UNIVERSITY OF EDUCATION, WINNEBA

THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI) IN ACADEMIC RESEARCH: A STUDY OF POSTGRADUATE STUDENTS AT UNIVERSITY OF EDUCATION, WINNEBA

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A thesis submitted to the school of graduate studies in partial fulfilment of the requirement for the award of the degree of Master of Philosophy (Development Communication)

DEPARTMENT OF DEVELOPMENT COMMUNICATION, SCHOOL OF COMMUNICATION AND MEDIA STUDIES UNIVERSITY OF EDUCATION, WINNEBA

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DECLARATION

Student's Declaration

I, MAHAMA OSMAN KPAN-NAA, declare that this thesis, with the exception of quotations and references contained in published works, international journals and online documents which have all been identified and duly acknowledged, is entirely my own original work and has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE: ……

DATE: ……

Supervisor's Declaration

I hereby declare that the preparation and presentation of this project work was supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: DR. AKWASI BOATENG BOSOMPEM

SIGNATURE: ……

DATE: ……

DEDICATION

I dedicate this work to my mother and late father for their support and encouragement throughout my academic journey.

ACKNOWLEDGEMENT

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ABSTRACT

This article explores the use of generative (AI) in academic research at the University of Education, Winneba (UEW). With the pervasion of artificial intelligence, there have been debates about its applications and implications on various sectors including teaching and learning in higher education institutions. Given the spread and use of generative (AI) tools, several scholars have conducted different studies of these communication tools from the lens of the Global North with relatively little attention on their influence in the Global South including Africa and particularly Ghana. In other words, little work has been done on how generative (AI) is changing academic activities including research in Africa and Ghana. For example, the few studies on artificial intelligence in Ghana have largely focused on the use of generative AI by faculty members in higher education with little done on how students have accepted and utilized the tools in academic work. This article addresses this gap by examining what postgraduate students at University of Education, Winneba are using generative (AI) tools in their academic research for. Utilizing a qualitative approach, this study collected data through interviews and focus group discussion for detailed insights into the experiences and motivations of graduate students in utilizing generative (AI) in academic research. The study revealed that postgraduate students are integrating generative AI tools in academic research, for example, to improve the quality of writing; reduce grammatical errors; and facilitate efficient access to research materials. These tools reduce the cognitive load associated with academic tasks, allowing postgraduate students to focus more on critical thinking and creativity. However, the study identified the potential risk for over-reliance on generative AI tools, which could lead to diminished writing skills and critical thinking abilities over time. As generative AI tools enhance the academic research and learning outcomes, there is the need for balanced approach to their integration into academic research including equipping postgraduate students with the necessary skills for responsible and ethical use.

CHAPTER ONE

INTRODUCTION

1.0 Overview

The context of this study is provided in the introduction, which also explains key AI concepts. It continues by going into detail about the study's objectives, research questions, and problem. The chapter outlines the study's organization, scope, and significance among other things.

1.1 Background of the Study

With the emergence of artificial intelligence (AI) academic institutions are currently investigating its uses and potential to improve the learning environment for students and assist lecturers in their education and research (Sandu & Gide, 2019). Leading the way in technology is ChatGPT, a machine learning chatbot created by OpenAI that uses sophisticated language processing (NLP) methods to understand, analyze, and produce material (Adiguzel et al., 2023). Artificial intelligence has the capability to transform research, training, and learning experiences which has drawn a lot of interest, (Popenici & Kerr, 2019). ChatGPT is the quickest platform ever, with billion active users globally since its introduction in November 2022 (Hu, 2023).Since the emergence of Artificial intelligence and its related application there have been contentious discussions about the use of generative AI technologies in higher education (Rudolph et al., 2023).While some scholars claim that it promotes plagiarism, others maintain that this new technology can greatly enhance classroom interaction and make it easier for students and teachers to obtain the information they need to succeed in school (Zhang, 2023).

According to Overton, (2018) artificial intelligence refers to any program that does something that we would think of as intelligent in humans. Nwakunor (2021) defines

artificial intelligence (AI) as computer-controlled robots that possess human-like intelligence. These robots mirror the capacity of the human mind and are controlled digitally with the help of a computer. Artificial Intelligence records and evaluates each action a user takes. Artificial intelligence is utilized in many areas of life for the comfort and advancement of humans as a result of science and technology (Adejo & Misau, 2021). Artificial intelligence refers to the programming for example, of computers to carry out tasks requiring human intelligence, such as language translation, speech recognition, visual perception, decision-making, and emotional processing (Irizarry et al, 2017). According to Heath (2018), artificial intelligence is the technology that gives machines the capacity to think, plan, plan ahead, solve issues, move, and to some extent, be creative. From the above explanation, it can be implied that Artificial Intelligence involves training and advancement of computers to carry out tasks requiring human intelligence, including such speech processing, outcome, visual perception, language understanding, conversing, and emotional states, (Irizarry et al, 2017).

In explaining further Liu (2016) posited that artificial intelligence (AI) as intelligent systems or robots that mimic human intelligence functions and advance the study of human intelligence. In a similar vein, Omame et al (2020) highlighted generative artificial intelligence as a field in computer science that concentrates on how computers perceive information, learn (machine learning), and see, including image analysis, 3D perception, text categorization, and eye functioning model. Generative models such as ChatGPT are already being used in various functions of university institutions, including learning, teaching, research, administration, and community engagement (Sabzalieva & Valentini, 2023). Generative AI is a unique category of AI that uses deep–learning models to generate humanlike content when presented with diverse prompts Aydın and Karaarslan (2023,) including generating digital images, words, or other

content types. According to Lim et al. (2023), generative AI differs from other types of AI, such as conversational AI, having the unique ability to generate the content as response. Generative AIs such as ChatGPT combine both generative and conversational AI to simulate conversation, providing efficient and relevant knowledge acquisition (Balas and Ing 2023,). Given this, Scientists and academics are continuously delving into artificial intelligence from different angles, and revealing its huge potential (Konnikov et al., 2020).

Many well-known information-finding issues have become far more significant in the technology age as applications have become more potent, diverse, and pressing (Vijayakumar & Sheshadri, 2019). The introduction of ChatGPT (GPT4) in 2023 for example has sparked conversation and ethical anxiety around the usage of AI-powered tools in education. There are two schools of thought in these dialogues, that is the hopeful and the dystopian, like any new or developing technology. Academics such as Heaven (2023) contend that rather than outlawing programs like ChatGPT, people should consider how such programs might transform education by acting as an effective teaching tool, promoting media literacy, creating customized lesson plans, saving teachers' time, and instructing students on responsible media use.

Generative AI platforms like ChatGPT are able to "personalize learning experiences, provide intelligent tutoring, enhance content production and curation, enable literacy development and translation, facilitate analysis of data and predictive modeling, promote accessibility and inclusivity, as well as enhance administrative efficiency which can revolutionize the educational landscape (Kucikova, 2023). However, given that students may readily use programs like ChatGPT to conduct and write their projects, there is rising fear that academics and teachers will need to switch to a variety

of assessment technologies in order to accommodate more critical viewpoints due to such technological advancement.

According to Zawacki-Richter et al, (2019) "a range of technologies and approaches, including machine learning, language processing, data gathering, neural networks, or an algorithm," are together complement of artificial intelligence (AI). Technology solutions that "are able to execute tasks that are generally associated with human talents" are typically what makes artificial intelligence unique (Popenici, 2023). A compositional AI model such ChatGPT can generate answers that resemble those of a human relying on the data it receives and the patterns it has discovered from a corpus of online material. Machine learning, a branch of artificial intelligence, is used by generative AI models such as ChatGPT to identify patterns in the training data. The "Guidance for Generative AI in Education and Research" by UNESCO recognizes that generative AI has the potential to significantly improve thinking skills, automate information processing, and present outputs throughout all considerable visual tools of human thought (UNESCO, 2023). It can also facilitate the delivery of final outputs by supplying knowledge products in an incomplete state. Although the report advocates for a human-centered approach to the deployment of generative AI, it also presents a number of issues. These issues include matters of safety, privacy of data, copyright, manipulation, and moral applications in the creation of knowledge and education (UNESCO, 2023). This first global recommendation on generative AI in education follows UNESCO's 2021 Suggestion on the Ethics of Artificial Intelligence which encourages that governments control the use of generative AI in schools (UNESCO, 2023).

Machine learning, a branch of artificial intelligence, is used by generative AI models such as ChatGPT to identify patterns in the training data. These patterns enable the model, which is typically a multilayer perceptron, to extract the features and produce text that makes sense and is relevant. These models give the impression of being human when responding to inquiries, but in reality, they are able to acquire realistic conversations with users since they are trained on a large amount of data and can forecast the most likely word in a sequence depending on context (Fuchs, 2023). With time, tools like ChatGPT can adjust its output to become more precise, enhancing its generative powers and producing ever-more-complex results (Fuchs, 2023).

