UNIVERSITY OF EDUCATION, WINNEBA

INFORMATION AND COMMUNICATION TECHNOLOGY INTEGRATION IN SENIOR HIGH SCHOOLS IN GHANA: VISUAL ART TEACHERS IN MFANTSEMAN MUNICIPALITY IN PERSPECTIVE

BARNABAS TEIKO BILLHALL

MASTER OF PHILOSOPHY

2026

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A thesis submitted to the school of Graduate Studies
in partial fulfilment of the requirements for
the award of Master of Philosophy
(Arts and Culture)

Department of Music Education
School of Creative Arts
UNIVERSITY OF EDUCATION, WINNEBA

DECEMBER, 2025

DECLARATION

I, **Barnabas Teiko Billhall** hereby declare that this Thesis, with the exception of quotations and references contained in published works which have been identified and duly acknowledged is the result of my knowledge, it contains no material previously published by another person or material which has been accepted for the award of any other degree of the university except where due acknowledgement has been made in the text.

SIGNATURE: ……. **DATE:** ……..…

SUPERVISORS' DECLARATION

This is to certify that this work is the result of the student's own effort and therefore declares that the preparation and presentation of this Thesis was supervised in accordance with the guidelines on supervision of Thesis laid down by the University of Education, Winneba.

NAME OF PRINCIPAL SUPERVISOR: DR. VICTOR Q. N. TEYE

SIGNATURE: ……. **DATE:** ……..…

NAME OF CO-SUPERVISOR: PROF. JOSEPH ESSUMAN

SIGNATURE: ……. **DATE:** ……..…

DEDICATION

I dedicate this work to my sisters, Bernice Teiko, Maame Adjoa Teiko, Ewuraba Nyarko Teiko and finally, to all who supported me throughout the programme duration. God richly bless you all.

ACKNOWLEDGEMENT

This dissertation would not have been successful without the support of certain personalities whose efforts have made the preparation of this work possible.

First and foremost, my thanks go to the Almighty God for giving me life and strength to complete this study. I also want to render my profound gratitude to Dr. Victor Q. N. Teye and Dr. Joseph Essuman of the Department of Graphic Design, Art Education, University of Education, Winneba, who supervised this work and for the patience they had whilst undertaking this work. Their tolerance and accommodating nature must be acknowledged.

I cannot exclude the constant co-operation of the Heads of Department of the Visual Arts in the five public Senior High Schools in the Mfantseman Municipality.

Finally, my warmest appreciation goes to my course mates for their tremendous support in diverse ways.

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ACRONYMS AND ABBREVIATIONS

APA – American Psychological Association

CK – Content Knowledge

eBook – Electronic Book

GES – Ghana Education Service

HDMI – High-Definition Multimedia Interface

ICTs – Information Communication Technologies

LED TV – Light-Emitting Diode Television

MoE – Ministry of Education

MS – Microsoft

NGOs – Nongovernmental Organisations

PCK – Pedagogical Content Knowledge

TPACK – Technological Pedagogical Content Knowledge

SHS – Senior High School

USB – Universal Serial Bus

VLE – Virtual Learning Environment

WASSCE – West African Senior School Certificate Examination

ABSTRACT

This study investigated the integration of Information and Communication Technology in Senior High Schools in Ghana, focusing on the lived experiences of Visual Art teachers in the Mfantseman Municipality of the Central Region. Guided by the Technological Pedagogical Content Knowledge (TPACK) framework, the study adopted a qualitative case study design involving 20 Visual Art teachers selected through purposive and convenient sampling. Data were collected using interviews and classroom observations and analysed thematically. The study found that teachers' TPACK, particularly in blending content and pedagogy with technology, was generally low, resulting in limited ICT integration in teaching and learning. The barriers to effective ICT integration encompassed the centralisation of ICT laboratories, inadequate infrastructure, restrictive policies limiting students from bringing personal digital devices to school. Additional constraints included limited access to specialised software such as CorelDraw and Photoshop, lack of in-service training for Visual Art teachers, unreliable internet connectivity, and inadequate technical support. These challenges hinder both teacher effectiveness and students' development of digital creativity and 21st-century competencies. Consequently, they raise critical concerns about the implementation and efficacy of national ICT policies in Visual Art education within SHSs in Gahan, specifically in Mfantseman Municipality. The study recommends targeted professional development programmes, decentralisation of the ICT laboratory within the Visual Art department. It also advocates for supportive policy interventions by the Mfantseman Municipal Education Directorate, school heads, School Management Committees to enhance ICT integration. Overall, the findings provide critical insights for stakeholders seeking to improve technology-supported pedagogy and student outcomes in Visual Art education.

CHAPTER ONE

INTRODUCTION

This chapter presents a general overview of the Information and Communication Technology integration in Senior High Schools in Ghana, which looked at the perception of Visual Art Teachers in the Mfantseman Municipality. The chapter is divided into background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, delimitations of the study, definition of terms and organisation of the rest of the text.

1.1 Background to the Study

Information and Communication Technology (ICT) has become an essential component of 21st-century education, which is purely learner-centred. ICT has saturated almost every domain of life. This includes health care, commerce, civic activities, medicine, engineering, transportation, telecommunications, governance, and education (Yoo, 2010; Ivanković, Špiranec, & Miljko, 2013). The emergence of Information and Communication Technologies in education has ushered in a transformative era, transforming the gathering, storage, organisation, and dissemination of instructional content. This technological evolution has significantly contributed to information transfer, thereby enhancing the teaching and learning process (Machmud, Widiyan, & Ramadhani, 2021; Ekunola, Onojah, Talatu, & Bankole, 2022). The pervasive influence of ICTs has become a cornerstone of modern society, permeating all aspects of life, including education (Nautiyal, Malik, & Agarwal, 2018; Parette, Quesenberry, & Blum, 2010).

The Government of Ghana (GoG) recognises the importance of ICT in its quest to transition from an agrarian economy to an information and knowledge-based economy, as part of its broader socioeconomic development goals (Tsapali, Major, Damani, Mitchell, & Taddese, 2021). This acknowledgement reflects the government's understanding of how ICT can contribute to various sectors for overall national progress. Multiple ICT in education policies and curriculum reforms have been implemented over the years in pursuit of this national goal, with the common goal of encouraging teachers' use of technology as pedagogical tools to foster student-centred pedagogy and equip learners to use technology resources to develop the necessary skills and knowledge to be active participants in the national and global knowledge economy (MoE, 2015; MoE, 2018).

In today's digital age, ICT has become a crucial part of our lives and the educational system. It also plays a central role in societal functioning (Das, 2019). In general, whether consciously or unconsciously, ICT has assumed a central role in the lives of many people in this era. A few years ago, when our physical world was literally shut down and economic activity came to a halt due to the COVID-19 pandemic outbreak, the digital world opened up. Life as we know it changed tremendously because ICT provided alternative dynamic digital platforms for effective and efficient communication in all facets of life (Naresh, 2020; Sánchez-Cruzado, Santiago Campión, & Sánchez-Compaña, 2021; Batra & Kumar, 2022). ICT is now global in every corner of our modern culture because there has been an increase in the use of ICTs all over the world in the post-COVID-19 pandemic era. This extraordinary increase in the use of ICTs worldwide has had a pervasive impact on various aspects of life. This influences how people communicate, work,

and navigate their daily lives (Aldaajeh, Salous, Alrabaee, Barka, Breitinger, & Choo, 2022). ICTs are integral to individuals' daily lives and critical for a nation's sustained economic growth, quality education, societal well-being, critical infrastructure resilience, and national security (Aldaajeh et al., 2022).

The educational landscape demands the integration of ICT as an essential component of teaching and learning processes worldwide. This digital paradigm has revolutionised learning cultures, providing new opportunities for collaborative and learner-centred approaches (Bhattacharya & Sharma, 2007). In today's classrooms, ICT facilitates the sharing of learning resources and ideas, promotes learner-centred and collaborative principles, and enhances critical thinking, creative thinking, and problem-solving skills (Rege Colet, 2017). The 21st century has witnessed an educational rebirth fuelled by the popularity of digital technology. This is ushering in significant changes under the umbrella of an ICT-enabled learning environment (Rege Colet, 2017).

Historically, traditional tools such as textbooks and blackboards assisted teaching and learning. However, the integration of digital technologies such as computers, tablets, mobile apps, the internet, projectors, and interactive software packages has transformed these environments, meeting the demands of a society that increasingly values digital literacy (UNESCO, 2002). Due to the great number of ICTs in today’s teaching-learning process, the teacher is no longer the clichéd sage on the stage but rather the guide on the side (King, 1993). The nature and interests of today's digital native students contribute to the evolving face of Visual Art Education. Teachers in this era are no longer perceived as mere knowledge

transmitters but as guides on the journey of learning, fostering an environment where students can be the best versions of themselves (Bindu, 2018).

The expectations for students in this ICT-centric society extend beyond traditional learning. They are anticipated to continue studying throughout their lives, collaborate with others, solve complex problems, and effectively represent and share their knowledge using a variety of systems (Sandholtz, Ringstaff & Dwyer, 1997). A significant paradigm shift from teacher-centred instruction to learner-centred instruction is imperative to equip students with the knowledge and skills demanded by the 21st century (Sandholtz et al., 1997). The contemporary classroom is increasingly animated with digital communication, fostering exploration, engagement, and information sharing (Sandholtz et al., 1997).

In the digital era, teachers' roles have evolved from mere preachers to managers of students' social and emotional behaviours, mentors for holistic development, and motivators in the digital environment (Amin, 2016). Effective use of ICT in educational practices has resulted in a more interactive and engaging learning environment, reshaping both the teacher and student roles (Agrahari, 2016). The current age emphasises the significance of information and technology in all aspects of life, necessitating teachers to be equipped with technology to ensure students are similarly prepared (Bhattacharjee & Deb, 2016). Visual Art Education, being a part of this evolving landscape, cannot remain immune to rapid technological advancements and innovations (Amin, 2016).

The integration of ICT into Visual Art Education has become a global mandate, especially for educational institutions in developing countries like Ghana. The

education system of the 21st century requires teachers to integrate ICT into the teaching-learning process to enhance pedagogy with modern digital tools (Liesa-Orús, Latorre-Cosculluela, Vázquez-Toledo, & Sierra-Sánchez, 2020). The nature and interests of 21st-century students, referred to as 'digital natives,' significantly contribute to the changing face of education (McLoughlin & Lee, 2008). Students, being technologically savvy, are active producers of knowledge and are responsible for their learning. Visual Art educators need to develop new strategies to address uncertainties hindering students' learning and performance by integrating ICT in the classroom (McLoughlin et al., 2008).

Due to the proliferation of personal computers in the digital world, Visual Art educators must keep pace with technological advancements. Regular in-service trainings are essential for Visual Art educators to acquire the requisite computer knowledge, enabling them to integrate technological advancements into their pedagogy (Wilks, Cutcher, & Wilks, 2012). Throughout history, Visual Artists have continually improved their tools, media, and production techniques backed by Information and Communication Technology. Modern art, often associated with digitised media, now sees the computer as a basic tool for the Visual Artist (Pramanik, 2011; Gherman, 2018).

However, the integration of ICT into Visual Art Education is a nuanced and technical process. Effective implementation requires not only technological, pedagogical, and content knowledge but also continuous practice, training, and technical support. Educational authorities must periodically review and revamp the entire ICT infrastructure system to mitigate the challenges associated with ICT

integration in teaching and learning (Pramanik, 2011). The researcher, recognising the importance of understanding the state of ICT integration among Ghanaian Senior High School Visual Art teachers, embarked on this study to identify challenges and opportunities. The goal is to contribute to a nuanced understanding of the current landscape, paving the way for informed improvements of ICT integration in Visual Art Education within the Ghanaian context.

1.2 Statement of the Problem

The integration of Information and Communication Technology Senior High Schools (SHSs) in Ghana has received significant policy attention and investment. Ghana's ICT-in-Education policy advocates learner-centred, constructivist, and technology-enhanced instruction aimed at improving teaching and learning outcomes across subject areas, including Visual Arts (Ghana Education Service [GES], 2020; Ministry of Education [MoE], 2022; UNESCO, 2021). However, despite substantial investment in ICT infrastructure, the realisation of ICT's full pedagogical potential in Ghanaian SHSs remains a significant challenge (Adarkwah, 2021; UNESCO, 2021; World Bank, 2021). In particular, the integration of ICT in Visual Art education at the SHS level remains limited, and the use of technology to support creative, student-centred learning practices is minimal (MoE, 2022; Abedi, 2023). This situation contradicts the core objectives of Ghana's ICT-in-Education policy and curricula and reveals a persistent gap between policy expectations and classroom practice (GES, 2020; UNESCO, 2021).

The persistence of this policy–practice gap raises critical concerns about the effectiveness of ICT-in-Education policies in achieving their intended outcomes within Visual Art education. Although national policies stipulate the pedagogical

use of ICT, there remains a disparity between these requirements and the instructional practices employed by teachers in SHS classrooms (GES, 2020; UNESCO, 2021). This gap calls into question the efficacy of ICT policy implementation and highlights the need for a deeper understanding of how ICT influences teaching and learning outcomes in practice, particularly in Visual Art education (Abedi, 2023).

Systemic constraints further compound this challenge. Inadequate ICT infrastructure, unreliable internet connectivity, restricted access to centralised ICT laboratories, and limited availability of subject-specific digital tools continue to impede effective ICT integration in Visual Art education in Ghanaian SHSs (MoE, 2022; Nti & Asare, 2022; Soma, Nantomah, & Adusei, 2021). Despite the presence of ICT laboratories and internet access in many SHSs (Amponsah, 2022), these resources are often underutilised pedagogically. Consequently, students have limited opportunities to develop essential digital creativity, design, and problem-solving skills required for participation in contemporary artistic, creative, and digital economies (Abedi, 2023; Adarkwah, 2021; GES, 2020).

At the classroom level, Visual Art instruction continues to rely predominantly on traditional, teacher-centred approaches, notwithstanding the growing relevance of digital art tools in contemporary Visual Art practice. Evidence suggests that ICT is often used superficially as a visual aid rather than as an integral pedagogical tool that supports instructional delivery, student engagement, and creative exploration (Amponsah & Boateng, 2021; García et al., 2022; Tondeur et al., 2020; MoE, 2015). The coexistence of traditional teaching methods alongside limited and non-transformative uses of ICT remains a persistent obstacle to effective integration (Abedi, 2023). These challenges are further exacerbated by inadequate ICT

resources and limited teacher digital competence, which continue to hinder meaningful ICT integration in Visual Art education despite the existence of national ICT-in-education policies (Boakye et al., 2022; Tanye, 2021).

Given that teachers play a pivotal role in mediating curriculum implementation, this situation necessitates an investigation into their perceptions, competencies, and classroom practices related to ICT integration in Visual Art education. In the complex landscape of contemporary instructional approaches, innovative pedagogical strategies are required to address both national policy expectations and school-specific realities (Adjin-Tettey, Selormey, & Nkansah, 2022). Consequently, examining how Visual Art teachers engage students through the use of digital tools in SHS classrooms is critical for understanding the pedagogical utilisation of ICT and its contribution to fostering essential 21st-century skills (OECD, 2021).

Furthermore, while the COVID-19 pandemic exposed significant structural and policy deficiencies in ICT readiness within Ghana's education sector (Tanye, 2021; Boakye & Ampofo, 2022), empirical studies focusing on ICT integration in the teaching and learning of Visual Arts in Ghanaian SHSs in the post-COVID context remain limited. In the context of the growing global demand for ICT-related and creative digital skills, concerns have emerged that SHS students may lack the competencies required for future employment, post-secondary education, and participation in the fast-evolving 21st-century digital economy (UNESCO, 2021; World Bank, 2020; OECD, 2020). Ghanaian SHS students who lack ICT skills are therefore at a potential disadvantage if they are not adequately prepared for contemporary digital and creative industries (Banson, 2022; Kostis & Kafka, 2022; Adarkwah, 2021; World Bank, 2021).

Therefore, identifying the challenges associated with integrating ICT into pedagogy in Visual Art education in Ghanaian SHSs is crucial for addressing existing disparities and improving educational outcomes. Without empirical evidence on how Visual Art teachers integrate ICT and the factors shaping their practices, efforts to enhance technology-supported teaching and learning risk remaining ineffective. Addressing this gap is essential for aligning policy with practice, strengthening pedagogical quality, and equipping students with relevant digital art competencies required in contemporary Visual Art practice (García, García-Carmona, Trujillo-Torres, & Moya-Fernández, 2022). Hence, this study investigates the integration of ICT into Ghanaian Senior High School Visual Art education, focusing on the experiences of Visual Art teachers in the Mfantseman Municipality.

1.3 Purpose of the Study

The purpose of the study was to explore ICT integration in Senior High School Visual Art education in the Mfantseman Municipality of Ghana. Specifically, the study sought to examine the interplay of Visual Art teachers' knowledge of technology, pedagogy, and content, the extent Visual Art teachers engage students in ICT-based learning within the context of Visual Art education, and the barriers that hinder Visual Art teachers from effectively integrating ICT into their Visual Art lessons.

1.4 Objectives of the Study

The following were the objectives of the study:

1. To investigate the interplay of technological pedagogical content knowledge of Visual Art teachers in the Mfantseman Municipality.
2. To explore the extent to which Visual Art teachers engage their students in the use of ICT resources in the Mfantseman Municipality.
3. To identify the challenges that militate against Visual Art teachers in integrating ICTs into Visual Art lessons in the Mfantseman Municipality.

1.5 Research Questions

The following research questions guided the study:

1. What is the interplay of technological pedagogical content knowledge of Visual Art teachers in the Mfantseman Municipality?
2. To what extent do Visual Art teachers engage their students in the use of ICT resources in the Mfantseman Municipality?
3. What are the challenges that militate against Visual Art teachers in integrating ICTs into Visual Art lessons in the Mfantseman Municipality?

1.6 Significance of the Study

The findings of the study will inform school heads, policymakers, the Ghana Education Service (GES), and other education stakeholders in the Mfantseman Municipality about the challenges Visual Art teachers encounter in integrating ICTs into Visual Art lessons. This information will enable these stakeholders to implement necessary measures to support effective ICT integration and may highlight the need to decentralise ICT laboratory within the Visual Art department of Senior High Schools in the municipality.

The study will also guide GES, school heads, policymakers, and other stakeholders on the development of a comprehensive policy framework, including provisions that allow students to bring their own technological devices to school, thereby facilitating successful ICT integration in Visual Art teaching and learning. This approach could help reduce the substantial educational budgets required to equip classrooms with ICT resources, while ensuring students have access to relevant digital tools.

Additionally, the findings may serve as a baseline for school heads, GES, and policymakers to design strategies for enhancing ICT integration in Senior High Schools and for planning targeted professional development programmes that equip Visual Art teachers with the necessary TPACK and 21st-century teaching skills for effective ICT use.

Overall, the study will contribute to the body of research on ICT integration in education and will be useful to researchers exploring ICT use in Visual Art pedagogy. The findings and recommendations will also guide school heads, policymakers, GES, and other education stakeholders in creating a more dynamic and engaging learning environment for Visual Art students, ultimately enhancing their academic success and preparing them for future careers in creative and digital industries.

1.7 Delimitation of the Study

According to Simon and Goes (2013), the delimitations of a study are those characteristics that arise from limitations in the scope of the study, defining the boundaries of the study. The study was delimited to five public Senior High Schools in the Mfantseman Municipality in the Central Region of Ghana offering

Visual Art courses. The five schools were used for the study due to their proximity to the researcher and also due to the fact that not much related research has been conducted within the Mfantseman Municipality.

1.8 Limitations of the Study

This study was conducted within the Mfantseman Municipality, which served as a bounded setting for the research. As a result, the transferability of the findings to other districts in the region or the country as a whole may be limited, given differences in ICT infrastructure, teacher capacity, and resource availability. The study offers a context-grounded account of how Visual Art teachers perceive ICT integration and the constraints that shape these perceptions. To support transferability, the analysis foregrounds challenges that are widely reported across curriculum areas, including uneven access to devices and connectivity, limited professional development, time pressure within crowded timetables, and weak technical support. Readers and policymakers are therefore encouraged to interpret the findings as analytically informative and most applicable to settings with comparable institutional and resource conditions.

1.9 Definition of Terms Used

ATLS.ti: In this study, the term refers to a qualitative data analysis software used to aid the analysis of the qualitative data thematically.

High-Definition Multimedia Interface: This term has been used in the study to refer to a connector and a capable used to connect devices such as Television, Projector and Laptop Computer in the classroom.

iBox: This term has been used in the study to refer to Ghana's offline technology, designed and deployed for students to access quality educational content.

iCampusGH: This term has been used in the study to refer to the online version of the e-learning solution designed to engage students while they are on vacation.

Pedagogy: A term generally used to refer to strategies of instruction or style of instruction, or instructional methods.

Pen drive: In this study, the term refers to a very small, portable storage device used to move data between electronic devices, such as a TV and a laptop, in the classroom.

Projector: In this study, the term refers to a digital device with integrated USB and HDMI ports through which certain devices, such as laptop computers, were connected to show PowerPoint slides, images and videos in the classroom.

Tablet: This term has been used in the study to refer to a small handheld personal computer with a touch screen used to show images, videos and access the internet during lesson delivery.

1.10 Organisation of the Rest of the Text

In line with the in-house style of the School of Graduate Studies of the University of Education, Winneba, this thesis was presented in five chapters. Chapter One comprises the introduction, which deals with the background to the study, statement of the problem, research objectives, and research questions, significance

of the study, delimitation of the study, limitations of the study, definition of terms and organisation of the rest of the text. Chapter Two considered the theoretical framework and the review of related literature of the study on which the study is based. Chapter Three focused on the research approach, design, population under study, sample size and sampling techniques, research instruments, trustworthiness of the research instruments, procedures for data collection and analysis, as well as ethical considerations. Chapter Four covered the presentation and analysis of data collected, the interpretation and the discussion of results. Finally, Chapter Five summarises the findings, draws conclusions, implications and makes recommendations and suggestions for further research. The general format for the report complies with the APA format, and the references have been arranged in alphabetical order according to authors' second names.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Introduction

Review of literature is a broad, comprehensive in depth, systematic and critical review of scholarly publications, including unpublished scholarly print materials, audiovisuals and personal communications. It analyses, critically evaluates sources, theories, methods, gaps in research; synthesises the researcher's own theme/argument of position and outlines the parameters of one's own research (Creswell, 2014). Hammond and Wellington (2013) state that reviewing the literature entails researchers to establish an overview of what has already been studied in the field or area under intention of the investigation. This chapter of the study devotes itself to presenting the existing theories and literatures in the arena of ICT integration in Visual Art Education. That is, the researcher discussed the structural components of Technological Pedagogical and Content Knowledge (TPACK) framework (Mishra & Koehler, 2006), which served as the foundation for this study. The researcher reviewed relevant literature on the interplay of technological pedagogical content knowledge among Visual Art teachers in the Mfantseman Municipality. Particular attention was given to how content knowledge, pedagogy, and technology intersect to shape and inform instructional practice.

The review also examined the ways in which teachers integrate ICT resources to enhance student engagement, facilitate creative expression, and support the development of 21st-century skills within Visual Art education. Additionally, the literature explored the challenges that militate against the effective integration of

ICT into Visual Art teaching and learning in the Mfantseman Municipality, including systemic, infrastructural, and pedagogical constraints. Through critical review and synthesis of existing studies, the researcher sought to identify patterns, challenges, and best practices that inform effectives ICT integration. This synthesis provided deeper insights into teachers' competencies in leveraging technology for pedagogical purposes.

2.2 Theoretical Framework

The theoretical framework informing this study is the Technological Pedagogical Content Knowledge (TPACK) developed by Mishra and Koehler (2006). The theory developed as a generally established framework to give interpretation of teachers' task in using ICTs for teaching (Mishra & Koehler, 2006). It is a theory that emerged to describe the set of intelligence that teachers must possess to effectively teach their students using ICTs. Koehler and Mishra (2009), argued that at the heart of good teaching there are three components; content, pedagogy and technology, plus the relationships between and among them. This means teachers need to develop not only knowledge of technology, pedagogy and content, but also the knowledge of how these knowledge domains are related. This knowledge requirement for teachers was described by Koehler and Mishra (2005, 2009) in a theoretical framework called Technological Pedagogical Content Knowledge (TPACK). In this study, TPACK is used as a framework for describing the knowledge teachers need to integrate technology in their Visual Arts teaching and as a guide for the design of professional development arrangements to develop technology integration knowledge and skills among in-service Visual Art teachers.

The TPACK framework is a syncretistic mixture of interaction, intersection and interplay of three bodies of knowledge that must be available, synchronised in a unified package and presented fully in any ICT integrated classroom. The amalgamation of the three bodies of knowledge of the TPACK framework are: Technological Knowledge (TK), Pedagogical Knowledge (PK) and Content Knowledge (CK). The symbiotic relationship between Technological Knowledge (TK), Pedagogical Knowledge (PK) and Content Knowledge (CK) guides the teacher to effectively use ICT in the classroom to teach new theories from the known to unknown to enable the learners to discover the unknowns through the application of ICT tools. The TPACK framework explains the use of ICT for teaching and learning from a knowledge context. Therefore, the utilization of the Technological Pedagogical Content Knowledge (TPACK) framework provided a robust foundation for the study. TPACK, as developed by Mishra and Koehler (2006), was chosen as the theoretical framework, offering a comprehensive interpretation of teachers' roles in using ICTs for teaching. The framework, rooted in the understanding that effective teaching involves the interplay of content, pedagogy, and technology, guided the study of Visual Art teachers' experiences in integrating ICT in the context of the Mfantseman Municipality.

Furthermore, the framework's emphasis on the interconnection of knowledge domains offers a systematic way to building technology integration abilities in Visual Art educators. By smoothly aligning with the challenges of ICT integration, TPACK provided theoretical depth and practical applicability to the study, ensuring a thorough examination of Visual Art teachers' experiences in Mfantseman Municipality. According to Altun and Akyildiz (2017), teaching in

21st century schools has developed into a more complex and difficult profession as students are exposed to much digital technology, and are highly adept in using new technologies. However, the TPACK model has introduced a new structure that guides the use of ICTs for teaching and learning purposes and how it fits into the structure of the classroom to enable quality educational practices when using ICT. TPACK is a model that proposes the use of technological, pedagogical and content knowledge to achieve an adequate integration of ICT in the teaching-learning process (Cejas-León, Navío-Gámez, & Barroso-Osuna, 2016; Chen & Jang, 2014; Gómez, 2015). Nowadays, this pedagogical and technological model is transforming school activities inside and outside the classroom (Bueno-Alastuey, Villarreal, & García-Esteban, 2018; Turgut, 2017). According to Ammade, Mahmud, Jabu and Tahmir (2020), teachers' competencies in integrating technology in their teaching can form as a bridge to support the learners in maximising their achievements. Therefore, preparing teachers for Information and Communication Technology (ICT) integration in class could support them by sparking their professionalism.

Research by Khan (2014) supports this notion by presenting a model of Technological, Pedagogical, and Content Knowledge (TPACK) as part of teachers' professional development in Bangladesh. In addition, Chai, Koh and Tsai (2010) carried out encouraging research, measuring the perceived development of teachers' knowledge of technology, pedagogy, and content. Using the TPACK questionnaire of Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009), their findings revealed that knowledge in these three areas are all significant predictors of teachers' preparations for using technology for teaching. TPACK as

a model of technological integration explores teachers' comprehension of how ICT can be used as a pedagogical tool in teaching and learning. Altun and Akyildiz (2017) stated that the basis of TPACK is to create effective teaching with technology. This entails a deep understanding of the theory of technology use, of pedagogical technique – using technologies in constructive ways to generate teaching content – of what makes learning easy or difficult, and of how technologies can remedy the problems students face. To face challenges and improve 21st-century skills, pedagogical abilities and the ability to use ICT in learning are very important factors (Schoen & Fusarelli, 2008). In the framework of the Partnership for 21st-century Learning, learning in the 21st-century is focused on the synergy between content, the ways of teaching, and the use of information technology, which is known as TPACK (Technological Pedagogical Content Knowledge). Yildiz (2017) stated that teachers must have TPACK competence to achieve success in learning.

TPACK is the knowledge needed for a pre-service teacher to use the appropriate technology-based analysis of material and pedagogy. Bearing in mind the importance of TPACK in 21st-century learning, it is necessary to equip students with TPACK (Imansari, Mukhadisb, Hadic, Hakkun, & Elmunsyah, 2020). Hennessy, Ruthven and Brindley (2005) and Tay, Lim and Koh (2012) have conducted research and the result was that the use of ICT in the classroom can improve the understanding of teacher knowledge and pedagogical abilities. Such teacher skills must be developed through the integration of ICT in learning (Nazarenko, 2015). The framework of the Partnership for 21st-century Learning stated that learning in the 21st-century involves understanding the material or

content, ways of teaching, and the synergistic use of information technology, which is also known as TPACK (Technological Pedagogical Content Knowledge). This is in line with the explanation mentioned by Yildirim and Sensoy (2018), Chai, et al. (2017), Bibi and Khan (2017), Yildirim (2018), Yildiz (2017), Baya'a and Daher, (2015) and Chai, Koh and Tsai (2013).

Furthermore, as claimed by Kutaka (2015), TPACK is closely related to creativity, collaboration, and accountability in teaching and learning activities. Considering the importance of TPACK in preparing teachers for the 21st-century, the task of higher education is to equip students with TPACK capabilities that synergise the ability of technology integration with pedagogical abilities that are compatible with learning content. According to Gorder (2008), the most important factor to integrate ICT effectively in the classroom is the teachers' ability and efficiency to organise technology-embedded learning activities based on learners' needs. It concerns teachers' understanding on know-hows for drawing upon their technological knowledge, pedagogical knowledge and content knowledge to design ICT-embedded lessons to meet the needs of the pupils. The technological pedagogical content knowledge (TPACK) theorised by Mishra and Koehler (2006) seem extremely appropriate for stimulating teachers' reflections on their ICT integration classroom. TPACK framework provides a dynamic lens of depicting teachers' competency in designing and conducting technology-enhanced instruction, assessment of teachers' technology integration knowledge and experiences (Lin, Tsai, Chai, & Lee, 2013; Graham, 2011). TPACK measures pre-service and in-service teachers' readiness to teach effectively with technology (Koehler, Mishra, Akcaoglu, & Rosenberg, 2013).

2.2.1 Views on the TPACK Framework and its Constructs

The TPACK model is a framework of reference that allows the creation of active strategies for teaching and learning through the use of ICT (Chua & Jamil, 2014; Urban, Navarro, & Borron, 2018; Ozudogru & Ozudogru, 2019). Even the use of technological, content and pedagogical knowledge allows the creation of new virtual educational spaces (Oster-Levinz, & Klieger, 2010; Brantley-Dias, & Ertmer, 2013; Phillips, 2016). The origins of the TPACK model come from the ideas about the use of pedagogical and content knowledge in the educational field proposed by Shulman (Leiva-Núñez, Ugalde-Meza, & Llorente-Cejudo, 2018). Subsequently, Mishra and Koehler created the TPACK model by integrating technological knowledge with content and pedagogical knowledge (Chua & Jamil, 2014). TPACK originates from Shulman's general idea by adding technological knowledge into PCK framework to understand how the increasing use of emerging technologies in schools can represent teachers' technology integration expertise. According to Shulman (1987), PCK represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organised, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction. Teachers should have ample theoretical understanding of their teaching practice which is formulated from the integration of their content knowledge with their pedagogical knowledge.

Interestingly, acronym of TPCK was changed to TPACK as it represents a 'Total PACKage' for effective teaching with technology (Thompson & Mishra, 2007). The notion of TPACK addressed a theoretical space for technology integration since it emphasised the different types of knowledge needed by teachers (Mishra

& Koehler, 2006). It therefore constituted a challenge to teacher educators to examine how technology-rich lessons can be effectively designed with the support of the TPACK framework. The main idea of TPACK is characterising the different types of knowledge which comprises three primary knowledge sources: content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK); their mutually integrated knowledge: pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK) and the heart of these knowledge bases: technological pedagogical content knowledge (TPACK). Content Knowledge (CK) refers to the topics taught in the classes, Pedagogical Knowledge (PK) refers to teaching methods and Technological Knowledge (TK) refers to the use of ICT in the educational field (Brantley-Dias, & Ertmer, 2013; Cabero-Almenara, Roig-Vila, & Mengual-Andrés, 2017).

Also, Pedagogical Content Knowledge (PCK) refers to what is used to teach the contents of the course, Technological Content Knowledge (TCK) refers to use of technology to transmit the contents of the course. Technological Pedagogical Knowledge (TPK) refers to use of technology in the educational context (Cabero-Almenara, Roig-Vila, & Mengual-Andrés, 2017; Gómez, 2015). The TPACK model has been implemented in the courses on history (Vaerenewyck, Shinas, & Steckel, 2017), languages (Sancar-Tokmak & Yanpar-Yelken, 2015) and mathematics (Kartal & Cinar, 2018). Kartal and Cinar (2018) used the TPACK model to analyse the impact of digital tools and technological applications (e.g., GeoGebra and Mathematica) in the teaching-learning process on mathematics. Even this pedagogical and technological model has improved academic

performance through the creation of digital stories in language courses (Sancar-Tokmak & Yanpar-Yelken, 2015).

The TPACK model allows evaluating the use of digital tools and technological applications in the teaching-learning process and identifying the impact of ICT in school activities (Phillips, 2016; Cabero-Almenara, Roig-Vila, & Mengual-Andrés, 2017; Cheng & Xie, 2018). The seven components of TPACK are briefly described in Table 2.1 which is based on the previous study (Mishra; & Koehler, 2006; Cox & Graham, 2009; Chai, Koh, Tsai, & Tan, 2011).

Table 2.1 - Brief description of components in the `TPACK framework

Component	Description
CK	Knowledge about the subject matter to be learned or taught.
PK	Knowledge about the methods, processes and practices of teaching which include classroom management, lesson plan development and implementation, student learning and assessment.
PCK	Knowledge needed to develop and deliver effective content-specific instruction without using digital technologies
TK	In the case of emerging technologies, it includes knowledge of operating systems and computer hardware, and the ability to use standard sets of software and web.
TCK	Knowledge of how the content can be represented by and researched with technology without the consideration of implemented pedagogy or teaching.
TPK	Knowledge of how various technologies can be used in teaching without considering the specific subject matter.
TPACK	Knowledge of effective teaching with technology which requires an understanding of the complex interplay between the technological, pedagogical and content knowledge.

TCK, TPK and TPACK which were rooted from TK, PK and CK are strongly interrelated due to their common denominator. The interactions between the three elements are paramount as effective teaching requires teachers to have a rich

understanding of the complex interplay between the content, pedagogical and technological knowledge (Mishra & Koehler, 2006). According to Peng and Daud (2015), the emergence of digital technology has become an imperative part of educators' teaching and pupils' learning process and the TPACK framework may help to better understand the potential contributions of these new technologies for education. Koehler & Mishra (2008) argued that teaching with these new technologies does not take place in isolation but is situated and contextual. Teachers need to develop the flexibility to incorporate knowledge about students, the school, the available infrastructure and the environment.

Consequently, the context added into the seven knowledge domains listed on Table 2.1 as an indispensable part of the TPACK framework. The TPACK framework was adapted for this study to show that improving teacher performance at the Senior High School educational level in Ghana, specifically Mfantseman Municipality, through the use of ICT tools will depend on the level of computer literacy and proficiency to integrate technology in instructional methods since these range of skill sets are required for continuous professional development tasks. As a result, the easier it is for teachers to use technology in their pedagogy and appreciate its worth, the better it will inspire the teachers' desire to utilise technology, thereby boosting the adoption of technology in every sphere of life. Therefore, the Technology, Pedagogy Content Knowledge (TPACK) framework is appropriate for the study because it can show how ICT is successfully integrated and used in teaching and learning Visual Arts in Senior High Schools in Ghana.

2.3 Technological Pedagogical Content Knowledge of Visual Art Teachers

According to Kara (2021), traditional approaches and instructional instruments are changing as a result of technology advancements. Because of the rapid development of ICT, Visual Arts teachers now have numerous chances to enable students to learn in a global, interactive, and dynamic environment. Art educators can improve students' learning by wisely integrating and infusing computer and learning technologies into student-centred or effective learning environments (Gregory, 2009). Although the elements influencing the educational technology integration process are multifaceted, teachers' lack of competencies in knowledge, skills, and abilities, particularly in the use of technology in the teaching process, is a major cause of concern (Estes & Dailey-Hebert, 2018; Kabakçı Yurdakul, 2011). The Technology Pedagogy and Content Knowledge (TPACK) framework is one of the most effective approaches the Visual Arts teachers can employ to integrate technology into the classroom. TPACK is defined as the basic knowledge that teachers need to make teaching effective with technology and the theoretical framework of the application of the knowledge (Mishra & Kohler, 2006; Niess, 2005).

