something, the bell rings or we run out of time. It's hard to do ICT every day"* (T07).

Such structural and operational pressures underscore DOI's notion that complexity and environmental fit influence the rate and quality of innovation uptake.

Despite these barriers, enabling conditions played a significant role in supporting ICT integration. Leadership support emerged as a key facilitator, with headteachers providing moral encouragement, allocating specific ICT timeslots, and promoting experimentation without penalizing initial failures. One teacher noted,

> *"When management supports you, you're willing to try, even if everything isn't perfect"* (T18).

Peer networks and informal mentoring further strengthened adoption, as teachers frequently learned from colleagues' demonstrations and shared troubleshooting strategies. T05 emphasized,

> *"Sometimes I learn more from watching my colleague try a new app than from formal workshops"*.

Such social structures illustrate DOI's social system dimension, where knowledge-sharing and observational learning enhance the diffusion of innovations.

The data also highlighted the role of incremental experimentation in overcoming resource limitations. By starting with low-risk ICT activities, such as short videos or simple digital quizzes, teachers gradually built confidence and modelled effective practices for their peers. Over time, these small successes increased perceived usefulness and encouraged wider adoption, reflecting both TAM and DOI constructs. From a TAM perspective, these practices enhanced perceived ease of use and reinforced teachers' professional identity, while DOI emphasizes how trialability, observability, and social reinforcement can mediate systemic constraints.

Overall, teachers' accounts reveal that ICT integration in primary classrooms is shaped by both structural barriers and enabling social conditions. Infrastructural limitations, curriculum pressures, and technical unreliability constrain adoption, while leadership support, peer collaboration, and incremental experimentation facilitate it. The findings highlight that successful ICT integration requires not only pedagogical competence but also an institutional and social environment that promotes experimentation, supports teacher confidence, and accommodates technological limitations. The interplay of TAM and DOI frameworks provides a comprehensive lens to understand how perceived usefulness, ease of use, trialability, and social reinforcement collectively determine the sustainability and effectiveness of ICT in literacy and numeracy instruction.

4.5 Chapter Summary

This chapter presented and discussed data collected through interviews, classroom observations, and document reviews to address the study's research questions. The findings were discussed using the Technology Acceptance Model and the Diffusion of Innovations theory, alongside relevant literature reviewed in Chapter Two. The first research question examined teachers' perceptions of the impact of ICT integration on pupils' literacy

performance and revealed that ICT was generally perceived as enhancing engagement, comprehension, and literacy development. The second research question explored teachers' views on ICT-based instruction in numeracy and found that ICT-supported teaching was perceived as improving pupils' understanding of mathematical concepts through visual and interactive learning. The third research question investigated the institutional and contextual factors influencing ICT integration and showed that while teachers recognised the usefulness of ICT, its effective integration was constrained by limited infrastructure, inadequate training, and uneven institutional support.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter concludes the study on the integration of ICT in Ghanaian primary schools, focusing specifically on teachers' perceptions of ICT use in literacy and numeracy instruction. In terms of structure, the chapter first provides a summary of the study, highlighting the major findings from the analysis. It then presents the conclusions drawn from the research, outlines the study's limitations, and ends with recommendations for policy, practice, and future research.

5.1 Summary of key findings

This study examined teachers' perceptions of the integration of Information and Communication Technology (ICT) in literacy and numeracy instruction in public primary schools in Accra and the broader implications of ICT use for teaching and learning. The study situated ICT as a critical pedagogical tool capable of enhancing pupils' learning outcomes, while recognising that its effectiveness is shaped by teacher competence, institutional support, and contextual realities within public basic schools. A review of existing literature revealed that, although ICT-in-education has received increasing scholarly attention globally, there remains a relative paucity of qualitative, context-specific studies focusing on teachers' lived experiences of ICT integration in Ghanaian public primary schools, particularly within urban settings.

Data for the study were generated through semi-structured interviews with twenty purposely selected teachers drawn from two public primary schools in Accra. These interviews were complemented by classroom observations and document analysis, including school records

and training documents, to provide contextual depth and methodological triangulation. The analysis of the data was guided by the Technology Acceptance Model (TAM) and the Diffusion of Innovations (DOI) theory, which provided a lens for understanding teachers' perceptions, adoption behaviours, and the institutional conditions shaping ICT integration.

The study was guided by three research questions. The first research question explored how primary school teachers perceive the impact of ICT integration on pupils' literacy performance. The second examined teachers' perceptions of the role of ICT-based instruction in shaping pupils' numeracy abilities. The third investigated the institutional and contextual factors that enable or constrain the integration of ICT in literacy and numeracy instruction in public primary schools. The key findings emerging from these questions are summarised below.