Although there have been some prior academic studies on artificial intelligence such as ChatGPT in particular, Sullivan et al. (2023) draw attention to the underrepresentation of student voices in this field. Conducting assessments and peer reviews will provide a further opportunity for further research to know the immediate ways students are participating and using generative AI tools (Sulliwan et al, 2023). This is because the classroom was forgotten from almost all the articles related to artificial intelligence (Sullivan et al, 2023, p. 7). Gimpel et al. (2023) contended that generative AI tools, such as ChatGPT, quill bot, Grammarly and perplexity improved higher education academic research. This is especially true given that professors and students now incorporate them into their daily lives in areas even outside of higher education. This highlight the need to improve education to harness the benefits of AI in research, learning and teaching as opposed to being cautious (Gimble et al 2023,). Considering how instructors might use AI to enhance teaching requires first knowing about how students are now using and accepting tools in their education, learning and research.

Given the benefits and constraints connected with technology acceptance and adoption in general and AI integration among students in particular, Ghana's university education is a fascinating and pertinent content to study to provide perspectives of students in other global South contexts (Badat, 2020). Numerous public universities exist, each with a unique student body composition and degree of technology proficiency. Therefore, analyzing artificial intelligence's role in graduate programs and research at universities of education such as University of Education, Winneba provides insight into how these technologies (AI) could either improve or worsen the research and educational gaps in institutions, especially in a country where access to high-quality education and infrastructure has been uneven. In order to achieve this, this study concentrates on students in the graduate programs in communication and media studies, foreign languages, mathematics, social sciences and faculty of business at the University of Education, Winneba to investigate how generative AI could enhance their studies and learning.

1.2 Statement of the problem

The use of artificial intelligence (AI) has evolved over decades − we have moved from utilizing computers and the worldwide web to having options with generative AI (Chen, Chen, & Lin 2020). The integration of GenAI into academic research is rapidly gaining momentum, offering new opportunities to accelerate methodological innovations, speed up literature reviews (Ebadi et al., 2025). The advent of generative artificial intelligence (GenAI), led to widespread release and adoption of pre-trained generative transformers such as GPT-3, GPT-4 and Deep Seek within academia (Strzelecki et al., 2024). Generative AI powered tools like citation managers and plagiarism checkers are becoming indispensable in academic research, improving the quality and integrity of scholarly work in Education (Berendt & Preibusch, 2017)

This subject is important given the generative AI tools impact on academic research, teaching, student learning and integration among others (Susnajk, (2022); Ventayen, (2023)). These concerns have sparked debates on how generative AI is transforming the research activities of students and academics in universities. Despite the debates on evolution implication and transformation of generative AI and its application in academic research, little work has been done in that regard, especially from the context of Ghana, Africa and global south.

Studies of AI have been conducted in the western context for example, (Kasneci et al., (2023); Qadir, (2022); Rudolph et al., (2023); Susnjak, (2022); Zhai, (2022)) among othes, have examined how generative artificial intelligence tools are changing the dynamics in research, teaching and learning in higher education from Western perspectives. These scholars established from their studies that generative artificial intelligence has affected every facet of education especially among university students and learners. In Africa including Ghana, a few studies on generative artificial intelligence have been conducted, for example, Okolo et al. (2023), Makeleni et al. (2023) have largely focus on different areas such as marketing and advertising among others with relatively little on how artificial intelligence is improving learning of students. There is little research on generative artificial intelligence in many sectors including education. The few studies on generative artificial intelligence in relation to Ghana have focused on the use of generative artificial intelligence tools used by teachers in their academic activities (Nurudeen,2023), higher education marketing (Boateng, 2024) and using AI in brands and advertising (Boateng,2023) among others.

However, none of these studies has particularly explored how these generative artificial intelligence platforms have been accepted and used by postgraduate students in public

universities in Ghana. Given this, this current study attempts to bridge this gap by investigating how postgraduate students at University of Education, Winneba use generative artificial intelligence (AI) tools in their academic research. In addressing the gap, this study seeks to achieve the research goals and answer the research objectives that follow.

1.3 Research Objectives

1. To investigate the use of generative AI in academic research by postgraduate students at University of Education, Winneba.
2. To identify what motivate the use of artificial intelligence (AI) tools by postgraduate students at University of Education, Winneba in academic research.
3. To examine the perception of postgraduate students of UEW about the use of generative AI in their academic research.

1.4 Research Questions

1. What do postgraduate students at University of Education, Winneba use generative artificial intelligence in academic research for?
2. What motivates the use of generative artificial intelligence (AI) by postgraduate students at University of Education, Winneba in their academic research?
3. What is the perception of postgraduate students about the use od generative AI in their academic research?

1.5 Scope of the Study

The study focuses on the use of generative artificial intelligence (AI) in academic research among postgraduate students at the University of Education, Winneba (UEW). The study will investigate the extent to which postgraduate students at UEW utilize

generative AI tools in their academic research includes the types of tools used and the specific research tasks they applied to. The study will also examine the motivations behind postgraduate students' use of generative AI. The study again will explore postgraduate students' perceptions of generative AI. The study is limited to postgraduate students at UEW and aims to provide insights into their experiences, motivations, and perceptions regarding the use of generative AI in academic research.

1.6 Significance of the Study

This study is significant in several ways. First, the study adds to the field and knowledge of artificial intelligence, which is a relatively new and developing area in media and communication technologies. Given that artificial intelligence is new especially in developing countries like Ghana, this study contributes to literature regarding their implications in society, particularly on research in higher education. The findings and recommendations including suggestion for further studies could serve as a foundation and basis for more research in the field of artificial intelligence. It is also useful for higher education institutions and policy makers in the integration of artificial intelligence in teaching and learning in Ghana and beyond.

1.7 Organization of the Study

The thesis is organized into five (5) chapters. The first chapter (chapter 1) includes the general introduction, problem statement, objectives, research questions, scope of the study and limitations, and study significance. The second chapter covers the body of literature that has already been written, with a focus on discussions and reviews of works that address the research topic. The research methodology is presented in Chapter three (3). It includes the selection of research methods, design, data collection and analysis techniques, sampling and sample size among others. The data gathered from

the fieldwork is presented, analyzed, and discussed in the fourth chapter. The summary of the results, conclusions, and suggestions are presented in Chapter five (5).

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews and analyzes literature with respect to how artificial intelligence tools are used by higher education students. The literature review situates the context of this study through analysis of various literature to provide understanding. The discussions are provided in the subsections below.

2.1 Teaching and learning in Education

The concept of teaching and learning in education has undergone significant transformations over the years, influenced by both pedagogical advancements and shifts in societal needs. Education, traditionally viewed as the transmission of knowledge from teacher to student, has evolved to embrace a more dynamic interaction where learners actively participate in the construction of knowledge (Freire, 1970). In contemporary educational discourse, teaching and learning are seen as deeply intertwined processes, characterized by the collaborative exchange of ideas, critical thinking, and the application of knowledge to real-world situations. Understanding these processes requires a comprehensive examination of various teaching and learning theories, methodologies, and the factors that shape their effectiveness in diverse educational settings. One of the foundational theories in the context of teaching and learning is the constructivist theory, which posits that learners actively construct their own understanding of the world, building upon prior knowledge and experiences (Piaget, 1971).

According to constructivism, learning is not a passive absorption of information but a process through which learners make meaning by interacting with their environment.

Piaget's theory of cognitive development highlights that learners progress through different stages of development, which influences their ability to understand and process information. Vygotsky (1978) further expanded on this idea with his sociocultural theory, which emphasizes the importance of social interactions and cultural context in shaping the learning process. Vygotsky introduced the concept of the zone of proximal development (ZPD), where learners can achieve higher levels of understanding and skill through guidance from more knowledgeable others, such as teachers or peers. These theories underscore the importance of engaging students in activities that challenge them while providing the necessary support to facilitate deeper learning.

In addition to cognitive theories, teaching and learning are also informed by behaviorist principles, particularly the work of Skinner (1953) and his notion of reinforcement. Behaviorism focuses on observable behaviors and how they are shaped by stimuli and reinforcement from the environment. In educational settings, behaviorist approaches have led to the development of techniques such as positive reinforcement, where desired behaviors are encouraged through rewards, and negative reinforcement, where undesirable behaviors are discouraged. While behaviorism has been criticized for its lack of attention to internal cognitive processes, it remains influential in classroom management and instructional strategies aimed at fostering student engagement and motivation (Bandura, 1986). Another critical perspective in the discourse of teaching and learning is the experiential learning theory, championed by Kolb (1984), which emphasizes learning through experience. Kolb's experiential learning cycle consists of four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This model suggests that learners acquire knowledge by engaging in hands-on experiences, reflecting on those experiences, forming conceptual

understandings, and applying their new knowledge in practical contexts. Experiential learning has been widely adopted in education, particularly in vocational training and professional development, where learning through doing is essential for mastering practical skills (Dewey, 1938).