However, Pedagogical Content Knowledge refers to the ability of the teacher to transform content into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students (Shulman, 1987, cited in An, Kulm and Wu, 2004). According to An, Kulm, and Wu (2004) pedagogical content knowledge has three components: Knowledge of content, Knowledge of curriculum, and Knowledge of teaching. An et. al., (2004) point out the importance of knowledge of teaching and they accept it as the core component

of pedagogical content knowledge. Grouws and Schultz (1996) opined that pedagogical content knowledge includes, but is not limited to, useful representations, unifying ideas, clarifying examples and counterexamples, helpful analogies, important relationships, and connections among ideas. ICT pedagogical content knowledge is the integration of ICT, teacher's subject (content) knowledge, and teaching skills (pedagogy) to enhance the teaching-learning process between teachers and students. The integration of ICT in pedagogy improves the effectiveness and efficiency of teaching and learning in the classroom to support students in their academic growth. According to Andyani, Setyosari, Wiyono and Djatmika (2020), there are some indicators to measure the use of ICT in pedagogy and they include: Substitution of ICTs, Augmentation of ICTs, Modification of ICTs, and Redefinition of ICTs. Pedagogical Content Knowledge (PCK) is knowledge about pedagogy, teaching practice, and planning processes applicable and appropriate to be taught on the given subject matter (Loughran, Berry & Mulhall, 2012). PCK knowledge is included in choosing what learning approach or method to choose to teach specific content. The choice of approach or method in teaching mathematics differs from the approach or method of teaching other fields such as Indonesian, Natural Sciences, or Social Sciences. PCK deals with the representation and formulation of theories, pedagogical techniques, knowledge of what makes a theory difficult or easy to learn, and also knowledge of knowledge from previous learners' epistemological theories (Koehler & Mishra, 2008).

Most importantly, correct theoretical representations are needed to overcome learning difficulties and misunderstandings to create more meaningful learning.

PCK includes knowledge about creating a conducive learning atmosphere in implementing the learning process, including the provision of facilities that can support the optimal learning process (Anderson, Barham, & Northcote, 2013). The fourth point PCK for social studies teachers can reinforce those academic skills and technological literacy are one unit. This is reinforced by the challenges of changing times that require students to understand technology as a whole. As Grossman and McDonald (2008) points out, research on teaching and research on teacher education are two distinct but closely related fields that are already proliferating, with the two rarely intersecting. Central to the idea of PCK is the notion that 'deep knowledge' of content is crucial to effective teaching and cannot be taken for granted. The dichotomization of content and pedagogy, perhaps as prevalent in education as in any field, contributes to the sense that a 'great divide' separates teacher educators from their colleagues in the disciplines a lamentable situation that makes it unnecessarily difficult to give new teachers the training they need and deserve (Bain & Mirel, 2006; Labaree, 2006; McDiarmid & Vinten, 2000). Such compartmentalization is troubling for a number of reasons. The separation of content from pedagogical training in teacher preparation programmes leaves many prospective teachers lacking adequate and flexible content knowledge for teaching, a separation that often renders the content prospective teachers do learn inert and disconnected from both the school curriculum and from the methods of instruction most likely to connect knowledge to students.

Moreover, as Seixas (2001) has written, not being a subject studied in college, Visual Arts is not the starting point for student teachers in the way that the study of literature or history might be. Put another way, what future teachers learn in

college, from a subject matter standpoint, is quite different from what they will eventually be asked to teach. And when the chips are down, inexperienced teachers tend to revert to what they know (typically, what they have seen in their own classes as students themselves) over the teaching practice they idealise (Lortie, 1975), or tend to rely on textbooks to guide their practice often with poor results (Loewen, 2009). A growing literature base supports the idea that the cultivation of content knowledge, and subject matter content itself, should receive more attention in teacher preparation programmes. Much of this work has centred on the theory of pedagogical content knowledge. In traditional subjects such as mathematics (Koehler, Mishra, Akcaoglu, & Rosenberg, 2013; Hill, Ball, & Schilling, 2008; Krauss, Brunner, Kunter, Baumert, Neubrand, Blum, & Jordan, 2008; Hill, Schilling, & Ball, 2004), science (Gess-Newsome & Lederman, 2002; Sadler, Sonnert, Coyle, Cook-Smith, & Miller, 2013), and English/language arts (Gudmundsdottir, 1991; Howey & Grossman, 1989), at levels that span the KG curriculum, and also in less traditional subjects like physical education (Chen, 2002; Siedentop, 2002) and even school leadership (Stein & Nelson, 2003), PCK has been used as a framework for defining professional teaching knowledge.

Also, it figured prominently in a recent study (Kleickmann, Richter, Kunter, Elsner, Besser, Krauss, & Baumert, 2013) exploring how structural differences in teacher preparation programmes affect PCK development. This is fertile ground and, yet, little of it has been ploughed where Visual Art Education is concerned. A few researchers (Gudmundsdottir & Shulman, 1987; Segall, 2004; Whitson, 2004) have attempted to explain pedagogical content knowledge of teachers, but none have adequately explored the complex relationship between Visual Arts as subject

and the theory of PCK. VanSledright (2013) has explored the relationship between historical thinking and teaching practice promises to expand the conversation about teacher knowledge in ways that are consistent with the theory of PCK, while Monte-Sano (2011) and Monte-Sano & Budino (2013) have even addressed PCK development for history teaching explicitly, but this work still does not address the fundamental question of what pedagogical content knowledge in Visual Arts might look like. Why has Visual Arts, as a subject, been so resistant to the PCK framework? The reason PCK has never been a good fit for Visual Arts, and it is related to the first: it is clear that Visual Arts has what Shulman (1986) called a missing paradigm problem. In his initial articulation of what PCK is, Shulman argued that research on teaching and teacher education was marred by a blind spot with relation to content researchers, in other words, had failed to recognise that pedagogical techniques do not exist in a vacuum. They need to be paired appropriately with subject matter knowledge (and considered in light of other contextual information, such as the curriculum itself and the nature of the students being taught) in order to actually bring about effective student learning. His solution to this problem was to theorise the foundations of teacher knowledge to incorporate knowledge of subject matter and describe its relationship to the pedagogical techniques employed by teachers.

Crucially, Shulman (1986) argued that converting subject matter knowledge into knowledge for teaching depends on developing a deep understanding of the disciplinary structures that helped create that knowledge in the first place. This has proven to be an especially tricky problem for Visual Arts researchers interested in PCK to handle mainly because identifying the structures of a subject that has never

been adequately defined inevitably seems like a fool's errand, but also, too, because some Visual Art educators harbour a longstanding distrust of knowledge generated in the disciplines that prevents them from even beginning to theorise knowledge in the way Shulman described. This implies that defining the structures of knowledge in Visual Arts is a key to developing a working framework for PCK in the field. Doing so may also, in turn, contribute something to the ongoing debate over goals and purposes that have long dogged Visual Arts as a field. In a sense, then, addressing the missing paradigm problem may help resolve some of the tensions that have helped lead to the marginalisation of Visual Arts in the school curriculum by providing a renewed rationale for its place in schools. Pedagogical Content Knowledge is a powerful construct to guide researchers and teacher educators in terms of which type of knowledge teachers have (Friedrichsen, 2008).

Primarily, Shulman (1986) introduced the theory of PCK in the field of teacher education and stated that teachers should have content knowledge of subject matter, pedagogical knowledge of subject matter and curricular knowledge. Shulman (1986) stated that PCK is a unique knowledge needed to transform several types of knowledge required for teaching and identified Subject matter content knowledge as a distinct component of it. Magnusson, Peachey, Gillen, Livingstone, and Smith-Robbins (1999) have adopted the Shulmans' idea unambiguously and commented that PCK is the transformation of several forms of knowledge for teaching (including subject matter knowledge) and symbolises a specific domain needed for teachers' knowledge. In contrast, Marks (1990) argued that pedagogical content knowledge and content knowledge cannot be clearly distinguishable knowledge components. Cochran, DeRuiter and King (1993) also

agreed with it and stated that teachers' PCK develops with time due to progressive awareness of students' needs. Fernandez- Balboa and Stiehl (1995) also obtained equivalent results to Marks in University lecturers. Koballa, Graber, Coleman and Kemp (1999) also concluded the same by the data gathered from trainee chemistry teachers of German gymnasium schools. Veal and MaKinster (1998) gave a hierarchy of knowledge contributing to development of teachers' PCK. It ranges from lowest General PCK followed by Subject specific PCK, Domain specific PCK to Topic specific PCK. Theoretical studies about interaction and interplay of PCK's components have been studied repeatedly like Loughran, Berry and Mulhall (2000) identified 12 interactive elements of PCK. Halim and Meerah (2002) investigated twelve pre-service teachers from diverse backgrounds of science degree and found that most of the trainees had the same misunderstanding as students of school. They asserted that rich content knowledge is mandatory for developing comprehensive PCK. Angell, Ryder and Scott (2005) compared PCK of expert and novice teachers in different content areas in physics. The results revealed the experts made wide linkages between knowledge of different contexts and showed a worthy group of pedagogical skills in contrast to novice teachers concentrated on transmitting content. In Indian perspective, PCK is not determined as a highly investigated research area. Mostly research has been done on teachers' knowledge which suggested various teaching skills, teaching methods.

2.4 Extent to which teachers engage students in the use of ICT resources

The mastery of computer skills is one of the first steps teachers must achieve to successfully integrate technology into the classroom. Wang (2002) explained, equally important is the perceptions pre-service teachers develop out of their

training about effective teaching and learning in the classroom with computers. Pre-service teachers face new challenges and acquire new strategies to teach throughout their education. Therefore, they must learn how to develop clear, concise standards to teach by, that incorporate computers in the learning process on a regular basis. The purpose of the Wang study was to determine the perceptions of pre-service teachers in regard to the role of the teacher in a room with computers. Also, Wang investigated to what degree and how the pre-service teachers could actually use the computers in the classroom. While many pre-service teachers are educated by instructors at universities to integrate technology into classroom instruction, Wang (2002) explained that the process must go much deeper than that. Norum, Grabinger and Duffield (1999) noted that the presence of computers changed the traditional classroom by: (a) the shift of responsibility from teacher centred to student centred, (b) new arrangements in the classroom setup, (c) reformation of social organisation, and (d) the establishment of a new type of partnership between teachers and students. Even though teachers are willing to make changes and adopt new ideas.

Again, Sandholtz, Ringstaff and Dwyer (1992) stated that the change is slow, and sometimes includes temporary regression. Barker and Bills (1999) found that many teachers teach according to how they were taught, trained, and the experiences they have had in the past. Wang (2002) demonstrated that pre-service teachers' perceptions are an integral part of shaping future teaching behaviours. Today, computers have become essential to the learning process. Therefore, Wang concluded that pre-service teachers' perceptions of computers are just as important as how they are used in the classroom.

2.4.1 Involving Learners in Virtual Worlds in Teaching and Learning

There are many ways teachers can use virtual worlds in education to facilitate teaching and learning to equip learner with 21st century skills. Ryan (2008) outlines 16 ways instructors can use virtual worlds in the classroom. They include: adding a visual element, as an interactive library, a connection device, role playing device, simulation device, games for learning, soft skill development, research, virtual tourism and field trips, social device, to create anonymity, recruitment, build awareness and/or promote an event, learn how to build and as an open learning environment. The experience of the initial utilisation of this educational technology confirms that virtual worlds have a role in Visual Art Education. As effective instruction is considered an instruction which enables students to acquire specific skills, knowledge and attitudes, Reiser and Dick (1996) contend that after effective instruction, students can be motivated well. To motivate students in the instruction process, all factors must be determined well. During the determination process, there are four important principles that play a key role. These principles are listed below:

- Begin the planning process by clearly identifying the general goals and specific objectives students will be expected to attain;
- Plan instructional activities that are intended to help students attain those objectives;
- Develop assessment instruments which can measure the attainment of those objectives;
- Revise instruction in light of student performance on each objective and student attitudes towards instructional activities (Reiser et al., 1996).

Teachers should follow these principles in order to apply their instruction successfully when involving students, the use of virtual worlds in the classroom to ensure effective teaching and learning. Instructional design pays attention to the instruction from the learner perspective rather than from the content perspective which is a traditional approach (Reiser et al, 1996).

2.5 Challenges of ICT Integration into Teaching and Learning Visual Arts

There are several explanations for the failure of ICT utilisation in public secondary schools. A study by Howell, Lundall and Patrick (2000), on the key factors blocking educational institutions from using ICT as an administrative tool was conducted in Indonesia. The study sample constituted of 10 schools, in rural Indonesia. 10 head teachers, 30 students randomly sampled and 20 teachers purposively sampled. From the study Howell et. al., (2000) identified major challenges such as lack of electricity, lack of funds, and insecurity. On top of that, very little of the equipment available nationally is allocated for ICT use in education, in schools. Howell et. al., (2000) also cited insufficient funds, insufficient number of computers, lack of teachers with IT skills, teachers' inability to integrate the computer into the different subject areas and lack of appropriate microcomputer teaching programmes as the major challenges facing introduction of ICT in school administration.

However, Karsenti (2004) conducted another study on the problems blocking public secondary schools from equipping themselves with computers in Kenya. The study involved 8 public secondary schools in Nyanza province, 8 Principals of these schools, 24 students randomly sampled and 16 teachers purposively

sampled. The study established that hardware was one of the major constraints on the use of innovative technologies in school administration. Also, the high costs of equipment greatly exacerbate the group usage ratio. There was also the mind-boggling difficult feat of achieving a student-computer ratio of 10:1 and 100% Internet connection in most of the primary, secondary, and higher educational institutions in Kenya. Furthermore, in Kenya, the low density of telephone A good number of authors (Intsiful, Okyere & Osae, 2003; Selinger, 2001; Tunca, 2002), have also cited lack of tools, inoperative telephone lines; marginal, disparate, inadequate and obsolete communications networks; fluctuating electric power supplies; recurrent power brownouts and blackouts; ailing road systems are major problems facing the application of ICT.

Again, Murphy, Anzalone, Bosch and Moulton (2006), in a study on how infrastructure may affect ICT use in school administration found that there was a thorny issue of infrastructure, which is indispensable for ICT use by educational institutions for teaching and learning and administrative purposes. The study emphasised on the participation of all public secondary school teachers in the ICT integration process of teaching and learning and school administration. Further, the study suggested that principals and teachers should be mobilised and encouraged to use ICT. It is observable that aside from the issue of unequal distribution of technological equipment across public secondary schools, lack of appropriate equipment, and qualified human resources, further contribute to the challenges facing application of ICT in teaching and learning and school administration. This implies that without the establishment of necessary interventions, many schools will lag behind in the application of ICT. The ability to use ICT effectively and

appropriately is now seen as essential to allow learners to acquire and exploit information within every sphere of human activity (Creighton, 2003). It can be assumed that specific forms of ICT will change with time. However, the need to be able to evaluate and use ICT purposefully will remain the key to full participation in an information society. The Information and Communication Technologies can help to broaden access to education and improve learning outcomes. The success in the use of ICT in education depends largely on teachers and their level of skills in integrating ICT into the teaching process and in utilising ICT to provide learner-centred, interactive education (Salomon, 1993). Therefore, we need to build teachers' capacity in the use of ICT for education by training teachers to be able to use ICT and to integrate ICT into teaching for achieving improved educational outcomes with ICT. To make the best use of ICT tools, teachers must understand the relevance, usefulness and usability of ICT tools (Jonassen & Carr, 2000).

Also, research studies in education have shown that information and communication technologies (ICT) coupled with the necessary pedagogical strategies engage students in higher order thinking (Oliver & Hannafin, 2000; Jonassen & Carr, 2000; Kearney & Treagust, 2001). The primary motivation for integrating ICT in education is this belief that it supports students in their own constructive thinking, allows them to transcend their cognitive limitations, and engages them in cognitive operations that they may not have been capable of otherwise (Salomon, 1993). ICT integration is interpreted as ICT functioning as an integral or mediated tool to accomplish specific teaching or learning activities to meet certain instructional objectives. For ICT to be effectively integrated in

schools, it should be used as a mediational tool in these activities to engage students in higher order thinking. Higher order thinking skills are goal-directed, multi-step, strategic processes such as designing, decision making, and problem solving that require analysing, evaluating, connecting, imagining, elaborating and synthesising (Iowa Department of Education, 1989). And engagement entails mindfulness, cognitive effort and attention of the students in the learning environment (Kearsley & Shneiderman, 1998). Ertmer (1999) provides a model that describes two types of barriers that hamper teacher ICT implementation efforts in the classroom, namely, first-order barriers (i.e., extrinsic to the teacher) and second-order barriers (i.e., intrinsic to the teacher). First-order barriers typically refer to resources that are missing or inadequately provided. These barriers according to Donnelly, McGarrand and O'Reilly (2011) are easily removed when money is provided. Hence these barriers are concentrated on initially. They include technical support, lack of access to appropriate resources (software, hardware, and internet access), inadequate training, and lack of time. Having to deal with first-order barriers may frustrate teachers before they can start the integration process (Ertmer, 1999).

2.5.1 Resources, Support and Cultural Barrier

Furthermore, building on earlier work by Ertmer (1999) on first and second order barriers, Hew and Brush (2007) provide an analysis of barriers documented over ten years (1995-2006). They identify six main categories of barriers limiting integration, where four compromised first-order barriers (i.e., resources, support, subject, and culture) and two compromised second-order barriers (i.e., teacher attitudes and beliefs and teacher knowledge and skills). The authors described

resources, teacher knowledge and skills, and teacher attitudes and beliefs as the three most frequently cited barriers impacting technology integration. Lack of access to resources has been cited as one of the main barriers to ICT integration (Ertmer, 2005; Hew & Brush, 2007). Resources may refer to either; 1) access to ICTs, 2) access to available ICTs, 3) time, or 4) technical support. Access refers to the correct amount and type of ICTs in places where teachers and students can use them, in order to ensure that ICTs are integrated into lessons (Wilson-Strydom, Thomson & Hodgkinson-Williams, 2005; Hew & Brush, 2007). Increased access to resources, however, does not necessarily mean that integration will be guaranteed. Schools with limited hardware and software have limited chances to integrate ICTs. On the other hand, increased access to ICTs does not necessarily lead to increased integration of ICTs (Wilson-Strydom et al., 2005). This goes to show that other factors influence integration, apart from the obvious first-order barriers. Most teachers complain about time required to prepare for using ICTs, thus, they need time to review websites and content (Hew & Brush, 2007; Ertmer, Kleickmann, Richter, Kunter, Elsner, Besser, & Baumert, 2012). The most cited barrier to integration is lack of professional development or teacher training (DuPlessis & Webb, 2012).

Accordingly, Ertmer (1999) emphasises strongly that teachers need access to multiple types of training where technology and pedagogical needs are addressed. This is because teachers' ability to use ICTs affects their willingness to integrate them into the classroom. If teachers do not have the knowledge and skills to use ICTs, they will not integrate them (Hew & Brush, 2012; Eteokleous, 2008). Literature does, however, state that even though some teachers have received

training on ICT use and they have the knowledge on integration, they may still not integrate ICTs. They are associated with teachers' ways of seeing and doing things and with changes in pedagogy, personal preferences, teacher attitude, and philosophy about teaching and learning (Eteokleous, 2008; Sang, Valcke, vanBraak, & Tondeur, 2010; DuPlessis, & Webb, 2012). These barriers are more difficult to overcome mainly because they are more tacit and personal (Ertmer, 1999). The level of ICT skills possessed by teachers is a factor in the integration of ICTs. However, the level of ICT skills is not the only factor that is influential in ICT integration. Second-order barriers such as self-efficacy, pedagogical beliefs (discussed above), and teacher attitudes also play an important role (Albion, 1999). Inadequate training, therefore, produces teachers with limited ICT skills, and subsequently teachers who lack confidence in teaching with ICTs (Albion, 1999; Hew Brush, 2007; Eteokleous, 2008). Adequate teacher training is therefore the primary way to address second-order barriers. One of the greatest challenges in ICT integration in education is balancing educational goals with economic realities. ICTs in education require large capital investments. Due to financial difficulties, governments in some parts of the world, especially developing countries, prioritise the rehabilitation of school buildings and teacher welfare.

2.5.2 Lack of Professional Development in ICT Competencies

A workshop on ICT capacity-building boosts a teacher's confidence and improves lesson delivery. Teachers must be regularly exposed to ICT capacity training in order to broaden their knowledge through support opportunities such as workshops. The extent with which a teacher is exposed to ICT capacity building will result in the teacher becoming highly competent in evaluating his or her own

academic progress. The length of time a Visual Art teacher spends in an ICT capacity building workshop has a significant impact on lesson output. This is essential for exposing students to the larger global community. However, Okonkwo (2014) posited that teachers are not fully utilising technological advances, through frequent exposure to ICT workshops, questioning whether they will meet the needs of shifting-knowledge-based societies and increasingly diverse student populations. A predetermined process is important for integrating ICTs in the classroom, school management, library, and any educational setting. Integrating ICTs enhances the quality of education by helping teachers to do their job and by helping students to learn more effectively. In these contexts, teachers' shifting role in the 21st century involves an essential mission, which is to be the frontiers for applying technological innovations to the teaching and learning process. At this point, necessary skills and level of future teachers' researchers are key factors in implementing new ICTs, (Goktas, Hermans, Tondeur, vanBraak & Valcke, 2009). Consequently, schools of teacher education play a crucial role in preparing further teachers to become proficient in the integration of ICTs into Curriculum. They need to help prospective teachers understand how ICTs can be used to teach content in rich and meaningful ways (Keating & Evans, 2001; Roblyer & Edwards, 2000).

On the other hand, integration of ICTs into pre-service teacher education is critical in integrating ICTs in K-12 schools. Despite the huge investment of financial and human resources, pre-service teacher education programmes do not provide teachers with the necessary skills, competencies, and experiences to prepare them to use ITCs effectively in their future professions (Bullock 2004; Duran, 2000;

Moursund & Bielefeldt, 1999). Teachers' perception of the strength of personalised learning in their school is strongly related to measures of the IT resources available in the school (Underwood & Banyard, 2008). Counter-intuitively, the Virtual Learning Environment (VLE) which can be seen as a vehicle to deliver personalised learning was not highly valued by teachers. A survey of over 300 teachers (Banyard, Underwood, Kerlin, & Stiller, 2011) asked them to identify their most important pieces of technology. Over half identified their Interactive Whiteboard as their must have technology and a further quarter chose their laptop. There were mentions for Google, YouTube, and data-sticks but very few for the Virtual Learning Environment. Few studies investigate the role of professional development through capacity building workshops in expanding and deepening how teachers implement ICT arts integrated instruction. Yet, Diamond (1991) suggests that teachers' perspectives cannot be transformed nor newly attained unless there is some comprehensive overview within which they can be construed. LaJevic (2009) adds that teachers need to become well informed about arts ICT integrated instruction and research on curriculum, demonstrate comfort with diverse ways of knowing, and accept the importance of risk-taking when striving for professional growth.

Once more, the following studies provide some insight into how professional development can be designed to impact a teacher's capacity and willingness to integrate ICT into arts in an era when there is no room for insecurity in teaching (LaJevic, 2009.) and cognitive demands are high. Saraniero and Goldberg (2011) investigated two models of professional development in ICT arts integration to determine which approach positively impacted teacher practice and student

achievement. The researchers developed three randomly assigned groups of teachers who were asked to integrate Visual Art and drama with reading lessons. The first group (n=17) attended a summer institute (30 hours) and received 25 hours of coaching during the school year. The second group (n=18) attended the summer institute but received no coaching. The third group (n=33) did not participate in the institute nor did they receive coaching. No statistically significant differences were found prior to the study between teacher groups in terms of professional qualifications, previous training in the arts, or teaching experience. Using a mixed-methods approach, the researchers determined that teachers who participated in the coaching model demonstrated greater confidence, superior work samples, and more frequent implementation of arts integrated instruction. The researchers noted that first attempts at lesson plans were modest for all three groups, but the teachers who received coaching developed better second lesson plans in terms of aligning instruction with the objectives and understanding how to authentically integrate the arts and reading content. The institute only group showed no statistically significant improvement between lessons. While teacher confidence in facilitating arts integrated instruction decreased the following year for both the coached and non-coached groups, those who had received the coaching demonstrated higher confidence overall and greater frequency of implementation. Interestingly, differences in student achievement between the three groups on standardised tests were not significant; yet, both the coaches and institute only teachers reported that students demonstrated higher student engagement and enthusiasm for learning, better retention of curriculum, more creative participation and more self-reflection when utilising arts integration. Teachers stated that students continued to demonstrate these improved habits of mind and dispositions

after the study concluded. Short-term professional development is common; yet, this study shows that ongoing professional development may be necessary to improve teachers' abilities to plan for and enact high-quality arts integrated lessons, particularly when instruction is oriented toward 21st century skills and knowledge.

Moreover, research by Gomes (2005) revealed that a lack of digital literacy training; a lack of pedagogic and didactic training in how to use ICT in the classroom; and the lack of training in the use of technology in specific subject areas were barriers to integrating new technologies into classroom practice. In some parts of the world due to educational background generally there is a lack of preparedness for students entering higher education in the knowledge and skills required for the basic use of technologies. In the delivery methods of using ICTs in education, learning challenges still occur when ICTs are delivered in different ways (online, blended, etc.), especially when content is not adapted to the technology and context, and when there is limited interaction between students and educators (Mbodila, Jones, & Muhandji, 2013). In general, integrating ICTs use in education requires establishment of infrastructural facilities, acquisition of technologies and their periodic updating, management and professional support services (Yelland, 2001). There is a gap between the level of ICT presence in schools and the extent of their integration in teaching and learning. Technology itself and computers do not bring about ICT integration, and their installation in classrooms will not automatically lead to their use by the teacher (Saba, 2009).

Accordingly, a number of factors are responsible for the slow pace of ICT integration in teaching and learning. Ertmer (1999) identified two barriers to technology integration in education as first order (external) and second order (internal) barriers. First-order barriers are factors that are external to the teacher but limit the extent of technology use in teaching and learning. They include access to computers and other ICT devices, insufficient time to plan instruction and lack of administrative and technical support. Second order-barriers are intrinsic to the teacher. They include personal attitudes, established classroom practices, perceptions held as a result of cultural and/or other beliefs that may hinder the implementation of technology integration (Ertmer, 1999). A third-order barrier to teachers' practice of technology integration has been theorised as the inability of teachers to create dynamic learning environments using their TPACK competencies, thus the lack of design thinking by teachers (Tsai & Chai, 2012). At this stage, it is impossible to overlook certain internal or external obstacles. Because education integration is a multifaceted process with numerous aspects influencing its effectiveness, it is vital to re-examine these hurdles in light of changing conditions (Izmirli, & Kirmaci, 2017).

Basically, Flanagan and Jacobsen (2003) summarised the barriers to technology integration into four main themes thus: pedagogy, equity, professional development and leadership. Akbaba-Altun (2006) also grouped these challenges into five (5) main themes namely; infrastructure, personnel, curriculum, administration and supervision. In Ghana, Mangesi (2007) identified such challenges as urban bias, limited skills of teachers and inadequate collaboration

between educational policy makers and policy implementers. The challenges identified in the literature are synthesised and discussed under two main themes:

- infrastructural challenges and
- human resource challenges.

2.5.3 Infrastructural Barriers

This is one of the prevailing themes in the literature on challenges to integration of ICTs in teaching and learning (Akbaba-Altun, 2006; Mue, 2014; Opoku-Peprah, 2016). Undoubtedly, modern technologies are costly, and an investment in them requires an expenditure of huge amounts of money, first in the purchase of ICT equipment and then in skills training for staff, maintenance of equipment, wiring, ensuring security and others (Department of Education U.S., 2002). In Turkish schools, Akbaba-Altun (2006) noted that infrastructure was the common category that school principals, computer coordinators and supervisors noted as problematic to ICT integration. Infrastructural challenges included concerns about the physical setting of ICT tools, equipment breakdowns and those having to do with security and maintenance. Akbaba-Altun, (2006) reiterated that, generally, school buildings constructed several years before the introduction of computers in schools lack features that make them suitable for connecting and using computers and other ICT devices. In many institutions, there are reports of scarcity of computers partly because repairs are often delayed when there is a breakdown and principals and ICT coordinators do not usually have the required knowledge to repair broken down equipment.

However, Opoku-Peprah (2016) in his study of the challenges of ICT use in Senior High Schools in Ghana found that there were limited computers and software, no

internet access among others. The predominant challenge reported by most of the respondents in his study was lack of computer laboratories and limited resources and materials for teaching ICT. Mue (2006) in his study of the challenges faced in the introduction of ICT in education in Kenya confirmed the lack of adequate infrastructure in schools as the major challenge with the incorporation of ICTs in education. Similar findings were made by Albugami and Ahmed (2015) in Saudi Arabian secondary schools where ICT implementation was found to be hindered by lack of space and resources and maintenance challenges. According to Mfum-Mensah (2003), the introduction of ICT in Ghanaian schools is likely to lead to a digital divide between the urban schools who already have access to most educational resources and rural schools who are already impoverished when it comes to resources. This, he opines, is likely to escalate the existing disparities in Ghana's educational system. Flanagan and Jacobsen (2003) asserted that schools in lower socio-economic areas (villages or rural areas) struggle to raise sufficient funds to buy new equipment, and this is sometimes further compounded by instances of irregular power supply to these areas and sometimes outright lack of power supply.

2.5.4 Human Resource Barriers

The study conducted by Jones (2004) discovered seven barriers affected the integration of ICT into lessons: lack of confidence among teachers during integration, lack of access resources, lack of time for the integration, lack of effective training facing technical problems in use, lack of personal access during lesson preparation, age of the teachers, and teaching experiences. However, Flanagan and Jacobsen (2003) posit that successful technology integration is

complex and requires many interrelated variables, perhaps the most important among these being the right personnel to manage the process. Several challenges associated with human resources are found in the literature, including those relating to principal and teachers' professional development, skills gaps and so on. School heads, as instructional leaders, are expected to support their teachers to integrate ICTs into their lessons. Considering that these leaders are themselves not adequately prepared to effectively take up their roles as technology leaders, the role of challenging, equipping and motivating teachers to use technology in 'authentic ways' in teaching and learning becomes a difficulty (Flanagan & Jacobsen, 2003). The direct result of this, perhaps, is the lack of professional development and training of teachers in technology integration literacy. This lack of ICT skills and training is a concern in many countries where efforts are being made to integrate technology in education (Albugami & Ahmed, 2015).

Furthermore, in their qualitative study of four Ghanaian schools, Malcom and Godwyll (2009) identified lack of resource capacity to provide ICT training and equipment servicing and lack of professional development programmes for teachers to upgrade their skills in emerging technologies as apart from other infrastructural issues, some of the challenges confronting successful ICT integration in Ghana. Another problem identified in the Ministry of Education's e-Readiness report of 2009 in Ghanaian second cycle institutions is the wide inequality in the distribution of ICT teachers and ICT infrastructure in Ghanaian schools. This problem is further emphasised by Mfum-Mensah (2003) and Mangesi (2007). Schools with more than five ICT teachers were found in the urban areas whereas those in the rural areas had less than three teachers. This consolidates

the fact of the challenges associated with attracting teachers into schools in the rural areas of the country (Ministry of Education, 2009). This situation is likely to widen the gap between urban (have) schools and rural (have-not) schools (Mfum-Mensah, 2003).

2.5.5 Lack of ICT Policy Framework Guidelines

Again, the lack of policy framework guidelines for ICT integration in schools is another challenge to effective implementation in schools (Mfum-Mensah, 2003). As with organisations outside education, the impact of change on technology decision-making in secondary schools is evident (Kokay, 2004). There is little time to enable schools to gather information required to make a decision, nor time to reflect on the effect of the decisions once made. Often other issues arrive on the scene before there has been time to deal adequately with the previous one. Unlike other decisions made within a school that can be reviewed and changed if required, changes in technology occurring outside education dictate the speed and currency of the decision-making process within the school. The dictates of time lapse pose a big challenge in the integration of ICTs in schools as some programmes and approaches may become obsolete in the transition period which may take two to three years. A year in the ICT arena is a very short period as new innovations take center stage in the world of competition by various software companies (Kokay, 2004). Swarts (2006) posits that ICTs can be powerful, essential tools for learning, understanding, interpreting and communicating about the real world or they can be black holes into which money is poured, intelligence and time, getting very little in return. However, Kokay (2004) notes that because of the pace of technology, it is difficult to produce technical plans that look ahead and determine which forms

of hardware, software and support will be required to meet the future needs and goals of the school. Implementation of a new policy can often be plagued by a range of problems. An incorrect perception can impede the successful outcome of any change (Al-Sharija, 2012). For instance, Graetz, Rimmer, Lawrence and Smith (2006) noted that change is initiated by the conception that a specific need exists. As a consequence, the success of change depends on the accuracy of assessing the importance of that need by the organisation (Camerson, Quinn, DeGraff, & Thakor, 2022). Technical plans based on uncertainties owing to high speed of innovations can be daunting for change agents as trial and error takes toll on their very confidence necessary for the ICT integration process.

Finally, one major limitation for change in ICT and education is that many of those involved in helping people to learn in both formal and non-formal contexts have little or no skills in the appropriate use of new technologies (Unwin, 2005). This is particularly so in poorer countries, and most notably in Africa. Unwin (2005) notes that there have, to date, been rather few effective and sustainable schemes designed to enhance ICT for e- literacy among teachers. ICT implementation requires visionary and focused leadership. However, this can be an intricate issue (Krauss, 2013). Bush (2008) says that vision building is a highly sophisticated dynamic process which few organisations can sustain. In fact, an ICT master plan that is formulated according to a school's vision and its sociocultural setting assures effective integration of ICT (Afshari, Bakar, Luan, Samah & Fooi, 2009).

2.6 Chapter Summary

This chapter critically reviewed the literature on the integration of Information and Communication Technology (ICT) in education, with particular emphasis on Visual Art education at the Senior High School level. Anchored in the Technological Pedagogical Content Knowledge (TPACK) framework, the review examined the interplay between technological, pedagogical, and content knowledge as essential for effective ICT integration. Empirical studies were considered, highlighting how teachers' competencies in these domains influence instructional practices and student learning outcomes, and how ICT tools can enhance creativity, engagement, and the development of 21st-century skills. The chapter also identified key challenges to ICT integration, including infrastructural limitations, human resource constraints, inadequate professional development, poor internet connectivity, and restrictive institutional policies. By synthesising theoretical and empirical scholarship, the review established a strong foundation for the present study and highlighted gaps in knowledge, particularly within the context of Visual Art education in Ghana.

The insights gained informed the research design and methodological choices presented in the next chapter, which details how the study investigated teachers' experiences and practices regarding ICT integration in Visual Art education.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The purpose of the study was to explore ICT integration in Senior High School Visual Art education in the Mfantseman Municipality in the Central Region of Ghana. This chapter presents the approach and methods used to answer the research questions and to achieve the objectives of the study. It explains the rationale and design of the research, as well as the population, the sampling technique, and the sample size. It also describes the type of data, the data collection instruments, and their trustworthiness. It further discusses the procedure for data collection, data analysis, ethical considerations and acknowledges the limitations of the study.

3.1 Research Paradigm

The study adopted interpretivism and social constructivism, drawing on the interpretive sociology associated with Weber (1920) and the pragmatist tradition associated with Dewey (1859–1952). These paradigms were selected because the central aim of the study is to understand how people make meaning of their lived experiences within a specific context. A constructivist stance is appropriate because it treats meaning as something that is jointly produced through interaction, requiring reciprocity between the researcher and participants as they co-construct interpretations of the phenomenon (El Hussein, Hirst, Salyers, & Osuji, 2014). In practice, this orientation favours open-ended engagement that elicits how participants explain, frame, and interpret their experiences, rather than limiting inquiry to surface description (Kusi, 2012). Social constructivism also recognises

that knowledge is not simply "found" by the researcher. It is produced through social processes, language, and context, with both researcher and participants playing active roles in constructing accounts of reality. This position supports an in-depth exploration of a phenomenon in its socio-cultural setting and helps the study attend to complexity, local meanings, and context-specific explanations (Creswell, 2013).

Interpretivism aligns with the study's reliance on naturalistic qualitative methods such as interviews and observations, which allow participants' meanings to emerge in ways that are grounded in everyday life. When handled rigorously, interpretivist qualitative inquiry can produce credible and trustworthy accounts because it prioritises participants' perspectives, prolonged engagement with the setting, and careful interpretation of context (Pham, 2018). The interpretivist position also fits the study's analytic intent because it privileges depth over broad generalisation. The goal is to develop a nuanced understanding of the phenomenon in its unique context, with claims framed in terms of situated meaning and potential transferability rather than population-wide inference (Creswell, 2007). Consistent with this, interpretive analysis seeks to generate rich, descriptive accounts that foreground deep understanding of social phenomena and the meanings people attach to them (Henning, 2004). Therefore, interpretive theory will guide the analytical framework used to make sense of data generated through the qualitative strategies adopted in the study.