Findings from the first research question showed that teachers generally perceived ICT as a valuable tool for improving literacy learning, particularly when aligned with pupils' developmental stages. In lower primary classes, ICT was mainly used to support foundational literacy skills such as phonics, letter-sound correspondence, and oral reading, with audio-visual resources enhancing pupils' engagement and comprehension. In upper primary classes, ICT supported more advanced literacy tasks, including reading comprehension, vocabulary development, and contextual understanding. Teachers reported that ICT increased pupil motivation and participation, especially among shy or low-performing learners. These findings suggest that teachers perceived ICT as useful for literacy instruction, a core construct of the Technology Acceptance Model.

The second research question revealed that teachers viewed ICT as particularly helpful in teaching numeracy concepts that pupils often find abstract or difficult. Visual and interactive digital tools were perceived to support understanding of concepts such as fractions,

problem-solving, and basic arithmetic operations. Teachers reported that ICT-enabled lessons encouraged pupil interaction, peer collaboration, and sustained attention. However, they also noted that the effectiveness of ICT in numeracy instruction depended largely on how it was used pedagogically, rather than on the technology itself.

Findings from the third research question indicated that ICT integration was shaped by a combination of enabling and constraining institutional and contextual factors. Key constraints included limited access to functional ICT equipment, high pupil-to-device ratios, unreliable electricity and internet connectivity, and insufficient formal professional development opportunities. Teachers' confidence and competence with ICT also emerged as significant factors influencing adoption. Conversely, supportive school leadership, peer collaboration, informal mentoring, and opportunities for experimentation were identified as important enablers of ICT use. These findings align with Diffusion of Innovations theory, which emphasises the role of organisational support, compatibility, and social systems in the adoption and sustainability of innovations.

Overall, the study demonstrates that while teachers in public primary schools in Accra largely recognise the pedagogical value of ICT for literacy and numeracy instruction, effective integration is contingent upon teacher competence, pedagogical design, and supportive institutional conditions. The findings highlight the need to move beyond mere provision of ICT resources towards sustained professional development and systemic support to ensure meaningful and equitable ICT integration in Ghanaian primary education.

5.2 Limitations of the study

Despite the insights generated by this study, certain limitations should be acknowledged. First, the study was conducted in only two public primary schools within Accra, with a

relatively small sample of twenty teachers. While this allowed for in-depth exploration of teachers' perceptions and classroom practices, the findings cannot be statistically generalised to all public primary schools in Accra or Ghana. Instead, the results should be interpreted as context-specific and analytically transferable to similar urban public-school settings.

Second, the study relied largely on self-reported data from teachers through interviews. Although classroom observations and document analysis were used to complement and validate these accounts, there remains the possibility of social desirability bias, where participants may have overstated positive ICT practices or underreported challenges. Observations were also limited in number and duration, meaning that they may not have captured the full range of ICT use across different subjects and school terms.

Third, the study focused on teachers' perceptions of ICT's impact on pupils' literacy and numeracy performance rather than on direct measurement of student learning outcomes. As such, the findings reflect teachers' professional judgments and experiences, not objective assessments of pupils' academic achievement. This limits the ability to make causal claims about the effect of ICT integration on learning outcomes.

Finally, the study adopted a cross-sectional design, capturing teacher perceptions at a single point in time. This approach does not account for how ICT practices, teacher competence, or institutional support may evolve with sustained exposure, training, or policy changes. A longitudinal design could have provided deeper insight into changes in ICT adoption and instructional practices. Notwithstanding these limitations, the study provides rich, contextualised insights into ICT integration in urban public primary schools and contributes valuable qualitative evidence to an under-researched area in Ghanaian education.

5.3 Conclusion

This study examined teachers' perceptions of the integration of ICT in literacy and numeracy instruction in public primary schools in Accra, Ghana. Guided by the study's research objectives and supported by relevant theories and literature, the study explored how ICT influences pupils' learning, as well as the institutional and contextual factors that shape its effective use in classrooms.

The findings revealed that teachers generally perceived ICT integration as having a positive impact on pupils' literacy and numeracy development. ICT was viewed as enhancing lesson delivery, improving pupil engagement, and supporting understanding through visual, interactive, and learner-centred approaches. In literacy instruction, ICT was perceived to improve reading, writing, and comprehension skills, while in numeracy, it was seen to support concept clarity, problem-solving, and pupils' confidence in handling mathematical tasks.