This approach aligns with the constructivist view that learners should be active participants in their own learning processes, applying their knowledge to real-life situations to enhance retention and comprehension. In modern education, student-centered learning has gained prominence, shifting the focus from traditional teacher-led instruction to approaches that prioritize the needs, interests, and abilities of the learners (Weimer, 2013). This pedagogical shift is supported by research that suggests that students learn more effectively when they have agency over their learning and are encouraged to take responsibility for their educational outcomes. In student-centered learning environments, teachers act as facilitators rather than sole knowledge providers, guiding students in discovering knowledge through inquiry-based learning, problem-solving, and critical thinking (Rogers, 1983). This approach is reflected in various educational reforms aimed at creating more personalized learning experiences, such as differentiated instruction, which tailors teaching methods and materials to the diverse needs of students in the classroom (Tomlinson, 2001). Despite the emphasis on student-centered learning, the role of the teacher remains crucial in fostering effective teaching and learning outcomes. Teachers' pedagogical knowledge, classroom management skills, and ability to adapt instruction to meet the needs of diverse learners are critical factors in promoting student achievement (Hattie, 2009). Research has shown that effective teaching requires not only content knowledge but also the ability to create a supportive and engaging learning environment. Classroom interactions, feedback, and assessment strategies play a significant role in enhancing student learning (Black &

Wiliam, 1998). For instance, formative assessment, which involves providing ongoing feedback to students throughout the learning process, has been shown to improve learning outcomes by helping students identify their strengths and areas for improvement (Sadler, 1989).

Technology has also had a profound impact on teaching and learning in education, particularly with the rise of digital tools and online learning platforms. The integration of technology in education has transformed traditional classroom practices, offering new opportunities for interactive and personalized learning experiences. E-learning, blended learning, and flipped classrooms are some of the innovative approaches that leverage technology to enhance teaching and learning (Garrison & Vaughan, 2008). These approaches enable students to access learning materials at their own pace, collaborate with peers, and receive immediate feedback, thereby promoting active learning and improving educational outcomes (Means et al., 2010). However, the effective integration of technology requires teachers to develop digital literacy skills and adapt their instructional methods to accommodate technological tools (Mishra & Koehler, 2006). The Technological Pedagogical Content Knowledge (TPACK) framework, proposed by Mishra and Koehler (2006), highlights the importance of teachers' ability to integrate technology with content knowledge and pedagogical strategies to create meaningful learning experiences.

Another important aspect of teaching and learning is the role of assessment in evaluating student learning and guiding instructional practices. Assessment serves both formative and summative purposes, providing feedback to students and teachers on the progress of learning and measuring students' achievement of learning objectives (Stiggins, 2002). Formative assessments, such as quizzes, peer reviews, and self-

assessments, are designed to provide ongoing feedback during the learning process, while summative assessments, such as exams and standardized tests, evaluate students' overall performance at the end of a learning period (Harlen & James, 1997). Effective assessment practices are crucial for identifying gaps in learning, tailoring instruction to meet students' needs, and ensuring that educational goals are met. However, there is growing concern about the overreliance on standardized testing, which may not accurately reflect students' learning and can contribute to a narrow focus on test preparation rather than deep learning (Kohn, 2000).

The social and emotional aspects of learning have also gained attention in educational research, particularly in light of the growing recognition of the importance of social-emotional learning (SEL) in promoting student well-being and academic success (Durlak et al., 2011). SEL focuses on the development of skills such as self-awareness, self-regulation, social awareness, relationship-building, and responsible decision-making. Research indicates that students who participate in SEL programs demonstrate improved academic performance, behavior, and emotional well-being (Zins et al., 2004). Teachers play a crucial role in fostering SEL by creating a supportive classroom environment, modeling positive behaviors, and incorporating social-emotional learning into daily instruction (Jones & Bouffard, 2012). As schools increasingly recognize the importance of educating the whole child, SEL is becoming an integral component of teaching and learning in education.

Finally, inclusive education has emerged as a critical area of focus in teaching and learning, particularly in efforts to provide equitable educational opportunities for students with diverse needs. Inclusive education aims to create learning environments where all students, regardless of their abilities, backgrounds, or learning styles, can

participate fully and thrive (Ainscow, 2005). This approach is grounded in the belief that diversity should be celebrated and that all students should have access to high-quality education. However, achieving inclusive education requires teachers to adopt flexible teaching methods, differentiate instruction, and provide appropriate accommodations and support for students with special needs (Florian & Black-Hawkins, 2011). Research has shown that inclusive education benefits not only students with disabilities but also their peers by fostering a more supportive and empathetic classroom environment (Avramidis & Norwich, 2002).

The process of becoming a teacher (and teacher educator) is intricate and multidimensional, requiring the mastery of a variety of attitudes, beliefs, and dispositions in addition to knowledge and skill. "Teaching (and by extension, teaching people how to teach) is an extraordinarily difficult form of professional practice that looks easy," contends (Labaree, 2005). Because of this, the complex, contextual, and dynamic nature of teaching must be taken into account in the creation of policy, practice, and research in teacher education. "Understanding and valuing that complexity is at the heart of uncovering quality in teacher education," claim Loughran & Hamilton (2016, p. 5). Therefore, it is important to recognize this complexity in discussions about teacher education and to take into account the multifaceted nature of the professional knowledge needed to become a teacher, in addition to other aspects like identity, agency, and reflection. "The teacher as a professional view goes beyond providing teachers with teaching and management skills,"(Zeichner 2014, p. 560). Moving past a reductionist view of teaching, which regards teachers as merely implementers or doers, is therefore crucial. Moving past a training perspective that incorporates a constrained and basic understanding of teaching and the process of learning to teach is also essential (Flores, 2023) It's crucial to think about not just the "what" and "how," but also the

"why" and "for what purposes." Prompt feedback, encouraging teamwork among students, and pleasant student relationships both within and outside of the classroom are characteristics of effective teachers (Hammer et al, 2010). Teaching materials have a greater impact on students' learning than the quantity of topics taught in class, according to Weimer (2006), who also claims that teaching methods and content are intrinsically intertwined and co-dependent. By encouraging discussion and activities that improve students' comprehension and retention of the information, placing an emphasis on quality aids students in developing a mastery grasp of the subject (Weimer, 2006). Instructors are advised to focus their time on subjects that are most pertinent to the specific learning objectives that are set forth for that course and program, rather than covering a large quantity of material over the course of a semester (Weimer, 2006). Studies have indicated that students who are enrolled in more challenging courses tend to put in less effort, perceive them as having less significance, and have lower self-confidence in their ability to perform well in the class (Lynch, 2008).

2.2 Technology in Education

In the 21st century, the integration of technology into education has revolutionized teaching and learning processes, reshaping how educators and learners engage with content. The role of technology in education has evolved from simple tools to complex systems that foster collaborative, personalized, and data-driven learning experiences. The integration of digital technologies has spurred numerous pedagogical innovations that extend beyond traditional classroom boundaries (Alqahtani & Kavakli-Thorne, 2020). These technologies include hardware such as computers, tablets, and interactive whiteboards, alongside software like learning management systems (LMS), intelligent tutoring systems (ITS), and educational games, which contribute to enhancing student engagement, comprehension, and retention. Teachers' use of technology is not set in

stone because of the way it is constantly entwined with change (Ruggiero & Mong, 2015). Online learning has become a constant part in education because to the COVID-19 pandemic, which has driven the digital transformation of the field (García-Morales et al., 2021). As a result, many technology technologies and platforms are now used to facilitate online learning, with artificial intelligence being no different. Numerous features that educational technology offers have been noted, including datafication, immersive experience, scalability, human-to-human and human-to-machine technology-enabled interactions, and datafication (Castro, 2019). This research thus takes into mind the relevance of analyzing the situations in which these talents are used.

Teachers and students agree that benefits of e - learning are the most beneficial resource (Bond et al. 201). F 8urthermore, the majority of students are open to using electronic channels for their studies and already have access to a wide variety of resources. Nevertheless, as mentioned by (Redecker et al 2012) there is a need for further teacher education to address scholastic digital literacy (Norris J,2017). It has long been known that instructional technology has a lot of promise to raise student engagement (Bond et al. 2020; Norris & Coutas, 2014). However, imposing technology on pupils and expecting improved outcomes is not the whole story. We advise caution because, in the absence of a well-thought-out plan and a solid pedagogical foundation, technology can actually encourage disengagement and learning of students (Howard et al., 2016; Popenici, 2013). Although research in this field has mostly focused on STEM and health, there is generally a beneficial association between the use of technology and student involvement, particularly in university courses (Chen et al. 2010). (Li et al., 2017; Nikou & Economides, 2018).