3.2 Research Approach

The study adopted a qualitative research approach. According to Denzin and Lincoln (2000), Qualitative research is a set of interpretive material practices that

make the world visible, and researchers study things in their natural settings, attempting to make sense of, or to interpret phenomena in terms of the meanings people bring to them. Qualitative research is concerned with understanding the meanings that people attach to phenomena within their social world. It aims to provide an in-depth and interpreted understanding of the social world of research participants by learning about their social and material circumstances, their experiences, perspectives, and histories (Snape & Spencer, 2003). Qualitative research assumes that the social world is regulated by normative expectations and shared understanding. The norms in society are obeyed for peaceful existence. Qualitative research was selected because it aligned with the study's objectives, which focus on understanding how Visual Art teachers' technological pedagogical content knowledge shapes their classroom practice. It also enabled an in-depth examination of the extent to which teachers engage learners in ICT-based learning within Visual Art lessons, and the barriers that limit effective ICT integration in their teaching. This approach was appropriate for generating context-specific insights from the Mfantseman Municipality in the Central Region of Ghana. This qualitative research was also relevant for developing new insights about the phenomenon.

3.3 Research Design

Research design is a basic plan that guides the data collection and analysis (Churchill & Iacobucci, 2005). The study employed a case study design. In a qualitative research approach, the case study design serves as a foundation for in-depth investigation and understanding of complex phenomena within their real-life contexts (Yin, 2009). This section explains why a case study design was selected

for the study, with specific attention to an interpretive case study approach. The choice of this design is grounded in several clear reasons that align with the study's purpose and context.

Firstly, the complexity of the research topic necessitates an in-depth exploration that goes beyond surface-level analysis. The aim is to unravel the multifaceted layers that constitute the phenomenon under investigation. Whether it pertains to organisational dynamics, societal issues, or individual experiences, a case study design offers the requisite depth to capture the richness and intricacy of the subject matter (Yin, 2011; Creswell, 2012). Moreover, the flexibility inherent in case study designs aligns seamlessly with the exploratory nature of qualitative research. Case studies afford researchers the freedom to adapt their methodologies in response to emerging insights and evolving research questions. This helped to endow the researcher's richer understanding of the phenomenon understudy as indicated by Creswell (2012).

Furthermore, an interpretive case study is especially appropriate when the study seeks to explain the participants' own meanings and interpretations of the phenomenon. Using an interpretive lens means the researcher accepts that what people know and believe is shaped by their context, and that this context strongly influences their views and experiences. Through in-depth interviews and observations, the researcher seeks to uncover the underlying meanings, values, and cultural nuances embedded within the case (Yin, 2011). Additionally, using the Case Study approach advances the field of study and the knowledge base of a particular area under study. The data collected and the subsequent analysis using

the case study give a rich interpretation of the data. A deeper understanding of meaning is gained through the Case Study approach that can improve practice, influence and inform policy, and have an impact on future research (Merriam, 2009). Another reason the researcher adopted a qualitative case study was that case studies are appropriate when trying to eliminate erroneous conclusions, so that one is left with the most compelling interpretation of the data (Golightly, 2006). In brief, the Case Study method allows investigators to retain the holistic and meaningful characteristics of real-life events (Yin, 2009). Yin further posits that for subjectivity in the implementation, presentation, and evaluation of research, then Case Study is the appropriate method to use. The approach relies on personal interpretation of data and inferences (Yin, 2011).

3.4 Population

The study's population comprises all Visual Art teachers from the five public Senior High Schools in the municipality. This includes Mfantsiman Girls Senior High School, Saltpond Methodist Senior High School and Mankessim Senior High School, which fall within the Mfantseman Municipality, whilst Kwegyire Aggrey Senior High School and Abeadze State College fall into the Peri-Urban and Rural setting respectively. The population of Visual Art teachers consisted of 27 teachers, representing the total teaching staff teaching Visual Art subjects across these five educational institutions in the Mfantseman Municipality.

3.4.1 Target Population

The target population for this study comprises a total of 27 Visual Art teachers from each of the five public Senior High Schools in the Mfantseman Municipality.

The distribution of teachers is as follows: Abeadze State College has five (5) teachers, Mankessim SHS has five (5) teachers, Mfantsiman Girls SHS has six (6) teachers, Saltpond Methodist SHS has five (5) teachers, and Kwegyire Aggrey SHS has six (6) teachers.

3.4.2 Accessible Population:

The accessible population represents the subset of the target population that is realistically available and willing to participate in the study (Asiamah, Mensah, & Oteng-Abayie, 2017; Lohr, 2019). In this study, the accessible population was 20 participants. All the accessible population were still teaching Visual Art education in the five public Senior High Schools within the Mfantseman Municipality.

3.5 Sampling Technique and Sample Size Selection

According to Lyimo (2013), sampling is a process of selecting several individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group. This study employed a purposive sampling and a convenience sampling technique sequentially to select the appropriate units that formed the sample. Convenience and purposive samples are described as examples of non-probability sampling (Fox, 2010). The researcher employed purposive sampling and convenience sampling; this is because purposive sampling and convenience sampling are adequate and convenient for this study. Madalane, Chauke and Motlhaka (2022) describe purposive sampling as a method of sampling where the researcher deliberately chooses who to include in the study based on their ability to provide necessary data. Purposive sampling

was employed first to ensure the selection of participants aligned with the research objectives. Purposive sampling was used to identify and select Visual Art teachers who met the inclusion criteria of academic qualification, professional qualification, subject expertise and teaching experience. From each of the five public Senior High Schools within the Mfantseman Municipality, the Visual Art teachers who met the established criteria were recruited. Purposive sampling, as pointed out by McMillan & Schumacher (2001), is a sample chosen based on some characteristics possessed by the subjects and deemed important for the research based on the judgment of the researcher. Subsequently, a convenient sampling technique was employed to select the participants based on their availability, accessibility and willingness to participate in the study.

A convenience sample is a non-probability sampling technique where the researcher selects subjects based on their accessibility and proximity to the researcher. This method relies on data collection from population members who are conveniently available to participate in the study. Convenience sampling is a relatively fast and easy way to achieve the sample size needed for the study. Convenience samples are the most common form of qualitative sampling and occur when people are invited to participate in the study because they are conveniently (opportunistically) available with regard to access, location, time and willingness (Lopez & Whitehead, 2013). The Mfantseman Municipal Assembly, as the setting, was classified into three based on the level of development. A senior high school fell into either a Municipal, Peri-Urban or Rural setting. Mfantsiman Girls Senior High School, Saltpond Methodist Senior High School and Mankessim Senior High Technical School fall within a Municipal whiles Kwegyire Aggrey Senior High

Technical School and Abeadze State College fall into Peri-Urban and Rural setting respectively. The schools were selected in each setting to ensure representativeness.

However, after the application of the purposive sampling and convenient sampling techniques to select 20 participants for the study, Table 3.1 below has been duly provided to show the summary of the population size and sample size, ensuring a consistent sample size of four (4) participants per school stratum.

Table 3.1: *The population and sample size of the respective school (stratum)*

School Stratum	Population	Sample Size
Abeadze State College	5	4
Mankessim SHS	5	4
Mfantsiman Girls SHS	6	4
Saltpond Methodist SHS	5	4
Kwegyire Aggrey SHS	6	4
Total	**27**	**20**

This meticulous sequential application of purposive sampling and convenient sampling techniques ensured that each school contributed proportionally to the overall sample size, resulting in a representative and balanced selection of teachers from the entire target population of 27.

3.6 Research Instruments

This section delineates the comprehensive qualitative research methodology employed, integrating two key instruments: semi-structured interviews and non-participant observation. The synergistic use of these instruments provides a rich

and multifaceted exploration of the research questions, contributing to a nuanced understanding of the study's subject matter.

3.6.1 Interview

In this study, primary data were collected by employing the semi-structured interview method. According to Pathak and Intrata (2012), in a semi-structured interview, the researcher asks a series of open-ended questions, with accompanying queries that probe for more detailed and contextual data. Respondents' answers provide rich, in-depth information that helps the researcher to understand the unique as well as shared circumstances in which they live, and meanings attributed to their experiences (Pathak et al., 2012). Hove and Anda (2005) indicated that such interviews combine particular questions (to get forth the foreknown information), and open-ended questions (to provoke unanticipated types of information). Additionally, the semi-structured format allows and encourages the investigator to interject with additional questions as needed. The semi-structured interview guide was based on the research objectives and the literature review. The interview guide consisted of open-ended questions that aimed to explore the following aspects:

- The interplay of technological pedagogical content knowledge of Visual Art teachers, which refers to their ability to use ICT effectively and appropriately to enhance the teaching and learning of Visual Art skills.
- The extent to which Visual Art teachers involve students in the use of ICT resources in the Visual Art classroom, such as digital cameras, smartphones, scanners, printers, projectors, computers, software, and online platforms.

- The challenges that militate against ICT integration in Visual Arts, such as lack of ICT infrastructure, equipment, and maintenance, inadequate ICT skills and knowledge, insufficient instructional time and support, curriculum and assessment constraints.

All the interviews were recorded on a digital voice recording device to increase the trustworthiness of the answers. All the interviews were recorded on a digital voice recording device and transcribed verbatim to increase the trustworthiness of the answers. All the interviewees' responses, however, were also meticulously recorded on paper as field notes. The researcher also used the recorded fielded notes to ensure immersion and data accuracy during the transcription process, which helped with clarity. One-on-one semi-structured interviews lasted for roughly 35 to 40 minutes each. The five Senior High Schools in Mfantseman Municipality each had five semi-structured interview sections. A total of (20) interviews were conducted, and the researcher felt it was sufficient.

3.6.3 Observation

Observation is a method of collecting data by watching and recording the behaviour and actions of the participants in their natural setting (Creswell & Plano Clark, 2018). According to Kawulich (2012), observation is an excellent tool for researchers to have to enable them to collect data. Observation is the process of gathering data by watching. It is one of the central building blocks of many qualitative research studies. Angrosino (2005) separates qualitative observation into three basic types, including nonparticipant observation. Nonparticipant observation was used in this study. Observation is traditionally recorded as field notes, written accounts created by the researcher either during or after a period of

observation in a notebook, but for this study, notebook and laptop and smartphones were used to gather data. Accordingly, for this study, the observation was conducted by the researcher during the regular Visual Art classes of the 20 teachers who participated in the study.

The observation focused on the following aspects:

- The types and rate of ICT tools used by the teachers and students in Visual Art teaching and learning activities. The interaction and communication patterns between the teachers and students, and among the students, in relation to ICT use in the Visual Art classroom.
- The interplay of technological pedagogical content knowledge (TPACK) of Visual Art teachers, which refers to their ability to use ICT effectively and appropriately to enhance the teaching and learning of Visual Art skills.
- The extent to which Visual Art teachers engage students in the use of ICT resources in the Visual Art classroom, such as digital cameras, scanners, printers, projectors, computers, software (CorelDraw and Photoshop), and online platforms.
- The challenges that militate against ICT integration in Visual Arts, such as lack of ICT infrastructure, inadequate ICT skills and knowledge, insufficient time and support, curriculum and assessment constraints.

The observation was guided by a checklist that was developed based on the research objectives and the literature review. The observation was recorded using field notes and photographs, with the consent of the teachers and students. The observation lasted for fifteen weeks within one academic year, with each teacher being observed unobtrusively for three sessions.

3.7 Pre-testing

Before conducting the actual research, researchers must practise the tools for data collection that they will use in carrying out their studies. This helps them to become familiar with these tools and to use them effectively as researchers (Swanson & Chermack, 2013). The researcher conducted a pretest of the research instruments to establish their trustworthiness by applying them to five (5) identified Visual Art teachers from five (5) different Senior High Schools within the Cape Coast Metropolitan Assembly. The pretest subjects were briefed on their role, and then the researcher administered the data collection instruments to them and closely monitored and recorded their responses. After completion, the researcher used the data to estimate the accuracy of the instruments and to ensure that they were clear, precise, and comprehensive enough. For the sake of triangulation, besides the observation checklist, a semi-structured interview was developed for this qualitative study. Specific probing interview questions based on the research questions were designed. Besides, an interview is one of the most common ways to understand experience, meaning and human beings (Smith & Sparkes, 2016; Lincoln & Guba, 1985).

Semi-structured interviews were conducted to collect qualitative data. The interview questions mainly sought to discuss:

a) the interplay of TPACK of Visual Art teachers,

b) the extent to which teachers engage students in the use of ICT resources and

c) the challenges that militate against ICT integration in Visual Art education.

Probing questions were used to expand on themes developed during the interviews. Participants were also allowed to elaborate on any of the questions further. The interviews were supplemented by the non-participant observations. However, any

ambiguities in the data collection instruments were clarified to ensure that the correct data was gathered. The researcher then corrected all the data collection instruments by removing the identified ambiguities. The pretest was very crucial because it helped the researcher to check the data analysis procedure and to restructure the research items. It also enabled the researcher to identify and correct some research items that were wrongly formulated and could have produced some unintended results.

3.8 Trustworthiness

The trustworthiness of this study refers to the degree of confidence in the data, interpretation, and methods used to ensure the quality of the study (Connelly, 2016). The trustworthiness of this study is enhanced by the following strategies:

- Triangulation: Data triangulation, specifically method triangulation, was employed by comparing teachers' interview responses with classroom observations and relevant documents such as syllabus, lesson notes, and ICT policies to address different aspects of the research problem and to validate and corroborate the findings and ensure credibility of the themes (Johnson & Onwuegbuzie, 2004).
- Member checking: The study involved the participants in verifying the accuracy and completeness of the data collected from them, as well as the interpretation and representation of their views and experiences (Creswell & Clark, 2018). The participants were allowed to review and comment on the transcripts of the interviews and the observation notes, and to provide feedback and clarification if needed.

- Peer debriefing: The researcher consulted with the supervisors and other experts in the field to obtain their feedback and suggestions on the research design, data collection, data analysis, and results presentation (Schwandt, Lincoln & Guba, 2007). The peer debriefing helped the researcher to check for flaws and problems in the study, as well as to enhance the trustworthiness of the findings.
- Reflexivity: The study acknowledged and addressed the potential biases and assumptions of the researcher that may influence the data collection and analysis process, as well as the interpretation and presentation of the findings (Creswell & Clark, 2018; Weerasinghe, Hanson & Hutter, 2015). The researcher maintained a reflexive journal throughout the study, where he recorded his reflections, thoughts, feelings, and decisions regarding the research process and the participants.

3.9 Procedures for Data Collection

Creswell (2012) stresses the importance of respecting the site where the research takes place. Before collecting the data, the researcher visited the respondent's environment formally to familiarise himself with the setting and obtain consent from the participants. According to Creswell (2012), this respect is shown by gaining permission before entering the site. Therefore, the researcher obtained a letter of introduction from the Department of Music Education of the University of Education, Winneba, to seek permission and cooperation from the respondents in the study area. The researcher also contacted the school authorities and teachers involved in the study and informed them about the purpose and scope of the study. The researcher assured them of the confidentiality and anonymity of the information gathered

and their rights and responsibilities as research subjects. Therefore, the researcher used pseudonyms for each of the participants to ensure confidentiality. Pseudonyms such as R1, R2, R3, R4 were assigned to teachers in Saltpond Methodist SHS, P1, P2, P3, P4 were assigned to teachers in Mankessim SHS, T1, T2, T3, T4 were assigned to teachers in Abeadze State College, V1, V2, V3, V4 were assigned to teachers in Mfantsiman Girls SHS and F1, F2, F3, F4 were assigned to teachers in Kwagyir Aggrey SHS.

For the data collection, the researcher scheduled a specific date and time for the interview and classroom observation with the respondents. The researcher designed an observational checklist and an interview guide to guide both the observation and interview processes. The researcher made sure that the observation checklist and interview guide reflected the research objectives and questions. The researcher then divided the interview guide into sections covering the critical areas of the research questions. The interview guide allowed the researcher to interact directly with the respondents and obtain relevant answers to the questions. This helped to answer the research questions effectively. Rapley (2000) argues that the face-to-face interview allows for a deeper understanding of the participants' perspectives, expressions, and experiences. To ensure that, the researcher did not violate any ethical issues. The researcher explained the purpose and overview of the interview and the research to the participants before each interview. The researcher also asked for their permission to record the interview and to take notes. Again, the researcher constantly emphasised the confidentiality and security of the recordings and the notes throughout the interviews and made them feel at ease talking to the researcher in confidence. The researcher also obtained data from the non-participant observation by watching and sitting in the respondents' classroom

lessons and taking notes of the major areas under the observational checklist. The data collection took 25 weeks in one academic year.

Appendices can be found at the end of this research document. Appendix A represents the researcher's invitation letter to the respondents. Appendix B represents the researcher's Interview Guide. Appendix C represents the researcher's Observation Checklist. Appendix D represents the researcher's Introductory Letter. Appendix E is the Invitation Letter of the Ghana Education Service to the ICT Workshop. Appendix F represents the Ghana Education Service ICT Workshop suspended Sine Die. Appendix G is the Invitation Letter of the Ghana Education Service to the ICT Workshop in the Greater Accra and five (5) Northern Regions. Appendix H represents the Ghana Education Service at the ICT Workshop Exclusively for ICT and French Teachers. Appendix I represents the researcher's Fieldwork photographs of Visual Art Teachers in Mfantseman Municipality, integrating ICT tools in the classroom. Appendix J represents the researcher's Fieldwork photographs of Visual Art Students in Mfantseman Municipality using their Teachers' Mobile Phones to access the Internet during Practical Exercise.

3.10 Data Analysis Procedures

The data analysis procedures for this study involved the following steps:

Data screening and cleaning: The data collected from the semi-structured interviews were checked for accuracy, completeness, and consistency. Any missing, invalid, or outlier values were identified and handled appropriately. The data were also coded and categorised for further analysis.

Descriptive statistics: The data were summarised using descriptive statistics, such as figures and numbers. These statistics were used to describe the demographic characteristics of the participants. The descriptive statistics were presented in a table, as well as a narrative in the results section.

Thematic analysis: The data collected from the semi-structured interviews were analysed using thematic analysis, which involves identifying, coding, and categorising the main themes and patterns that emerge from the data (Braun and Clarke 2006). The thematic analysis followed six steps: familiarising with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing the report. The themes were related to the teachers' experiences, perceptions, and opinions regarding ICT integration in Visual Art education, as well as the opportunities and challenges they faced in using ICT in their teaching and learning processes. The thematic analysis was supported by ATLAS.ti software, which facilitated the organisation, coding, and visualisation of the data.

3.11 Ethical Considerations

Yin (2011) states that studying a contemporary phenomenon in its real-life context requires the researcher to follow ethical practices of the highest standard. Therefore, the researcher adhered to the principles of confidentiality, anonymity, informed consent, and power relations. Confidentiality means protecting the privacy and trust of participants so that they can share their experiences with the researcher freely, while taking steps to report any harm, abuse, or fraud that the researcher becomes aware of. Kirk (2007) suggests that it is good practice to inform participants about the limits of confidentiality and the situations that may

trigger them, to respect and safeguard their responses. Accordingly, the researcher ensured that the participants' responses were used only for this study. Anonymity means not disclosing the real names of research participants and research sites in reports to protect their identity and prevent any potential harm. The researcher carefully designed the research instrument to avoid invading the privacy of the participants or criticising the teaching methods they used. Therefore, the researcher did not include any field for the names of respondents in the interview questions. Regarding informed consent, the researcher obtained a letter of introduction from the Department of Music at the University of Education, Winneba and sent it to the selected schools to contact all the relevant authorities for the commencement of the study. The researcher also obtained permission from the head teachers of the schools that were involved before the research started. The researcher explained the objectives and scope of the study to the participants clearly and assured them that the information they provided would be used for academic purposes only.

3.12 Chapter Summary

Chapter Three outlined the research methodology employed to explore ICT integration in Senior High School Visual Art education in the Mfantsiman Municipality. Guided by interpretivist and social constructivist paradigms, the study adopted a qualitative approach using an interpretive case study design to capture teachers' experiences within their socio-cultural contexts. Twenty Visual Art teachers from five public schools were purposively and conveniently selected to ensure diverse representation. Data were collected through semi-structured interviews and non-participant classroom observations, with rigour maintained through triangulation, member checking, peer debriefing, and reflexivity.

Thematic analysis, supported by ATLAS.ti, informed data interpretation, while ethical considerations, including informed consent and confidentiality, were strictly observed. Overall, the chapter established a robust and transparent methodological framework for the presentation and discussion of findings in the subsequent chapter.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.1 Overview

The purpose of the study was to explore ICT integration in Senior High School Visual Art education in the Mfantseman Municipality in the Central Region of Ghana. This chapter focuses on the analysis of empirical data obtained from the research field and the discussion of the findings of this research. The study investigates the interplay of technological pedagogical content knowledge of Visual Art teachers in Mfantseman Municipality, captures the extent to which Visual Art teachers in Mfantseman Municipality engage their students in the use of ICT resources and highlights the challenges, that militate against Visual Art teachers in Mfantseman Municipality in integrating ICTs into Visual Art classroom environment in the five public Senior High Schools within Mfantseman Municipality in the Central Region of Ghana.

However, upon successful completion of data collection, it was screened and edited to make sure that invalid or extraneous factors are eliminated in order to fine-tune respondents' pattern of responses and completion. The findings were presented in four main sections. The first section focuses on the demographic data of the participants in terms of their sex, age, highest level of professional qualification, position, and teaching experience. The second section concentrates on the analysis of the interview data from the major themes that emerged from the research questions. The third section focuses on the summary tables of the analysis of the interview data from the major themes that emerged from the research questions. The fourth section deals with the observational report and the summary of findings.

SECTION ONE

4.2 Socio-Demographic Data of Participants

A summary of the personal characteristics of respondents is shown below by representation of the total number of respondents in different categories. The bio-data covers the following: sex, age, highest level of professional qualification, position, and teaching experience**.**

Table 4.1: Socio-Demographic Characteristics of Respondents

Variable	**Variable Category**	**Total Number**
Respondent's position	Teachers head of department	15
Grand total		20
Gender	Male	14
	Female	6
Grand total		**20**
Age (in years)	Under 20	0
	20 – 29	6
	30 – 39	8
	40 – 49	5
	50 – 59	1
Grand total		**20**
Highest educational qualification of teachers and heads of department	Bachelor degree	14
	Pdge	2
	Master's degree	4
Grand total		20
Number of years teaching experinces of teachers and heads of department	≤ 5	4
	6 – 10	7
	11 – 15	5
	16 – 20	3
	21 and more	1
Grand total		**20**

Source: reacher's fieldwork Data (2021)

Table 4.1, with regard to respondents' position, shows that out of the 20 respondents, 15 are Teachers and the remaining 5 are Heads of Department. This

indicates that there were more Teachers than Heads of Department in the study. Again, Table 4.1 shows that 14 of the respondents were males and 6 were females. The results demonstrate that the study skewed towards males because there were more male respondents than female respondents selected for the study.

Table 4.1 shows that six (6) of the respondents were within the age range of 20-29. Eight (8) were between the ages of 30-39, Five (5) were between the ages of 40-49, whilst One age fell between 50-59 years. It can be deduced from the results that the majority of the teachers in Mfantseman Municipality are relatively young and, as such, full of energy to participate in the research. Since all the teachers that were used in this study are involved in providing teaching and guidance services, it was important that the number of years they had served or practised was also known, since this could inform how teachers have been teaching as well as how experienced they were with teaching.

Table 4.1 shows that 4 teachers had spent 1-5 years teaching and providing guidance to students, whilst 7 had spent 6-10 years teaching. Again, 5 teachers have spent between 11-15 years in the teaching field, and teachers who have spent between 16-20 years of teaching were documented as 3. Teachers who have spent 21 years or more were documented as 1. The result expresses that the teachers are in a good position to provide responses that reflect their expertise.

Teachers and Heads of Department were also gauged on their academic qualifications that impacted their professional orientations. The results were presented in Table 4.1. The Table shows that 14 teachers are Degree holders, 2 of them had PGDE certificate, whereas 4 are Master's Degree holders. The results clearly indicate that the majority of respondents had qualifications ranging from a

Bachelor's Degree to a Master's Degree, indicating that the respondents are highly educated and thus in a position to provide professional guidance to their students to maximise their potential. It can also be deduced from the results that the majority had degrees, which is in the right direction for teachers in the educational area. Professional upgrading has become very flexible in the Ghanaian educational setting, where, through various means, teachers' top-up their qualifications. Therefore, researchers such as Darling-Hammond & Young (2002) found that the teachers' credential was a factor in determining students' achievements. They found that the higher the level of education one has, the more knowledge they are perceived to have.

SECTION TWO

4.3 Analysis of the Interview Data

One-on-one semi-structured interviews lasted for roughly 35 to 40 minutes each. The five Senior High Schools in Mfantseman Municipality each had five semi-structured interview sections. A total of (20) interviews were conducted and recorded on a digital voice recording device, and the researcher felt it was sufficient. Data saturation was achieved when there were no new themes or information emerging after several interviews. A semi-structured interview guide was used to collect information from the participants concerning the themes under each of the research questions.

Research Question One: What is the interplay of Technological Pedagogical Content Knowledge of Visual Art Teachers in Mfantseman Municipality?

The primary intent of this research question was to underscore the pivotal role of Content Knowledge (CK) and Technological Knowledge (TK) and their influence

on effective pedagogical practices within the Senior High School education system in Ghana, with a specific focus on Visual Art teachers in Mfantseman Municipality.

According to the interview data, the following themes emerged: (1) Limited Content Knowledge, (2) Ineffective Content Knowledge and Rote Learning in the 21st Century, (3) Deep Content Knowledge but Limited Pedagogical Content Knowledge, (4) Limited Content Knowledge and Low-Level Student Competencies and (5) Pedagogical Approaches and Limited Technology Integration.

1. Limited Content Knowledge

Respondent R1 emphasises the pivotal role of Content Knowledge (CK) in effective teaching, stating, "when a teacher is aware of the underlying principles governing a theoretical concept, he/she devises ways to impart it to learners to prepare them for future life" (R1). This underscores the necessity for teachers to possess a depth of knowledge and understanding of their subject matter, which forms the basis for effective pedagogy. The respondent further questions the effectiveness of teaching without CK, stating, "What kind of pedagogy is the person building on?" (R1). This perspective advocates for a strong foundation of subject knowledge to underpin effective teaching. This finding aligns with existing research that has consistently demonstrated the link between teachers' CK and their ability to facilitate meaningful learning experiences for students (Agathangelou & Charalambous, 2020).

The respondents asserted that “no one can undermine the fact that teachers' Content Knowledge (CK) plays a major role in enabling them to transfer what they have learnt to educate their students” (V3 & V4). Both respondents V3’s & V4’s emphasis on Content Knowledge (CK), inspiring successful pedagogical approaches, reinforces the importance of teachers’ subject expertise as the cornerstone of effective teaching (Iserbyt, Ward, & Li, 2017). Their assertion that the development of pedagogical content knowledge (PCK) relies on the development of CK highlights the interdependence of these forms of knowledge. This finding underscores the need for teacher education programmes to prioritise the development of strong subject knowledge in conjunction with pedagogical skills.

2. Ineffective Content Knowledge and Rote Learning in the 21st Century

Furthermore, the respondents challenge the conventional focus on academic outcomes as the primary aim of education, especially within the Ghanaian curriculum. They argue that teaching should extend beyond enabling students to attain high marks and prestigious university placements. Instead, they proposed that teaching should “have an impact on the learners’ life” (R1), equipping students with the knowledge and skills to navigate future life situations. The respondent concludes by asserting that “teachers with profound CK can achieve this broader educational aim, thereby earning the title of 'professionals.' Such teachers do not solely focus on learners’ academic outcomes but also educate them on how to deal with life challenges using rich content knowledge in tandem with the right technology and pedagogy” (R1). This perspective advocates for education that goes beyond rote memorisation and high-stakes examinations to prepare students

for the challenges and opportunities of life beyond the classroom. It aligns with the broader global movement in education that emphasises the development of 21st-century skills, such as critical thinking, problem-solving, and adaptability (OECD, 2018; Chalkiadaki, 2018).

3. Deep Content Knowledge but Limited Pedagogical Content Knowledge

Respondent R2 highlights the integral role of Content Knowledge (CK) in teaching, asserting, "it is the Content Knowledge (CK) that drives the teacher to build upon effective pedagogical ways to deliver the theoretical concepts to students using the right technology" (R2). It underscores that teachers must possess a depth of knowledge and understanding of their subject matter to engage in meaningful pedagogy. The respondent further questions the effectiveness of teaching without CK, stating, "What concept is the person going to deliver?" (R2). Moreover, the respondent posits that CK serves as a prerequisite for developing Pedagogical Content Knowledge (PCK), where "CK informs students about the principles underlying concepts, and PCK enhances theoretical meaning among students" (R2). The symbiotic relationship between CK and PCK highlighted in this data emphasises that the former informs students about the principles underlying theoretical concepts, while the latter enhances theoretical understanding among students. This interdependence underscores the importance of professional development and pre-service training programmes that focus on building both CK and PCK (Gess-Newsome, 2015). This finding highlights the significance of not only subject-specific knowledge but also expertise in pedagogy as a foundation for effective teaching.

4. Limited Content Knowledge and Low-Level Student Competencies

Respondent R3's emphasis on the direct influence of teachers' CK on students' academic learning outcomes reinforces the well-documented relationship between teacher subject knowledge and student achievement (Evens, Elen, & Depaepe, 2015), stating unequivocally that, "no one can undermine the fact that teachers' Content Knowledge (CK) does not have a direct bearing on students' academic learning outcomes, which plays a major role in enabling them to transfer what they have learned" (R3). This perspective underscores that teachers with a depth of knowledge and understanding of their subject matter are better equipped to facilitate meaningful learning experiences and enhance students' ability to apply their knowledge in various contexts. On a broader scale, Respondent R4 expands on the implications of CK in education, arguing that "teachers' Content Knowledge (CK) is very crucial in all spheres of education across the globe since it goes beyond academic outcomes but makes students active discussants and respondents within their various communities" (R4). Furthermore, Respondent R4 asserts that a teacher with depth of CK is considered a professional in the field, as they can "inculcate knowledge into students to build upon their life experiences and to increase their academic outcomes" (R4). This perspective aligns with the socio-constructivist view that learning extends beyond the acquisition of knowledge to the active participation of students in the co-construction of meaning (Kaya, Kaya, Aydemir & Ebenezer, 2021). It underscores that education should empower students to engage in discussions, contribute to their communities, and become active agents of change. This finding is in line with the goals of education that aim not only to prepare students for future academic success but also to equip

them with the skills, competencies and knowledge needed for civic engagement and active citizenship (Charalambous, Hill, Chin & McGinn, 2020).

5. Pedagogical Approaches and Limited Technology Integration

Another pivotal facet of the findings revolves around the integration of technology into pedagogical practices. In the interview, respondents described their instructional methods for teaching Visual Arts. They emphasised the utilisation of student-centred approaches, the lecture method, practical activities, and a judicious blend of theoretical concepts and practical demonstrations. Furthermore, they commented that they occasionally employ ICT tools such as laptops and mobile phones to augment students' understanding and stimulate their creativity. For instance, a respondent commented that "I occasionally use my laptop to provide sample videos and pictures of the practical work to students to give them a good theoretical concept of the nature of the practical work before allowing them to execute it" (P1). The respondents, however, noted that these few ICT tools have allowed them to occasionally provide students with sample digital videos and images to enhance the overall learning experience of the students. Again, another respondent expressed, "I use the lecture method to teach the theory lessons and the demonstration method for the practical lessons. So, it is a combination of the two. I expose my students to things they are unaware of. I issue a challenge to them and tell them they can do whatever they want to address the problem" (P3). For respondent (P3), he mainly uses the demonstration method for the practical lessons by occasionally displaying digital images and videos on the smartphone and laptop. I do not discourage students; instead, I provide them with the necessary

guidance and space to work through motivation to improve the approach they are employing" (P3).

The statements elucidate that the degree of ICT integration into pedagogy among teachers is very low due to a lack of the needed ICT tools. The fact that the majority of the respondents mentioned the occasional usage of technology indicates that the degree of ICT integration among them is very low. This corroborates the study of Yidana (2007), which revealed that teachers were in the low-level category of technology users. Similarly, the finding corroborates what is observed in the Ministry of Education-sponsored study on 'e-readiness of second cycle institutions in Ghana' (MOE, 2009). According to the e-readiness study report, the integration of ICTs for instructional purposes in Ghanaian schools is generally low, and only a few schools have ICT tools and equipment that can be used to support this (MOE, 2009). Also, according to the report, the low use of ICT tools is seen as a direct link to limited access to ICT facilities.

In contrast, Respondent R1 rather highlighted two main challenges stemming from age-related limitations and the absence of ICT laboratories within the school environment. In describing the absence of an ICT lab to extrinsically and intrinsically motivate teachers to engage students in the use of computers to design during lesson delivery, the respondent was quick to admit with no equivocation that "being in my fifties**,** I must admit that I still struggle with some computer programmes, especially CorelDraw and Photoshop" (R1). This underscores the dire need for regular ICT integration workshops for teachers and accessible and up-to-date ICT facilities to bolster effective teaching practices. Respondents R2 and R3 were the most vocal in expressing an enthusiastic embrace of technology,

harnessing PowerPoint presentations, applications for feedback, and continuous assessment software to enrich the educational experience. The respondents highlighted that they "have been using computers in our lesson delivery for a few years now. For example, PowerPoint presentations and demonstrations, applications for gathering student feedback, or continuous assessment application software like MS Excel allow teachers to grade and rank students as well as analyse students' results. Such things are possible thanks to technology (R2 & R3). For respondent R4, integrating ICT tools in pedagogy helps in nurturing critical literacy and improving learning outcomes; "adopting ICT tools in the classroom helps us determine the success of our teaching and whether we should modify our teaching methods or classroom management practices. So, I occasionally use it to improve pedagogy because I am a big fan of technology" (R4).

On the other hand, the respondents pointed out that even though they occasionally use ICT tools such as laptops, tablets and mobile phones to increase student participation, they primarily employ the lecture method for theory lessons and the demonstration method for the traditional studio-based practical activities. They lamented about the challenges they face in their quest to integrate ICTs into their pedagogy. They highlighted challenges such as "inadequate computers, instructional time limitations and related major proximity barriers in accessing the ICT laboratory" (F1, F2, F3, F4, V1, V2, V3, & V4). The respondents expressed that the ICT labs in their schools are quite far away from the Visual Art classrooms, and they expressed that even after booking for the place ahead of time, "the students have to walk for about eight to ten minutes to the ICT lab and spend additional three to five minutes to settle down in the lab before teaching and

learning can commence" (F1, F2, F3, F4, V1, V2, V3, & V4). For the respondents, "this situation seriously wastes significant instructional time, and this obviously makes some of us reluctant to use the ICT lab" (F1 & F3). The respondents lamented that "it is high time the government of Ghana formulated a policy guideline that will establish a decentralised departmental ICT laboratory system in every department within the Senior High Schools to make ICTs available and accessible to all students" (F2 & F4), views reinforced by respondents V1, V2, V3 and V4.

The respondents identified ICT as playing a pivotal role in engaging students. Respondent T1 explained that ICT enables Visual Art teachers to increase student participation and also to arouse students' interest in class, views reinforced by respondents T2 and T3. The respondent T1 pointed out that he occasionally employs a variety of technologies, such as PowerPoint, laptop, mobile phone and tablet, to increase students' participation and also to arouse students' interest in class. He described, "I try to integrate ICTs into the lessons to add variation to my teaching. I occasionally incorporate an interesting video documentary into the lesson and allow students to watch video presentations on my laptop and tablet, which truly helps them to understand the topics" (T1). The respondents highlighted that the usage of a projector in the classroom improves student participation, understanding, collaborative and communication skills. They expressed, "although our schools do not currently have a projector, we sometimes try to improvise the use of a projector by borrowing projectors and use it in our lesson when the situation calls for it (R3 and T4).

The interview statement that using a projector in class facilitates the teaching and learning process aligns with Corbeil (2007) that learners prefer projected PowerPoint for their vividness, liveliness, clearness and interactivity. It assists the students to comprehend better as they can watch the visual with examples. Similarly, previous research done by Craig and Amernic (2006) indicated that the use of a multimedia projector makes learning more long-lasting than the use of traditional textbooks. However, respondent T4 commented on the constraint of instructional time limitations and the absence of an ICT laboratory within the school environment, forcing teachers to primarily focus on traditional studio-based activities. "The problem is that the Visual Art programme is practical-based, and the instructional time is not enough for me to integrate ICT into my lessons the way I desire. Furthermore, there is no ICT laboratory in this school, and this has even exacerbated the situation. So, I focus more on the studio-based practical activity to sharpen the creativity of the students towards their final year WASSCE practicals" (T4). Respondent T4, however, recommended that "there should be a decentralised departmental ICT laboratory to make ICTs available and accessible to all students" (T4), a profound view shared by all the Visual Art teachers within the Mfantseman Municipality.