Despite these perceived benefits, the study found that the effective integration of ICT was constrained by several institutional and contextual challenges. These included inadequate ICT infrastructure, limited access to digital devices, inconsistent power supply, insufficient training opportunities for teachers, and weak institutional support. At the same time, supportive factors such as teachers' positive attitudes towards ICT, peer collaboration, and basic ICT skills were identified as enabling ICT use in classrooms.

Overall, the study concludes that while ICT holds significant potential for improving literacy and numeracy instruction in public primary schools, its impact is largely dependent on the availability of resources, institutional support, and sustained professional development for

teachers. Addressing these challenges is essential for maximising the educational benefits of ICT and ensuring its effective integration into teaching and learning processes.

5.4 Suggestions for further studies

Based on the findings and discussions from this study, the following suggestions are made to contribute to knowledge and literature on ICT integration in primary education. It is suggested that further studies be conducted on the impact of ICT-based instruction from pupils' perspectives to provide a more comprehensive understanding of how ICT influences literacy and numeracy learning outcomes. Such studies would help to relate teachers' perceptions and classroom practices to pupils' actual learning experiences and outcomes.

It is also recommended that future studies adopt quantitative or mixed-method approaches to examine the relationship between ICT integration and pupils' performance in literacy and numeracy across a wider population. This would allow for the collection of data from a larger sample of schools and support generalisation of findings. In addition, further research could investigate the role of school leadership, policy implementation, and institutional support systems in shaping ICT integration in public primary schools. Studies may also explore the long-term effects of ICT use through longitudinal designs to assess sustainability and progression over time. These studies would contribute to a deeper understanding of the factors influencing ICT integration in Ghanaian primary schools and provide stronger empirical evidence to inform policy, practice, and future interventions.

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APPENDICES

APPENDIX A: Interview Materials (Interview Guide)

UNIVERSITY OF MEDIA, ARTS AND COMMUNICATIONS

SCHOOL OF GRADUATE STUDIES

INTERVIEW GUIDE FOR PRIMARY SCHOOL TEACHERS

INTRODUCTION

Hello, my name is Vera Yayra Deh. I am a graduate student of the University of Media, Arts and Communication, specifically from the School of Graduate Studies. As part of the requirements for the programme I am pursuing, I am conducting research titled:

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) INTEGRATION AND TEACHING AND LEARNING IN PUBLIC PRIMARY SCHOOLS IN ACCRA

Your participation in this study makes you a valuable contributor to knowledge on the use of ICT in primary education. The study seeks to understand teachers' experiences and perceptions regarding the integration of ICT in literacy and numeracy instruction in public primary schools. The findings of this research will be beneficial to educators, policymakers, and stakeholders interested in improving teaching and learning through ICT.

By virtue of your role as a primary school teacher, you have been selected to participate in this study. I would therefore humbly request your time to engage in a short discussion. This study is conducted purely for academic purposes, and I assure you that all information provided will be treated with strict confidentiality and used solely for this research.

Thank you.

PREAMBLE

1. Could you please tell me about your teaching background and how long you have been teaching?
2. What class level(s) do you currently teach?
3. How would you describe your level of experience or confidence in using ICT in teaching?

QUESTIONS TO ADDRESS THE RESEARCH QUESTIONS

ICT AND LITERACY INSTRUCTION

- How do you use ICT when teaching literacy-related subjects such as reading and writing?
- What types of ICT tools or digital resources do you commonly use during literacy lessons?
- In your view, how does ICT affect pupils' literacy skills such as phonics, reading fluency, and comprehension?
- Are there differences in how ICT supports literacy learning in lower and upper primary classes?

ICT and Numeracy Instruction

- How do you use ICT in teaching numeracy or mathematics?
- In your experience, how does ICT help pupils understand mathematical concepts?
- Which numeracy topics do you find ICT most useful for, and why?
- How do pupils generally respond to ICT-based numeracy lessons compared to traditional teaching methods?

Teacher Confidence and ICT Use

- How comfortable do you feel using ICT in your classroom?
- What challenges do you face when integrating ICT into your lessons?
- What factors encourage or discourage you from using ICT regularly?

Institutional and contextual factors

- What ICT resources are available in your school for teaching and learning?
- How does school leadership support or influence ICT use in the classroom?
- What challenges related to infrastructure, training, or resources affect ICT integration?
- Are there any forms of support, such as peer assistance or training, that help you use ICT more effectively?