Research has shown that discussion boards, public webpages, education methods, common university programs, and videos are the most often studied strategies for improving learner engagement (Henrie et al. 2015). Moreover, Facebook, web conferencing software, and digital games were the best resources for its improvement (Schindler et al, 2017). There are conflicting findings on this issue because other research revealed that the tools that had the biggest effects on participation were multimodal production tools, text-based tools, and approach to teaching and learning and sharing (Bond et al. 2020). It is more likely that participation will result in a variety of positive outcomes and that this energy and commitment will then be reinvested in the programs and learning environment the more empowered and involved learners were within their educational community (Bond et al. 2020).

Although the amount of research on the relationship between technology use and student involvement is growing, there is still a lack of theoretical framework and understanding in the field (Henrie et al., 2015). It has been determined that a critical component is maintaining lecturer attendance all across the course and offering ongoing support to facilitate students' real use of technology. When educational technology is integrated and students find it relevant, relatable, and anxiety-free, they are more likely to be engaged. Giving students the chance to choose more activities and technologies, as well as to work in groups, can all help them feel more in control of their education in this setting. Students' learning may be fostered by thoughtfully interacting with and applying technology, as well as by giving them opportunities for actively participating (Bond et al., 2020).

2.2.1 Technological Tools and Digital Platforms in Education

In recent decades, technological tools and digital platforms have become increasingly integral to education, transforming teaching methods, learning environments, and educational outcomes. These tools are designed to foster collaborative learning, increase student engagement, and provide personalized learning experiences. With the rapid advancement of technology, educators and institutions are continually adopting new digital platforms to enhance teaching and learning experiences. Among the most impactful tools are Learning Management Systems (LMS), Intelligent Tutoring Systems (ITS), gamified learning tools, and collaborative platforms that facilitate remote learning. The integration of such technologies in education has shifted the focus from traditional teaching methods to more interactive, student-centered approaches (Holmes, Bialik, & Fadel, 2019). However, while these tools offer numerous benefits, their adoption is not without challenges, including issues related to equity, accessibility, and the digital divide, which often disproportionately affect marginalized student populations (West, 2019).

Learning Management Systems (LMS) such as Moodle, Blackboard, and Google Classroom are among the most widely used digital platforms in education today. These systems serve as virtual classrooms where teachers can post assignments, deliver lectures, and track student progress. One of the key advantages of LMS is that it provides a centralized platform for both teachers and students, streamlining administrative tasks and facilitating communication (Chen et al, 2021). Students can access course materials at their convenience, allowing for more flexibility in their learning process, especially in asynchronous learning environments. LMS also offers teachers data analytics capabilities, enabling them to track student participation and performance, thus allowing for timely interventions when necessary (Siemens, 2013).

Despite their many benefits, the use of LMS is often hindered by technical difficulties and requires significant investment in both infrastructure and training for educators (Noroozi, et al, 2019). Without adequate training, teachers may struggle to utilize the full range of LMS capabilities, which can limit its effectiveness in enhancing learning outcomes.

Another significant technological tool in education is the Intelligent Tutoring System (ITS), which leverages generative artificial intelligence (AI) to offer personalized instruction to students. ITS platforms such as Carnegie Learning's Cognitive Tutor adapt in real time to a student's learning needs, offering customized feedback and support based on their individual progress (Adesope, et al, 2014). Studies have shown that ITS can significantly improve learning outcomes, particularly in subjects such as mathematics and science, where students often struggle with complex concepts (VanLehn, 2011). ITS platforms utilize data analytics to continuously assess a student's strengths and weaknesses, adjusting instruction accordingly. This real-time feedback mechanism helps students grasp difficult concepts more effectively and reduces the need for one-on-one tutoring, which may not be readily available in all educational contexts. However, the high cost of developing and maintaining ITS platforms limits their accessibility, particularly in low-income schools and regions (Alqahtani & Kavakli-Thorne, 2020). Moreover, the ethical implications of using AI in education, particularly concerns about data privacy and algorithmic bias, are issues that must be addressed as ITS becomes more prevalent (Baker & Hawn, 2021).

Gamification is another innovative approach that has gained traction in education, using game elements such as points, levels, and badges to motivate students and make learning more engaging. Digital platforms like Kahoot, Quizlet, and Duolingo

incorporate gamification to promote active learning, increase student engagement, and enhance knowledge retention (Dichev & Dicheva, 2017). These platforms provide students with interactive quizzes, flashcards, and challenges that make learning fun and competitive. Research has shown that the use of gamification in educational settings can lead to improved student motivation and better academic performance (Huang & Hew, 2021). For instance, in a study conducted by (Hwang et al, 2018), students who used gamified platforms demonstrated higher levels of engagement and achieved better academic results compared to those who learned through traditional methods. While gamification has proven effective in enhancing student motivation, it is essential to design such tools carefully to ensure they do not oversimplify complex topics or become mere distractions from meaningful learning experiences (Sailer et al, 2017).

Collaborative digital platforms such as Google Docs, Microsoft Teams, and Slack have also revolutionized the way students and educators interact and collaborate. These platforms enable real-time collaboration, allowing multiple users to work on the same document or project simultaneously, regardless of their location. This capability has been particularly beneficial for group projects and remote learning scenarios, where students may not be physically present in the same classroom (Noroozi et al., 2019). The integration of these platforms into education has also been critical in facilitating communication between teachers and students, enabling educators to provide timely feedback and guidance. Collaborative tools foster a more inclusive and participatory learning environment, allowing students who may be hesitant to speak up in traditional classroom settings to contribute to discussions and projects through digital platforms (Firat, 2016). However, effective use of these platforms requires both students and teachers to have access to reliable internet connections and adequate technological

devices, which can be a significant barrier in low-resource environments (Wong & Li, 2020).

The outbreak of COVID-19 pandemic had accelerated the adoption of digital platforms in education, as schools and universities around the world transitioned to online learning to ensure continuity of education and corporate sectors. Video conferencing tools such as Zoom, Google Meet, and Microsoft Teams became essential for conducting live classes and maintaining a semblance of the traditional classroom environment (Zawacki-Richter et al, 2019). These platforms allowed teachers to deliver lectures, facilitate discussions, and conduct assessments in real-time, bridging the gap created by physical distancing measures. While these tools provided a lifeline for education during the pandemic, they also highlighted the significant digital divide that exists in many parts of the world. Students without access to high-speed internet or technological devices were at a distinct disadvantage, as they struggled to keep up with online lessons and assignments (Boulianne, 2021). This digital divide underscores the importance of addressing issues of equity and access in the adoption of technological tools in education.

In addition to live conferencing tools, online learning platforms like Coursera, edX, and Khan Academy have made significant contributions to education by providing open-access courses to learners worldwide (Siemens, 2013). These platforms offer a wide range of subjects and courses from top universities, allowing students to learn at their own pace and earn certifications that are recognized by many employers and academic institutions. The flexibility of these platforms makes them particularly appealing to adult learners and working professionals who may not have the time to commit to traditional classroom-based education (Pane, Griffin, McCaffrey, & Karam, (2014)).

However, online learning platforms are not without challenges. Issues such as learner motivation, course completion rates, and the lack of personalized feedback have been identified as key areas that need improvement (Siemens, 2013). Additionally, the shift to online learning has raised questions about the role of social interaction in education and how it can be effectively replicated in virtual environments.

Another key consideration in the use of technological tools and digital platforms in education is the need for continuous professional development and training for educators. Teachers must be equipped with the necessary skills to effectively integrate digital tools into their pedagogy (Luckin et al, 2016). Without adequate training, teachers may struggle to utilize the full range of capabilities offered by these platforms, limiting their potential to enhance learning outcomes. Moreover, teachers need to be supported in developing digital literacy skills, not only to use technological tools but also to help their students navigate the increasingly digital world (Chen et al., 2021). A study by Goodyear and Retalis (2010) emphasized the importance of teacher training in the successful adoption of technology in education, noting that even the most advanced tools are unlikely to be effective if educators are not properly trained in their use.

Despite the numerous advantages of technological tools and digital platforms in education, there are also significant challenges that must be addressed to ensure their effective and equitable implementation. One of the most pressing concerns is the issue of data privacy and security. As more educational activities move online, there is an increasing amount of student data being collected by digital platforms, raising concerns about how this data is being used and who has access to it (Slade & Prinsloo, 2013). Educational institutions must ensure that they have robust data protection policies in

place to safeguard the privacy of students and educators alike. Additionally, Baker & Hawn, 2021). If not there is a growing concern about algorithmic bias in educational technologies, particularly in tools that use AI to assess student performance and predict future success (carefully monitored, these algorithms could perpetuate existing inequalities and disproportionately disadvantage certain groups of students.