The data regarding pedagogical approaches and ICT integration suggest a dynamic educational landscape. Respondents P1, P2, P3, and P4 highlighted diverse strategies, including student-centred approaches, group-based learning, and practical demonstrations, underlining the importance of promoting creativity and experimentation in teaching. This aligns with the literature on student-centred learning approaches that emphasise the active involvement of students in the

learning process (Bonwell & Eison, 1991; Xhomara, 2022). Respondents T1, T2, T3, and T4 presented varying perspectives on the integration of ICT tools in teaching. While respondents T1 and T3 embraced technologies, using ICT tools to enhance their lessons, respondent T4 expressed a more reserved approach due to constraints related to resources and the practical nature of Visual Arts education. This variety in experiences underscores the need for flexible, context-specific approaches to ICT integration (Ertmer, 2005).

The statements elucidate that some teachers rely on technology in their classrooms, and some do not use it at all. This finding is in line with several early research which investigated why teachers do not use computers in their classrooms. Not surprisingly, the research (Rosen & Weil, 1995; Winnans & Brown, 1992; Dupagne & Krendl, 1992; Hadley & Sheingold, 1993) discovered several inhibitors, such as lack of computer availability, lack of teaching experience with ICT and lack of time required to successfully integrate technology into the curriculum.

Research Question Two: To what extent do Visual Art teachers in Mfantseman Municipality engage their students in the use of ICT resources?

In the dynamic realm of education, the integration and engagement of students in Information and Communication Technology (ICT) have emerged as a transformative force, particularly in specialised fields such as Visual Arts. The convergence of technology and creative expression holds immense promise for enhancing students' learning outcomes, motivation, and engagement. However, in the Mfantseman Municipality, as in many educational jurisdictions, navigating the

challenges and opportunities presented by ICT in the Visual Art curriculum is a pressing concern. This discussion delves into empirical interview data from Visual Art teachers within the Mfantseman Municipality to illuminate the multifaceted aspects influencing the extent of ICT integration in Visual Art education. The qualitative insights garnered provide a nuanced understanding of prevailing conditions, challenges, and aspirations related to teachers involving their students in the use of ICT resources during lesson delivery. To foster a comprehensive discussion, six key themes emerged and they are: (1) Limited ICT Infrastructure, (2) School-level Policy Restricting Students' Use of ICT Tools (3) Limited Hands-On Student Engagement with ICT Tools, (4) Limitations in Technology Access, (5) Recognition of ICT Benefits, and (6) Call for Collaboration and Development. By examining these themes, this discussion aims to provide a holistic and contextualised picture of the current state and future directions of ICT integration in Visual Art education in the Mfantseman Municipality.

1. Limited ICT Infrastructure

The responses from Visual Art teachers underscore the pivotal role of infrastructure in ICT integration. Respondents highlighted challenges such as slow Wi-Fi and unreliable internet connectivity in existing ICT laboratories, hindering effective use of online resources. They expressed their frustration over not being able to access educational websites, videos, podcasts, and other digital media that could enrich their teaching and learning of Visual Art. Respondents emphasised, "even though there is an ICT laboratory in our schools, we do not give assignments to students using the internet because the Wi-Fi is slow and unreliable" (V3 & V4). The disproportionate student-to-computer ratio also poses a problem for ICT

integration. The teachers reported that the existing ICT laboratory could not accommodate all the students in their classes, resulting in long queues, limited instructional time, and unequal access. They suggested that having decentralised departmental ICT laboratories would be more convenient and efficient, as it would reduce overcrowding, increase accessibility, and promote collaboration among students and teachers. One of the teachers stressed the importance of an online virtual library but lamented its absence. He acknowledged the restriction on the students to use personal ICTs in the school by attributing it to the draconian, generally accepted verbalised GES rules and regulations prohibiting students from bringing their own digital tools to school. He stated, "I always teach with my laptop, but the school does not have an online virtual library to facilitate learning. The GES rules and regulations prohibit students from bringing their own mobile phones, tablets, and laptop computers to school. So, when the students are going on vacation, I provide them with the topics and online virtual library and YouTube links to access the virtual learning materials with their parents' smartphones to prepare them for the topics that will be treated in the subsequent semester" (T1). However, he acknowledged that this approach had its own challenges and risks, such as lack of parental supervision, data costs, device compatibility, and distraction from other apps and games. Improving network connectivity, increasing connected computers, and establishing virtual libraries are imperative to enhance the ICT learning environment. The teachers recommended that government should invest more in upgrading the Wi-Fi routers, installing more computers, creating an online virtual library platform, and providing technical support for ICT integration.

2. School-level Policy Restricting Students' Use of ICT Tools

The interviews reveal the influence of informal or unofficial policy restrictions on ICT integration in Visual Art education. A respondent highlighted the generally accepted verbalised Ghana Education Service (GES) rules and regulations prohibiting students from bringing their own personal devices to school. Although, there is no official GES policy document explicitly prohibiting students from bringing their own ICT devices, all the respondents consistently and unanimously stated unequivocally reported the existence of a verbally enforced institutional policy that restricts students from bringing their personal ICT devices to school. This unwritten policy is widely acknowledged and adhered to by school authorities. The respondent explained that the policy was intended to prevent distraction, misuse, or theft of devices among students, but it also had a negative impact on the ICT integration in Visual Art education. She said, "the GES rules and regulations prohibit students from bringing their own mobile phones, tablets, and laptop computers to school. This limits the access, availability, and diversity of ICT resources for students and teachers. We do not have the required ICT devices to access online resources, create digital artworks, or share our work with others" (V2).

2.1 Existence of Unwritten School Policy Prohibiting Students' ICT Devices

The interviews revealed that all respondents confirmed the presence of an informal or unofficial but strictly enforced school rules and regulations prohibiting students from bringing personal ICT devices such as smartphones, tablets, and laptops to school. Although the Ministry of Education, Ghana Education Service and school authorities could not provide any official document to support the ban, teachers explained that the policy is consistently

communicated during staff meetings, assemblies, and Parent Association (PA) meetings. As a result, the policy functions as a de facto policy that strongly influences students' digital engagement (Creswell, 2013; Miles & Huberman, 1994). The teachers unanimously repeated the same account, indicating that the practice is not isolated but rather a widespread culture across Senior High Schools in the Mfantseman Municipality.

2.2 Media Evidence Showing Strict Implementation of Phone Restrictions in Ghanaian Senior High Schools

To provide contextual validation, the researcher triangulated respondents' reports with local news reports documenting the enforcement of the policy in Ghanaian Senior Schools. The four different cases outlined below show clearly the seizure of student mobile phone and in some extreme cases, the destruction of student mobile phone in Ghanaian Senior Schools.

1. Agona Kwanyako SHS in the Central Region of Ghana – School authorities reported seized and destroyed over 70 mobile phones, reinforcing a strict ban on phone possession.

   Source: Ghana Business News

   Full Link:

   https://www.ghanabusinessnews.com/2017/02/13/school-authorities-destroy-70-mobile-phones/

2. Karaga SHS in the Northern Region of Ghana – Over 100 seized phones were burnt publicly as part of the enforcement of a mobile phone ban.

Source: ModernGhana

Full Link:

https://www.modernghana.com/news/810587/burning-of-students-phones-at-karaga-shs-condemned.html

3. Nkwanta SHS in the Oti Region of Ghana – Students engaged in violent protest after school authorities seized their mobile phones, showing the tension the policy can create.

   Source: ModernGhana

   Full Link:

   https://www.modernghana.com/news/1400376/nkwanta-shs-students-clash-with-school-authorities.html

4. Tumu Secondary Technical School in the Upper West Region of Ghana – Students demonstrated following the seizure of their phones by school authorities

   Source: Citi Newsroom

   Full Link:

   https://citinewsroom.com/2019/05/tumu-secondary-technical-students-demo-over-seizure-of-phones/

These news articles show clearly that mobile phones bans, whether explicitly written or unwritten are strictly enforced in Ghanaian Senior High Schools.

Nevertheless, the respondents consistently revealed that without student access to personal ICT devices such as such as smartphones, tablets, and laptops, it will be practically impossible to integrate CorelDraw, Photoshop, Mobile Photography, Video Art and Online Research in Visual Art lessons. The respondents advocated for a policy shift, suggesting that allowing students to bring their own devices would facilitate teaching and learning, especially in the context of the COVID-19 era. They acknowledged that there would be benefits and challenges of allowing students to bring their own devices to school, such as increasing student autonomy, motivation, and engagement, but also creating issues of equity, security, and compatibility. One of the respondents without mincing words hammered that in an era marked by the widespread use of social media where online museums and galleries can be created and accessed easily, "I believe that it is high time the GES removed the blanket ban on the use of mobile phones, tablets in school and allow students to bring their personal laptop computers to school" (V3).

Moreover, other respondents supported that social media and online museums and galleries can enhance the teaching and learning of Visual Art by providing exposure, inspiration, feedback, and collaboration opportunities for students and teachers" (T3, P2, & F4). They highlighted that, students can use Instagram or Pinterest to showcase and commercialise their artworks, follow other artists, and get comments and likes. They pointed point that students can also use Google Arts & Culture or Smithsonian Learning Lab to explore artworks from different cultures, periods, and styles, and learn from experts and curators. The teachers recommended that the GES should revise the policy to allow conditional or partial use of their personal devices, such as mobile phones, tablets, digital cameras and

laptops during specific classes, studio projects, or activities. The teachers proposed that GES should provide guidelines and training for responsible and ethical use of mobile phones, tablets, digital cameras and laptops by Visual Art students. They also suggested that GES should help the schools to establish partnerships with online museums and galleries for educational purposes and seek their support and resources for ICT integration in Visual Art education. These variations in ICT integration practices underscore the pressing necessity of addressing infrastructure disparities, organizing regular ICT integration workshops for teachers and ensuring equitable opportunities for educators to harness technology in their teaching methodologies.

Consistently, the teachers' call for a policy guideline to allow students to bring their own devices to school aligns with the evolving landscape of education that recognises the role of personal digital tools in enhancing the teaching and learning process. This revelation is in consonance with the findings of Jones, Chin and Aiken (2014) and Traxler (2016) in their study on Bring Your Own Device which found that Bring Your Own Device (BYOD) lessons have gained popularity across the world. Similarly, Cheng, Guan and Chau (2016) and Gillies (2016) study, Bring Your Own Device (BYOD) also holds several attractions for schools. It allows learners to access online learning resources which would be unavailable without significant infrastructural and capital investment by the institution. It allows learning which is more closely aligned with learners' interests, expectations and lifestyle in the rest of their society.

3. Limited Hands-On Student Engagement with ICT Tools

The difficulties in practical-oriented courses, particularly in the use of Graphic Design software like Photoshop and CorelDraw, were evident in the responses. Respondents T3 and T4 expressed the difficulty in teaching practical aspects without a dedicated ICT laboratory. They explained that they wanted to teach their students how to draw, edit, animate, or print digital artworks using the Graphic Design software, but they could not do so due to the lack of adequate computers, printers, scanners, and other related devices. They also said that they wanted to direct their students to online virtual libraries, where they could access a variety of digital resources, tools, and examples that could enhance their learning and creativity. However, they faced another challenge of the instructional time, which was very limited and inflexible. They said that the duration, regularity, and schedule of the classes did not allow them to use the ICT laboratory effectively, as they had to share it with other subjects and departments. One of the respondents commented that directing students to online virtual libraries will go a long way to improve the teaching-learning process, as well as exposing the students to the virtual world to sharpen their creative skills. The respondent bemoaned, "unfortunately, the instructional time is very limited and there is no virtual library in the school to embark on such a positive adventure to improve teaching and learning" (T4). The teachers recommended that the schools should allocate more time and space for ICT-based learning, provide more Graphic Design software and hardware, and adopt blended or flipped learning approaches, where students could learn the theoretical aspects online and practice the practical aspects in class and art studio.

4. Limitations in Technology Access

The respondents highlighted limitations in technology access, with some teachers resorting to using personal laptops, tablets and smartphones for instructional purposes. The teachers shared their concerns about the absence of a classroom television and projectors impacting the effective delivery of multimedia content. They explained that they wanted to use the television or projector to display videos, images, slides, or animations that could illustrate and demonstrate the theoretical concepts and skills of Visual Art. However, they could not do so due to the lack of a television and projector in their classrooms, and they had to rely on their own laptops and smartphones, which had small screens and low sound quality. One respondent emphasised, "hmmm, the school does not have an ICT laboratory, and to avoid confusion, I do not direct students to use any online virtual libraries" (T2). Respondent T2 further added, "We have ICT teachers, but they are just as confused as the rest of us when it comes to online virtual teaching. It is the employer's responsibility to offer resources for me to work effectively" (T2). The respondents expressed their dissatisfaction with the lack of technology access and the lack of support and guidance from the ICT teachers and the school administration. They said that they felt frustrated, demotivated, and unprepared for ICT integration in Visual Art education. The teachers recommended that the school should provide more technology devices, such as televisions, projectors, speakers, scanners, printers, laptops, tablets, etc., for the Visual Art classrooms, and train and empower the ICT teachers to assist and mentor the Visual Art teachers in using the online virtual libraries and other ICT resources.

Consistently, the respondents highlighted that the long-standing centralised ICT laboratory system in SHSs restricted equitable access to ICT tools, resulting in overcrowding in ICT lab and limited hands-on practice time for students. The respondents shared that "ICT labs are shared across subjects, limiting time for Visual Arts classes" (V1, V3, R2, R4, P1, & P4). The respondents consistently underscored that the overcrowding in a single-shared ICT laboratory affects supervision, student engagement, limits access and prevents teachers from fully implementing TPACK-based lessons.

5. Recognition of ICT Benefits

Despite the challenges, there is a unanimous recognition of the benefits associated with ICT integration in Visual Art education. One respondent emphasised the positive impact of digital technologies in making lessons interesting and meaningful, shaping their IT skills. The respondent stated, "looking at the nature of Visual Art disciplines, I usually use digital technologies such as a laptop, tablet and even a smartphone during teaching since it makes lessons very interesting and meaningful to students" (F3). The respondent explained that he occasionally uses digital technologies to create and present multimedia, interactive, or gamified content that could capture the attention, interest, and curiosity of the students. He also said that he uses digital technologies to provide feedback, assessment, and guidance to the students, and to personalise their learning according to their needs, preferences, and goals. He added that he uses digital technologies to shape the IT skills of the students, such as developing digital literacy, creativity, communication, or collaboration skills. He said that he occasionally demonstrates to the students how to use various software, tools, and platforms to create, edit,

share, and critique digital artworks, and how to communicate and collaborate with other students, teachers, and artists online.

Another respondent highlighted the advantages of using ICT, especially during the COVID-19 pandemic, in preventing the rapid spread of the virus. Respondent R1 revealed, “to me, technology integration is superior to the traditional teaching of Visual Art disciplines because it facilitates learning, improves students’ ability to retain information/knowledge and increases their motivation to learn independently” (R1). He explained that he intermittently uses ICT to facilitate learning by enabling access, flexibility, and diversity of learning resources for the students. He said that he uses ICT to improve students’ ability to retain information/knowledge by enhancing their memory, comprehension, and application of the theoretical concepts and skills of Visual Art. He also said that he occasionally employs ICT to increase their motivation to learn independently by fostering their curiosity, engagement, and autonomy in their learning process. He added that he uses ICT to prevent the rapid spread of the COVID-19 virus by allowing remote, online, or blended learning for the students, reducing physical contact and crowding in the classrooms, and ensuring health and safety protocols for the students and teachers. One of the respondents expressed “I believe that in this COVID-19 era, it will be wise for the framers of curriculum to integrate online virtual library to facilitate teaching and learning to bridge future learning gap deficit that will be created by another pandemic” (T3).

The finding is in line with the studies conducted by Gyampoh, Ayitey, Fosu-Ayarkwah, Ntow, Akossah, Gavor, and Vlachopoulos (2020) who asserted that teaching online during this COVID pandemic can be termed as a response to an

emergency remote situation. The researchers proposed that the curriculum framework in teacher education should be reviewed to include online teaching as one of the modes of teaching and learning. Hence, tutors should be given more training in online teaching.

6. Call for Collaboration and Development

The responses collectively call for collaboration and development to address the identified challenges. Respondents advocated for the establishment of decentralised departmental ICT laboratories, policy revisions allowing students to bring their personal devices to school, and the purchase of projectors to facilitate teaching and learning. Respondent T3 emphasised, "the Visual Art department should have its own ICT laboratory. A decentralised ICT laboratory will facilitate effective ICT integration in the teaching-learning process" (T3). He explained that having a dedicated ICT laboratory for the Visual Art department would improve the access, availability, and diversity of ICT resources for the teachers and students. He also said that it would reduce the overcrowding and waiting time that they faced when using the existing centralised ICT laboratory, which was shared with other subjects and departments. He added that it would promote collaboration and communication among the Visual Art teachers and students, as they could work together on projects, share ideas, and give feedback using the ICT resources. This view was shared by all the teachers. The teachers also suggested that the GES should revise the policy that prohibits students from bringing their own devices to school. They acknowledged that there were challenges and risks associated with allowing students to bring their own devices, such as creating issues of equity, security, and compatibility. However, they argued that these challenges could be

addressed or mitigated by providing guidelines, in-service training, and support for responsible and ethical use of ICT. They said that allowing students to bring their own devices would increase their autonomy, motivation, and engagement in ICT-based learning and enable them to access a variety of online resources, tools, and platforms.

Also, the respondents requested that the schools purchase projectors and television sets for the Visual Art Department, as they would enhance the delivery and presentation of multimedia content. They said that using television and projectors would help them to display videos, images, slides, or animations that could illustrate and demonstrate the theoretical concepts and skills of the Visual Arts. They also said that using television and projectors would help them to engage and motivate the students, and to facilitate feedback and assessment. The respondents expressed their belief in the potential of ICT in Visual Art education and called for collaborative efforts from educational institutions and policymakers to overcome the existing limitations. They recommended that the GES and policymakers should create a shared vision and goals for ICT integration in Visual Art education, provide professional development and mentoring opportunities for teachers, involve students and parents in the decision-making and evaluation process, and seek external partnerships and funding sources for ICT resources and support. These highlight the intricate relationship between infrastructure, policies, and effective ICT integration in Visual Art education in the Mfantseman Municipality. Addressing these challenges requires a comprehensive approach involving infrastructure development, policy revisions, and collaborative efforts among stakeholders. The infrastructure development should aim to improve the network

connectivity, increase the number of connected computers, install iBox systems with Visual Art-related contents, and establish iCampuseGH as well as virtual libraries for all the schools within the Mfantseman Municipality. The policy revisions should aim to allow students to bring their own devices to school and provide guidelines and training for responsible and ethical use of ICT. The collaborative efforts should aim to create a shared vision and goals for ICT integration in Visual Art education, provide professional development and mentoring for teachers, involve students and parents in the decision-making and evaluation process, and seek external partnerships and funding for ICT resources and support.

The recognition of ICT benefits further emphasises the urgency of overcoming barriers to provide enhanced learning experiences for Visual Art students. These learning experiences include exposure to a variety of digital resources, tools, and examples, inspiration from other artists and cultures, feedback and assessment from teachers and peers, and collaboration and communication with other students, teachers, and artists. This exploration contributes to the broader discourse on the intersection of technology and creativity in contemporary educational settings. Technology and creativity are essential aspects for Visual Art education, as they help students develop digital literacy, creativity, communication, and collaboration skills, and express their artistic vision and identity.

Research Question Three: What are the challenges that militate against Visual Art teachers in Mfantseman Municipality in integrating ICTs into Visual Art lessons?

The key intent of this research question was to identify the challenges that militate against ICT integration in the Senior High School education system in Ghana, with a specific focus on Visual Art teachers within the Mfantseman Municipality. The following themes emerged from the interview data; (1) ICT Integration into Pedagogy challenges, (2) limited Access to Centralised ICT lab, (3) Limited Electricity supply, (4) Insufficient Funds, (5) Limited ICT Equipment and (6) Limited Proficiency in Specific Software, (7) Absence of Tailored ICT Workshops for Visual Art Teachers and (8) Visual Arts and ICT Integration as a 21st-Century Educational Necessity.

1. ICT Integration into Pedagogy Challenges

Another pivotal facet of the findings revolves around the integration of Information and Communication Technology (ICT) into pedagogical practices. The interview responses from Respondents highlight a significant challenge in the integration of ICT in Visual Arts education. The respondents noted, "even though there is an ICT laboratory in our schools, we do not give assignments to students to do using the internet because the Wi-Fi internet is slow and unreliable due to poor network connectivity" (V3 & V4). Such limitations demonstrate that despite the recognition of the potential benefits of ICT integration, the practical implementation remains challenging due to infrastructure issues. This lack of access not only impedes the expansion of students' horizons but also restricts the creative skills in the field of Visual Arts. Respondents, however, expressed the need for a more flexible

approach in the use of personal digital devices. One of the respondents argued that, "it is the employer's responsibility to offer resources for me to work effectively. I have a smartphone and a laptop to assist, so the school or GES must provide ICT tools such as projectors, television sets, and a virtual library platform to facilitate teaching and learning in this era of COVID-19 pandemic lockdowns" (T1). Several respondents, including T3, T4, P1, and F3, unanimously highlighted the significance of ICT integration, particularly in the context of the global COVID-19 pandemic. For instance, P1 emphasised, "the use of ICT in teaching and learning in the heat of the COVID-19 pandemic is one of the potential ways that can ensure that the virus does not spread very fast" (P1). These perspectives underline the changing dynamics of education, where technology plays a vital role in ensuring continuity during crises.

However, the interviews also revealed that a lack of ICT infrastructure and skills remains a challenge, preventing educators from fully harnessing the potential of technology. The interview data also highlight the challenges faced by Visual Art teachers in teaching practical-oriented subjects. Respondent R2 revealed that he only uses the laptop to show the students the interface of CorelDraw and Photoshop during lesson delivery. "I only teach the theory aspect of it. I only use my laptop to show the students the interface of CorelDraw and Photoshop" (R2). This is due to a lack of access to these software programmes on computers in the ICT labs within the schools and the limitations of their personal devices. This limitation inhibits the practical, hands-on experience that is essential for students in the field of Visual Arts.

Furthermore, the absence of projectors in the classrooms emerged as a common challenge faced by respondents. Respondents also emphasised the limitations of small laptop screens in reaching all students effectively, leading to the occasional avoidance of video presentations. The absence of projectors in educational institutions raises concerns about the adequacy of visual aids in teaching and the potential impact on student engagement. Despite the challenges, there is a strong positive attitude towards ICT integration among most of the Visual Art educators. For instance, the respondents mentioned that they "perceive ICT integration as a breakthrough of learning in this 21st century, so we occasionally use it" (F1 & F3). Their belief in the positive impact of ICT on learner motivation and engagement aligns with the broader discourse on technology's potential to improve educational outcomes.

2. Limited Access to Centralised ICT lab

The respondents emphasised the challenges associated with a centralised ICT lab, highlighting the inconvenience and time wasted due to the distance between the ICT lab and the Visual Art classrooms, studio and the Department. They commented that "our school is a 'Grade A' school within this Municipality and we have only one centralised ICT lab, but the ICT lab is always busy and constantly used by other students and the ICT teachers. The ICT lab is a little far away from the Visual Art classrooms, and even after booking for the place ahead of time, the students have to walk for about eight to ten minutes to the ICT lab and spend an additional three to five minutes settling down in the lab before teaching and learning can commence. The situation seriously wastes significant instructional time, and this obviously makes some of us reluctant to use the ICT lab" (V1 &

V2). They, however, advocated for a total shift from a centralised ICT laboratory system to a decentralised departmental ICT laboratory system to ensure the successful integration of ICTs in the teaching and learning process. For the respondents, it is high time the government of Ghana formulated a policy guideline that will "decentralise departmental ICT laboratories in every department within the Senior High School to make ICTs available and accessible to all students" (V3 & V4).

The challenges associated with a centralised ICT lab, as highlighted by respondents, underlined the importance of addressing infrastructure and resource limitations in educational institutions. Their proposal for the decentralisation of departmental ICT laboratories reflects the need for policy interventions to enhance accessibility and usability of technology in education (OECD, 2015). Moreover, the fact that there is only one centralised ICT laboratory in all the schools, which rarely enhances the study of ICT, aligns with the findings of Tilya (2008), who posited that ICT needs to be enhanced by an ICT policy that ensures people are capable of using it to source and assimilate information and transform it into useful knowledge. Similarly, studies (Cheng, 2009; Kozma, 2008; Selwyn, 1999; Tondeur, van Braak, & Valcke, 2007) emphasise that without decentralised supportive measures, national policies will not easily result in changes in instructional practices.

3. Limited Electricity supply

Respondents eloquently conveyed the grievous nature of the electrical infrastructure within the school, which has emerged as a substantial barrier. The

respondents commented that the issues of challenges of ICT use in their schools are far-fetched. They explained that the electrical system in their schools is very poor. A respondent expressed, “I have observed on numerous occasions how there were power breaks, equipment breakdowns, and some wires being burnt at the ICT lab due to the poor wiring system” (V1). For the respondent V1, most of the sockets within most of the classrooms are not functioning, with some classrooms lacking them, and these pose a huge problem, especially if the teacher is not even willing to use a projector or television for teaching. Again, to exacerbate this, other respondents reported a disconcerting practice of disconnecting electrical sockets in classrooms by the school authorities to dissuade students from charging mobile phones. They pointed out that the electrical sockets and power plugs, particularly in the classrooms, are not working because “they have been intentionally disconnected by the school authorities to prevent the students from charging mobile phones they illegally smuggle to school” (V2 & V3). For the respondents, this situation is very common in all of the public Senior High Schools within the Mfantseman Municipality, and this situation literally discourages the integration of ICT in teaching and learning. They also explained that teachers literally cannot charge their laptops in the classroom to prevent the laptop from shutting down during lesson delivery, especially when the battery of the laptop computer reaches the low threshold and switches to low battery mode. This, regrettably, impedes ICT integration, as teachers are unable to power their laptops during instructional sessions. Frequent power outages, system failures, and damaged wiring have collectively curtailed the functionality and reliability of essential ICT resources such as projectors and computers (Sarker, 2014; Desa UN, 2014).

4. Insufficient Funds

One of the main challenges that hinders the effective integration of ICT in teaching and learning is the lack of adequate financial resources for acquiring, maintaining, securing, and upgrading ICT equipment and infrastructure. This theme emerged from the responses of the respondents, who expressed their frustration with the high cost of modern technologies, the frequent breakdown of computers, iBox devices, the unreliable power supply, the vulnerability to virus infections, and the poor maintenance culture in their schools. These factors limit the availability and accessibility of ICT tools for lesson delivery and student learning. Respondents P3 and F2 hammered by pointing out that the computers within their schools are inadequate, considering the large number of students they have in their schools. They highlighted that the ICT labs in their schools are always occupied by other students, which makes it difficult to access them. They expressed, "there are no funds to purchase additional ones to supplement those we have already, which sometimes poses technical challenges to some of us in our quest to integrate ICT in teaching and learning of Visual Arts" (P3 & F2).

Again, the respondents expressed that modern technologies are costly, and an investment in them requires an expenditure of huge amounts of money, "first in the purchase of ICT equipment and then in skills training for staff, maintenance of equipment, wiring, ensuring security" (T4 & V1). The respondents indicated that investing in ICT requires a substantial amount of money, not only for purchasing ICT equipment, but also for providing skills training for staff, wiring, ensuring security, and other related expenses. One respondent stated categorically that, "modern technologies are costly, and an investment in them requires an

expenditure of huge amounts of money, first in the purchase of ICT equipment and then in skills training for staff, maintenance of equipment, wiring, ensuring security and others" (R1). This finding is consistent with the previous literature that suggests that insufficient funding is one of the major barriers to ICT integration in education (Salam, Zeng, Pathan, Latif, & Shaheen, 2018).

The respondents also reported that the existing ICT equipment in their schools was often malfunctioning due to various reasons, such as a lack of air conditioners in the ICT laboratories, an erratic electrical power supply, virus infections, and a poor maintenance culture. These problems affect the functionality and usability of ICT tools and discourage teachers and students from using them. One of the respondents contended that, "insufficient funding is a barrier militating against the effective integration of ICT in teaching learning process. The computers breaking down easily due to a lack of air conditioners in the ICT laboratories, an erratic electrical power supply, virus infections, and a poor maintenance culture which can obviously be linked to insufficient funding and insecurity limit the use of ICT in lesson delivery" (R2). The respondents also expressed their desire to have more ICT laboratory in their departments, but lamented the lack of funds to purchase the equipment. They argued that having a specialised ICT laboratory at the Visual Art Department will enable them to integrate ICT more effectively in their teaching and learning of Visual Arts. Respondents R3 and R4 pointed out, "there should be a decentralised departmental ICT laboratory but unfortunately there are no funds to purchase additional ones to supplement those we have already which sometimes poses technical challenges to some of us in our quest to integrate ICT in teaching and learning of Visual Arts" (R3 & R4).

The findings of this study suggest that insufficient funds are a major barrier to ICT integration in education, and that more financial support is needed to provide adequate and reliable ICT equipment, infrastructure and in-service training for teachers. This would enhance the quality and efficiency of teaching and learning, and foster the development of ICT skills and competencies among teachers and students. The finding is in line with Rabah's (2015) assertion that ICT integration in education requires large budgets and financial investments. Investments should not involve only purchasing new equipment and software, but also developing school infrastructures, for example, by refurbishing and maintaining existing equipment. Similarly, previous research done by Anderson, Varnhagen and Campbell (1998), Cuban, Kirkpatrick, and Peck (2001), Ertmer (1999), Schoep (2004) and Vaughan (2002) indicated that investments in schools consisting solely of buying technological tools are not enough. Budgets for ICT investment should include equipment, resources, and software, as well as developing the infrastructure, updating and upgrading it regularly. Therefore, the budget for ICT integration in an educational institution should translate into consistent investments that include equipment, infrastructure and support services.

5. Limited ICT Equipment

A major challenge that hinders the effective integration of ICT in Visual Art education is the limited availability and accessibility of ICT equipment within school premises. According to respondents, the ICT laboratory in their school has a scarcity of computers, where an average of 30 students share a single computer. They lamented that, “there is an average of about 30 students using a computer… most of the computers are very old and not working properly… They break down

easily because of a lack of air-conditioners, power fluctuations, virus infections and poor maintenance culture" (P1 & P2). This situation limits the students' access and time for meaningful and interactive learning activities using ICT tools. Moreover, the use of outdated and malfunctioning computers, mainly due to the lack of proper environmental and technical support, impairs the functionality and usability of ICT tools, thus discouraging ICT integration. Respondents highlighted the inadequacy of ICT infrastructure in most schools within the municipality. They reported that, "most ICT labs in most SHS within this Municipality lack the needed infrastructure… there are no funds to purchase additional ones to supplement those we have already" (P3 & P4). The absence of an ICT laboratory poses significant difficulties in the quest to seamlessly integrate ICT into teaching and learning. The respondents' solution, a clarion call for more computers, projectors, printers, scanners, digital cameras, software applications, high-speed internet access, and other pertinent ICT resources, resonates with the pressing need for a comprehensive framework to enable effective and efficient ICT integration within the realm of Visual Art education. The responses elucidate that the computers in the ICT laboratories are obsolete, and averagely there is a ratio of about 30 students to a computer. The finding corroborates Toprakci (2006), who revealed that inadequate computers, obsolescence of ICT systems and other factors were the barriers to the effective implementation of ICT usage in schools.

Moreover, two of the Visual Art teachers in the SHS located in a rural area within the Mfantseman Municipality acutely identified a glaring inequality between urban and rural schools concerning access to ICT equipment and infrastructure. They have astutely observed that schools in rural areas, such as their own, receive

significantly less attention and investment in ICT from government and other stakeholders. The respondents pointed out the absence of an ICT laboratory in their school. They bitterly lamented that "…because our school is a less endowed Senior High School located in a rural village within the Mfantseman Municipality, when the government provides ICT equipment to be distributed to schools, we do not get some due to the bias nature of the officials towards schools in rural areas" (T1 & T2). For the respondents, they have been teaching in their school for the past five years and they bemoaned and queried, "as we are speaking now, our school has no ICT laboratory and yet we are expected to integrate ICT in our lesson delivery in the classrooms. How on earth can this be possible? (T3 & T4). The respondents pointed out the precarious nature of their situation, stating that their students will be competing with the same students in other schools and "when the students fail in the WASSCE exams, the teachers will be blamed for the poor performance of the students" (T2 & T3).

The respondents expressed that they have, over the years noticed that the government and other stakeholders of education pay very little attention to and invest in ICT in remote schools, like their own. This, according to them, has created a substantial barrier for them to successfully integrate technology into their instruction. For these respondents, this discrepancy has consequences for all students, not just the teachers who teach. They commented that this poor investment in ICT in rural schools casts a shadow of uncertainty over the pursuit of equitable access to educational opportunities and resources. Two other respondents also eloquently illuminated the lack of support for teachers endeavouring to integrate ICT within their lessons. They lamented the absence of

motivation and encouragement emanating from school administration and their colleagues. Furthermore, they raised concerns about the absence of an ICT coordinator and the insufficiency of technical support within the school. These concerns underscore the necessity for an enabling environment that empowers and encourages educators to explore ICT's potential in the pedagogical process. The respondents hammered that, they "need ICT laboratory and ICT Coordinators in the school" (T3 & T4).

The absence of an ICT laboratory and ICT Coordinators in one of the Senior High Schools in the rural enclave within the Mfantseman Municipality poses significant difficulties in the bid to seamlessly integrate ICT into pedagogy. The respondents expressed that they need an ICT laboratory, and they also need to have an ICT coordinator in the school who can help the teachers and students. An ICT coordinator who is there at school that teachers can turn to if a laptop does not work or students cannot access internet, folders or files on a computer. This is totally lacking in the school. It is comparable to when young children are learning to ride a bicycle. There will be someone behind the bike holding the bicycle seat. The person holding the bicycle seat eventually let go of the bicycle, but the person will still be behind the bicycle and watching. This is the support that is lacking for the Visual Art teachers in the school.

6. Limited Proficiency in Specific Software

Another challenge that affects the effective integration of ICT in Visual Art education is the lack of teacher proficiency in specific software such as CorelDRAW and Photoshop. These software applications form an integral part of

the curriculum, and a paucity of proficiency acts as a significant stumbling block to effective ICT implementation. Respondents shared their experiences of teaching in their various Visual Art Departments by highlighting that not all teachers have CorelDRAW and Photoshop software installed on their laptops. They stated that each teacher currently has a laptop computer because of the government's one teacher one laptop policy, but only a few teachers have Photoshop software installed on their laptops. One of the respondents expressed, “even though the five teachers here in this department can use computers quite effectively, particularly MS Word, PowerPoint and Excel, just three of us can use the Photoshop software programme, but when it comes to CorelDraw, I am the only one who can use it effectively. My colleagues do not even have the CorelDraw installed on their laptops” (F2). The respondents pointed out that the current objective-based syllabus demands teachers to teach CorelDraw and Photoshop, but these topics are not taught fully and effectively “because not all the teachers can manipulate these CorelDraw and Photoshop software programmes” (R1, T3, P2, V3 & F2). However, one of the respondents optimistically expressed, “I believe that with constant workshops and practice, my colleagues can manipulate these Graphic Design software programmes easily” (F2).

Other respondents, in a tone of apprehension, underscored the existence of teachers who are reluctant to use Graphic Design software due to a lack of confidence and anxiety surrounding computer software. They reported that they have witnessed many times in their career that some Visual Art teachers are a little bit phobic of computer software. The respondents expressed that because the teachers lack the expertise, they are not comfortable at all with the interface of CorelDraw and

Photoshop software programmes. They pointed out and questioned, “the mere interface of CorelDraw and Photoshop makes them tremble. How can a Visual Art teacher with this trait adopt and integrate ICT successfully into his/her teaching? There is no way the fellow can do that” (T3 & F2). The respondents pointed out that digital technology inclusion requires a certain level of expertise and since the teacher lacks those skills, it becomes very challenging for the teacher to resort to the strategy of integrating CorelDraw and Photoshop in lesson delivery. Respondent F4 also highlighted the challenge posed by the lack of competence among Visual Art teachers in manipulating software like Photoshop and CorelDraw. He pointed out that, some of the Visual Art teachers in the Senior High School teachers lack skills to effectively implement computer-aided strategies. The respondents stated, “some teachers cannot manipulate Graphic Design software programmes such as Photoshop and CorelDraw” (F2, P2 T3). They queried “how can such a teacher use it in teaching and learning?” (V3 & F2). Respondent R3 and T2 also shared a similar view that “some of the Visual Art teachers can use ICTs in teaching topics that involve only simple typing with MS Word and presentation with MS PowerPoint” (R3 & T2), but when it comes to disciplines that require them to use Photoshop and CorelDraw software to create artistic design, they find it very difficult.