CONCLUDING PART

- In your opinion, what can be done to improve ICT integration in literacy and numeracy teaching in public primary schools?
- Is there anything else you would like to share about your experience with ICT in teaching and learning?

RESPONDENT PROFILE

- Name (optional)
- School
- Position
- Number of years teaching
- Highest educational qualification
- Age range

THANK YOU VERY MUCH FOR YOUR TIME AND CONTRIBUTION.

A2: Participant List (20 Participants)

Participant Code	Gender	Age	Teaching Level	ICT Competence	Years of Experience
T01	F	23	Lower Primary	Low	3
T02	M	26	Upper Primary	Medium	6
T03	F	34	Lower Primary	Low	12
T04	M	31	Upper Primary	Medium	8
T05	F	28	Lower Primary	Medium	5
T06	M	22	Upper Primary	Low	2
T07	F	39	Upper Primary	Low	10

T08	M	27	Lower Primary	Medium	4
T09	F	32	Upper Primary	Low	3
T10	M	45	Lower Primary	High	15
T11	F	37	Upper Primary	Medium	7
T12	M	25	Upper Primary	Low	1
T13	F	30	Lower Primary	Medium	6
T14	M	41	Upper Primary	Medium	9
T15	F	50	Lower Primary	Low	11
T16	M	29	Upper Primary	Medium	5
T17	F	24	Upper Primary	Low	2
T18	M	33	Lower Primary	Medium	4
T19	F	57	Upper Primary	Low	13
T20	F	36	Lower Primary	Medium	7

A3: Observation Checklist (Class Sessions)

Observation Item	Yes	No	Notes / Examples
Teacher uses ICT to explain lesson			

Students actively interact with ICT tools			
ICT is used for literacy activities			
ICT is used for numeracy activities			
Lesson involves multimedia (video, audio, apps)			
Students appear engaged and attentive			
Peer collaboration observed			
ICT use supports understanding of concepts			
Classroom management accommodates ICT activities			
Technical issues disrupt lesson			

A4: Document Review Template

Documents Reviewed: Lesson plans, teaching timetables, ICT policy documents, curriculum guides, instructional materials.

Review Items:

- Evidence of ICT integration in lesson plans
- Frequency of ICT use across subjects
- Alignment with curriculum objectives
- Availability of ICT resources listed in school inventories

A5: Thematic Maps

Theme 1: Pedagogical Usefulness of ICT (TAM)

- Codes: “Improved comprehension,” “enhanced problem-solving,” “interactive lessons”
- Subthemes: Literacy, Numeracy, Conceptual Understanding

Theme 2: ICT and Pupil Engagement

- Codes: “Increased motivation,” “peer collaboration,” “attention span”
- Observation triangulation: Higher engagement in interactive lessons

Theme 3: Teacher Confidence and Ease of Use (TAM)

- Codes: “Self-efficacy,” “professional development,” “technology avoidance”
- Subthemes: Experienced teachers vs. novice teachers

Theme 4: Structural and Institutional Barriers (DOI)

- Codes: “Device shortages,” “electricity outages,” “curriculum pressure”
- Subthemes: Infrastructure, Policy Constraints, Resource Limitations

Theme 5: Facilitating Conditions (DOI)

- Codes: “Leadership support,” “peer mentoring,” “trialability”
- Subthemes: School culture, Support networks, Innovation adoption

A7: Coding Example (NVivo)

Code	Definition	Example Quote
Engagement Boost	Increased pupil attentiveness and participation	“Students were excited to answer questions after the video activity” (T12)
Pedagogical Usefulness	ICT supports teaching of literacy/numeracy	“Digital storytelling improved comprehension and vocabulary” (T03)

Infrastructure Barrier	Lack of resources limits ICT use	“Most of the time pupils only watch because there aren’t enough computers” (T02)
Leadership Support	Headteacher encouragement promotes adoption	“When management supports you, you’re willing to try” (T18)
Teacher Confidence	Ability to use ICT effectively	“I feel confident using apps, but sometimes I avoid devices if I’m unsure” (T09)

APPENDIX B: Ethical Documents

B1: Ethical Considerations Checklist

Ethical Aspect	Implemented (Yes/No)	Notes
Informed consent obtained	Yes	Written/oral for all 20 participants
Confidentiality ensured	Yes	Pseudonyms, encrypted storage
Voluntary participation	Yes	Withdrawal allowed anytime
Minimal risk maintained	Yes	Non-sensitive topics
Debrief provided	Yes	Study purpose explained post-interview
Data security	Yes	Encrypted drives, password protection

Approval from University	Yes	