Furthermore, the reliance on technological tools and digital platforms in education raises questions about the role of traditional teaching methods and the value of face-to-face interaction. While digital tools can enhance learning in many ways, they cannot fully replicate the social and emotional aspects of learning that occur in a physical classroom (Firat, 2016). Educators must strike a balance between using digital tools to enhance learning and maintaining the human element of teaching that fosters relationships, collaboration, and critical thinking.

2.2.2 Technology and Distance Education

Distance education has undergone significant transformation over the past few decades, driven primarily by technological advancements. Technology's role in distance education is multi-faceted, encompassing instructional delivery, learner engagement, and administrative support, thereby contributing to the overall effectiveness of distance learning systems (Bates, 2019). This review will explore various dimensions of technology integration in distance education, focusing on the evolution of distance learning technologies, their impact on teaching and learning processes, the challenges and opportunities they present, and emerging trends that are shaping the future of distance education.

Distance education, originally characterized by correspondence courses where printed materials were mailed to students, has evolved significantly due to advancements in

technology (Garrison & Anderson, 2003). Early forms of technological intervention in distance education began with radio and television broadcasts, which were used to reach a broader audience. The introduction of computer-based learning in the 1980s marked a new era in distance education. The development of the internet in the 1990s and the subsequent growth of online learning platforms have redefined distance education, making it more accessible and interactive (Moore & Kearsley, 2011). The integration of learning management systems (LMS) such as Moodle, Blackboard, and Canvas further enhanced the ability of institutions to manage courses, track student progress, and provide instructional materials (Alavi & Leidner, 2001).

As the internet became more widely available, distance education transitioned from primarily asynchronous models, where students could access materials at their convenience, to include more synchronous methods, such as live video conferencing, which facilitates real-time interaction between students and instructors (Hrastinski, 2008). The adoption of broadband technology and the proliferation of mobile devices have further expanded the reach of distance education, enabling students to access learning materials anytime, anywhere (Kirkwood & Price, 2014).

The integration of technology into distance education has had profound effects on both teaching and learning processes. From an instructional perspective, technology has allowed educators to adopt more flexible and student-centered pedagogies. Constructivist approaches, which emphasize active learning and collaboration, have been made possible through the use of online discussion forums, wikis, and collaborative tools (Jonassen, 2004). Teachers are now able to design learning experiences that are more interactive, allowing students to engage with content through multimedia, simulations, and virtual labs (Anderson, 2008). Furthermore, the use of

data analytics and artificial intelligence in LMS platforms enables personalized learning by adapting content delivery based on individual student performance (Siemens, 2013). On the student side, technology has democratized access to education by removing geographic barriers and providing opportunities for lifelong learning (Picciano, 2017). Online education platforms like Coursera, edX, and Udemy have opened up higher education to millions of learners around the world, particularly those who would not have access to traditional educational institutions (Bates, 2019). The ability to learn at one's own pace and revisit materials as needed is particularly beneficial for adult learners and those with varying learning styles (Anderson & Dron, 2011).

However, the impact of technology on learning is not entirely positive. While it has increased accessibility, it has also introduced challenges related to student engagement and motivation. Research suggests that online learners often experience feelings of isolation, which can negatively impact their academic performance and satisfaction (Rovai, 2002). To mitigate these issues, educators have employed various strategies, including the use of synchronous communication tools, social media integration, and peer-to-peer learning networks (Hrastinski, 2009). Furthermore, the digital divide, characterized by unequal access to technology, remains a significant barrier to effective distance education, particularly in developing countries (West, 2019). The integration of technology into distance education is not without its challenges. One of the most significant issues is the digital divide, which refers to the disparity in access to technology among different populations (Warschauer, 2004). While internet penetration has increased globally, there are still significant gaps, particularly in rural and low-income areas, where reliable access to broadband internet and technological devices is limited (Van Dijk, 2020). This lack of access prevents students from fully participating

in distance education and undermines the equity goals that such systems aim to achieve (Beaunoyer, Dupéré, & Guitton, 2020).

Another challenge is related to the technological literacy of both educators and students. While younger students tend to be more tech-savvy, there is a learning curve associated with the adoption of new technologies, particularly for older learners and instructors (Selwyn, 2016). Instructors, in particular, may find it difficult to transition from traditional face-to-face teaching methods to online pedagogies that require familiarity with digital tools (Bennett & Maton, 2010). Professional development programs are therefore essential to equip educators with the skills necessary to effectively integrate technology into their teaching practices (Johnson et al., 2016). The effectiveness of technology in distance education also depends on the quality of instructional design. Poorly designed online courses, which merely replicate traditional classroom-based approaches, often result in disengaged learners and high dropout rates (Pappas, 2015). Effective online learning environments require a different approach to instructional design that takes into consideration the specific needs of distance learners, including clear communication, timely feedback, and opportunities for interaction (Salmon, 2011).

Despite the challenges, technology presents numerous opportunities for enhancing distance education. One of the most significant opportunities is the potential for personalized learning, which is made possible by advances in artificial intelligence and learning analytics (Luckin et al., 2016). Personalized learning systems can analyze student data and adapt instruction based on individual learning needs, providing targeted support to students who may be struggling and offering advanced materials to those who are excelling (Holmes, Bialik, & Fadel, 2019).

Technology also enables greater flexibility in the design and delivery of distance education courses. The use of mobile learning (m-learning) allows students to access course materials on their smartphones and tablets, making learning more accessible and convenient (Traxler, 2007). Additionally, the integration of multimedia elements, such as videos, animations, and interactive simulations, enhances student engagement and understanding of complex concepts (Mayer, 2009). Virtual and augmented reality technologies are also beginning to be used in distance education, offering immersive learning experiences that were previously only possible in traditional classrooms (Liu et al., 2020). Furthermore, the rise of massive open online courses (MOOCs) has expanded the reach of distance education to a global audience. MOOCs offer learners access to high-quality educational content from leading universities and institutions at little to no cost, thereby democratizing education (Yuan & Powell, 2013). While completion rates for MOOCs are generally low, they provide valuable opportunities for lifelong learning and skill development (Jordan, 2015).

Several emerging trends are shaping the future of technology in distance education. One such trend is the increasing use of artificial intelligence (AI) to enhance learning outcomes. AI-powered tools, such as intelligent tutoring systems (ITS), can provide personalized instruction to students by adapting to their learning styles and progress (VanLehn, 2011). AI is also being used to automate administrative tasks, such as grading and providing feedback, thereby allowing instructors to focus on more meaningful interactions with students (Holmes et al., 2019). Another trend is the growing use of gamification in distance education. Gamification refers to the use of game design elements, such as points, badges, and leaderboards, to motivate and engage learners (Deterding et al., 2011). Research has shown that gamification can increase student motivation and improve learning outcomes, particularly in online environments

where students may struggle with self-discipline and engagement (Sailer et al., 2017). Blockchain technology is also gaining attention as a tool for managing educational credentials and ensuring the security of student data. Blockchain can be used to create secure, tamper-proof records of student achievements, which can be easily verified by employers and other institutions (Grech & Camilleri, 2017). This technology has the potential to revolutionize the way educational institutions manage and verify student records, particularly in the context of distance education, where students may be located across multiple jurisdictions.

Finally, the COVID-19 pandemic has accelerated the adoption of technology in education, highlighting the importance of distance education systems in ensuring continuity of learning during times of crisis (Bozkurt et al., 2020). The pandemic has forced educational institutions around the world to rapidly shift to online learning, resulting in increased investment in digital infrastructure and a greater focus on improving the quality of online education (Hodges et al., 2020). While the pandemic has exposed existing inequalities in access to technology, it has also provided an opportunity to reimagine the future of education, with technology playing a central role in making education more flexible, inclusive, and resilient.

2.2.3 Challenges and Limitations of Technology Integration

The integration of technology into education, though transformative, presents a myriad of challenges. These difficulties vary across contexts, from developed to developing countries, and stem from factors such as inadequate infrastructure, limited digital competence, and resistance from educators. Understanding these challenges is essential for advancing technology's role in educational settings. One of the most persistent barriers to technology integration is the lack of adequate infrastructure, especially in

underdeveloped regions. Without stable internet access, up-to-date hardware, or appropriate educational software, the full potential of technology in enhancing teaching and learning remains unfulfilled (Durff & Carter, 2019). Many educational institutions, particularly in rural or economically disadvantaged areas, struggle with outdated devices, slow internet speeds, and inadequate maintenance support, leaving both students and teachers frustrated (Tosuntaş et al., 2019).