The responses suggest that not all teachers can manipulate graphic design software programmes such as CorelDRAW and Photoshop. The finding is in line with the studies conducted by Pelgrum (2001) and Al-Oteawi (2002) in less developed nations, which revealed that teachers' inability to use and manipulate ICTs is one of the primary reasons they are unwilling to adopt and implement their usage in

the classroom. The interview responses also revealed that most teachers utilise computer-based technology mostly for regular tasks such as preparing lesson notes in MS Word, using MS Excel to generate students' continuous assessment, and a few teachers use Photoshop/CorelDraw for their personal private business. This is a positive trend, because research conducted by Wozney, Venkatesh and Abrami (2006) show that the more teachers embrace and utilise ICT tools for personal reasons, the more likely they are to adopt and integrate ICT into their lesson delivery. These findings collectively emphasise the critical importance of targeted ICT in-service training and support for educators to develop the requisite proficiency to integrate these software tools effectively into instruction. It is important to note that the lack of Visual Art teachers proficient in ICT skills extends to the realm of pedagogical practices and attitudes toward ICT integration (Lobo & Sánchez, 2015).

7. Absence of Tailored ICT Workshops for Visual Art Teachers

The respondents reported the lack of subject-specific ICT workshops tailored for Visual Art teachers, attributing this to the inadequacy of directives and funding from education officers. One of the respondents stated with no equivocation that, "I have seen ICT workshops being organised exclusively for the ICT teachers, but sadly in the case of the Visual Art teachers, workshops are not organised for us. One of the education officers told me that; they have not received any directives or money from the government for such a purpose" (P1). In a similar vein, respondent P2 highlighted the absence of ICT integration workshops specifically for Visual Art teachers underscored the importance of in-service training to consolidate acquired knowledge. Respondent P2 commented that, "I once asked

one of the educational officers when they will organise ICT integration capacity building training for Visual Art teachers, he told me categorically that they themselves have not had one in a long time. The issue is that without the follow-up ICT training and seminars, teachers will quickly forget what they have learned" (P2). Respondents advocate for specialised ICT training for Visual Art teachers. They argue that such training can enhance creative thinking and improve student outcomes. This aligns with the idea that technology can be a catalyst for innovation and better educational results. Respondent P4 supported by purporting that, "it will be best for the education authorities to begin to organise frequent ICT in-service trainings for all teachers to upgrade their knowledge and skills in ICT integration in lesson delivery to improve the teaching and learning process. A specific ICT training should be organised for Visual Art teachers to improve and inspire our creative ideas and also improve student learning outcomes" (P4).

Also, the teachers unanimously cogently stressed the urgency for transformative change in this regard. Respondent T1, who holds the position of Head of Department, voiced regret over the lack of ICT training throughout their career. Respondent T1 spelt out that, "to improve teacher performance and self-competence levels, ICT integration into teaching and learning necessitates constant professional development in ICT training. Unfortunately, none of the teachers in the Visual Department in this school has ever attended any ICT in-service training or seminar. In my teaching career, I have never attended any ICT training as the Head of Department. It is very sad, and this narrative must change. Something should be done about it" (T1). Respondents fervently appealed to educational authorities for the organisation of ICT in-service training sessions, underscoring their pivotal role in elevating teaching and learning. The respondents were in

unanimous agreement, affirmed the need for ICT workshops, especially considering the new government's Professional Development Allowance (PDA) policy that has been introduced to equip teachers. They advocated that the focus should be directed towards regular ICT workshops to equip teachers with ICT training programmes to improve teaching and learning. The respondents mentioned that, "as Visual Art teachers, we have never been invited to attend any ICT workshop before in our teaching career. Nevertheless, now that there is a new policy and the government is paying 'One Thousand Two Hundred Ghana Cedis Professional Development Allowance' to teachers, we are highly optimistic that the National Teaching Council will instruct the 'Teacher Professional Training Service Providers' to organise regular ICT integration capacity building workshops for the Visual Art teachers" (T3 & T4).

The interviews revealed that Visual Art teachers need ICT integration professional development workshop training programmes to enable them integrate ICT in their lesson delivery to improve the teaching-leaning process. The finding falls in line with Moyle (2007) that professional development of teachers is conducted on the assumption that it improves teacher capabilities, e.g., in integrating educational technologies into their teaching, will in turn improve student learning outcomes. Also, Smaldino, Lowther, Russell, & Mims, (2008) study established that, the teacher in tomorrow's classrooms needs to exemplify a willingness to explore and discover new technological capabilities that enhance and expand learning experiences. In a similar study, Olivia and Pawlas (2004) concurred and stated that, professional development is a programme of activities planned and carried out to promote the personal and professional growth of teachers.

8. Visual Arts and ICT Integration as a 21st-Century Educational Necessity

Respondents expressed dissatisfaction with the absence of any prior participation in ICT training, underlining the undeniable significance of ICT in contemporary education. The respondents, in alignment with the prevailing sentiment, vociferously argued for the need for regular in-service ICT training to enhance their TPACK. They have also proposed that specialised ICT training for Visual Art teachers holds the potential to foster creative thinking and enhance positive learning outcomes. Concomitantly. Respondent P3 expressed bitterly, "I have never attended any ICT training or seminar before in my career as a Visual Art teacher. Hmmm…may be the authorities think it is not a priority but that is very sad and unfortunate for them to think that way" (P3). For the respondents the 21st-century education is driven by ICT and since ICT has been integrated into the Visual Art syllabus, they "believe that a deliberate ICT professional development training policy should be put in place to prepare and develop the teachers to meet the educational goals of the country" (P3 & P4).

Again, the respondents reiterate the need for organised ICT integration workshops for Visual Art teachers and the challenges stemming from a lack of directives and funding. The respondents expressed that, they "have seen ICT workshops being organised exclusively for the ICT teachers and even French teachers in SHS but sadly in the case of Visual Art teachers, ICT integration workshops are not organised for us. One of the education officers once told us point blank that; they have not received any directives or money from the GES for such a purpose" (F1 & F2). The respondents emphasise that, regular ICT integration seminars can enhance teaching and learning outcomes. This underscores the practical implications of ICT training for educators and students. They emphasised that, in

this culture of artificial intelligence, Visual Art teachers need to be given ICT integration in-service training on a regular basis. This will assist us to carry out our teaching very well. The respondents lamented, “in fact, no workshop has been organised; they should organise some for us. We need regular online teaching training and there must be online virtual library resources in the school to facilitate teaching and learning in this culture of artificial intelligence” (F3 & F4). The undeniable fact is that, regular ICT integration seminars assist teachers to improve their teaching, learning outcomes of their students, and also enable the teachers to put what they have learned into practice on a daily basis during lesson delivery so that they do not forget their basic ICT skills.

However, the respondents highlight the challenges related to directives and funding for ICT training. This indicates a need for better coordination and resource allocation in educational planning. The respondents stated categorically with no equivocation that, they "have also seen ICT in-service training organised solely for ICT teachers nationwide, but unfortunately, ICT in-service trainings are not organised for Visual Art teachers. According to one of the education officers that we talked to some time ago. In fact, they all told us that they have not received any instructions or funds from the government to organise ICT in-service training for Visual Art teachers" (V1 & V2).

Respondents advocate for a deliberate policy to ensure ICT professional development for Visual Art teachers. This aligns with the need for a structured approach to ICT training in education. Respondent V3 lamented bitterly that, "in all of my years as a Visual Art teacher, I have never been invited to an ICT seminar or training before. It is possible that the authorities believe it is not a top priority,

but it is very sad and awful that they feel that way. I believe that a deliberate mandatory ICT professional development training policy should be put in place to prepare and develop the teachers to meet the educational goals of the country since ICT is the driving force behind 21st-century education and since ICT has been incorporated into the Visual Art syllabus" (V3). A respondent supports the idea that specialised ICT workshops can enhance creative thinking and student outcomes. This underscores the potential benefits of targeted training. The respondent supported the idea that specialised ICT training can enhance creative thinking and student outcomes, stating, "in order to improve the teaching and learning process, it will be preferable for the educational authorities to start scheduling regular ICT workshops or in-service trainings for all teachers. This will allow teachers to update their knowledge and abilities in ICT integration in lesson delivery. For Visual Art teachers, specialised ICT training should be organised to enhance and stimulate our creative thinking as well as to enhance student learning results" (V4).

Furthermore, the respondents stress the importance of ongoing professional development in ICT training and lament the absence of such training for Visual Art teachers. This highlights the critical role of continuous learning for educators. They stressed that ICT integration into teaching and learning demands ongoing professional development in ICT training to enhance teacher performance and self-competence levels. The respondents unhappily expressed, “none of the Visual Art department teachers in this school has ever participated in an ICT seminar or training. I have not received any ICT training throughout my entire career as a Visual Art teacher, even though I am the head of department. This story must change because it is so depressing. It needs to be addressed" (R1 & R2).

However, the respondents expressed hopes that the National Teaching Council will direct the organization of ICT workshops, particularly considering the government's Professional Development Allowance. They expressed that, "we have never before in our teaching careers received an invitation to attend an ICT workshop as Visual Art teachers. Nevertheless, now that the government is paying teachers a 'One Thousand Two Hundred Ghana Cedis Professional Development Allowance,' we have high hopes that the National Teaching Council will direct the" (R3 & R4). These collective experiences underscore the dire need for comprehensive and continuous ICT training for educators, both in terms of their professional development and their efficacy in imparting knowledge.

These statements elucidate that Visual Art teachers are not being given the necessary ICT workshop training. This finding is in agreement with Okonkwo (2014) that teachers are not fully utilizing technologies advances through frequent exposure to ICT workshops, questioning whether they will meet the needs of shifting-knowledge-based societies and increasingly diverse student populations. With students' enthusiasm increasing on the use of ICTs, teachers need constant exposure to ICT capacity building workshops to come into mainstream and maximise the benefits that ICTs offer.

Similarly, the statements suggest that teachers and schools lack the necessary online teaching training and online virtual library resources respectively. The finding is in line with Kyei-Blankson and Keengwe (2011) who are of the view that proper training and support have not been provided to instructors who are transforming course content from the traditional face-to-face to online mode.

SECTION THREE

Summary Table 4.2: Visual Art Teachers' Understanding of ICT Pedagogical Content Knowledge (TPACK)

Participant Category	Understanding of ICT–PCK	Role of Content Knowledge (CK)	Pedagogical Orientation (PK)	Technological Knowledge (TK)	Interpretive Notes
R1, R2, R3, R4	ICT–PCK develops gradually through teaching experience	Strong CK enables clear explanation of artistic principles and prepares learners for real-life application	Predominantly demonstration and verbal explanation	Occasional use of laptop for images and videos	Strong CK–PK alignment is evident; however, ICT use remains supportive rather than transformative, indicating partial TPACK integration.
T1, T2, T3, T4	ICT–PCK depends largely on depth of CK	CK encourages discussion and informed citizenship	Teacher-centred with structured delivery	Very limited ICT use	Strong CK and PK but weak TK reveal an imbalanced TPACK profile.
I1, I2, I3, I4	ICT–PCK evolves with awareness of learner needs	CK influences students' academic outcomes	Lecture combined with practical demonstration	Smartphone and laptop for visual support	Emerging TPACK is evident, but students remain passive consumers of ICT rather than active users.
V1, V2, V3, V4	ICT–PCK enhances conceptual understanding	CK guides content selection and sequencing	Partly student-centred and discussion-based	Occasionally uses PowerPoint and digital visuals	Technology reinforces existing pedagogy without redefining instruction, reflecting additive rather than integrative TPACK use.

Summary Table 4.3: Instructional Methods Employed and ICT Integration

Participant Category	Instructional Methods	ICT Tools Used	Purpose of ICT Use	Interpretive Notes
T1, T2, T3, T4	Lecture, demonstration, studio-based practice	Laptop, smartphone	Visual illustration and concept clarification	ICT supports explanation but does not enable hands-on digital creation, reflecting teacher-centred pedagogy.
R1, R2, R3, R4	demonstration, studio-based practice	Laptop, images and videos	Visual illustration and exposure to artistic exemplars	ICT supports explanation but is not integrated into practical production, reflecting traditional method with teacher being the sage on the stage.
I1, I2, I3, I4	Group work, artwork evaluation	Images and videos	Motivation and inspiration	ICT stimulates creativity conceptually but is not integrated into practical production.
V1, V2, V3, V4	Demonstrations and discussion of student challenges	Mobile devices	Exposure to artistic exemplars	Pedagogical practices remain traditional, with ICT serving a supplementary role.

Summary Table 4.4: Challenges Affecting the Integration of CK, PK, and TK

Challenge Identified	Affected Knowledge Domain	Effect on Teaching	Interpretive Notes
Centralised ICT laboratory	TK	Loss of instructional time	Restricts seamless integration of CK, PK, and TK during lessons.
Poor internet connectivity	TK	Inability to assign online tasks	Limits online research and digital pedagogy.
Limited software skills	CK–TK	Software taught theoretically	Leads to fragmented and superficial TPACK implementation.
Absence of projectors	TK	Poor visibility of digital content	Reduces the effectiveness of ICT-supported instruction.

Summary Table 4.5: Teachers' Suggestions for Improving ICT Pedagogical Content Knowledge

Suggested Strategy	Targeted Knowledge Domain	Expected Outcome	Interpretive Notes
Establish Departmental ICT Laboratories	TK	Increased access to ICT	Enables real-time and consistent ICT integration in Visual Art lessons.
Regular ICT Workshops	TK–PK	Enhanced instructional skills	Promotes continuous and sustainable TPACK development.
Training in Photoshop/CorelDraw	CK–TK	Improved digital art competence	Aligns curriculum expectations with classroom practice.
Policy reform on student device use (adopting Controlled BYOD initiative)	TK	Increased student engagement	Encourages learner-centred and participatory ICT pedagogy.

Summary Table 4.6: Extent of Student Engagement in ICT-Based Learning

Level of Involvement	Description	Interpretive Notes
Low	Teachers exclusively control ICT use	Students remain passive recipients of digital content.
Occasional	Students observe videos and images	ICT is used mainly for exposure, not skill acquisition.
Minimal hands-on	No direct student use of software such as CorelDraw/Photoshop	Indicates absence of learner-centred TPACK enactment.

Summary Table 4.7: ICT Tools Used in Teaching Visual Art

ICT Tool	Frequency of Use	Instructional Purpose	Interpretive Notes
Laptop	Frequent	Display images and videos	Supports basic visual explanation but not creative production.
Smartphone	Occasional	Show artistic examples	Reflects improvised ICT use due to limited resources.
Photoshop/CorelDraw	Rare	Occasional Demonstration only	Weak CK–TK integration and limited practical engagement.

Summary Table 4.8: Institutional Challenges and Recommended Solutions

Challenge	Impact on Teaching	Recommendation	Interpretive Notes
Limited ICT resources	Restricts digital practice	Provide adequate ICT equipment	Enhances ICT-supported Visual Art pedagogy.
Restrictive policies	Limits student ICT access	Review and revise policies, allow students to bring their devices	Promotes learner-centred ICT integration, and directly cuts down government ICT budgetary support.
Lack of projectors	Poor multimedia visibility	Procure projectors	Improves clarity and effectiveness of instruction.
Poor internet connectivity	Limits student ICT access	Provide strong, active internet connectivity,	Enhances learner-centred ICT integration
Centralised ICT laboratory	Limits student ICT access	Establish Departmental ICT Laboratories	Enables real-time and consistent ICT integration in Visual Art lessons.

Summary Table 4.9: Teachers' Attitudes Toward ICT Integration

Teacher Category	Attitude Toward ICT	ICT Skill Level	Interpretive Notes
Enthusiastic teachers	Positive	Moderate	Motivation exists, but skills require enhancement.
Willing but no workshop	Positive	Low	Lack of workshop limits effective ICT integration.
Skilled but constrained	Positive	High	Institutional barriers restrict practical application.

Summary Table 4.10: Attendance of ICT Integration Training

Training Attendance Status	Interpretive Notes
None	Explains limited technological knowledge and weak overall TPACK development.

Summary Table 4.11: Identified ICT Training Needs of Visual Art Teachers

Training Area	Relevance to Teaching	Interpretive Notes
ICT-Based Lesson Planning	Enhances instructional design	Strengthens PK–TK integration.
Digital Art Software	Improves content delivery	Supports effective CK–TK alignment.
Digital and Online Assessment	Encourages innovation	Promotes formative/summative and technology-driven assessment.
Research Skills	Sustains professional growth	Supports long-term TPACK devel

SECTION FOUR

4.4 Observational Report

The observational study aimed to examine the current practices and challenges of ICT integration in Visual Art teaching and learning in five selected public Senior High Schools in the Mfantseman Municipality in Ghana. Specifically, the observational study was focused on the utilisation of ICTs by Visual Art teachers during lesson delivery. The researcher used a non-participant observation method to collect data from Visual Art teachers during their regular lesson delivery. The researcher used an observation checklist and a field note to record the data. The observation checklist consisted of four main categories: (1) the ICT pedagogical content knowledge of Visual Art teachers, (2) the extent to which Visual Art teachers involve students in the use of ICT resources, and (3) the challenges that militate against ICT integration in Visual Arts. The data collected from the observation were analysed using thematic analysis. The results of the observational study are presented below:

1. The Interplay of Technological Pedagogical Content Knowledge of Visual Art Teachers in Mfantseman Municipality.

The primary intent of this research objective was to keenly observe the level of interplay between Content Knowledge (CK) and Technological Knowledge (TK) and their influence on effective pedagogical practices among Visual Art teachers in Mfantseman Municipality. Conferring to the observation data, the themes that emerged are meticulously presented below:

a. Pedagogical Content Knowledge with ICTs

The primary objective was to observe how the teachers combine pedagogy, and content knowledge with ICTs. The researcher observed that to a large extent teachers demonstrated an accurate knowledge of the subject matter and presented materials at an appropriate level for students and to the purposes of the content standards. Teachers demonstrated ability to use basic technological tools such as laptop, tablet, phones, only to show pictures, videos and artistic texts to the students to link present content with past and future learning experiences and real-world experiences and applications.

Across the situations, the researcher observed instructional practice followed a pattern. It began with a 'recap' of previous lessons, followed by an introduction of new knowledge in small amounts and linked to previous knowledge, students practicing by creating artefacts with art materials after each new piece of knowledge, and teachers assisting students while they practiced and asking them to evaluate the lesson. However, the teachers did not give the students opportunity to create digital artworks with any ICT tool.

b. Instructional Methods with ICTs

The researcher observed that to a large extent teachers effectively engaged students in learning by using a variety of traditional instructional strategies but occasionally employ some technological tools such as computers, tablets and mobile phones to stimulate the interest of the learners. Throughout lesson, teachers communicated clearly and checked for understanding by walking around casually to check independent artwork. The researcher observed that teachers reinforced learning objectives consistently throughout the lesson delivery. Teachers managed the classroom structure to engage students both individually and in groups in meaningful exploration, discovery and hand-on practical activities within a range of physical learning environment. Teachers differentiated instruction to meet students' needs using traditional approaches. Small group activities were assigned to students in the classroom. During small group, all students worked on the same practical activities and received the same lesson. The teachers spent usually specifically 10 to 15 minutes working with groups A and B and 15 to 20 minutes working with group C, which struggled with the learning material.

Surprisingly, in the observed classroom and studio lessons, all displayed common visible activities in teacher-led pedagogies such as the traditional instructional methods of talk and chalk, copying from the board, reading from text books, imitation, repetition and oral response. The respondents employed more teacher-centered teaching methods within an instructional period. It was found that the teaching strategies used most in the classroom were lecture method and demonstration. The lecture method was used to teach the theory lessons and the demonstration for the studio practical lessons, followed by both individual and

group work. Laptop computer, Tablet and Mobile Phone served as the technology tools used most often only as a visual aid.

c. Assessments Methods with ICTs

The researcher observed that to a very large extent teachers assessed their teaching and learning utilizing the formative and summative assessment tests congruent to the lesson and provided timely appropriate feedback. Teachers used the assessment tools to inform, guide and adjust students' learning. Teachers also asked questions to assess students' comprehension, waited adequate time for students to respond to the questions, listened carefully to students' responses, and restated the students' answers when necessary. The teachers gave students studio based practical exercises to assess the creativity of the students.

d. Evaluation Methods with ICTs

The researcher observed that to a very large extent teachers evaluated students' learning by utilizing qualitative evaluation (such as interview, observation and art appreciation) and quantitative evaluation (such as studio-based practical work, class test, class exercise and written assignment) tests congruent to the lesson. Most of the teachers used MS Excel sheets to systematically gather, analyse all relevant data to measure students' learning progress. Additionally, some of the teachers also engaged the students in art appreciation presentations to evaluate their practical works. The MS Excel was used to determine the total score, position and rank of each student.

2. Extent Visual Art Teachers in Mfantseman Municipality engage Students in the use of ICT Resources

The primary intent of this research objective was to observe the extent Visual Art teachers involve their students in the use of ICT resource during lesson delivery. The following themes emerged:

a. Giving Assignment to be done using the Internet at the ICT lab

The researcher observed that only a few Visual Art teachers in the Mfantseman Municipality to some extent gave students reading assignments to be done using the internet. For example, three teachers in two different schools instructed students to use the internet at the ICT laboratory to read and watch pictures and videos about renaissance arts, conceptual arts, photography, intaglio printing, clay formation and glaze application methods. The rest of the teachers did not give students assignment to be done using the internet at all. In a nutshell, the researcher observed that the teachers were not extrinsically and intrinsically motivated enough to engage students in learning by using ICTs due to limited ICT infrastructure in the schools.

b. Directing Students to use Online Virtual Library

During the lesson delivery, the researcher observed that teachers did not at all direct the students to use any Online Virtual Library for virtual tourism and virtual field trips. The researcher noticed that the schools did not have a virtual school library system to support teachers and students with digital learning resources to facilitate teaching and learning to safeguard students' access to eBooks and digital visual literacy support to close the learning gap created by COVID-19 pandemic lockdowns. The researcher noticed that the schools did not launch any online virtual

school library platform for teachers and students to give them access to free online digital Teaching and Learning Materials such as eBooks, digital videos and audiovisuals in the event of another pandemics and lockdowns in the near future.

c. Use of Instructional Television/Videotaped Lessons

The researcher observed that teachers to some extent integrated television in their lessons to facilitate teaching and learning. The researcher noticed that some teachers showed practical lesson videos on the screen of LED TV to the students. For example, a teacher connected a pendrive to the 32-inch LED TV via the USB port of the television and played twenty-five minutes video clip of Renaissance Art in class during lesson delivery.

e. Giving Class Exercise to be done using CorelDraw and Photoshop

The researcher observed that teachers in the Mfantseman Municipality did not at all give the Visual Art students any class exercise or assignment to be done using graphic design programmes such as CorelDraw or Photoshop. The researcher observed that although ICT related topics such as CorelDraw and Photoshop have clearly been integrated in the syllabus of every subject area in Visual Art Education at the Senior High School level, the teachers to a very large extent did not give the any exercise to the students to be done using CorelDraw or Photoshop. The researcher noticed that one of the schools did not even have an ICT laboratory to facilitate the integration of ICT.

f. Use of Instructional Projected Slides

The researcher observed that some teachers to some extent used instructional PowerPoint slides to facilitate teaching and learning. The researcher noticed that the teachers in the Mfantseman Municipality used PowerPoint slides on a laptop computer by placing the laptop on a table in front of the students to watch the reeling animated slides on the laptop screen of the laptop. However, one of the teachers who sincerely admitted of occasionally borrowing projector from church hooked the laptop carefully to the borrowed projector via HDMI cable and displayed colour rich slides on the whiteboard, providing a wider view for students. The teacher used the projected PowerPoint slides to introduce terminologies in Graphic Design. Every terminology was matched with a picture to demonstrate its meaning. When explaining the meaning of the terminologies, the teacher used the half of the whiteboard to explain words to make the input more comprehensible to students. The teacher asked the students to go back to their textbooks to review after explaining the terminologies.

g. Leading Students to watch Digital Images on Mobile Phone/Tablet

During one of the lessons, the researcher observed that students were made to watch downloaded digital images on mobile phones and tablets. The researcher noticed that teachers showed still images on the screen of mobile phones and tablets to the students. The researcher noticed that the teachers occasionally gave their mobile phones to the students to use it to access the internet during practical activities. It was observed that teachers periodically showed the images on their tablet and mobile phone screen to the students by moving from one student to another student without allowing the students to touch the devices. The researcher

observed that the teachers' strategy to show the images to individual student coupled to their slow movements from one student to another really wasted a lot of instructional time. Also, the researcher observed that the students who were first served with the images began to engage in a private conversation which created a noisy atmosphere in the classroom.

h. Guiding Students to watch Digital Videos on a Laptop Computer

The researcher observed that most teachers used a computer laptop that was set on a table in front of the classroom to show downloaded "YouTube" videos to facilitate comprehension of theoretical concepts. The researcher noticed that the 24-inch screen of the laptop limited the view for students sitting and standing at the back and corners of the classroom. The researcher observed that the students who had limited view of the video quickly moved from their sitting place to vantage points to catch a glimpse of the video. Some of the students joined their colleagues in the front row of the class to have a wider view. This state of affair within the classroom disrupted the social distancing COVID-19 Protocol and rather created a scene of crowded students in front of a personal laptop computer.

3. Challenges that militate against ICT integration in Visual Arts in Mfantseman Municipality.

The key intent of this research objective was to observe the major challenges that militate against ICT integration in the Senior High School education within the Mfantseman Municipality. The following themes emerged:

a. Limited Supply of Electricity

The researcher observed that all the Senior High Schools in Mfantseman Municipality had been connected to the national electricity grid and the classrooms had been wired with switches, power plugs and sockets for easy connection of technological equipment to facilitate teaching and learning. The researcher noticed that most of the electrical outlets were damaged many years ago, making it difficult for the teachers to effectively implement their strategy. Again, the researcher observed that the electrical sockets and power plugs, particularly in the classrooms, are not working because they had been intentionally disconnected by the school authorities to prevent the students from charging banned mobile phone gadgets they secretly conceal and smuggle to school. The researcher noticed also that most of the teachers normally go to the classroom with their personal electrical cable extensions to tap power from a particular working socket outside the classroom and extend the power to the front of the classroom in order to easily connect their technological equipment. The researcher observed that none of the four schools that have ICT laboratories had a Standby Power Plant.

b. Insufficient Funds and Insecurity

The researcher observed that though the schools have ICT laboratories but the computer labs had not been adequately equipped with proper routine maintenance and repair, hence it was very common to see the schools' ICT labs full of broken-down computers with missing components, some repairable and some not. The researcher noticed that the schools incurred extra expenses trying to air condition and burglar proof the computer laboratory room to ensure the safety of the

computers. These extra expenses have made the schools to shy away from purchasing new computers to expand the ICT labs for their students.

c. Little Equipment made available nationally for ICT in Schools

The researcher observed that there were inadequate ICT resources such as hardware, software and peripheral equipment (such as printer, scanner, camera, microphones and projectors) in the schools. The researcher noticed that most of the ICT labs in the Senior High Schools within the Mfantseman Municipality enclave lacked high performance computers that can handle high demanding graphic design software programmes such as CorelDraw Graphic Suite and Adobe Photoshop.

Surprisingly, the researcher also observed that a certain Senior High School within the Mfantseman Municipality rural enclave does not have an ICT laboratory at all. Only one school had an efficient working iBox system and only one school had been hooked on iCampusGH online platform. Although there is a Wi-Fi busy internet in all the schools, not all of the computers in the ICT labs observed were networked and only the Sever Computers and other few computers usually not more than five computers in the ICT labs had Internet connectivity. Apart from one school that had no ICT lab, the ratio of students to computers per each school with ICT lab was found to be very low. After counting the computers in the ICT laboratory in each school, it was observed that there was approximately an average of 30 students to a computer in each school at the Senior High School level within the Mfantseman Municipality. The researcher observed that the Centralised ICT Laboratory System currently being practiced in the schools does not meet all the

teachers' and students' needs, and it causes significant time delays as well as putting too much pressure on the computers.

d. Lack of Visual Art Teachers with ICT Skills

The researcher observed that majority of the Visual Art teachers in the Mfantseman Municipality to a large extent were very much familiar with ICT software programmes such as MS Word, Excel, PowerPoint, CorelDraw and Photoshop. The researcher noticed that while majority of the teachers can operate MS Word, Excel and PowerPoint, only a few teachers can manipulate graphic design software programmes such as CorelDraw and Photoshop. Majority of the teachers did not have CorelDraw installed on their laptop computer. The teachers who could not manipulate Photoshop and CorelDraw software did not have it installed on their laptop computer and did not employ them in their lesson delivery at all. It was observed that the teachers had laptops and mobile phones but only a few teachers had tablets in addition. Although a teacher used a borrowed projector to deliver instruction in class, no teacher had a personal projector. However, it was noticed that MS Word was commonly used by the teachers to prepare their lesson notes whiles PowerPoint was used occasionally to show still pictures on the laptop screen during lessons and MS Excel for preparing the continuous assessment of the students.

e. Visual Art Teachers' inability to integrate ICT into their Subject Areas

The researcher observed that teachers were not able to effectively and fully integrate ICT into instruction due to large class size, limited instructional time, limited software, limited access to internet, limited technological tools such as

projector, digital camera, printer, scanner and also lack of ICT laboratory as well as limited personal computers and tablets to be used by the students. Surprisingly, it was noticed that all the educational contents on the iBox system did not have any Visual Arts related educational contents to facilitate teaching and learning of Visual Arts. The researcher also noticed that most of the schools battled with limited technical support to aid the teachers to integrate ICT effectively in their teaching practices to deliver their instruction.

f. Lack of Classroom Instructional Time Period for Teachers to use Computers during Lesson Delivery

The researcher noticed that the ICT laboratories in the schools have been cited at remote locations and students have to use some part of the limited instructional time period to walk all the way to the computer lab. The researcher observed that one of the major barriers that militate against the teachers in their quest to integrate ICT in Visual Art lessons was lack of classroom instructional time for teachers to guide students to use computer programmes to create designs during lesson delivery. The researcher noticed that the allotted instructional time frame for each Visual Arts elective subject on the timetable is quite short and inadequate for teachers to successfully integrate ICT effectively in the Visual Arts teaching and learning environment. The researcher observed that teachers mostly spent almost half of the instructional time period in teaching the theory aspect of the topics and the other half of the instructional time period was used solely for studio practical works. The researcher noticed the teachers instructing students to use traditional manual tools, equipment and other art materials to construct, assemble, design and create artworks manually with their hands to exclusively prepare the students

towards their WASSCE project work. This however, did not give students the opportunity to spend extra time to use computer to design during the lesson delivery. The researcher observed that that has been the status quo all these years.

g. Lack of Effective ICT Capacity Building Workshops

The researcher observed that there is no evidence confirming that Visual Art teachers in Mfantseman Municipality have attended any ICT integration capacity building workshop. It was observed that Visual Art teachers do not attend ICT integration workshop to update themselves on the emerging trends in ICT integration in Visual Art Education. The researcher noticed that not a single subject-specific CT integration capacity building workshop had been organised for the Visual Art teachers in Mfantseman Municipality.

h. SHS in Mfantseman Municipality with Limited Technical Support.

The researcher observed that majority of desktop computers in the schools' ICT laboratory were obsolete. The researcher noticed that some schools were using very old computers running on Windows 8 and 10. The schools had Wi-Fi busy internet connection but the wireless system was slow with the average bandwidth less than three megabit per second (3mbps). The researcher observed that the Wi-Fi signals were usually unstable and cuts off intermittently for days at a time, resulting in no internet connectivity. The Wi-Fi connections in the schools were only accessible at certain vantage points usually specifically the school administration blocks and the ICT labs. However, the researcher noticed that the wireless internet connection signal was although quite available in some of the classrooms but was very weak and in inaccessible because the radius parameter of

the Wi-Fi signals in the Senior High Schools did not travel beyond 100 meters. Therefore, during lesson delivery, the researcher observed that most of the teachers used their personal devices such as smartphones to access the internet. This strengthened their teaching and learning and also enabled them to make innovations in their teaching strategies. The researcher noticed that breakdown of computers, iBox devices, poor maintenance culture and lack of funding were key stumbling blocks to effective ICT support in the Senior High Schools in Mfantseman Municipality.

i. Schools in Mfantseman Municipality with Lack of Genuine Software

The searcher observed that there was a lack of genuine graphic design software programme such as CorelDraw Graphic Suite, Adobe Photoshop within the Senior High Schools in Mfantseman Municipality. The researcher noticed that although some of the Visual Art teachers have CorelDraw and Photoshop installed on their personal laptop computers, surprisingly, none of the aforementioned Graphic Design Software programmes has been installed on any of the computers in the schools' ICT laboratory. The researcher observed that some of computers in the school's ICT laboratory did not even have the capacity to handle these high demanding graphic design software programmes. However, the researcher noticed that the only graphic design programme accessible on the computers in the ICT laboratories is MS Paint, which has been the primary image-editing tool in Windows since Windows 1.0 was released in 1985.

j. Organization of ICT Workshops for Visual Art Teachers

The researcher observed that in January, 2020 and July 2021, Ghana Education Service organised ICT workshops exclusively for the SHS ICT teachers. Again, the researcher noticed that another ICT workshop was organised for the SHS French teachers. However, in the case of the Visual Art teachers, the researcher observed that no evidence of ICT integration capacity building workshop had been exclusively organised for the Visual Art teachers. The researcher noticed that no adequate plans had been put in place by the schools and educational authorities towards ICT integration capacity building workshop series to update and upgrade Visual Art teachers on the emerging trends in ICT integration in Visual Art Education.

k. Regularity of attendance by Visual Art Teachers at ICT Workshops.

The researcher observed that Visual Art teachers in the Mfantseman Municipality do not attend ICT workshop at all. The researcher noticed also that teachers had not attended any self-sponsored ICT integration capacity building workshops to update themselves on emerging trends in ICT integration in Visual Art Education to empower them in embracing the new technological tools. The researcher discovered that no ICT workshop has been organised for the teachers despite receiving a lump sum payment of the new yearly Professional Development Allowance. The researcher noticed that no ICT workshop has been organised for the teachers after the introduction of the Professional Development Allowance by the Ghana Government to enable teachers to invest in improving and upgrading their skills and keeping abreast with modern trends to assist in improving learning outcomes.

l. GES Policy on the Use of ICTs at the SHS Level

The searcher observed that there were Ghana Education Service rules and regulations prohibiting students from bringing their own ICT tools such as mobile phones, tablets and laptop computers to school. The researcher noticed that this single policy of GES to a large extent has taken ICTs away from the very classroom environment and does not allow proliferation of ICTs in the classroom to facilitate teaching and learning process. The researcher observed that although, there is no official GES policy document explicitly prohibiting students from bringing their own ICT devices, the researcher noticed the existence of a verbally enforced institutional policy that restricts students from bringing their personal ICT devices to schools. To provide contextual validation, the researcher triangulated respondents' reports with local news reports documenting the enforcement of the policy in Ghanaian Senior Schools. The cases outlined below show clearly the seizure of student mobile phone and in some extreme cases, the destruction of student mobile phone in Ghanaian Senior Schools.

1. Agona Kwanyako SHS in the Central Region of Ghana – School authorities reported seized and destroyed over 70 mobile phones, reinforcing a strict ban on phone possession.

   Source: Ghana Business News

   Full Link:

   https://www.ghanabusinessnews.com/2017/02/13/school-authorities-destroy-70-mobile-phones/

2. Karaga SHS in the Northern Region of Ghana – Over 100 seized phones were burnt publicly as part of the enforcement of a mobile phone ban.

Source: ModernGhana

Full Link:

https://www.modernghana.com/news/810587/burning-of-students-phones-at-karaga-shs-condemned.html

3. Nkwanta SHS in the Oti Region of Ghana – Students engaged in violent protest after school authorities seized their mobile phones, showing the tension the policy can create.

   Source: ModernGhana

   Full Link:

   https://www.modernghana.com/news/1400376/nkwanta-shs-students-clash-with-school-authorities.html

4. Tumu Secondary Technical School in the Upper West Region of Ghana – Students demonstrated following the seizure of their phones by school authorities

   Source: Citi Newsroom

   Full Link:

   https://citinewsroom.com/2019/05/tumu-secondary-technical-students-demo-over-seizure-of-phones/

These news articles show clearly that mobile phones bans, whether explicitly written or unwritten are strictly enforced generally in Ghanaian Senior High Schools.

Nevertheless, the researcher observed that the Centralised ICT Laboratory policy currently being practiced in the schools does not meet all the teachers' and students' needs. It causes huge traffic of students and significant time delay as well as putting too much pressure on the computers.