In some cases, these infrastructural challenges are compounded by the digital divide, where economically privileged schools have access to advanced tools, while disadvantaged ones do not. This disparity became glaringly evident during the COVID-19 pandemic, where students from urban areas with better resources adapted more seamlessly to online learning, while those in rural regions faced severe disruptions due to infrastructural limitations (Ullah & Ali, 2021). The digital divide not only affects students' access to educational content but also exacerbates inequalities in learning outcomes (Francom, 2020).

For technology integration to be effective, educators must be equipped with the requisite digital skills and competencies. Unfortunately, many teachers, particularly those in developing countries, lack sufficient training in using digital tools in pedagogical practices (Hew & Brush, 2007). Studies have shown that a significant portion of teachers exhibit low confidence in using technology, which stems from either inadequate training or resistance to adopting new teaching methods (Afridi & Chaudhry, 2019). Moreover, the professional development programs available to teachers are often insufficient, focusing more on the theoretical aspects of technology rather than practical applications in the classroom (GoGuardian, 2019).

Teacher attitudes also play a crucial role in technology integration. Research shows that many teachers hold negative perceptions toward technology, preferring traditional teaching methods over digital ones. This resistance is often due to concerns over technology's effectiveness in fostering interactive and engaging learning experiences (Abbasi et al., 2021). Educators, particularly those with limited exposure to technology, may view it as a threat to their teaching style or as a tool that increases their workload without adding tangible value to student learning (Dar et al., 2018). Another critical limitation of technology integration is the misalignment between technology and existing curricular frameworks. In many cases, technology is introduced into educational environments without proper consideration of its pedagogical implications. As a result, teachers often struggle to integrate digital tools effectively within the constraints of a rigid curriculum (Izmirli & Kirmaci, 2017). This problem is further exacerbated by the absence of harmonized instructional designs that accommodate technology-enhanced learning (Ajmal et al., 2019). Moreover, the one-size-fits-all approach to integrating technology fails to address the diverse learning needs of students. While technology has the potential to personalize learning experiences, the lack of tailored digital content that aligns with students' individual needs often limits its effectiveness (Ahmed et al., 2017). Additionally, the over-reliance on technology can diminish critical thinking and problem-solving skills if not appropriately integrated into the curriculum (Shah et al., 2020).

Cultural resistance to technology is another significant barrier, particularly in traditional educational environments where face-to-face teaching is considered the gold standard. Teachers in such settings may view technology as an unnecessary complication that detracts from the interpersonal relationships fundamental to learning (Asif et al., 2020). Furthermore, in some educational cultures, there is skepticism about the long-term

benefits of technology in improving learning outcomes. This is particularly true in societies where education systems prioritize rote memorization over creative and critical thinking skills that digital tools can help develop (Thaheem et al., 2021).

The attitudes of educational leaders also influence the extent to which technology is adopted. In institutions where administrators are not supportive of technological initiatives, the integration process is often stymied. Conversely, in environments where leadership is proactive in adopting new technologies and fostering a culture of innovation, technology integration tends to be more successful (Lemoine et al., 2020). Technology integration also raises concerns regarding equity and inclusivity. While digital tools have the potential to make education more accessible, they can also reinforce existing inequalities if not implemented thoughtfully. For example, students with disabilities may struggle to engage with standard digital platforms that are not designed with accessibility in mind. Similarly, students from marginalized communities who do not have access to devices at home are at a disadvantage compared to their peers (Janssen, 2020). Addressing these equity issues requires a comprehensive approach that goes beyond merely providing devices. Schools and educational systems need to ensure that digital tools are inclusive and accessible to all students, regardless of their socio-economic status or physical abilities (Izmirli & Kirmaci, 2017). Additionally, policies that support the equitable distribution of technological resources across schools are essential to preventing the digital divide from widening (Abbasi et al., 2021).

To overcome these challenges, several strategies can be adopted. First, governments and educational institutions need to invest in robust infrastructure that supports seamless technology integration. This includes ensuring that schools have access to

reliable internet, up-to-date devices, and technical support (Durff & Carter, 2019). Additionally, teacher training programs should be restructured to focus on practical applications of technology in teaching, rather than theoretical knowledge (Hamutoglu, 2021). Furthermore, a shift in curriculum design is necessary to accommodate the evolving role of technology in education. Educational authorities should collaborate with technology experts to develop curricula that integrate digital tools in ways that enhance learning rather than disrupt it (Afridi & Chaudhry, 2019). Schools should also prioritize professional development programs that equip teachers with the skills and confidence needed to integrate technology effectively into their pedagogy (GoGuardian, 2019).

Finally, addressing equity and inclusivity should be a central goal of any technology integration initiative. This means not only providing access to devices but also ensuring that digital tools are designed to meet the diverse needs of all students (Shah et al., 2020). By taking a holistic approach to technology integration, educational systems can ensure that all students benefit from the opportunities that digital tools offer, while minimizing the challenges and limitations associated with their use.

2.2.4 The Future of Technology in Education

The future of technology in education is poised for significant transformations, driven by innovations like artificial intelligence (AI), immersive learning environments, and data analytics. These advancements promise to reshape both teaching and learning experiences, presenting educators and students with opportunities and challenges alike. One of the most impactful changes on the horizon is the integration of generative AI in classrooms. AI has already begun automating tasks such as grading and lesson planning, which allows educators to focus more on personalized instruction and creative teaching

strategies (Schwartz et al., 2023). This shift not only makes teachers' jobs more efficient but also enables them to spend more time interacting with students. AI-powered tools like ChatGPT are expected to assist with more than just administrative tasks. These technologies can generate content, facilitate discussions, and even simulate human conversations to enhance student engagement and learning outcomes (Grassini, 2023). However, the rise of generative AI also raises concerns regarding academic integrity, with fears that students may use these tools to cheat. Educators will need to develop strategies to mitigate such risks while embracing AI's potential to revolutionize learning.

In addition to AI, immersive technologies like augmented reality (AR) and virtual reality (VR) are likely to play an increasingly central role in education. These tools enable students to experience complex concepts in a highly interactive and engaging way. For instance, learners can embark on virtual field trips to study environmental changes, or use AR to explore historical events, bringing abstract or distant content to life (Pilner Blair et al., 2023). The application of VR and AR in education is expected to expand further, enabling students not only to consume information but also to create interactive content themselves, which enhances both their learning and creative skills (Stanford GSE, 2023). Gamification is another trend set to shape the future of education. By incorporating game-like elements such as rewards and interactive video into learning platforms, educators aim to make learning more engaging and motivating for students. Gamification taps into students' natural competitive instincts, encouraging them to persevere in mastering challenging concepts (Schwartz, 2023). However, critics caution that while gamified rewards can boost engagement in specific tasks, they may not necessarily translate into a broader enthusiasm for learning across different subjects.

One of the promising aspects of future educational technology is the use of big data and analytics to personalize learning. By capturing vast amounts of data—every keystroke, quiz score, and interaction—educators can better understand students' learning behaviors and tailor instruction to meet individual needs (Stanford GSE, 2023). This granular approach to data allows for more precise identification of students' strengths and weaknesses, paving the way for personalized learning experiences that cater to diverse learning styles, multilingual learners, and students with disabilities (Schwartz et al., 2023). However, this comes with privacy concerns, as schools will need to implement stronger measures to safeguard student data from cyberattacks and unauthorized access (Stanford GSE, 2023).

While the possibilities seem endless, the future of education technology also faces some significant challenges. The growing dependence on technology introduces equity issues, particularly in terms of access. Not all students have reliable access to high-speed internet, advanced devices, or supportive learning environments, which can exacerbate existing educational disparities (TechTrends, 2020). Moreover, the sheer volume of available digital content raises concerns about the quality of learning materials, with educators struggling to sift through vast amounts of unfiltered information to ensure students receive accurate, reliable, and relevant content (TechTrends, 2020).

2.3 Artificial Intelligence in Education

About 50 years ago, at a Dartmouth College Workshop in Hanover, New Hampshire, USA, generative artificial intelligence (AI) was first used in education. This was only a decade or so after AI was established as a field of study in 1956 (Moor, 2006). Alan Turing first suggested the idea of generative artificial intelligence (AI) in the early

1950s. According to (Turing, 1950) a system could be considered "intelligent" if it could replicate human behavior to the point where it would be impossible to detect the difference between a machine and a human doing the activity (Russell & Norvig, 2010). Many subfields of generative AI technology, such as machine learning, have been built from Turing, (1950) early work (Akgun & Greenhow, 2022).

Semantic network-based scholars is a tutoring and authoring system for geography that was described in Carbonell's 1970 paper "AI in CAI: An Artificial-Intelligence Approach to Computer-Assisted Instruction" (Carbonell, 1970). About ten years later, an early collection of AIEd papers showed what was already possible (Sleeman & Brown, 1979). Among the papers in this collection were ones about computer-based coaching systems used in a gaming environment. (Burton & Brown, 1979); incorporating tutorial rules into an expert system to allow it to teach and explain the system's rules (Clancey, 1979); a knowledge representation to capture a learner's evolving understanding (Goldstein, 1979); an elementary programming tutor (Miller, 1979); and a quadratic equation tutoring system that carried out experiments to assess its own performance as a teacher and subsequently modified its own teaching strategies (O'Shea, 1979).Betty's brain is a system created to assist students in deepening their comprehension of ecology topics. It is an example of a learner centered technology (Biswas et al., 2016). The focus on learners as human beings with feelings and aspirations in addition to knowledge and skills has been one of the developments of AIEd since its inception. Our growing understanding of learner motivation mindset and academic feelings/emotions has prompted this broader focus on the nature of learners and learning (Schunk et al, 2008).

The effectiveness of learner-facing technologies in comparison to a teacher working with a whole class of students or a trained teacher working with a single student has been the subject of at least seven meta-studies and meta-analyses (Boulay, 2016). A systematic assessment of the literature on artificial intelligence applications in higher education found that the field is still in its infancy, with few studies discussing learning theory or the ethical implications of the technology (Zawacki-Richter et al, 2019). Many people are aware of artificial intelligence's (AI) potential in education (U.S. Department of Education, 2023; European Commission Directorate-General for Education Youth Sport and Culture, 2022). The impact of AI on education is becoming more widely recognized, but there is still a lack of understanding about it, as evidenced by policy reports (Educause & Valverde, 2019), researchers (Ahmad & Rahm-Skågeby, 2023), and even journals (Bates & Tam, 2024). Due to generative AI's widespread use in many academic fields, it can be difficult to comprehend how it affects educational systems as a whole (Crompton & Burke, 2023).

In response, researchers have carried out scoping reviews systematic literature reviews and meta-analyses to obtain an understanding of the state of the art in artificial intelligence (Hwang &Yang, 2022). The pedagogical goals and support for AI in educational practice, however, are still lacking despite these significant efforts especially in the K–12 setting (Zafari et al, 2022). Actually, the primary goal of current literature reviews is to provide an overview of how artificial intelligence (AI) is used in educational settings (Huang et al, 2023).

However, they do not go into great detail about the how, why, and for what pedagogical purposes generative AI has been implemented, nor how those implementations relate to earlier pedagogical practices. There is now little indication of a significant

advancement in the use of "modern" generative AI specifically to teaching, according to the editors of a special issue on AI in higher education that featured the aforementioned work. and learning, possibly with the exception of learning analytics, in higher education (Bates et al, 2020). Behaviorism is supported by AI research in education that focus on stimulus, response, and reinforcement (CH & Saha, 2019). According to behaviorist learning theories, behaviorist generative AI systems ignore the starting circumstances and prior learning in favor of rewarding and reinforcing students (Skinner, 1948). The emergence of analytics applied to data gathered at the class or cohort level in educational contexts and targeted toward administrator-facing tools has been the third major topic for AIEd. These analyses look into things like how learner engagement in massive online open courses (MOOCs) relates to overall success (Rienties et al, 2016). Various engagement patterns and the ability to quickly identify and address any issues or shortcomings in a system's interactions with students to include both individual and whole-class struggles with the material (Johnson, 2019). In their comprehensive systematic review, (Zawacki-Richter et al. 2019) discovered several articles about the use of AI in admissions choices. Regarding Artificial Intelligence in ethics and education, for instance, (Acikkar and Akay (2009, p. 7228) created a predictive model based on students' "performance in the physical ability test as well as [their] scores in the national selection and placement examination and graduation grade point average (GPA) at high school" to determine whether or not they would be admitted to a university to study physical education and sports.

There is a sizable amount of research literature on the use of AI in higher education. Despite the panic associated with artificial intelligence, a large portion of the literature material has focused on improving students' learning experiences and demonstrating the benefits of AI to change teaching and learning. For example, (Yang & Evans, 2019)

investigated the possible applications of chatbots, contending that despite their widespread use in business and healthcare contexts, current prototypes are not yet suitable for use in higher education (Sandu & Gide, 2019). Aiming to "customize the stream of documentation into the class according to a learner's needs, give helpful feedback and encouragement," Popenici & Kerr (2017) examined the role of AI in relatively high learning in terms of teacher-robots, or "teacherbots," for combined delivery or eLearning. They (Popenzi & Kerr,2017) urge people to reevaluate the teaching and their pedagogies.

In a similar vein, Chatterjee and Bhattacharjee (2020) note that generative AI can be used to customize learning, meaning that students can have a more personalized learning experience. Chatterjee & Bhattacharjee (2020) on students as well, emphasizing AI as a way to reduce workloads that are getting more and heavier, Wang et al. (2021). The authors investigate the factors affecting the intention of Intelligence apps in higher education. In a more recent statement, Popenici, (2023) alerts us to the risks associated with the use of generative AI, including the potential for discrimination and the amplification of biases. While AI offers clear benefits in computerizing assessments, further personalizing instruction, delivering oriented sector, or taking the place of university administration, it could also further disenfranchise and dehumanize learning (Popenici, 2023). As tools like “GPT detectors” are increasingly being utilized to ensure integrity in education and learning, scholars like Liang et al. (2023, p. 1) have cautioned that “GPT detectors frequently misclassify non-native English writing as AI-generated, raising concerns about fairness and robustness”.

Additionally, literature particularly about artificial intelligence including ChatGPT is starting to appear. In his study Fuchs, (2023) examines the benefits and challenges of

using Natural Language Processing models such as ChatGPT in the classroom. Fuchs, (2023) suggests that Natural Language Processing models be used to augment rather than replace human interaction in order to reduce ethical issues with AI and the possibility of prejudice. Fuchs, (2023) also contends that "students should be involved in the creation and deployment of Machine learning to satisfy their specific requirements and preferences" at universities (Lankathilaka & Perera, 2023). Examine artificial intelligence benefits and drawbacks in a same manner. (Lankathilaka & Perera, 2023) contend that in order to allay worries about bias, plagiarism, and ethics, legislators and educators must work together. In order to inform policy decisions, they also need greater study on artificial intelligence in the field of education. A few academics have started investigating how students feel about AI in general considering that most of the studies conducted have focused on educators rather than the students; a gap that this study attempts to address. For example, the survey conducted by Chan and Hu (2023) of university students in Hong Kong; of students in Kazakhstan on their attitudes toward artificial intelligence like ChatGPT; and students in Ireland (Irfan et al., 2023). The scarcity of academic research on university students' usage of artificial Intelligence tools in Ghanaian and other global South contexts, which as well as the literature's narrow focus on global South contexts, represent gaps in the field that needs to be addressed.

After performing an initial examination of the artificial intelligence field, it was noted that there is a growing curiosity about the application and implementation of cutting-edge AI tools in educational settings (Blikstein, 2018 & Pham & Sampson, 2022). There are a number of comprehensive literature evaluations on the potential applications and future use of AI that either examine AI in general or concentrate on AI in particular domains, like healthcare, business, ethics, and teaching (Borges et al., 2021 & Enholm

et al.,2021 and Morley et al., 2020 and Shah & Chircu 2018 and Zhai et al., 2021; Zhang & Lu, 2021). The, scholarly works that integrate these two domains have been sought after. Examining artificial intelligence (AI) and cutting-edge technology in education more broadly, such digital transformation, has led to the identification of studies that focused on a particular type of AI, namely chatbots and virtual assistants in the educational setting (Hwang & Chang 2021; Pérez et al., 2020; Winkler & Söllner 2018; Wollny et al., 2021), and how they interacted with students (Abbas et al., 2022; Almahri et al., 2020; Frangoudes et al., 2021). These studies also identified recommendations for additional research (Almahri et al., 2020; Frangoudes et al., 2021; Hobert & Berens, 2020; Winkler & Söllner 2018). It should be mentioned that the existing research on the application of different versions of AI in postsecondary learning though evident is somewhat thin (Rudolph et al. 2023).

Although chatbots are now widely employed in business and healthcare contexts, Yang & Evans (2019) investigated the possible applications of chatbots and argued that current concepts are not yet ready for usage in higher education. Aiming to "customize the feed of information and materials into the course of according to a learner's needs, provide feedback and encouragement. (Popenici & Kerr ,2017) examined the role of generative AI in higher education through the lens of teacher-robots, or "teacherbots," for both blended or distance learning courses. urge us to reevaluate the duties such for educators as well as their methods of instruction. In a similar vein, (Chatterjee and Bhattacharjee,2020) note that generative AI can be used to customize learning, meaning that students can have a more personalized learning experience. The focus is on students as well, emphasizing AI as a way to reduce burdens that are getting more and heavier.