4.5 Summary of Findings

This chapter examined the integration of ICT in Senior High School Visual Art education in the Mfantseman Municipality, focusing on teachers' Technological Pedagogical Content Knowledge (TPACK), student engagement with digital resources, and the contextual factors influencing implementation. The findings indicate that, although teachers demonstrate strong subject knowledge and employ established pedagogical strategies such as demonstrations and studio-based practices, ICT integration remains largely supplementary. Technology is predominantly used for presenting images, videos, and digital content, with limited opportunities for students to participate in practical digital art activities, resulting in a partial and uneven implementation of TPACK and restricted development of students' digital competencies.

The study further identified significant structural and institutional constraints that impede effective ICT integration. These include inadequate or outdated ICT infrastructure, centralised laboratory arrangements that limit access, unreliable internet connectivity and power supply, insufficient funding, and limited teacher proficiency in specialised software such as CorelDraw and Photoshop. The absence of targeted professional development programmes in ICT competencies and restrictions on students' personal device usage further restrict meaningful engagement with technology. Collectively, the findings highlight a pronounced

gap between the pedagogical potential of ICT in Visual Art education and its practical implementation. They underscore the urgent need for enhanced infrastructure, dedicated departmental ICT facilities, and sustained, context-specific professional development to facilitate effective, student-centred ICT integration, as discussed in the concluding chapter.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the study and key findings, implications, conclusions, recommendations and suggestions for further research.

5.2 Summary of the study

The study investigated ICT integration in Senior High School Visual Art education in the Mfantseman Municipality of Ghana. It focused on the interplay of the technological pedagogical content knowledge of Visual Art teachers and the extent to which Visual Art teachers in Mfantseman Municipality engage their students in the use of ICT resources. The study also examined the barriers that hinder teachers from effectively integrating ICT into their Visual Art teaching practice. The objectives of the study were:

4. To investigate the interplay of technological pedagogical content knowledge of Visual Art teachers in the Mfantseman Municipality.
5. To explore the extent to which Visual Art teachers engage their students in the use of ICT resources in the Mfantseman Municipality.
6. To identify the challenges that militate against Visual Art teachers in integrating ICTs into Visual Art lessons in the Mfantseman Municipality.

The study adapted Technological Pedagogical Content Knowledge (TPACK) developed by Mishra and Koehler (2006) as its conceptual framework. The study adopted the qualitative research approach and case study design. The target population was 27 Visual Art teachers, and the accessible population was 20 Visual Art teachers. Purposive sampling and convenience sampling techniques were used

sequentially to select 20 respondents for the study. Instruments used in gathering data were semi-structured interviews and non-participant observation. The qualitative data were thematically analysed and summarised to identify the main research finding, and thereafter conclusions, implications and recommendations were made.

Key Findings from Research Objectives.

This section summarises the dominant patterns that emerged from participants' lived experiences in Mfantseman Municipality. The findings are organised around the three research questions: teachers' TPACK, student involvement in ICT-based learning, and the barriers shaping ICT integration in Visual Art classrooms.

1. Visual Art teachers' TPACK was generally low, especially for Visual Art-specific applications. Most teachers described strong confidence in Visual Art content and basic digital tools (for example, smartphones, laptops, internet browsing, and simple presentations). However, many reported limited competence and confidence in using specialised Visual Art software such as CorelDRAW and Photoshop for instruction. Teachers linked this gap to limited access to functional ICT tools, weak internet connectivity, high data costs, limited lesson time, and the absence of sustained in-service training targeted at Visual Art. This pattern reflects the TPACK expectation that effective integration depends on the intersection of content, pedagogy, and technology knowledge, rather than basic ICT familiarity alone. It also aligns with evidence that lack of competence, access, time, and technical support often suppress meaningful classroom use of ICT.
2. ICT use in Visual Art lessons was mostly teacher-led and occasional, with limited hands-on student engagement. Teachers reported using ICT mainly to display

images, videos, or slides to support explanation and demonstration. Students, however, were rarely involved in practical ICT tasks such as creating designs digitally, editing images, or exploring Visual Art ideas with software. Participants attributed low student hands-on engagement to inadequate devices, frequent breakdowns, limited or competitive access to ICT spaces, costly data, and school rules forbidding students from bringing their personal digital devices to school. Teachers consistently indicated that a controlled "learning-focused" device access arrangement would improve participation, practice, and skill development during Visual Art lessons.

3. ICT integration barriers were interconnected and systemic, rather than single-factor problems. Teachers described barriers that operated together: weak infrastructure, limited maintenance and technical help, lack of software access, unreliable internet, high data cost, limited time for practical work, and centralised ICT access models that reduce department-level availability. Despite these constraints, teachers expressed strong positive beliefs about ICT's relevance to Visual Arts and a willingness to improve, especially if training is practical, Visual Art-specific, and supported with follow-up supervision and access to tools. This finding is consistent with research that stresses the need for coherent planning, resources, professional learning, and school-level support systems for integration to move beyond demonstration to active learning.

5.3.1 Summary Discussion

In examining teachers' technological pedagogical content knowledge (TPACK) and the extent to which teachers involve students in ICT integration lessons, the interviews shed light on the low level of technology integration, reflecting both

competencies and challenges. The struggle with Graphic Design Software applications like CorelDraw and Photoshop, and policy constraints forbidding students from bringing their personal digital devices to school, emerges as a crucial area for improvement.

Interview responses underscore a critical gap in Visual Art teachers' professional development. The absence of exclusive workshops tailored for these educators stands out as a significant hurdle. This discussion goes beyond the mere identification of the issue, emphasising the importance of recognising the unique needs of Visual Art teachers. It calls for targeted professional development opportunities that address the specific requirements of these educators, ensuring their readiness to navigate the evolving landscape of technology integration in Visual Art Education.

The centralised ICT laboratory model practised in the schools hinders progress and poses formidable barriers to the seamless integration of ICT. The decentralisation of department-based ICT labs reveals an urgent need for an ecosystem that fosters accessibility, addressing the limitations hindering effective integration. This calls for a systemic re-evaluation of ICT infrastructure distribution and utilisation across schools.

The observation report highlights the coexistence of traditional and technology-integrated methods, with the traditional method of teaching still taking centre stage. Challenges with insufficient instructional time, lack of professional development, lack of competence to manipulate CorelDraw and Photoshop software and other barriers such as poor internet connectivity, equipment breakdowns, absence of an ICT lab, lack of projectors and technical support

underscore the need for addressing infrastructure gaps and enhancing teaching strategies.

5.4 Conclusions

Firstly, the findings suggest that Visual Art teachers in Mfantseman Municipality have some basic ICT competence, but this competence does not yet translate into strong Visual Art-specific TPACK for teaching. Teachers can use common tools such as phones, laptops, and simple presentations, yet many struggle to use specialised Visual Art applications like CorelDRAW and Photoshop in ways that support instruction and learning. This points to a professional learning need that is specific to the subject and its digital tools, rather than a lack of motivation or interest in technology use.

Secondly, the study also shows that student participation in ICT-based Visual Art learning remains limited because classroom ICT use is mostly demonstration-based and constrained by access and policy conditions. Teachers often rely on showing images, videos, or slides, while students rarely engage in hands-on digital art production because they lack regular access to devices and software, do not have consistent supervised opportunities for practice, and face restrictive rules around student device use.

Finally, the results indicate that improving ICT integration in Visual Art will require coordinated school-level systems rather than isolated interventions. The barriers teachers described are interconnected. Weak infrastructure and maintenance, unreliable internet and high data costs, limited training support, restricted time for practical work, and access models that centralise ICT resources combine to reduce both teacher and student use. Sustained progress is more likely when the Mfantseman Municipal

Education Directorate, School Heads, School Management Committees collaboratively establish predictable access, continuous support, and a well-defined accountability framework. Such coordinated and systemic efforts are essential to ensure that ICT integration extends beyond sporadic or ad hoc initiatives and becomes embedded in the daily pedagogical practices of Visual Art teachers.

5.5 Practical Implications

The implications of the findings extend beyond the immediate challenges discussed. The study indicates that the Visual Art teachers' level of knowledge in terms of blending content and pedagogy with technology is quite low. The implication is that there is more to do in the area of teaching with technologies. These Visual Art teachers need to develop their competencies in the pedagogical and educational use of technologies (Uerz, Volman, & Kral, 2018). The study highlights the need to implement tailored professional development programmes that focus on empowering teachers with 21st-century ICT skills to address diverse TPACK competencies and bridge skill gaps. The study suggests that the Ghana Education Service needs to provide more ICT in-service training and support for the Visual Art teachers. This could involve organising regular ICT integration workshops, providing online ICT courses and resources, and establishing ICT mentoring and coaching programmes.

The study calls for a broader recognition of the role ICT can play in fostering creativity, critical thinking, and digital literacy within Visual Art education. The study suggests that the government needs to invest more resources in improving the ICT infrastructure, equipment, and maintenance in the public Senior High Schools. This could involve providing more computers, projectors, affordable high-speed internet connectivity, software applications and regular ICT in-service training for teachers. The study

advocates for policy revisions that facilitate the integration of personal ICT tools by students, fostering an environment conducive to innovation. The implications emphasise the commencement of a decentralised approach to ICT labs, ensuring accessibility and equitable distribution of resources to empower all schools. The study suggests that tailored in-service workshops should be organised regularly for teachers to provide opportunities to develop their TPACK so that they can effectively integrate technology into their teaching to equip the students with the 21st Century skills, such as creativity and critical thinking.

5.6 Recommendations

Based on the findings of the study, the following recommendations are made:

1. Institutionalise termly or semester-based, practical Visual Art-focused ICT training for Visual Art teachers, with follow-up activities that require classroom transfer (lesson demonstrations, peer coaching, and supervision). The Mfantseman Municipal Education Directorate should also require each SHS to implement a basic ICT support and sustainability plan (a designated ICT coordinator or committee, inventory, routine maintenance, clear reporting lines for faults, and modest budgeting for repairs and consumables). This responds directly to the identified gaps in Visual Art-specific competence and the lack of sustained support systems (Bingimlas, 2009; Lawless & Pellegrino, 2007; Hew & Brush, 2007).

2. Create reliable access for the Visual Art department by adopting a decentralised access model that fits each school's capacity, either a small department-based ICT space or a bookable mobile set of devices (laptop or desktop access, projector, speakers, and basic printing or scanning where feasible). School

Heads should protect instructional access through timetabling, clear custody rules, and a simple maintenance routine. They should also introduce a controlled learning-focused device-use framework and treat technical failure as a predictable implementation challenge that requires support, rather than blame (Hew & Brush, 2007; Bingimlas, 2009).

3. Use ICT consistently at a realistic minimum level by planning lessons that combine demonstration with student activity, even if offline (for example, reusable image banks, short videos, and step-by-step design exercises that do not always require internet). Teachers should build a shared repository of Visual Art teaching resources, apply ICT for assessment and feedback, enforce clear classroom routines for device use, and document recurring constraints for structured reporting to School Management Committees and the Mfantseman Municipal Education Directorate. This responds to the finding that teachers value ICT and are willing to learn, but need practical routines and shared support to shift from occasional use to sustained learning activities (Koehler & Mishra, 2009; Hew & Brush, 2007).

5.7 Areas for Further Research

The study provides valuable insights into the integration of ICT in Visual Art education in Ghana, and it opens up several areas for further research. First, a similar study should be conducted in other parts of Ghana for comparison purposes to allow for a clear assessment and evaluation of ICT integration in Visual Art Education in selected Ghanaian Senior High Schools. Second, a study should be conducted to determine the effects of computer-aided instruction and the performance of Visual Art students in

selected Senior High Schools in Mfantseman Municipality. Third, more research is needed to explore the integration of ICT in Visual Arts-related subjects and courses in other levels of education in Ghana, such as primary, junior high, or tertiary education. Fourth, more research is needed to examine the integration of ICT in Visual Art Education in other countries in Africa, to compare and contrast the experiences, challenges, and opportunities of ICT integration in different cultural, economic, and educational contexts.

REFERENCES

Abbott, J. A., & Faris, S. E. (2000). Integrating technology into preservice literacy instructions: A survey of elementary education students' attitudes toward computers. *Journal of research on computing in education*, 33(2), 149-161.

Abedi, E. A. (2023). Tensions between technology integration practices of teachers and ICT in education policy expectations: implications for change in teacher knowledge, beliefs and teaching practices. *Journal of Computers in Education*, 1-20.

Adams, D., & Schvaneveldt, T. (1991). A Short Introduction to Social Research. *Sage Publications,* 199–229.

Adarkwah, C. K. (2020). Challenges and opportunities of ICT integration in education: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*, 16(1), 4-18.

Adarkwah, C. K. (2021). ICT integration in education: A case study of teachers' experiences and perceptions in Ghana. International *Journal of Education and Development using Information and Communication Technology,* 17(1), 19-34.

Adarkwah, M. A. (2021). "I'm not against online teaching, but what about us?": ICT in Ghana post Covid-19. *Education and information technologies*, *26*(2), 1665-1685.

Adjin-Tettey, T. D., Selormey, D., & Nkansah, H. A. (2022). Ubiquitous Technologies and Learning: Exploring Perceived Academic Benefits of Social Media Among Undergraduate Students. *International Journal of Information and Communication Technology Education (IJICTE)*, *18*(1), 1-16.

Afshari, M., Bakar, K. A., Luan, W. S., Samah, B. A., & Fooi, F. S. (2009). Factors affecting teachers' use of information and communication technology. *International Journal of Instruction*, 2(1). 84.

Agrahari, R. (2016). The nature of educational reform and change: From teacher-centred to student-centred learning. *Educational Quest-An International Journal of Education and Applied Social Sciences*, *7*(2), 133-139.

Agyedu, G. O. Donkor, F., & Obeng, S. (2013). Teach yourself research methods. *Payless Publication Limited*, 91-142.

Agyei, D. D., & Voogt, J. (2011). ICT use in the teaching of mathematics: Implications for professional development of pre-service teachers in Ghana. *Education and Information Technologies*, 16(4), 423-439.

Akbaba-Altun, S. (2006). Complexity of integrating computer technologies into education in Turkey. *Journal of Educational Technology & Society*, 9(1), 176-187.

Albion, P. R. (1999). Self-efficacy beliefs as an indicator of teachers' preparedness for teaching with technology. In the Society for Information Technology & Teacher Education International Conference. *Association for the Advancement of Computing in Education (AACE)*,1602-1608.

Albugami, S., & Ahmed, V. (2015). Success factors for ICT implementation in Saudi secondary schools: From the perspective of ICT directors, head teachers, teachers and students. *International Journal of education and development using ICT*, 11(1): 36-54.

AlDaajeh, S., Saleous, H., Alrabaee, S., Barka, E., Breitinger, F., & Choo, K. K. R. (2022). The role of national cybersecurity strategies in the improvement of cybersecurity education. *Computers & Security*, 102754.

Alessi, M. S., & Trollip, S. R. (2001). Multimedia for Learning, Methods and Development. *A Pearson Education*: 167-201.

Almiron-Roig, N. (2007). ICTs and financial crime: An innocent fraud?. *International Communication Gazette*, 69(1), 51-67.

Al-Oteawi, S. M. (2002). The perceptions of administrators and teachers in utilising information technology in instruction, administrative work, technology planning and staff development in Saudi Arabia. [Doctoral dissertation] *Ohio University*, 123-250.

Al-Sharija, M. (2012). Leadership practices of Kuwaiti secondary school principals for embedding ICT (Doctoral dissertation, Queensland University of Technology). *QUT ePrints*, 36.

Altun, T, & Akyildiz, S. (2017). Investigating Student Teachers' Technological Pedagogical Content Knowledge (TPACK) Levels Based on Some Variables. *European Journal of Education Studies,* 3(5), 467-485.

Amedeker, M. K. (2020). Changing Educational Policies: Implications for ICT Integration in Science Instruction and performance of students in Ghanaian Senior High Schools. *Educational Technologies (ICEduTech),* 72-78.

Amin, J. N. (2016). Redefining the role of teachers in the digital era. *The International Journal of Indian Psychology*, 3(3), 40-45.

Ammade, S., Mahmud, M., Jabu, B., & Tahmir, S. (2020). TPACK Model-Based Instruction In Teaching Writing: An Analysis of TPACK Literacy. *International Journal of Language Education*, 4(1), 129-140.

Amponsah, K. D. (2022). The Impact of Internet Usage on Students' Success in Selected Senior High Schools in Cape Coast Metropolis, Ghana. *European Journal of Educational Sciences*, *9*(2), 1-18.

Amponsah, S., & Boateng, F.K. (2021). ICT infrastructure available and utilisation in Ghanaian senior high schools. *Journal of Education and Practice*, 12(18), 45-54.

An, S., Kulm, G., & Wu, Z. (2004). The pedagogical content knowledge of middle school mathematics teachers in China and the US. *Journal of mathematics teacher education*, 7, 145-172.

Anderson, A., Barham, N., & Northcote, M. (2013). Using the TPACK framework to unite disciplines in online learning. *Australasian Journal of Educational Technology*, 29(4), 549-565.

Anderson, S. E., & Maninger, R. M. (2007). Preservice teachers' abilities, beliefs and intentions regarding technology integration. *J. Educational Computing Research,* 37(2), 151-172.

Anderson, T., Varnhagen, S., & Campbell, K. (1998). Faculty adoption of teaching and learning technologies: Contrasting earlier adopters and mainstream faculty. *The Canadian Journal of Higher Education,* 28(2), 71-98.

Andyani, H., Setyosari, P., Wiyono, B., & Djatmika, E. (2020). Does technological pedagogical content knowledge impact on the use of ICT in pedagogy?. *International Journal of Emerging Technologies in Learning (iJET)*, 15(3), 126-139.

Ang'ondi, E. K. (2013). Teachers' Attitudes and perceptions on the use of ICT in teaching and learning as observed by ICT champions. In *Proc. 10th IFIP World Conference on Computers in Education,* 5-11.

Angell, D., Ryder, T., & Scott (2005). Information and Communication Technology for Administration and Management for secondary schools in Cyprus. *Journal of Online Learning and Teaching*, 4(3), 135-147.

Angrosino, M. V. (2005). Project in ethnographic research. *Waveland Press*, 729 – 746

Apawu, J., Yidana, I., & Apeanti, W. O. (2012). ICT Integration Level of Mathematics Tutors of Colleges of Education in Ghana. *International Journal of Pedagogy, Policy and ICT in Education*, 2(1), 25-36.

Asamoah, R., Asiedu, N. K., & Buadi, D. W. (2022). Use of ICT in teaching and learning in second-cycle institutions: understanding the technological aspect of the TPack model. *UDS International Journal of Development*, 9(1), 737-748.

Asiamah, N., Mensah, H., & Oteng-Abayie, E. F. (2017). General, target, and accessible population: Demystifying the concepts for effective sampling. *The qualitative report*, *22*(6), 1607-1621.

Asiri, M. J. S., Bakar, K. A., & Ayub, A. F. B. M. (2012). Factors influencing the use of learning management systems in Saudi Arabian higher education: A theoretical framework. *Higher Education Studies*, 2(2), 125-137.

Awoyemi, M. O., & Durate, S. N. (2007). Research Methodology in Education. *K.N.I?.Ltd*, 101-183.

Baeten, M., Kyndt, E., Struyven, K and Dochy, F. (2010). Using student-centred learning environments to stimulate deep approaches to learning: Factors encouraging and discouraging their effectiveness. *Educational Research Review,* 5(1), 243-260.

Bain, C. D., & Rice, M. L. (2006). The influence of gender on attitudes, perceptions, and uses of technology. *Journal of Research on Technology in Education*, 39(2), 119-132.

Balanskat, A. (2006). ICT impact report. *European Schoolnet*, 1, 1- 71.

Koehler, M. J., Mishra, P., Akcaoglu, M., & Rosenberg, J. M. (2013). The technological pedagogical content knowledge framework for teachers and teacher educators. *ICT integrated teacher education: A resource book*, 2-7.

Banson, M. O. (2022). Achieving Quality and Equity in Ghana's Secondary Education: Strategies, Opportunities, and Constraints (Master's thesis, Oslomet-storbyuniversitetet). *ODA Oslomet,* 1-94.

Banyard, P., Underwood, J., Kerlin, L., & Stiller, J. (2011). Virtual learning environments: Personalising learning or managing learners? In M. Thomas (Ed.), *Digital education: Opportunities for social collaboration,* 123-141

Baya'a, N., & Daher, W. (2015). The Development of College Instructors' Technological Pedagogical and Content Knowledge. *Procedia - Social and Behavioural Sciences*, 174, 1166-1175.

Barfi, K. A., Bervell, B. & Arkorful, V. (2021). Integration of social media for smart pedagogy: initial perceptions of senior high school students in Ghana. *Education and Information Technologies*, 26 (3), 3033-3055.

Barker, B. O., & Bills, L. (1999). Engaged learning using the Internet: SURWEB as a student-focused learning tool. *ERIC Document Reproduction Service*, (439), 691.

Batra, S., & Kumar, S. (2022). Amalgamation of ICT in Education during COVID-19. *RESEARCH REVIEW International Journal of Multidisciplinary*, *7*(2), 71-74.

Bell, J. (2010). Doing your research project: A guide for first-time researchers in education, health and social sciences. *Maidenhead,* 24-40.

Bereczki, E. O., & Kárpáti, A. (2018). Teachers' beliefs about creativity and its nurture: A systematic review of the recent research literature. *Educational Research Review*, 23, 25–56.

Bertot, J.C., Jaeger, P. T., & Justin M. G. (2010). Using ICTs to Create a Culture of Transparency: E-government and social media as Openness and Anti-corruption Tools for Societies. *Government Information Quarterly,* 27(3) 264-1.

Best, J. & Kahn, J. (2006). Education research. *Prentice Hall, Inc.,*51-73.

Bhattacharjee, B., & Deb, K. (2016). Role of ICT in 21st Century Teacher Education. *International Journal of Education and Information Studies*, 6(1), 1-6.

Bhattacharya, I., & Sharma, K. (2007). India in the knowledge economy–an electronic paradigm. *International journal of educational management*, *21*(6), 543-568.

Bindu H. (2018). How the role of a teacher has evolved. *Deccan Herald*, 669781. Retrieved 26/6/2022 From https://www.deccanherald.com/content/ 669781/how-role-teacher-has-evolved.html

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science &Technology Education*, 5(3), 235-245.

Binkley, T. (1995). Autonomous Creations. *Leonardo,* 3(5), 333-336.

Birch, A. & Irvine, V. (2009). Preservice teachers' acceptance of ICT integration in the classroom: Applying the UTAUT model, *Educational Media International,* 46, 295- 315.

Boakye, K. B., & Banini, D. A. (2008). *Teacher ICT readiness in Ghana*. In K. Toure, T. M. S. Tchombe, & T. Karsent (Eds.), ICT and changing mindsets in education. ERNWACA/ROCARE, 147-152.

Boni, R. K. (2018). The use of ICT for teaching and learning in senior high schools in Ghana: A study of Nungua and Presbyterian, Teshie [Master's thesis, University of Ghana, Legon] *UGSpace,* 74-82.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom. 1991 ASHE-ERIC higher education reports*. ERIC Clearinghouse on Higher Education, The George Washington University, One Dupont Circle, Suite 630, Washington, DC 20036-1183.

Borteye, L. Joppe, R. J., & Kombo, Y. (2010). Research fundamentals. *Harper Collins Publishers,* 31-43.

Brantley-Dias, L., & Ertmer, P. A. (2013). Goldilocks and TPACK: Is the Construct 'Just Right? *Journal of Research on Technology in Education*, 46(2), 103-128.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77.

Breiner, J. M., Harkness, S. S., Johnson, C. C., & Koehler, C. M. (2012). What is STEM? A discussion about conceptions of STEM in education and partnerships. *School Science and Mathematics*, 112(1), 3-11.

Bricyboateng.com (2021). Ges to organize ict training for teachers across the country. *Bricyboateng Online*, 2021. https://bricyboateng.com/ges-to-organize-ict-training-for-teachers-across-the-country-check-deadline/.

Bryman, A. (2008). Social Research Methods. *Oxford University Press*, 5-10.

Bryman, A. (2012). Social Research Methods. (4th Ed.), *OUP Oxford,* 12-35

Buabeng-Andoh, C. (2017). An investigation of educational use of information and communication technology from the perspectives of Ghanaian students. *International Journal of Information and Communication Technology Education*, 13(3), 40–52.

Buabeng-Andoh, C. (2012). An exploration of teachers' skills, perceptions and practices of ICT in teaching and learning in the Ghanaian second-cycle schools. *Contemporary educational technology*, 3(1), 36-49.

Buabeng-Andoh, C., & Yidana, I. (2015). Teachers' ICT usage in second cycle institutions in Ghana: a qualitative study. *International Journal of Education and Development Using Information and Communication Technology*, 11(2),104-112.

Bueno-Alastuey, M. C., Villarreal, I., & García-Esteban, S. (2018). Can telecollaboration contribute to the TPACK development of pre-service teachers? *Technology, Pedagogy and Education,* 27(3), 367-380.

Bullocl, D. (2004). Moving from theory to practice: An examination of the factors that pre-service teachers encounter as they attempt to gain experience teaching with technology during field placement experiences. *Journal of Technology and Teacher Education*, 12(2), 211-237.

Burns, S. N., & Grove, S. K. (2003). Understanding nursing research. *Philadelphia: Saunders,* 35-41

Burns, N., & Grove, S. K. (2003). The Practice of Nursing Research: Conduct, Critique and Utilisation. *WB Saunders*, 31-39.

Bush, T. (2008). Leadership and management development in education. *Leadership and Management Development in Education*, 1-184.

Cabero-Almenara, J., Roig-Vila, R., & Mengual-Andrés, S. (2017). Technological, Pedagogical, and Content Knowledge of Future Teachers according to the TPACK model. *Digital Education Review*, 32, 73-84.

Cameron, K. S., Quinn, R. E., DeGraff, J., & Thakor, A. V. (2022). Competing values leadership. *Edward Elgar Publishing*,122-124.

CBSNEWS (2023). Prepare for next pandemic, future pathogens with "even deadlier potential" than COVID, WHO chief warns. *CBSNEWS*, 2023. *Available at*: https://www.cbsnews.com/news/next-pandemic-threat-pathogen-deadlier-than-covid-world-health-organization/

Cejas-León, R., Navío-Gámez, A., & Barroso-Osuna, J. (2016). The university teacher's abilities from the TPACK model (technological and pedagogical content knowledge). *Píxel-Bit: Revista de Medios y Educación,* 49, 105-119.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology & Society*, 13(4), 63-73.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A Review of Technological Pedagogical Content Knowledge. *Educational technology & society*, 16(2), 31-51.

Chai, C. S., Koh, J. H. L., Tsai, C. C., & Tan, L. L. W. (2011). Modelling primary school pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) for meaningful learning with information and communication technology (ICT), *Computers & Education*, 57(1), 1184–1193.

Chai, C. S., Tan, L., Deng, F., & Koh, J. H. L. (2017). Examining Pre-service Teachers' Design Capacities for Web-Based 21st Century New Culture of Learning. *Australasian Journal of Educational Technology*, 33(1), 1-20.

Chalkiadaki, A. (2018). A systematic literature review of 21st century skills and competencies in primary education. *International Journal of Instruction, 11(3), 1*-16.

Charalambous, C. Y., Hill, H. C., Chin, M. J., & McGinn, D. (2020). Mathematical content knowledge and knowledge for teaching: Exploring their distinguishability and contribution to student learning. *Journal of Mathematics Teacher Education*, 23(1), 579– 613.

Chen, C H. (2008). Why Do Teachers Not Practice What They Believe Regarding Technology Integration?. *Journal of Educational Research* 102(1), 65-75.

Chen, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviours with educational technology. *Computers & Education* 54(1), 103-112.

Chen, Y. H., & Jang, S. J. (2014). Interrelationship between Stages of Concern and Technological, Pedagogical, and Content Knowledge: A study on Taiwanese senior high school in-service teachers. *Computers in Human Behaviour*, 32, 79-91.

Cheng, G., Guan, Y., & Chau, J. (2016). An empirical study towards understanding user acceptance of bring your own device (BYOD) in higher education. *Australasian journal of educational technology*, *32*(4), 1-17.

Cheng, S. L., & Xie, K. (2018). The relations among teacher value beliefs, personal characteristics, and TPACK in intervention and non-intervention settings. *Teaching and Teacher Education*, 74, 98-113.

Cheng, Y. (2009). Teacher management and educational reforms: Paradigm shifts. *Prospects*, 39(1), 69–89.

Cheryl, H. W. (2005). Educational technologists in Higher Education Institutions in South Africa. *Moving beyond random acts of progress*, *4*(1), 355-361.

Chua, J. H., & Jamil, H. (2014). The Effect of Field Specialisation Variation on Technological Pedagogical Content Knowledge (TPACK) Among Malaysian TVET Instructors. *The Malaysian Online Journal of Educational Technology*, 2(1), 36-44.

Churchill, G. A., & Iacobucci, D. (2005). Marketing Research: Methodological Foundations. *Thomson South-Western*, 30-61

Citinewsroom, T.V. (2020). Teachers are unhappy with GES's treatment at the training workshop. *Citinewsroom Online*, 2020. *Available at:* https://citinewsroom.com/2020/01/teachers-unhappy-with-ges-over-treatment-at-training-worksop/

Citinewsroom, T.V. (2020). Government to introduce new yearly allowance for teachers. *Citinewsroom Online*, 2020. *Available at:* (https://youtu.be/Td-gco15Nol)https://citinewsroom.com/2020/08/government-to-introduce-new-yearly-allowance-for-teachers/

Cochran, C., DeRuiter, R. & King, W J. (1993). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education*37 (2):163-178.

Cochran, F., DeRuiter, M. G., & King, P. L. (1993). Gender and age differences in employee decisions about new technology: An extension to the theory of planned behaviour. *IEEE Transactions on Engineering Management,* 52(1), 69-84.

Coe, R. (2012). The nature of educational research: Exploring the different understandings of educational research. In J. Arthur, M. Waring, R. Coe and L. Hedges (eds) Research Methods and Methodologies in Education. *Sage*, 1-400.

Colley, A., & Comber, C. (2003). Age and gender differences in computer use and attitudes among secondary school students: What has changed? *Educational Research, 45(2),* 155-165.

Corbeil, G. (2007). Can PowerPoint presentations effectively replace textbooks and blackboards for teaching grammar? Do students find them an effective learning tool? *Calico Journal*, 24(3), 631-656.

Cox, S., & Graham, C. R. (2009). Diagramming TPACK in practice: Using an elaborated model of the TPACK framework to analyse and depict teacher knowledge, *TechTrends*, 53(5), 60–69.

Craig, R. J., & Amernic, J. H. (2006). PowerPoint presentation technology and the dynamics of teaching. *Innov High Educ*, 31, 147-160.

Creighton, T. (2003). The Principal as Technology Leader. *Corwin Press, Inc,* 43-61.

Creswell, J. W. (2003). Research design: Qualitative, quantitative, and mixed methods approaches. (2nd ed.) *Thousand Oaks: Sage*, 9-11.

Creswell, J. W. (2005). Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research (2nd Ed.). *Pearson Merrill Prentice Hall*, 19-267.

Creswell, J. W. (2007). Qualitative inquiry and research design: Choosing among five approaches, (2nd Ed.). *Sage Publications*, 35-350.

Creswell, J. W. (2012). Research design: Qualitative, quantitative, and mixed methods approach. *Sage Publications*, 27-83.

Creswell, J. W. (2013). Qualitative inquiry and research design: Choosing among five approaches, (3rd Ed.). *Sage Publications*, 23-187.

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approach. *Sage Publications*, 1-93.

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research. *Sage publications*, 173-20.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technology in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal*, 38(4), 813–834.

Cubukcuoglu, B. (2015). Factors enabling the use of technology in subject teaching. *International Journal of Education and Development using Information and Communication Technology* (IJEDICT) 9(3), 50-60.

Darling-Hammond, L., & Youngs, P. (2002). Defining Highly Qualified Teachers: What Does Scientifically-Based Research Actually Tell Us? *Educational Researcher*, 31, 13-25.

Das, K. (2019). The role and impact of ICT in improving the quality of education: An overview. *International Journal of Innovative Studies in Sociology and Humanities*, *4*(6), 97-103.

Deaney, R., Ruthuen, K. & Hennessey, S. (2003). Pupils' perspectives on the contribution of Information and Communication Technology to Teaching and learning in the secondary school. *Research papers in education*, 18 (2), 141-165.

deGraft-Yankson, P. (2010). Framework development for integrating information and communication technologies into the Ghanaian senior high school visual art curriculum, PhD thesis. *Dept of General Art Studies, Kwame Nkrumah University of Science and Technology*,1-9.

deGraft-Yankson, P. & Avoke, E. K. (2007). ICT Profile of Ghanaian Senior High Schools - Implications for Visual Art Education in Ghana. *5th International Conference on Arts and Humanities* (pp. 6-10). Available at: http://www.hichumanities.org/2008%20Final%20Program.pdf.

DeJong, & Vandriel McLoughlin, C. (2004). Future Learning Landscapes: Transforming Pedagogy through Social Software. Innovate: *Journal of Online Education,* 4(5), 26.

Denzin N. & Lincoln Y. (Eds.) (2000). Handbook of Qualitative Research. London: *Sage Publication Inc,* 42-51.

Department of Education, U.S. (2002). Technology in Schools. Suggestions, Tools and Guidelines for Assessing Technology in Elementary and Secondary Education, *National Centre for Education Statistics, Office of Educational Research and Improvement, U.S. Department of Education,* 24-114.

Desa, U. N. (2015). World urbanisation prospects: The 2014 revision. United Nations Department of Economic and Social Affairs. *Population Division: New York, NY, USA*, *41*.

Devillis, R. E. (2006). Scale Development: Theory and Application. Applied Social Science Research Method Series. *SAGE Publishers Inc*, 26, 5-13.

Dewey, J. (1908). Does reality possess practical character? The Middle Works 4 (Jo Ann Boydston, Ed.). *Carbondale/Edwardsville: Southern Illinois University Press*, 18-27.

Dewey, J. (1922). Human Nature and Conduct. The Middle Works 14 (Jo Ann Boydston, Ed.). *Carbondale/Edwardsville: Southern Illinois University Press*, 45-55.

Dewey, J. (1925). Experience and Nature. The Later Works 1 (Jo Ann Boydston, Ed.). *Carbondale/ Edwardsville: Southern Illinois University Press*, 2-17.

Dewey, J. (1938). Experience and education. *Collier*, 13-21.

Diamond, M.C. (1991). What are the determinants of children's academic successes and difficulties? *New Horizons for Learning, 3-14.*

Dimitrios, T., & Antigoni, F. (2019). Limitations and Delimitations in The Research Process. *Perioperative nursing (GORNA)*, 7(3), 155–162.

Donelly, D., McGarr, O & O'Reilly, J. (2011). A framework for teachers' integration of ICT into their classroom practice. *Computers & Education* 57(2), 1469-1483.

Dupagne, M. & Krendl, K. A. (1992). Teachers' Attitudes Toward Computers: a review of the literature. *Journal of Research on Computing in Education*, 24, 420-429.

DuPlessis, A. & Webb, P. (2012). Teachers' perception about their own and their schools' readiness for computer implementation: A South African Case Study. *The Turkish OnlineJournal of Educational Technology* 11(3), 312-325.

Duran, M. (2000). Preparing technology-proficient teachers: In C.Crawford et al. (eds), Proceedings of Society for Information Technology and Teacher Education. International Conference. 2000. *Association for the Advancement of Cost Engineering [AACE],* 1343-1348.

Easterby-Smith, A., Golden, P. & Locke, T. (2008). How to design and evaluate education research. *McGraw-Hill Inc.,* 21-33.

Edumadze, J. K. E., & Owusu, A. A. (2013). Use of information and communication technology for teaching and learning in Ghanaian universities: Case of university of Cape Coast. *International Journal of Computing*, 2(6), 266–277.

Ekukinami, T. U. (2002). The status of Application of Information Technology in Primary Schools. *AKSJEMT: Ile-Ife, Obafemi Awolowo University*. 0/1/ 90-97.

Ekunola, G. T., Onojah, A. O., Talatu, A. F., & Bankole, M. O. (2022). Colleges of Education lecturers' attitude towards the use of virtual classrooms for instruction. *Indonesian Journal of Multidisciplinary Research*, *2*(1), 187-194.

El Hussein, M., Hirst, S., Salyers, V., & Osuji, J. (2014). Using grounded theory as a method of inquiry: Advantages and disadvantages. *The Qualitative Report*, 19(27), 1-15.

Ertmer, A. P. (2005). Teacher Pedagogical Beliefs: The final Frontier in our Quest for Technology Integration?. *Educational Technology Research and Development*, 53 (4), 25- 39.

Ertmer, P. A. (1999). Addressing First- and Second-Order Barriers to Change: Strategies for Technology Integration. *Educational Technology Research and Development*, 47(4), 47-61.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255-284.

Ertmer, P. A., Kleickmann, E., Richter, T., Kunter, W., Elsner, Y., Besser, I., & Baumert, S. (2012). The role of information and communication technology (ICT) in higher education for the 21st century. *The Science Probe*, 1(1), 30-40.

Estes, J. S., & Dailey-Hebert, A. (2018). Modelling Technology Integration in Teacher Preparation Programs. In J. Keengwe (Ed.), *Handbook of Research on Pedagogical Models for Next-Generation Teaching and Learning* (pp. 82–97).

Eteokleous, N. (2008). Evaluating computer technology integration in a centralised school system. *Computers & Education* 51(2), 669-686.

Etudor-Eyo, E., Ante, H.A., &Emah, E.I. (2011). Use of ICT and Communication Effectiveness among Secondary School Administrators. *Journal of Education and Sociology*, 2(1), 23-31.

Schoolnet, E. U. (2010). Summary: Netbook pre-pilot evaluation for teachers. *IGI Global*, 1525-1536. *Available at: http://www. eun. org/web*.

Evens, M., Elen, J., & Depaepe, F. (2015). Developing pedagogical content knowledge: Lessons learned from intervention studies. *Education Research International*, *2015*.

Evoh, J. C. (2007). Collaborative Partnerships and the Transformation of Secondary Education through ICTs in South Africa. *Educational Media International* 44(2)81-89.

Farren, M., & Kilboy, L. (2015). The transformative potential of action research and ICT in the second language (L2) classroom, *University Teaching Roundtable [UTR],* 2 (2), 49-59.

Fathima, S. (2013). Challenges of ICT in the teaching learning process. *International Journal of Engineering And Science*, 2, 51-54.

Fernández-Balboa E. & Stiehl, A. (1995). Teachers' attitudes toward technology integration in a Kazakhstani secondary school. *International Journal of Research in Education and Science (IJRES).*2(2*)*.322-332.

Flanagan, L. & Jacobsen, L. (2003). Technology leadership for the twenty-first century principal. *Journal of Educational Administration*, 41(2), 124-142

Fox, R. J. (2010). Nonprobability sampling. *Wiley International Encyclopedia of Marketing*, 526–535.

Frida, M. (2002). Sampling in Research. *The University of Central Arkansas,* 25-51.

Friedrichsen, P. J., Abell, S., Pareja, E. M., Brown, P. L., Lankford, D. M., & Volkmann, M. J. (2009). Does teaching experience matter? Examining biology teachers' prior knowledge for teaching in an alternative certification program. *Journal of Research in Science Teaching*, 46(4), 357– 383.

García, J. M. G. V., García-Carmona, M., Trujillo Torres, J. M., & Moya-Fernández, P. (2022). Teacher Training for Educational Change: The View of International Experts. *Contemporary Educational Technology*, *14*(1).

Gao, P., Wong, A. F. L., Choy, D., & Wu, J. (2010). Developing leadership potential for technology integration: Perspectives of three beginning teachers. *Australasian Journal of Educational Technology,* 26(5), 643–658.

Gay, LR (1992). Education, Research, Competencies for Analysis Adaptation. *McGraw-Hill Inc.*, 21-33.

Gess-Newsome, J. (2015). A model of teacher professional knowledge and skill, including PCK: Results of the thinking from the PCK Summit. In A. Berry, P. J. Friedrichsen, & J. Loughran (Eds.), Re-examining pedagogical content knowledge in science education. *Routledge*, (pp. 28–42).

Gev, Y. (1995). ISE – Information System in Education. In H. Barta, B., Telem, M., & Gev, Y (Eds.). Information Technology in Educational Management. *Chapman & Hall,* 46-47.

Gewerc, A. & Lourdes, M. (2011). Do innovation projects with ICT enhance learning? Experiences from case studies in Galician schools, *Journal for Educational Research Online,* 3(1), 56–74.

Ghana Education Service (GES). (2020). ICT in education policy framework, *Ministry of Education*, 12-28.

Ministry of Education (2018). National pre-tertiary education curriculum framework. Accra, Ghana: Ministry of Education, 1-22.

Ghana Ministry of Education (2015). ICT in Education Policy. *Republic of Ghana, 1-15.*

Ghana Ministry of Education (2009). Report on e-Readiness Assessment of Second Cycle Institutions in Ghana, ICT in Education Programmes Unit. *Ministry of Education*, 1-32.

Ghana Ministry of Education (2009). ICT in education policy. *Republic of Ghana*, 1-10.

Ghana Ministry of Education (2008). Draft ICT Education policy. *Republic of Ghana*, 10-15.

Ghana Ministry of Education (2003). Ghana ICT Policy Statement for Accelerated Development. *Republic of Ghana*, 1-15.

Gherman, I. (2018). Text and Image in the Digital Age–The Digital Revolution. *Open Journal for Information Technology*, *1*(1), 13.

Gillies, C. G. M. (2016). To BYOD or not to BYOD: factors affecting academic acceptance of student mobile devices in the classroom. *Research in Learning Technology*, 24. doi: 10.3402/rlt.v24.30357.

Goktas, K., Hermans, E., Tondeur, J., van Braak, J., & Valcke, M. (2009). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers& Education* 51(4), 1499-1509.

Gomes, C. (2005). Integration of ICT in science teaching: A study performed in the Azores, Portugal. *Recent research developments in learning technologies*, *13*(3), 63-71.

Gómez, M. (2015). When Circles Collide: Unpacking TPACK Instruction in an Eighth-Grade Social Studies Classroom. *Computers in the Schools*, 32(3), 278-299.

Gorder, L. M. (2008). A study of teacher perceptions of instructional technology integration in the classroom. *The Delta Pi Epsilon Journal,* 2, 63 – 76.

Gosmire, D., & Grady, M. (2007). A bumpy road: Principal as technology leader. *Principal Leadership*, 7(6), 17–21.

Graetz, F., Rimmer, M., Lawrence, A., & Smith, A. (2006). Managing organisational change (2nd ed.). *Deakin University: John Wiley & Sons*, 20-79.

Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, 57(3), 1953–1960.

Gregory, D. C. (2009). Boxes with Fire: wisely integrating learning technologies in the art classroom. *Art Education*, 62(3), 47-54.

Grey, C.J. (2005). Knowledge management practices for sustainable construction: Political tensions in engineering ICT knowledge tools in the private and public sectors, Information, Knowledge and Management: re-assessing the role of ICTs in public and private organisations. *Rome Superior School of Public Administration, ESRC, the University of Manchester, UMIST and the University of Pisa,* 3-19.

Grossman, C. C., & McDonald, C. M. (2008). What is STEM? A discussion about conceptions of STEM in education and partnerships. *School Science and Mathematics*, 112(1), 3-11.

Grossman, P. L. 1990. The Making of a Teacher: Teacher Knowledge and Teacher Education. *Teachers College Press*, 21-32

Grouws, D. & Schultz, K. (1996). *Mathematics teacher education*. J. Sikula (Ed) Handbook of Research on Teacher Education. *Macmillan* 30-81.

Guba, E. G., and Y. S. Lincoln (1994). Competing Paradigms in Qualitative Research. In Handbook of Qualitative Research, edited by N. K. Denzin and G. S. Lincoln. *Sage*, 105–117.

Gudmundsdottir, C. & Shulman, L. S. (1987). Digital Teaching. London: *Thames & Hudson Ltd.,* 5-19.

Gudmundsdottir, C. R. (1999), Diagramming TPACK in practice: Using an elaborated model of the TPACK framework to analyse and depict teacher knowledge, *TechTrends*, 53(5), 60–69.

Gudmundsdottir, S., & Shulman, L. (1987). Pedagogical Content Knowledge in Social Studies. *Scandinavian Journal of Educational Research* 31(2), 59–70.

Gulbahar, Y., & Guven, I. (2008). A survey on ICT usage and the perceptions of social studies teachers in Turkey. *Educational Technology & Society*, 11(3), 37-51.

Gulsecen, S., & Kubat, A. (2006). Teaching ICT to teacher candidates using PBL: A qualitative and quantitative evaluation. *Educational Technology and Society* 9(2): 96-106

Gunter, D. & Gunter, A. (2015). Teachers' attitudes towards information and communication Technologies: The case of Syrian EFL teachers. *Computer and Education* 47(4) 373-398.

Gwang-Jo, K. (2009). ICT in education: issues & questions. In the *Global Symposium on ICT in Education*, 9-11.

Gyampoh, A. O., Ayitey, H. K., Fosu-Ayarkwah, C., Ntow, S. A., Akossah, J., Gavor, M., & Vlachopoulos, D. (2020). Tutor perception on personal and institutional preparedness for online teaching-learning during the COVID-19 crisis: The case of Ghanaian Colleges of Education. *African Educational Research Journal*, 8(3), 511-518.

Hadjithoma-Garstka, C. (2011). The role of the principal's leadership style in the implementation of ICT policy. *British Journal of Educational Technology*, 42(2), 311–326.

Hadley, M. & Sheingold, K. (1993) Commonalities and Distinctive Patterns in Teachers' Integration of Computers, *American Journal of Education*, 101, 261-315.

Hargreaves, A. (2000). Four Ages of Professionalism and Professional Learning. *Teachers and Teaching: History and Practice*, 6, 151-182.

Halim D. & Meerah, M, (2002). Importance of ICT in Education. *Journal of Research & Method in Educ*ation (*IOSR-JRME*), 1(4), 03-08.

Hammond, M and Wellington, J. J. (2013). Research methods: the key concepts. *Routledge, 2-21.*

Hamzah, M. I. M., Nordin, N., Jusoff, K., Karim, R A., & Yusof, Y. (2010). A Quantitative Analysis of Malaysian Secondary School Technology Leadership. *Management Science and Engineering*, 4 (2), 124-130.

Hannafin, M.J., Land, S., & Oliver, K. (1999). Open learning environments: Foundations, methods, and models. In C. Reigeluth (Ed.), Instructional Design Theories and Models. *Mahwah, NJ: Lawrence Erlbaum Associates*, 115-140.

Hennessy, S., Ruthven, K., & Brindley, S. 2005. Teacher Perspectives on Integrating ICT Into Subject Teaching: Commitment, Construction, Caution and Change. *Journal of Curriculum Studies*, 37 (2), 155-192

Henning, W., van Rensburg, & Smit, B. (2004). Finding your way in qualitative research. *Van Schaik,* 19-30.

Hermans, E., Tondeur, J., van Braak, J and Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers& Education,* 51(4), 1499-1509.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, 55(3), 223-252.

Hicks, J. (1993). The age of the electronic image: The effect on art education. *Art Education*, *46*(6), 43-47.

Hill, H.C., Schilling, S.G., & Ball, D.L. (2004). Developing measures of teachers' mathematics knowledge for teaching. *Elementary School Journal*, 105, 11-30.

Hill, H.C., Ball, D.L., & Schilling, S.G. (2008). Unpacking pedagogical content knowledge: Conceptualising and measuring teachers' topic-specific knowledge of students. *Journal for Research in Mathematics Education,* 39, 372-400.

Hill, M., Ball, H., & Schilling, P. (2008). Introducing TPCK: In AACTE Committee on Innovation and Technology (Ed.), Handbook of Technological Pedagogical Content Knowledge (TPCK). *Routledge/Taylor & Francis Group*, 17-28.

Honan, E. (2008). Barriers to teachers using digital texts in literacy classrooms. *Literacy*, *42*(1), 36-43.

Hove, S. E., & Anda, B. (2005). Experiences from conducting semi-structured interviews in empirical software engineering research. In *11th IEEE International Software Metrics Symposium (METRICS'05)*,10.

Howell, C., Lundall, P. & Patrick, M. (2000). Computers in Schools: A national survey of Information Communication Technology in South African Schools. Cape Town: *Education Policy Unit, University of the Western Cape,* 30-187.

Howey, A., & Grossman, C. (1989). Age and gender differences in computer use and attitudes among secondary school students: What has changed? *Educational Research, 45(2),* 155-165.

Huang, H. M., & Liaw, S. S. (2005). Exploring users' attitudes and intentions toward the Web as a survey tool. *Computers in Human Behaviour*21 (5), 729–743.

Imansari, N., Mukhadisb, A., Hadi, S., Elmunsyah, H. (2020). Development of Technological Pedagogical Content Knowledge (TPACK) Through Blended Learning for Vocational Teacher Candidates. *International Journal of Innovation, Creativity and Change*, 11. Retrieved 26/06/2022 From www.ijicc.net

Intsiful, J., Okyere, P. F., & Osae, S. (2003). Use of ICT for education, research and development in Ghana: Challenges, opportunities and potentials. 2003 Round Table on Developing Countries' Access to Scientific Knowledge. *Journal of Technology Transfer,* 25, 329-342.

IOWA Department of Education. (1989). A guide for Integrating global education across the Curriculum. *Des Moines*, 21-27.

Iserbyt, P., Ward, P., & Li, W. (2017). Effects of improved content knowledge on pedagogical content knowledge and student performance in physical education. *Physical Education and Sport Pedagogy*, *22*(1), 71-88.

Ivanković, A., Špiranec, S., & Miljko, D. (2013). ICT Literacy among the Students of the Faculty of Philosophy, University of Mostar. *Procedia-Social and Behavioural Sciences*, *93*, 684-688.

Izmirli, O. S., & Kirmaci, O. (2017). New barriers to technology integration. *Eurasian Journal of Educational Research*, *17*(72), 147-166.

Jimoyiannis, A., & Komis, V. (2007). Examining teachers' beliefs about ICT in education: Implications of a teacher preparation programme. *Teacher Development*, 11(2), 149-173.

Johnson, P., Buehring, A., Cassell, C., & Symon, G. (2006). Evaluating qualitative management research: Towards a contingent criteriology. *International Journal of Management Reviews*, 8(3), 131-156.

Jonassen, D.H., & Carr, C.S. (2000). Mindtools: Affording multiple knowledge representations for learning. In S.P., Lajoie (Ed.), Computers as Cognitive Tools, Volume Two: No More Walls. Mahwah (NJ): *Lawrence Erlbaum Associates,* 48-63.

Jones, A. (2004). A Review of the Research Literature on Barriers to the Uptake of ICT by Teachers. *BECTA ICT Research*, 3-29.

Jones, B. H., Chin, A. G., & Aiken, P. (2014). Risky business: Students and smartphones. *TechTrends*, 58(6), 73–83.

Judge, S. (2005). Implementing partnerships across the curriculum with technology (ImPACT). *Journal of Research on Technology in Education*, 37(2), 197-213.

Jules Van Belle, G.C. and Soetaert, R. (2001). Breakdown into the virtual user-involved design and learning. *Journal of Technology and Teacher Education*, 9(1), 31-42

Jung, J., S. Park, J. Jang, and Y. Chen (2011). Is Pedagogical Content Knowledge (PCK) Necessary for Reformed Science Teaching? Evidence from an Empirical Study. *Research in Science Education*, 41 (2): 245–260.

Kabakçı Yurdakul, I. (2011). Examining technopedagogical competencies of preservice teachers based on their use of information and communication technologies. *Hacettepe University Journal of Education*, 40(40), 397-408.

Kalogiannakis, M., & Papadakis, S. (2019). Evaluating pre-service kindergarten teachers' intention to adopt and use tablets in teaching practice for natural sciences. *International Journal of Mobile Learning and Organisation*, 13(1), 113-127.

Kalusopa, T. (2005). The challenges of utilising information and communication technologies (ICT) for the small-scale farmers in Zambia. *Library Hi Tech,* 23 (3), 414 – 424.

Kara, S. (2021). An Investigation of Technological Pedagogical and Content Knowledge (TPACK) Competencies of Pre-Service Visual Arts Teachers. *International Journal of Technology in Education*, *4*(3), 527-541.

Karl, K. (2000). Democratic Governance and New Technology. Technologically Mediated Innovations in Political Practices in Western Europe. *Routledge, ECPR European Politics Series,*33-47.

Karsenti, T., Savoie-Zajc, J. and Larose, F. (2001). The ICT Pedagogical Approaches in Universities. *Quebec University Press*, 21-37.

Kartal, B. & Cinar, C. (2018). Examining Pre-Service Mathematics Teachers' Beliefs of TPACK during a Method Course and Field Experience. *Malaysian Online Journal of Educational Technology,* 6(3), 11- 37.

Kawulich, B. (2012). Collecting data through observation. *Doing social research: A global context, 6*(12), 150-160.

Kaya, Z., Kaya, O. N., Aydemir, S., & Ebenezer, J. (2021). Knowledge of student learning difficulties is a plausible conceptual change pathway between content knowledge and pedagogical content knowledge. *Research in Science Education*, 1-33.

Kearney, M., & Treagust, D.F. (2001). Constructivism as a referent in the design and development of a computer program using interactive digital video to enhance learning in physics. *Australian Journal of Education Technology*, 17(1), 64-79.

Keating, T., & Evans, E. (2001). Three Computers in the back of the classroom: Pre-service Teachers' conceptions of technology integration. In the Society for Information Technology & Teacher Education International Conference. *Association for the Advancement of Computing in Education (AACE)*, 1671-1676.

Khan, S. H. (2014). A model for integrating ICT into teacher training programs in Bangladesh. *International Journal of Education and Development using Information and Communication Technology*, 10 (3), 21-31.

King, A. (1993). From Sage on the Stage to Guide on the Side. *College Teaching*: 41(1), 30-35.

Kirk, D. (2007). The Foundations of Qualitative Research. *Manchester Metropolitan University,*21-43.

Kirk, J. & Miller, M.L. (1986). Reliability and validity in Qualitative research. *Sage*, 20-36.

Kleickmann, E., Richter, T., Kunter, W., Elsner, Y., Besser, I., Krauss, W., & Baumert, S. (2013). The role of information and communication technology (ICT) in higher education for the 21st century. *The Science Probe*, 1(1), 30-40.

Koballa, R., Graber, K., Coleman, L., & Kemp. O, (1999). Situating ICT in the teacher education program: Overcoming challenges, fulfilling expectations. *Teaching and Teacher Education,* 28(3): 461-469.

Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)?. *Journal of Education*, 193(3), 13-19.

Koehler, M. J., Mishra, P., Akcaoglu, M., & Rosenberg, J. M. (2013). The technological pedagogical content knowledge framework for teachers and teacher educators. *ICT integrated teacher education: A resource book*, 2-7.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? C*ontemporary Issues in Technology and Teacher Education*, 9(1), 60-70.

Koehler, M.J., & Mishra, P. (2008). Introducing TPCK. In AACTE Committee on Innovation and Technology (Ed.), Handbook of technological pedagogical content knowledge (TPCK) for educators. *Routledge/Taylor & Francis Group,* 3-29.

Koehler, M., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. Journal of Educational Computing Research, 32(2), 131–152.

Kokay, C.M. (2004). ICT decision-making process in self-managing secondary schools. *Griffith Research,* 31-176.

Korte, W. B. & Husing, T. (2006). *Benchmarking access and use of ICT in European schools 2006*: Results from head teachers and a classroom survey in 27 European countries. *Empirica*, 1-27.

Kostis, P. C., & Kafka, K. I. (2022). The European Experience in Lifelong Learning and the Restructuring of the Economy. In Human Capital and Production Structure in the Greek Economy: Knowledge, Abilities, Skills. *Springer International Publishing*, 241-260.

Kothari, C. R. (2007). Research methodology: Methods and techniques (2nd ed.). *New Age International Limited,* 5-39.

Kozma, R. B. (2008). Comparative analysis of policies for ICT in education. In J. Voogt & G. Knezek (Eds.), International handbook of information technology in primary and secondary education. *Springer*, vol. (20), 1083–1096.

Krauss, K. (2013). Collisions between the worldviews of international ICT policy-makers and a deep rural community in South Africa: Assumptions, interpretation, implementation, and reality. *Information Technology for Development*, *19*(4), 296-318.

Krauss, M. J., Brunner, P., Kunter, D., Baumert, W., Neubrand, D., Blum, D., & Jordan, W. (2008). What is technological pedagogical content knowledge (TPACK)?. *Journal of Education,* 193(3), 13-19.

Kusi, H. (2012). Doing Qualitative Research: A Guide for Researchers. *Emmpong Press*, 7-43.

Kutaka, K. (2015). A Proposed Model to Increase Creativity, Collaboration and Accountability in the Online Classroom. *International Journal of Innovation in Engineering and Technology*, 5 (11), 873-876

Kvale, S. (1996). Interviews: Learning the Craft of Qualitative Research Interviewing. *Sage Publications,*16-47.

Kyei-Blankson, L., and Keengwe, J. (2011). Faculty-faculty interactions in online learning environments. *International Journal of Information and Communication Technology Education*, 7: 25–33.

Labaree, D. F. (2006). The trouble with ed schools. *Yale University Press*. 17-62

LaJevic, L. M. (2009). Arts integration: An exploration of the dis/connect between policy 354 and live (d) practice. *Available from ProQuest Dissertations & Theses Global (304982890),* 89-153.

LaJevic, L. M. (2009). Arts integration: An exploration of the dis/connect between policy and live (d) practice. *The Pennsylvania State University*,1-9.

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research*, 77(4), 575-614.

LeCompte, M.D. & Goetz, J.P. (1982). Problems of reliability and validity in ethnographic research. *Review of Educational Research*, 31-60.

Leiva-Núñez, J. P., Ugalde-Meza, L., & Llorente-Cejudo. C. (2018). The tpack model in initial teacher training. *Píxel-Bit: Revista de Medios y Educación,* 53, 165-177.

Liesa-Orús, M., Latorre-Cosculluela, C., Vázquez-Toledo, S., & Sierra-Sánchez, V. (2020). The technological challenge facing higher education professors: Perceptions of ICT tools for developing 21st century skills. *Sustainability*, *12*(13), 5339.

Lin, T.C., Tsai, C. C., Chai, C. S., & Lee, M. H. (2013). Identifying Science teachers' perceptions of technological pedagogical and content knowledge (TPACK). *Journal of Science Education and Technology*, 22, 325–336.

Lincoln, Y.S., & Guba, E.G. (1981). Naturalistic Inquiry. *Sage Publishers*, 7-21.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. *Beverly Hills, CA: Sage Publications, Inc*, 21-332.

Lincoln, Y. S., & Guba, E. G. (1994). The countenances of fourth generation evaluation: Description, judgement and negotiation. Evaluation Studies Review Annual. *Sage Publications*, 31-48.

Lin, Y.-S. (2011). Fostering creativity through education – A conceptual framework of creative pedagogy. *Creative Education*, 2(3), 149–155.

Liu, A. (2006). Research in the Technological, Social, & Cultural Practices of Online Reading. *Peppler: WordPress*, 17-29.

Lobo, G. P., & Sánchez, C. B. (2015). Impact of ICT towards the Deepening and Generation of Knowledge by English Teachers in 98 Elementary Public Schools, Atlantic Department, Colombia. In *Conference proceedings. ICT for language learning*, 157.

Loewen, H. W. (2007). Educational technologists in Higher Education Institutions in South Africa: *Moving beyond random acts of progress*, 355-361.

Lofland, E. (1971). The basics of social research. *Thomson Wadsworth*, 31-46.

Lohr, S. L (2019). Sampling: Design and Analysis. *Cengage Learning*, 24-116.

Lopez, V., & Whitehead, D. (2013). Sampling data and data collection in qualitative research. *Nursing & midwifery research: Methods and appraisal for evidence-based practice*, *123*, 140.

Lortie, C. H. (1975). Why do teachers not practice what they believe regarding technology integration? *Journal of Educational Research,* 102, 65-75.

Loughran, C., Berry, R., & Mulhall, J. (2000). Computers and art education. *ERIC Documentation Reproduction Service,* 21-51.

Loughran, J., Berry, A., & Mulhall, P. (2012). Understanding and Developing Science Teachers' Pedagogical Content Knowledge. *Springer Science & Business Media*, 41-57.

Lu, M. (2003). Evaluating and selecting online magazines for children. *ERIC Documentation Reproduction Service*, 19-32.

Lui, S.H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers & Education,* 56,1012-1022.

Lyimo, D. (2013). Research design in social research. *SAGA Publication*, 31-42.

Machmud, M. T., Widiyan, A. P., and Ramadhani, N. R. (2021). The development and policies of ICT supporting educational technology in Singapore, Thailand, Indonesia, and Myanmar. *International Journal of Evaluation and Research in Education (IJERE), 10(1)*, 78.

Madalane, J., Chauke, O. R., & Motlhaka, H. A. (2022). Abuse of Men's Rights in Selected Xitsonga Drama Texts. *Journal of Pharmaceutical Negative Results*, 13, 1378-1382.

Magnusson, E., Peachey, A., Gillen, J., Livingstone, D., & Smith-Robbins, S. (1999). Researching Learning in Virtual Worlds. *Springer*, 32-47.

Magnusson, S., Krajcik, J., & Borko, H. (1999). Nature, Sources, and Development of Pedagogical Content Knowledge for Science Teaching." In Examining Pedagogical Content Knowledge: The Construct and Its Implications for Science Education, edited by J. Gess-Newsome and N. G. Lederman. *Dordrecht Kluwer,* 95–132.

Maki, C. (2008). Information and Communication Technology for Administration and Management for secondary schools in Cyprus. *Journal of Online Learning and Teaching*, (4)3, 20-37.

Malcom, E., Godwyll, F. (2009). Diffusion of information communication technology in selected Ghanaian schools. *Ohio University*, 17-39.

Malhotra, N. K. (2010). Marketing Research: An Applied Orientation. Sixth Edition, Global Edition. *Pearson Journal of Service Research*, 7, 343-359.

Mangesi, K. (2007). Survey of ICT and Education in Africa: Ghana Country Report. *InfoDev ICT and Education Series,* 1-9.

Marcelle, G. M. (2000). Gender, justice and information and communication technologies (ICTs), presented to the Expert Panel on Emerging issues, trends and new approaches to issues affecting women or equality between men and women at the 44th Session of the United Nations Commission on the Status of Women. *International Development Research Centre*, 35-75.

Marks, R. (1990). Pedagogical Content Knowledge: From a Mathematical Case to a Modified Conception. *Journal of Teacher Education*, 41(3): 3-11.

Martinovic, D & Zhang, Z. (2012). Situating ICT in the teacher education program: Overcoming challenges, fulfilling expectations. *Teaching and Teacher Education* 28(3), 461-469.

Mathenge, D. T. (2013). Factors affecting the outsourcing of accountancy services by Small and Medium Enterprises in Kenya. *International Journal of Social Sciences and Entrepreneurship*, *1*(5), 463-471.

Matthews, J. (1997). Computers and art education. *ERIC Documentation Reproduction Service* 21-37.

Mbodila, M., Jones, T., & Muhandji, K. (2013). Integration of ICT in education: Key challenges. *Scholarly Journal of Mathematics and Computer Science*, *2*(5), 54-60.

McDiarmid, C. S., Vinten, J. & Johansen, W. (2011), Modelling primary school pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) for meaningful learning with information and communication technology (ICT), *Computers & Education*, 57(1). 1184–1193.

McDiarmid, G., & Vinten-Johansen, P. (2000). A catwalk across the great divide: Redesigning the history teaching methods course. In knowing, teaching and learning: National and International Perspectives. *New York University Press*, 27-51.

McLoughlin, C. & Lee, M. J.W. (2008). Future Learning Landscapes: Transforming Pedagogy through Social Software. Innovate: *Journal of Online Education,* 4(5), 18-47.

McMillan, J.H., & Schumacher, S. (2001). Research in Education. A Conceptual Introduction (5th Ed.). *Longman*, 31-57.

Meenakshi (2013). Importance of ICT in Education. *Journal of Research & Method in Education* (*IOSR-JRME*), *1(4),* 03-08.

Mereku, D. K., Yidana, I., Hodasi, J. M., & Ayiku, R. (2009). Ghanaian teachers' TPACK: Implications for professional development. In I. A. Sánchez & P. Isaías (Eds.), Proceedings of the IADIS International Conference on e-Learning. *IADIS Press. 181-188.*

Mereku, D. K., Yidana I, Hodzi W., Tete-Mensah I., Tete-Mensah W., & Williams, J. B. (2009). Pan-African Agenda on Pedagogical Integration of ICT: Phase 1 Ghana report. University of Education, Winneba. Canada: *International Development Research Centre (IDRC),* 11-28.

Merriam, S. B. (1988). Case Study Research in Education. A qualitative Approach. *Jossy-Bass Inc.* 11-87

Merriam, S. B. (2009). Qualitative Research: A guide to design and implementation. *Jossey-Bass*, 4-71

Messick, S. (1995). Standards of Validity and the Validity of Standards in Performance Assessment. *Educational Measurement: Issues and Practice*, 14(4), 5-8.

Mfum-Mensah, O. (2003). Computers in Ghanaian secondary schools: Where does equity come in? *Current issues in comparative education,* 6(1), 40-49.

Miles, D. & Huber, L. (1994). The Foundations of Qualitative Research. *Manchester Metropolitan University*, 13-48.

Ministry of Education - MOE (2009). Report on e-Readiness Assessment of Second Cycle Institutions in Ghana, ICT in Education Programmes Unit. *Ministry of Education,* 9-15.

Mishler, R. (1986). Doing Case Study Research: A Practical Guide for Beginner Researchers. *Teachers College Press*, 13-67.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017-1054.

Monte-Sano, A. (2011). A summary of teacher attitudes to ICT use in schools. *Innovation in Education itec*, 1-8.

Monte-Sano, A., & Budino, T. (2013). From Information to Participation. *The Potential of New Technologies on Accountability Initiatives*, 36-43.

Morris, M. G., Venkatesh, V., & Ackerman, P. L. (2005). Gender and age differences in employee decisions about new technology: An extension to the theory of planned behaviour. *IEEE Transactions on Engineering Management, 52(1),* 69-84.

Mouza, C., & Barrett-Greenly, T. (2015). Bridging the app gap: An examination of a professional development initiative on mobile learning in urban schools. C*omputers & Education*, 88, 1-14.

Moyle, K. (2007, June). How can the value of educational technologies in schools be measured? In EdMedia+ Innovate Learning. *Association for the Advancement of Computing in Education (AACE)*, 130-139.

Mtanga, N., Imasiku, I., Mulauzi, F., & Wamundila, S. (2012). Use of ICT in Education: A Case Study of Selected Urban-Based High Schools in Lusaka, Zambia. *Proceedings of the Twentieth Standing Conference of East, Central and Southern African Library and Information Associations*,1-8.

Mue, J. S. (2014). Application of Information Communication Technology in school administration in public secondary schools in Langata Division, Nairobi County, Kenya. *Unpublished M. ED Thesis*, 1-36.

Murphy, P., Anzalone, S., Bosch, A., & Moulton, J. (2006). Enhancing learning opportunities in Africa: Distance Education and Information and Communication Technologies for Learning. Africa region human development working paper series. *The World Bank*, 4-11.

Mustafina, A. (2016). Teachers' attitudes toward technology integration in a Kazakhstani secondary school. *International Journal of Research in Education and Science (IJRES), 2(2),* 322-332.

Mutiani, M., Supriatna, N., Abbas, E. W., Rini, T. P. W., & Subiyakto, B. (2021). Technological, pedagogical, content knowledge (TPACK): A discourse in learning innovation on social studies. *The Innovation of Social Studies Journal*, *2*(2), 135-142.

Naicker, V. (2010). Educator's pedagogy influencing the effective use of computers for teaching purposes in classrooms: Lessons learned from secondary schools in South Africa. *Educational Research and Review* 5(11), 679-689.

Nardi, E.O. (2005). Introduction to Research Methodology. *Wiley*, 21-37.

Nardi, P. M. (2006). Doing Survey Research: A Guide to Qualitative Methods. *Pearson/Allyn & Bacon*, 108.

Naresh, R. (2020). Education after the COVID-19 crisis based on ICT tools. *Purakala*, *31*(1), 464-468.

Nautiyal, L., Malik, P., & Agarwal, A. (2018). Cybersecurity system: an essential pillar of smart cities. *Smart Cities: Development and Governance Frameworks*, 25-50.

Nazarenko, A. L. (2015). Blended Learning vs Traditional Learning: What works? (A case study research). *Procedia-Social and Behavioural Sciences*, 200, 77-82.

Newby, T., Stepich, D., Lehman, J., and Russel, J. (2000). Instructional technology for teaching and learning. *New Jersey*, 121-138.

Newman, W. L. (2000). Social research methods: Qualitative and quantitative approaches. *Allyn & Bacon,* 23-47.

Niess, M.L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. Teaching and Teacher Education, 21, 509–523.

Norum, K., Grabinger, R.S., & Duffield, J. A. (1999). Healing the universe is an inside job: Teachers' views on integrating Technology. *Journal of Technology and Teacher Education,* 7(3), 187-203.

OECD. (2018). OECD science, technology and innovation outlook 2018. *OECD Publishing*, 1-13.

OECD. (2020). Education responses to COVID-19: Embracing digital learning and online collaboration. *OECE Publishing*, 15-32.

Okonkwo, I. E. (2014). Towards quality art education: Challenges and opportunities. Unizik Journal of Arts and Humanities, 15(1), 110−130. https://doi.org/10.4314/ujah.v15i1.6

Okonkwo, I. E. (2014). Towards quality art education: Challenges and opportunities. Unizik Journal of Arts and Humanities, 15(1), 110−130. https://doi.org/10.4314/ujah.v15i1.6

O'Donnell, D. J. (1999). A study of gender differences in beliefs toward computer technology and factors that influence these beliefs in grades 4, 5, 6, and 7. [Doctoral thesis] *University of Hartford*, 97-315.

Okonkwo, C. A. (2014). A study of science education students' literacy skills for global connectivity in the 21st century. In Abonyi, O. (Ed.), 55th Annual Conference Proceedings of the Science Teachers Association of Nigeria. Ibadan. *Heinemann Educational Books Nigeria Publishers,* 311-319.

Olabe, P. B., & Kahn, T. (2012). From Information to Participation: The Potential of New Technologies on Accountability Initiatives. *Inter-American Development Bank*, 3-27.

Oldfield, A. (2010). A summary of teacher attitudes to ICT use in schools. *Innovation in Education: itec*, 1-8.

Oliva, P. F., & Pawlas, G. E. (2004). Supervision for today's schools. *Jossey-Bass, An Imprint of Wiley. 10475 Crosspoint Blvd*, 20-357.

Oliver, K. & Hannanfin, M. J. (2000). Student Management of Web-based Hypermedia Resources during Open-Ended Problem Solving. *Journal of Educational Research*, 94(2), 75-92.

Opoku, M. P. (2016). ICT education in Ghana: An evaluation of challenges associated with the teaching and learning of ICT in Basic schools in Atwima Nwabiagya District in Ashanti Region. *European Journal of Alternative Education Studies*, 2(2), 8-24.

Orodho, J.A. (2005). Techniques of writing research proposals and reports in education and social Sciences. *Bureau of Education Research, Kenyatta University, Reata Printers, 8-18*

Orotho, D. F., & Kombo, C. T. (2010). Essentials of nursing research: Appraising evidence for nursing practice, (7th ed.). *Wolters Kluwer Health*, 21-45.

Oster-Levinz, A., & Klieger, A. (2010). Indicator for technological pedagogical content knowledge (TPCK) evaluation of online tasks. *Turkish Online Journal of Distance Education*, 11(4), 47-71.

Ozudogru, M., & Ozudogru, F. (2019). Technological Pedagogical Content Knowledge of Mathematics Teachers and the Effect of Demographic Variables. *Contemporary educational technology,* 10(1), 1-24.

Parette, H. P., Quesenberry, A. C., & Blum, C. (2010). Missing the boat with technology usage in early childhood settings: A 21st-century view of developmentally appropriate practice. *Early Childhood Education Journal*, *37*(5), 335-343.

Pathak, A. & Intrata, C. (2012). Use of Semi-Structured Interviews to Investigate Teacher Perceptions of Student Collaboration. *Malaysian Journal of ELT Research.* Vol. 8 (1), 1-10.

Patton, M. Q. (1990). Qualitative Research and Educational Methods (5th ed.). *Sage Publications,* 5-23.

Patton, M. Q. (2002). Qualitative research & evaluation methods (3rd ed.). *Thousand Oaks: Sage Publications*, 155-166.

Paul, C. (2008). New media in the white cube and beyond: Curatorial models for digital art. *Leonardo Reviews Quarterly*, *1*(2010), 33.

Pedretti, E., Mayer-Smith, J. & Woodrow, J. (1999). Teaming technology-enhanced instruction in the science classroom and teacher professional development, *Journal of Technology and Teacher Education* 7(2),131-143.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education*37 (2), 163-178.

Peng, C., & Daud, S. (2015). Exploring elementary special education (hearing impairment) teachers' technological pedagogical content knowledge (TPACK). In the *1st International Conference on Special Education, Bangkok, Thailand*, 28-31.

Pham, L. T. M. (2018). Qualitative approach to research: a review of the advantages and disadvantages of three paradigms: Positivism, interpretivism and critical inquiry. *University of Adelaide*, 2-4.

Phillips, M. (2016). Re-contextualising TPACK: exploring teachers' (non-) use of digital technologies. *Technology, Pedagogy and Education*, 25(5), 555-571.

Polland, R. J. (2005). Essentials of survey research and analysis. *Nova Science Publishers Inc*. 1-44.

Popkewitz, T. S. (2000). The denial of change in educational change: Systems of ideas in the construction of national policy and evaluation. *Educational Researcher*, 29(1), 17–29.

Pramanik, R. (2011). Information and Communication Technology (ICT) among school-going children: A technological intervention. *Journal of Education and Practice*, *2*(10), 1-10.

Rabah, J. (2015). Benefits and Challenges of Information and Communication Technologies (ICT) Integration in Québec English Schools. *Turkish Online Journal of Educational Technology-TOJET*, *14*(2), 24-31.

Rapley, S. (2004). Social Research (3rd Ed). *Macmillan Press Ltd*, 49-63.

Rege Colet, N. M. (2017). From content-centred to learning-centred approaches: shifting educational paradigm in higher education. *Journal of Educational Administration and History*, *49*(1), 72-86.

Reiser, R. A., & Dick, W. (1996). Instructional planning: A guide for teachers. *Allyn and Bacon,* 21-58.

Roblyer, M. D., & Doering, A. H. (2014). Integrating educational technology into teaching: Pearson new international edition (6th ed.). *Pearson Higher Ed*, 35-71.

Roblyer, M. D., & Edwards, J. (2000). Integrating educational technology into teaching (2nd ed.). *Merrill*, 22-46.

Rogan, J. and Grayson, D. (2003). Towards a theory of curriculum implementation with particular reference to science education in developing countries. *International Journal of Science Education,* 25(10), 1171-1204.

Rosen, L. D. & Weil, M. M. (1995). Computer Availability, Computer Experience, and Technophobia Among Public School Teachers. *Computers in Human Behaviour*, 11, 9-31.

Rubin, M., & Rubin, A. (1995). *Research methods for business students* (5th ed.). *Pearson Education,* 29-61.

Russell, C. K., & Gregory, D. M. (2003). Evaluation of qualitative research studies. *Evidence-Based Nursing, 6*(2), 36–40.

Ryan, M. (2008). 16 Ways to Use Virtual Worlds in Your Classroom: Pedagogical Applications of Second Life. In *Researching Learning in Virtual Environments International Conference,* 269-178.

Saba, A. (2009). Benefits of technology integration in education. *Boise State University*, 47-61.

Salam, S., Zeng, J., Pathan, Z. H., Latif, Z., & Shaheen, A. (2018). Impediments to the Integration of ICT in Public Schools of Contemporary Societies: A Review of Literature. *Journal of Information Processing Systems*, *14*(1).

Salehi, H. & Salehi Z. (2012). Challenges for using ICT in education: Teachers' Insight. *International Journal of e-Education, e-Business, e-Management and e-Learning*, 2(1), 40-43.

Salomon, G. (1993). No distribution without individuals' cognition. In G. Salomon (Ed.), Distributed Cognitions: Psychological and Educational Considerations. *Cambridge University Press*, 111-138.

Samath, F. (2010). Education Reforms Herald Digital Learning, Radical Changes. *Ipsnews*, 1-4. Available at: http://ipsnews.net/news.asp?idnews=51995

Sancar-Tokmak, H., & Yanpar-Yelken, T. (2015). Effects of creating digital stories on foreign language education pre-service teachers' TPACK self-confidence. *Educational Studies*, 41(4), 444-461. https://doi.org/10.1080/0305 5698.2015.1043978

Sánchez-Cruzado, C., Santiago Campión, R., & Sánchez-Compaña, M. T. (2021). Teacher digital literacy: The indisputable challenge after COVID-19. *Sustainability*, *13*(4), 1858.

Sandholtz, J., Ringstaff, C. & Dwyer, D. (1997). Teaching with Technology. *Teachers College Press*, 50-97.

Sandholtz, J. H., Ringstaff, C., & Dwyer, D. C. (1992). Teaching in high-tech environments: Classroom management revisited. *Journal of Educational Computing Research*, *8*(4), 479-505.

Sang, G., Valcke, M., van Braak, K. & Tondeur, J. (2010). Student teachers' thinking processes nd ICT integration: Predictors of prospective teaching behaviours with educational technology. *Computers & Education* 54(1),103-112.

Saraniero, P., & Goldberg, M. (2011). The impact of professional development interventions on teacher learning in arts integration. *AERA, Arts Integration Professional Development*. 3-11.

Sarfo F. K., Amankwah F. & Konin, D (2017). Computer Self-Efficacy Among Senior High School Teachers in Ghana and the Functionality of Demographic Variables on their Computer Self-efficacy. *The Turkish Online Journal of Educational Technology*, 16 (1), 19-31.

Sarfo, F. K., Amankwah, S. K., Oti-Agyen, P., & Yidana, I. (2016). Information and communication technology access, use and competency level among second-cycle school teachers in Ghana. *Journal of Media and Communication Studies*, 8(5), 43.

Sarker, A. (2014). *E-public service delivery system* (Doctoral dissertation, KDI School*). KDI School*, 53-56.

Sarkar, S. (2012). The role of information and communication technology (ICT) in higher education for the 21st century. *Science*, *1*(1), 30-41.

Schiller, J. (2003). Working with ICT: Perceptions of Australian principals. *Journal of Educational Administration, 4(2),* 171-185.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK): the development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education*, 42(2), 123- 149.

Schoen, L. & Fusarelli, L. 2008. Innovation, NCLB and The Fast Factor: The Challenge of Loading Schools in The 21st Century. *Education Policy*, 22 (1), 181-203

Schoepp, K. (2005). Barriers to technology integration in a technology-rich environment. Learning and Teaching in Higher Education. *Gulf Perspectives*, 2(1), 56-79.

Schwandt, T. A., Lincoln, Y. S., & Guba, E. G. (2007). Judging interpretations: But is it rigorous? trustworthiness and authenticity in naturalistic evaluation. *New Directions for Evaluation,* (114), 11-25.

Seixas, C. H. (2001). Why Do Teachers Not Practice What They Believe Regarding Technology Integration?. *Journal of Educational Research,* 102(1):65-75.

Selinger, M. (2001). The Imfundo Project: ICT in teacher education in developing countries. *Society for Information Technology and Teacher Education International Conference*, (1), 3008 - 3013.

Selwyn, N. (2007). The use of computer technology in university teaching and learning: a critical perspective. *Journal of Computer Assisted Learning*, 23(2), 83–94.

Shekharan, U., & Bougie, R. (2010). Research Methods for Business: A Skill Building Approach (5th Ed.). *John Wiley*, 17-73.

Shulman, L. (1986). Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher*, 15 (2): 4–14.

Shulman, L. (1987). Knowledge and Teaching: Foundations of the New Reform. *Harvard Educational Review,* 57 (1): 1–22.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational researcher*, *15*(2), 4-14.

Shulman, L. S. (2013). Those who understand: Knowledge growth in teaching. *Journal of Education*, *193*(3), 1-11.

Siedentop, M.R. (2011). The impact of professional development interventions on teacher learning in arts integration. *Paper presented at the American Educational Research Association Annual Meeting,*3-12.

Simon, M. K., & Goes, J. (2013). Scope, limitations, and delimitations. *Dissertation for Success LLC*, 1-3.

Smaldino, S. E., Lowther, D. L., Russell, J. D., & Mims, C. (2008). Instructional technology and media for learning. *Pearson Education, Inc.,* 209-229.

Smith, B., & Sparkes, A. C. (2016). Interviews: Qualitative interviewing in the sport and exercise sciences. In *Routledge handbook of qualitative research in sport and exercise*. Routledge, 125-145.

Snape, D., & Spencer, L. (2003). The foundations of qualitative research. In J. Richie & J. Lewis (Eds.), Qualitative Research Practice. *Sage,* 1-23.

Staples, A., Pugach, M. C., & Himes, D. (2005). Rethinking the technology integration challenge: Cases from three urban elementary schools, *Journal of Research on Technology in Education,* 37, 285-311.

Stratton, S. J. (2021). Population research: convenience sampling strategies. *Prehospital and disaster Medicine, 36*(4), 373-374.

Swanson, R. A., & Chermack, T. J. (2013). Theory building in applied disciplines. *Berrett-Koehler Publishers,* 5-176.

Swarts, P. (2006). ICT & the Third Revolution in Education Policy. *Global e-schools and Communities Initiative*, 1-9,

Swarts, P., & Wachira, E. (2010). Tanzania: ICT in education situational analysis. *Global e-Schools and Communities Initiative*, 20–33.

Tamir, P. (1988). Subject Matter and Related Pedagogical Knowledge in Teacher Education. *Teaching and Teacher Education* 4 (2): 99–110.

Tay, L., Lim, S.K., Lim, P.c., & Koh, J. 2012. Pedagogical Approach for ICT Integration into Primary School English and Mathematics: Singapore Case Study. *Australian Journal of Educational Technology,* 28 (4), 740-754

Tedla, B. A. (2012). Understanding the importance, impacts and barriers of ICT on teaching and learning in East African countries. *International Journal for e-Learning Security (IJeLS)*, *2*(3/4), 199-207.

Teo, T. (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australian Journal of Educational Technology, 24(4),* 413-424.

Tezci, E. (2011). Factors that influence pre-service teachers' ICT usage in education. *European Journal of Teacher Education,* 34:4, 483-499.

Thomas, A., Nelson, M. &Silverman, I. (2015). Qualitative Research Methods. *SAGE Publication, Inc*, 12-57.

Thompson, A. D., & Mishra, P. (2007), "Becomes TPACK!", *Journal of Computing in Teacher Education*, 24(2), 38–39.

Tilya, F. (2008). IT and educational policy in the sub-Saharan African region. In J. Voogt, & G. Knezek (Eds.), International handbook of information technology in primary and secondary education. *Springer*, 1145–1159.

Tondeur, J., van Braak, J., & Valcke, M. (2007). Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology*, 38(6), 962–976.

Tondeur, J., Scherer, R., Siddiq, F., & Barren, E. (2020). A comprehensive framework for teachers' professional development for ICT integration. *Educational Technology research and Development*, 68(2), 743-772.

Toprakci, E. (2006). Obstacles to the integration of schools into information and communication technologies by taking into consideration the opinions of the teachers and principals of primary and secondary schools in Turkey. *e-Journal of Instructional Science and Technology*, 9 (1), 1-16.

Toure, K., Tchombe, T., Tchombé, T. M., & Karsenti, T. (Eds.). (2008). ICT and changing mindsets in education. *African Books Collective*, 1-8.

Traxler, J. (2016). Inclusion in an age of mobility. *Research in learning technology*, *24*.

Tsai, C. C., & Chai, C. S. (2012). The" third"-order barrier for technology-integration instruction: Implications for teacher education. *Australasian Journal of Educational Technology*, *28*(6), 1057-1060

Tsapali, M., Major, L., Damani, K., Mitchell, J., & Taddese, A. (2021). Country-level research review. *Edtech in Ghana*. 8-45.

Tuithof, H., Van Drie, J., Bronkhorst, L., Dorsman, L., & Van Tartwijk, J. (2021). Teachers' pedagogical content knowledge of two specific historical contexts was captured and compared. *Educational Studies*, 1-26.

Tunca, B. (2002). Barriers to using Technology. *World Conference on Educational Multimedia, Hypermedia and Telecommunications*, *(1),* 1980 - 1982.

Turgut, Y. (2017). Tracing preservice English language teachers' perceived TPACK in sophomore, junior, and senior levels. *Cogent Education*, 4(1), 1-20.

Uerz, D., Volman, M., & Kral, M. (2018). Teacher educators' competences in fostering student teachers' proficiency in teaching and learning with technology: An overview of relevant research literature. *Teaching and Teacher Education, 70,* 12-23.

Underwood, J., & Banyard, P. (2008). Managers', teachers' and learners' perceptions of personalised learning: Evidence from Impact 2007. *Technology, Pedagogy & Education. 17*(3), 233-46.

UNESCO. (2002). Information Communication Technology in Education. A curriculum for Schools and Programme of Teacher development. *UNESCO*, 43-57.

UNESCO. (2015). Information Communication Technology (ICT) in Education in Sub-Saharan Africa: A Comparative Analysis of Basic E-Readiness in Schools. *UNESCO Institute for Statistics*, (Information Paper No. 25), 1-32.

UNESCO. (2021). Reimagining our futures together: A new social contract for education. *UNESCO Publishing,* 42-67.

Unwin, T. (2005). Capacity building and management in ICT for education. *Monitoring and Evaluation of ICT in Education Projects*, 77.

Urban, E. R., Navarro, M., & Borron, A. (2018). TPACK to GPACK? The examination of the technological pedagogical content knowledge framework as a model for global integration into college of agriculture classrooms. *Teaching and Teacher Education*, 73, 81-89.

Vaerenewyck, L. M., Shinas, V. H., & Steckel, B. (2017). Sarah's Story: One Teacher's Enactment of TPACK+ in a History Classroom. *Literacy Research and Instruction*, 56(2), 158-175

vanBraak, J. (2008). Factors influencing the use of computer-mediated communication by teachers in secondary schools. *Computers & Education*, 36(1):41–57.

VanSledright, T. S. (2010). The denial of change in educational change: Systems of ideas in the construction of national policy and evaluation. *Educational Researcher*, 29(1), 17–29.

VanSledright, T. S. (2013). Instructional planning: A guide for teachers. *Allyn and Bacon*, 8-59.

Vaughan, W. (2002). Professional development and the adoption and implementation of new innovations: Do teacher concerns matter? *International Electronic Journal For Leadership in Learning,* 6(5), 1-11.

Veal, D. & MaKinster, M. (1998). An Initial Comparative of Educational Technology Courses for Training Teachers at Malaysian Universities: A Comparative Study. *The Turkish Online Journal of Education Technology*, 9(1), 23-27.

Verloop, N., J. H. VanDriel, and Meijer, P. C. (2001). Teacher Knowledge and the Knowledge Base of Teaching. *International Journal of Educational Research,* 35 (5): 441–461.

Vlachopoulos, D. (2020). COVID-19: Threat or opportunity for online education?. *Higher learning research communications*, *10*(1), 2.

Voogt, J., & Knezek, G. (Eds.). (2008). International handbook of information technology in primary and secondary education. Part One. *Springer Science & Business Media*, 725-997.

Wang, Y. (2002). When technology meets beliefs: Pre-service teachers' perception of the teacher's role in the classroom with computers. *Journal of Research and Technology in Education, 35*(1), 150-161.

Weber, M. (1913): Some Categories of Interpretive Sociology. *The Sociological Quarterly*, 22 (1981), 151-180.

Weber, M. (1914). Economy and Society. *University of California Press*, 31-63.

Weber, M. (1920). The Sociology of Religion. *Peter Own*, 20-128.

Weber, M. (1993). The sociology of religion. *Beacon Press*, 2-144.

Weber, M. (1949): 'Objectivity' in social science and social policy. In: The methodology of the social sciences. *The Free Press*, 50–112.

Weerasinghe, L. Hanson, W.E., & Hutter, I. (2015). Research Methods. *SAGE Publication, Inc*, 31-79.

Wiersma, M. (2009). Mixed method researcher: Instruments, validity, reliability and reporting findings. *Theory and Practice in Language Studies*, *3*(2), 254-262.

Williams, C. (2000). Internet access in us. Public schools and classrooms: 1994-99 9NCES 2000 - 086). U.S *Department of Education. Washington DC, National Centre for Education Statistics*, 1-5.

Wilkinson, A. M. (1991). The scientist's handbook for writing papers and dissertations. *Prentice Hall*, 21-87.

Wilkinson, S. (2010). Education research. *Addison Wesley Longman*, 21-53.

Wilks, J., Cutcher, A., & Wilks, S. (2012). Digital technology in the visual arts classroom: An [un] easy partnership. *Studies in Art Education*, *54*(1), 54-65.

Wilson-Strydom, M., Thomson, J., & Hodgkinson-Williams, C. (2005). Understanding ICT integration in South African classrooms: research: information and communication technologies. *Perspectives in education*, *23*(1), 71-85.

World Bank. (2020). The COVID-19 pandemic: Shocks to education and policy responses. *World Bank Group*. 9-21.

World Bank. (2021). Ghana Digital Economy Diagnostic. *World Bank Group*. 55-78.

Wood, F., & Bloor, M. (2006). Keywords in qualitative methods: A vocabulary of research concepts. *Keywords in Qualitative Methods*, 1-208.

Xhomara, N. (2022). Critical thinking: student-centred teaching approach and personalised learning, as well as previous education achievements, contribute to the critical thinking skills of students. *International Journal of Learning and Change*, *14*(1), 101-120.

Yelland, N. (2001). Teaching and learning with information and communication technologies (ICT) for numeracy in the early childhood and primary years of schooling. *Department of Education, Training and Youth Affairs*, 10-41.

Yidana, I. (2007). Faculty perceptions of technology integration in the teacher education curriculum: A survey of two Ghanaian universities. [Unpublished PhD Dissertation] *Ohio University*, 122-134.

Yildirim, H. I., & Sensoy, O. (2018). Effect of Science Teaching Enriched with Technological Practices on Attitudes of Secondary School 7th Grade Students towards Science Course. *Universal Journal of Educational Research*, 6(5), 947-959

Yildiz, A. 2017. Reflection From The Lesson Study For The Development of Techno-Pedagogical Competencies in Teaching Fractal Geometry. *European Journal of Educational Research,* 6 (1), 41-50

Yin, R. K. (1994). Case Study Research: Design and Methods. (2nd ed.). *Sage Publications*, 21-55.

Yin, R. K. (2009). Case study research: Design and methods (Vol. 5). *Sage Inc.*, 3-185.

Yin, R. K. (2011). Qualitative research from start to finish. *The Guildford Press*, 24-97.

Yoo, Y. (2010). Computing in everyday life: A call for research on experiential computing. *MIS Quarterly*, 213-231.

Zembal-Saul, C., Krajcik, J., & Blumenfeld, P. (2002). Elementary student Teachers' science content representations. *Journal of Research in Science Teaching*, 39(6), 443–463.

Zhao, Y. (2007). Social Studies Teachers' Perspectives on Technology Integration. *Journal of technology and teacher education,*15 (3), 311-333.

Zhao.Y, & Cziko, G. A. (2001). Teacher adoption of technology perceptional control theory Perspectives. *Technology and Teacher Education*, 9(1), 5-30.

APPENDICES

APPENDIX A

INVITATION LETTER

University Of Education, Winneba
Department Of Music Education
19th January, 2021.

Dear Respondent,

INVITATION TO PARTICIPATE IN A SURVEY

I hope this letter finds you well. My name is Barnabas T. Billhall, and I am currently conducting a research study on the topic:

"**Information and Communication Technology Integration in Senior High Schools in Ghana: Visual Art Teachers in Mfantseman Municipality in Perspective"**

Your expertise and experience as a Visual Art teacher make your insights invaluable to the success of this research.

Study Overview: This study aims to investigate the ICT integration practices of Visual Art teachers in the Mfantseman Municipality, using the Technological Pedagogical Content Knowledge (TPACK) as its theoretical framework. The study employs a qualitative approach, incorporating both interviews and non-participant classroom observations.

Your Involvement: I am seeking your participation in a 35 to 40-minute interview, where we will delve into your experiences with ICT integration in Visual Art teaching. Additionally, I would like to conduct non-participant classroom observations to gain a deeper understanding of your practices in the classroom environment.

Confidentiality: I want to assure you that all information provided during the interview and observations will be treated with the utmost confidentiality. Your identity will remain confidential, and the data collected will be used strictly for research purposes.

Thank you for considering this opportunity to contribute to advancing our understanding of ICT integration in Visual Art education. I look forward to the possibility of working with you.

Best regards,

.....

BARNABAS TEIKO BILLHALL
University Of Education, Winneba
Department Of Music Education
0247-021021

APPENDIX B

INTERVIEW GUIDE

Topic: "INFORMATION AND COMMUNICATION TECHNOLOGY INTEGRATION IN SENIOR HIGH SCHOOLS IN GHANA: VISUAL ART TEACHERS IN MFANTSEMAN MUNICIPALITY IN PERSPECTIVE"

SECTION 1: Demographics of Respondents

1. Your Gender: (a) Male [ ] (b) Female [ ]

2. Please, what age range do you belong to?

(a) Less than 30 years [ ] (b) 30-39 years [ ] (c) 40-49 years [ ] (d) 50 - 59 [ ]

3. Please, what is your current status or position in your Visual Art Department?

(a) Class Teacher [ ] (b) Head of Department [ ]

4. Please, what is your highest level of Academic Qualification?

(a) Diploma [ ] (b) Bachelor [ ] (c) Master [ ] (d)Doctorate [ ]

5. Please, what is your highest level of Professional Qualification?

(a) Diploma [ ] (b) Bachelor [ ] (c) PGDE [ ]

6. How many years have you been teaching Visual Arts in SHS?

(a) Less than 5 years [ ] (b) 6-10 years [ ]

(c) 11-15 years [ ] (d) 16years & above [ ]

SECTION 2: Interplay of Technological Pedagogical Content Knowledge (TPACK) of Visual Art Teachers in Mfantseman Municipality

a. What is your understanding of Technological Pedagogical Content Knowledge?

b. Do you think technological pedagogical content knowledge (TPACK) is crucial for teaching Visual Arts?

c. How does appropriate technological pedagogical content knowledge (TPACK) influence your teaching? Please elaborate on the relationship/interplay of TPACK.

d. Do you share the view that Teachers' TPACK develops with time due to progressive awareness of students' needs?

e. Do you also share the view that rich content knowledge is mandatory for developing comprehensive TPACK? Please elaborate on the appropriate instructional methods you employ when using ICT in your teaching.

f. How do you integrate technology in your pedagogy during lesson delivery in the classroom? Please elaborate on how you use ICT in your teaching of Visual Arts.

g. What difficulties do you experience when integrating ICT knowledge with Pedagogical and Content Knowledge in the classroom? Please, briefly describe your difficulties with the ICT tools you used.

h. How can you improve upon your Technological Pedagogical Content Knowledge?

SECTION 3: Extent to which Visual Art Teachers in Mfantseman Municipality engage students in the use of ICT resources

a. To what extent do you involve the students in the use of ICT resources?

   If high extent, explain why.

   If low extent, why?

   If you involve the students in the use of ICT resources regularly, explain why.

   If you involve the students in the use of ICT resources occasionally, explain why.

b. Do you use ICT tools in teaching Visual Art Students?

   If yes, how do you use it? If no, why?

c. What kind of ICT resources do you employ in your lesson delivery? Please, briefly elaborate on the type of ICT tools you integrate into your lessons.

d. How many times a week do you use ICT tools in your lesson delivery?

e. How often do you give practical exercises and assignments to students to be done using the ICT laboratory? If yes, why? If no, why?

f. How often do you give practical exercises and assignments to students to be done using the internet? If yes, why? If no, why?

g. How often do you give practical exercises and assignments to students to be done using the virtual library? If yes, why? If no, why?

h. How often do you give practical exercises and assignments to students to be done using Photoshop? If yes, why? If no, why?

i. II. How often do you give practical exercises and assignments to students to be done using CorelDRAW? If yes, why? If no, why?

j. What ICT assessment tools do you use to assess your students?

a. Have you ever attended any training on integrating ICTs in teaching and learning since you started teaching Visual Arts in SHS?

b. When was the training?

c. How regularly do you attend ICT capacity building workshops?

d. Describe the nature of the ICT training you attended?

e. In which of the following areas did you receive the training to integrate ICT in teaching and learning?

- Pedagogy
- Lesson planning
- Online integration of lessons
- Assessment of lessons

- Research
- Professional development of teachers

Please, briefly describe the particular area(s) you received the ICT integration training

f. What were the pitfalls you identified about the entire organisation of the ICT training you attended?

g. When was the last time you attended ICT training as a Visual Art teacher?

h. Do you think that ICT integration trainings are organised frequently for Visual Art teachers? If yes, why? If no, why?

i. In your view, how regularly should ICT integration training be organised for Visual Art teachers in SHS?

SECTION 4: Challenges that militate against Visual Art teachers in Mfantseman Municipality in integrating ICTs into Visual Art lessons.

a. Do you think that the lack of Visual Art teachers with ICT skills is a challenge to ICT integration in Visual Art Education? If yes, why? If no, why?

b. Do you think that SHS Visual Art teachers' inability to operate CorelDraw is a challenge to ICT integration in teaching and learning Visual Arts? If yes, why? If no, why?

c. Do you think that Visual Art teachers' inability to operate Photoshop is a challenge to ICT integration in teaching and learning in SHS? If yes, why? If no, why?

d. Do you think that insufficient funds are a challenge to ICT integration in SHS? If yes, why? If no, why?

e. Do you think that the limited supply of electricity is a challenge to ICT integration in SHS? If yes, why? If no, why?

f. Do you think that lack of instructional time is a challenge to ICT integration? If yes, why? If no, why?

g. Do you think that little equipment is made available nationally for ICT in schools? If yes, why? If no, why?

h. Do you think that the high cost of ICT equipment is a challenge to ICT integration in SHS? If yes, why? If no, why?

i. Do you think that GES rules and regulations forbidding SHS students from bringing their own ICT devices to school are a challenge to ICT integration in Visual Art Education? If yes, why? If no, why?

j. Do you have an ICT laboratory in your school? If no, explain why? If yes, please elaborate on some of the challenges you encounter in using the ICT laboratory.

k. Do you have internet connectivity in your school? If no, explain why? If yes, please briefly explain some of the challenges you encounter in accessing the internet connection in your school.

l. Do you think that the Centralised Laboratory system being practised in the SHS is a challenge to ICT integration? If yes, why? If no, why?

APPENDIX C

OBSERVATION CHECKLIST

Topic: "INFORMATION AND COMMUNICATION TECHNOLOGY INTEGRATION IN SENIOR HIGH SCHOOLS IN GHANA: VISUAL ART TEACHERS IN MFANTSEMAN MUNICIPALITY IN PERSPECTIVE"

1. Interplay of Technological Pedagogical Content Knowledge of Visual Art teachers

   i) to a very large extent; ii) to a large extent; iii) to some extent; iv) to a low extent

   Point of observation

   a. Pedagogical content knowledge with ICT [ ] i [ ] ii [ ] iii [ ] iv
   ……
   ……
   ……

   b. Instructional methods with ICTs [ ] i [ ] ii [ ] iii [ ] iv
   ……
   ……
   ……

   c. Assessment methods with ICTs [ ] i [ ] ii [ ] iii [ ] iv
   ……
   ……
   ……

   d. Evaluation methods with ICTs [ ] i [ ] ii [ ] iii [ ] iv
   ……
   ……
   ……

2. The extent to which Visual Art teachers engage students in the use of ICT resources.

i) to a very large extent; ii) to a large extent; iii) to some extent; iv) not at all.

Point of observation

a. Giving assignment to be done using the internet [ ] i [ ] ii [ ] iii [ ] iv
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b. Directing students to use online virtual library [ ] i [ ] ii [ ] iii [ ] iv
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……
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c. instructional television/videotaped lessons [ ] i [ ] ii [ ] iii [ ] iv
……
……
……

d. instructional radio/audio taped lessons [ ] i [ ] ii [ ] iii [ ] iv
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e. Giving class exercise to be done using CorelDraw/Photoshop
[ ] i [ ] ii [ ]iii [ ] iv
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f. Use of instructional projected slides [ ] i [ ] ii [ ] iii [ ] iv
……
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……

g. Leading students to watch digital images on a mobile phone/tablet/laptop
[ ] i [ ] ii [ ] iii [ ] iv
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……

h. Guiding students to watch digital videos on a mobile phone/tablet/laptop
[ ] i [ ] ii [ ] iii [ ] iv
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……

3. Challenges that militate against ICT integration in Visual Art lessons.

Point of observation

a. Limited supply of electricity [ ] Yes [ ] No
……
……
……

b. Insufficient funds and insecurity [ ] Yes [ ] No
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……
……

c. Little equipment made available nationally for ICT in schools [ ] Yes [ ] No
……
……
……

d. Lack of teachers with ICT skills [ ] Yes [ ] No
……
……
……

e. Teachers' inability to integrate ICT into their subject areas [ ] Yes] No
……
……
……

f. Lack of classroom instructional time period for teachers to use computers during lesson delivery [ ] Yes [ ] No
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g. Lack of effective capacity building workshop training series [ ] Yes [ ] No
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h. School with limited technical support [ ] Yes [ ] No
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……
……

i. Lack of genuine software [ ] Yes [ ] No

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……

j. GES Policy on the use of ICTs at the SHS level [ ] Yes [ ] No

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……

k. GES ICT workshop for Visual Art teachers

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l. Stakeholders/NGOs ICT workshop for Visual Art teachers

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m. Degree of Visual Art Teachers' regularity in the ICT workshop

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n. Nature of the ICT workshop

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o. Date of the Workshop

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……
……

p. Duration ICT workshop

……
……
……

APPENDIX D

RESEARCHER'S INTRODUCTORY LETTER

UNIVERSITY OF EDUCATION, WINNEBA
SCHOOL OF CREATIVE ARTS
DEPARTMENT OF MUSIC EDUCATION
P. O. Box 25, Winneba, Ghana
dmu@uew.edu.gh
+233 (03323) 22035 / (020) 2041084

Ref: SCA/DME/REF/Vol.1/103

19th January, 2021

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Dear Sir/Madam,

INTRODUCTION LETTER – BARNABAS TEIKO BILLHALL (200001864)

Barnabas Teiko Billhall is a final year student pursuing MPhil, Arts & Culture at the University of Education, Winneba, Graduate School.

He is currently writing his thesis on the topic "***Information and Communication Technology (ICT) Integration in Ghanaian Senior High School Education: The Case of Visual Art Teachers in Mfantseman Municipality.***" and therefore needs your assistance to enable him acquire the necessary information for his thesis.

I am officially introducing him to your organization/institution to provide him with the necessary information and assistance that he might need.

We count very much on your cooperation and understanding in this regard.

Thank You.

Yours faithfully,

John Francis Annan
Ag. Head of Department

APPENDIX E

INVITATION LETTER OF

GHANA EDUCATION SERVICE TO ICT WORKSHOP

GHANA EDUCATION SERVICE

In case of reply the number and date of this letter should be quoted

Ref. No. GES/HQ/SDTU/11/22

REPUBLIC OF GHANA

HEADQUARTERS
Ministry Branch Post Office
P.O. Box M. 45
ACCRA

8th February, 2022

ALL REGIONAL DIRECTORS,

INVITATION TO ICT TRAINING

As part of the One Teacher One Laptop initiative, all teachers are expected to undergo some basic ICT training to help them use the various e-learning resources that have been made available on the laptops. As a result, the Ghana Education Service (GES), in collaboration with KA Technologies (KAT) and Microsoft, is organizing an online workshop for teachers.

The Workshop will commence on 16th February, 2022 and will be held in three (3) sessions:

i. Afternoon Session (2:00pm - 4:00pm)
ii. Afternoon Session (4:00pm - 6:00pm)
iii. Evening Session (6:00pm - 8:00pm)

Each teacher will have **3-4 days** to complete the training and participate at any stipulated times or sessions.

Teachers will receive points for their Continuous Professional Development (CPD) and a certificate for participation upon successful completion and assessment.

All Regional Directors are kindly requested to inform teachers within their regions to participate.

Counting on your usual co-operation and support.

Thank you.

Yours faithfully,

ANTHONY BOATENG
DEPUTY DIRECTOR-GENERAL (MS)
***FOR*: DIRECTOR-GENERAL**

Cc: The Director-General, GES, Accra.
The Director, Administration, GES HQ, Accra
The Director, HRMD, GES HQ, Accra

APPENDIX F

GHANA EDUCATION SERVICE ICT WORKSHOP

SUSPENDED SINE DIE

GHANA EDUCATION SERVICE

In case of reply the number and date of this letter should be quoted

Ref. No. GES/HQ/SDTU/11/23

REPUBLIC OF GHANA

HEADQUARTERS
Ministry Branch Post Office
P.O. Box M. 45
ACCRA

10th February, 2022

ALL REGIONAL DIRECTORS,

RE- INVITATION TO ICT TRAINING

Management of Ghana Education Service (GES) will like to inform you that the online ICT training in connection with the One Teacher One Laptop initiative scheduled for 16th February, 2022 has been put on hold.

In collaboration with KA Technologies (KAT) and Microsoft, Ghana Education Service will have further deliberations and discussions to come up with a new date and timeline.

Thank you.

Yours faithfully,

ANTHONY BOATENG
DEPUTY DIRECTOR-GENERAL (MS)
***FOR*: DIRECTOR-GENERAL**

Cc: The Director-General, GES, **Accra**.
The Director, Administration, GES HQ, **Accra**
The Director, HRMD, GES HQ, **Accra**

APPENDIX G

INVITATION LETTERS OF

GHANA EDUCATION SERVICE TO ICT WORKSHOP

IN THE NORTHERN AND GREATER ACCRA REGIONS

GHANA EDUCATION SERVICE

In case of reply the number and date of this letter should be quoted

My Ref: GES/DG/247/22/124

Tel: 0551381098

Republic of Ghana

HEADQUARTERS
Ministry Branch Post Office
P. O. Box M 45
Accra

6th May, 2022.

Distribution List:
Upper west regional director
Upper East Regional Director
Savannah Regional Director
North East Regional Director
Northern Regional Director
Greater Accra Regional Director

INVITATION TO ICT TRAINING FOR JHS AND SHS TEACHERS

As part of the One Teacher One Laptop initiative, all teachers are expected to undergo some basic ICT training to help them use the various e-learning resources that have been made available on the laptops.

As a result, the Ghana Education Service (GES), in collaboration with KA Technologies (KAT) and Microsoft, is organizing a physical training for Junior and Senior High School teachers in the five (5) Northern and Greater Accra Regions.

The training will commence on **Monday, 16th May, 2022.** The KAT champions (ICT Coordinators trained by KAT) will support the training.

Teachers will receive points for their Continuous Professional Development (CPD) and a certificate for participation upon successful completion and assessment.

You are kindly requested to inform the teachers within the Region to participate.

Counting on your usual co-operation and support.

Thank you.

Yours faithfully,

PROF. KWASI OPOKU-AMANKWA
DIRECTOR-GENERAL

Cc: The Chairman, GES Council, Accra
The Deputy Director-General, (MS), GES, Accra
The Deputy Director-General, (Q&A), GES, Accra
The Ag. Director, HRMD, GES, Accra
The Director, Schools & Instructions Division, GES, Accra
The Director Administration, GES, Accra

APPENDIX H

GHANA EDUCATION SERVICE ICT WORKSHOP EXCLUSIVELY FOR ICT AND FRENCH TEACHERS

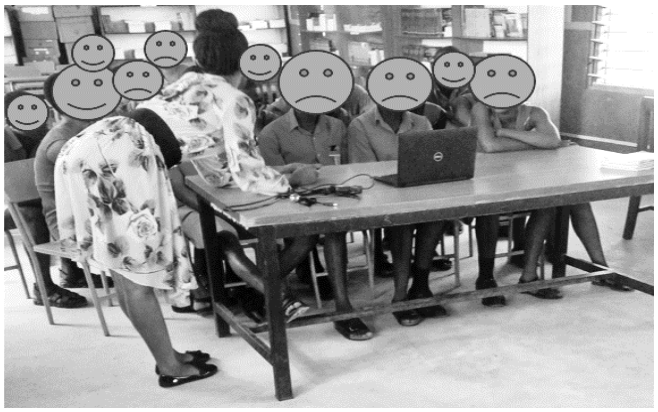
a. ICT Workshop Organised Exclusively for ICT Teachers in January, 2020.
https://citinewsroom.com/2020/01/teachers-unhappy-with-ges-over-treatment-at-training-worksop/ https://youtu.be/Td-gco15Nol

b. ICT Workshop Organised Exclusively for French Teachers in July 2021.
https://bricyboateng.com/ges-to-organize-ict-training-for-teachers-across-the-country-check-deadline/

APPENDIX I

RESEARCHER'S FIELDWORK PHOTOGRAPHS OF VISUAL ART TEACHERS IN THE MFANTSEMAN MUNICIPALITY INTEGRATING ICT TOOLS IN CLASSROOM

A male Visual Arts teacher leading his students to Watch digital videos on a laptop.



A female Visual Arts teacher leading her students to Watch PowerPoint slide images on a laptop.

APPENDIX J

RESEARCHER'S FIELDWORK PHOTOGRAPHS OF VISUAL ART STUDENTS IN THE MFANTSEMAN MUNICIPALITY USING THEIR TEACHERS' MOBILE PHONES TO ACCESS THE INTERNET DURING WASSCE PRACTICAL WORK

Visual art students in the Mfantseman Municipality are using their teachers' mobile phones to access the internet during the WASSCE project work.