According to Wang et al. (2021), "teachers' views regarding the acceptance of generative artificial intelligence (AI) tools influence the way they will be used to support teaching activities." The authors investigate the variables influencing the implementation of AI-based apps in higher education. In a more recent warning, Popenici (2023) noted that while generative AI can be very helpful in simplifying inspections, further personalizing instruction, providing adapted assistance, and incorporating across university administration, it can also additionally isolate and dehumanize learning. It carries risks to users' privacy and strengthen and discriminate against them. GPT analyzers regularly mistake foreign writing in english as AI-generated, presenting worries over fairness and robustness, have warned (Liang et al.,2023,). Additionally, literature particularly about ChatGPT is starting to appear Fuchs (2023). Fuchs (2023) examines the benefits and challenges of using NLP models such as ChatGPT in the classroom. Fuchs,92023) suggests that NLP models be used to augment human interaction rather than to replace it in order to reduce ethical issues regarding generative AI and the possibility of prejudice. Fuchs,2023 also contends that "students should be involved in the creation and execution of models that use NLP to meet their distinctive requirements and preferences" in higher education. Similar to this, Perera and Lankathilaka (2023) examine the benefits and possible drawbacks of Chat GPT.

They contend that in order to allay worries about bias, plagiarism, and ethics, legislators and educators must work together. In order to inform policy decisions, they also need greater study on artificial intelligence in the field of education. A few academics have started investigating how students feel about AI in general and NLP models in particular. Yilmaz et al. (2023) examined opinions toward ChatGPT among students in Kazakhstan; Chan and Hu (2023) examined learners at universities in Hong Kong; and

Irfan et al. (2023) conducted study on Irish students. As a result, the search parameters were modified to locate articles that examined chatbots' role in higher education. Currently, Open AI's ChatGPT is the most well-liked and sophisticated chatbot (McFarland, 2023). After focusing our search, we discovered several papers and one comprehensive literature review regarding ChatGPT in the previously indicated setting. As mentioned in the problem section, a knowledge gap was once again found; the pertinent publications indicated that additional research is necessary to fully comprehend the intricate and diverse nature of ChatGPT's influence on university education (Dwivedi et al. 2023; Kasneci et al., 2023; Rudolph et al., 2023; Talan & Kalinkara 2023, Van Dis et al., 2023).

It should be mentioned that there isn't much scholarly research on the application of different AI tools like ChatGPT versions in university education (Rudolph et al. 2023). The novelty of the subject has led to a dearth of research despite the functionality, advantages, and disadvantages of ChatGPTs as well as their ramifications, applications, possibilities, and dangers being examined. As a result, the dependability of the research that are now available is lacking. A number of the authors listed below have recognized this gap and stressed the importance of additional study to improve our comprehension of ChatGPT and its effects on many areas. ChatGPT has the potential to be used in higher education as a tool for independent study. Additionally, it has been demonstrated that ChatGPT may pass several exams at the university level and be useful for creating well-organized, informative papers (Zhai, 2022). Instructors are urged to create AI-infused learning activities that involve students in resolving real-world issues in order to enhance their students' thinking skills. In financial research, ChatGPT has been proven to help for data identification, idea development, and literature synthesis (Rudolph et al., 2023). When it comes to subjects requiring higher level thinking, it is

less proficient. As was previously mentioned, there are also worries that ChatGPT is being used for academic dishonesty (Susnajk, 2022; Ventayen, 2023).

Numerous scholarly works have indicated the necessity of expanding the understanding of AI tools like ChatGPT within the context of higher education, through direct and indirect means (Alenezi & Faisal, 2020; Kasneci et al., 2023; Qadir, 2022; Rudolph et al., 2023; Susnjak, 2022; Zhai, 2022). Student, professor, and system-facing generative AI in education are the three categories into which instructional generative AI tools can be divided (Baker et al., 2019). The several functions AI can perform in the education industry are made clearer by these categories. Technological tools and educational chatbots are examples of learner-facing AIEd solutions that engage with pupils directly and offer instruction tailored to their specific requirements. Teacher-facing Lesson preparation, evaluation, and student monitoring are just a few of the administrative and instructional chores that AI Ed helps teachers with. It also provides insights to enhance teaching methods and enhance the learning environment. At the institutional level, system-facing AIEd supports policy execution, resource allocation, and decision-making. Analyzing sizable datasets, for instance, assists administrators in reaching wise selections that are advantageous to the organization as a whole.

Higher education is currently utilizing all three categories in a number of ways, such as through phone app education (Crompton & Burke, 2018). Active learning is another common application of AI in education. Students can be trained to employ cognitive strategies and keep an eye on their own learning by using the insight they provide into their cognitive processes (Crompton et al., 2020). Artificial Intelligence in Education has also been used to forecast student success, identify knowledge gaps, select learning resources, promote collaboration, automate grading, assess student comprehension and

engagement, give tailored feedback, and instruct course material (Zawacki-Richter et al., 2019). The fact that AI may be used to give pupils individualized feedback and direction on their learning paths is a crucial factor to take into account (Maier & Klotz, 2022). Learning experiences, engagement, and accomplishments are frequently enhanced when learning resources can be tailored to each student's requirements and skills (Chen et al., 2020; Owoc et al., 2021).

When creating and planning technology for learning, interested parties should be aware of the bigger picture and take into account the norms and goals of educators, educational technology structures, and educational conditions because factors and user experience are essential to the design of instructional technology (Earnshaw et al. 2018). (Foulger et al., 2017). The application of AIs in faculty instruction and management has also received attention (Chen et al., 2020). According to their review, AI has been widely used at educational institutions across a range of administrative roles, but its impacts have not yet been evaluated or broadly analyzed. Teacher efficacy and efficiency have been enabled and/or enhanced by AI, leading to richer or higher-quality instruction (Chen et al. 2020). Artificial Intelligence (AI) holds promise for freeing up teachers' time so they can concentrate on deeper student interactions by automating administrative work and offering individualized support.

Generally speaking, AI-based products and services have a wealth of pedagogical possibilities for creating intelligent learning support systems and fostering student progress in flexible settings (Zawacki-Richter et al., 2019). Assessment may actually experience a renaissance with the accessibility of big data to improve analytics, making continuous student success analysis and just-in-time feedback much more likely (Luckin et al., 2016). The application of machine learning to education is a key field of

research. Assessment methods and class materials, evaluations and explanations, and exam assessment are only a few of the learning activities that can be improved by machine learning (ML) as a result of investigating the potential of ML (and crowdsourcing) to improve the education sector (Alenezi & Faisal 2020). These opportunities carry possible risks as well as ethical ramifications. Experts are aware of this and have often stressed how crucial it is to create moral frameworks for the use of AI in education (Baker et al., 2019; Russel & Norvig, 2016). In one case, during budget cuts, administrators of the aforementioned AI systems would be motivated to substitute profitable automated AI solutions for instruction, which could result in problems like underemployment (Zawacki-Richter et al., 2019).

In response, a number of organizations, including the Analysis & Policy Observatory in Australia and the Institute for Ethical AI in Education in the UK, were founded to create ethical governance frameworks for AI in education. An additional issue pertains to the innate prejudices, tainted data, or intentional activities of AI programmers that may cause behavioral abnormalities in the system, ultimately culminating in "maliciousness" (Zanetti et al., 2019). Ensuring the ethical and transparent application of AI is crucial, as is addressing worries about the technology's potential to worsen already-existing educational disparities (Owoc et al., 2021). It is crucial to remember that the use of AI in education should be guided by pedagogical reasoning rather than technical feasibility. The ethical, educational, social, cultural, and economic aspects of AIEd—which have been mainly disregarded in the literature to date—must be critically considered in order to do this (Zawacki-Richter et al., 2019). Innovative research and techniques, such implementing design-based approaches, are still required to maximize the learning effectiveness of AIEd (Easterday et al., 2017). Understanding the underlying dynamics involved in learning, the objectives and expectations of educators,

and the educational environments that facilitate technology use are all crucial to making the most of these tools.

Educational technology should be primarily developed to help students' improvement of this critical reasoning talent, as seen through the lens of evidential cognition in training (Sandoval et al. 2016). Moreover, a current problem for further research in the field of online education is the absence of theoretical frameworks in general (Hew et al., 2019). Overall, by providing accurate prediction, assessment, and engaging students with online materials and environments, artificial intelligence (AI) has proven to improve interactive guidance, student engagement, streamline educational administration, increase learning, and improve the quality of instruction (Luckin et al., 2016; Ouyang et al. 2022; Yang et al., 2020; Zawacki-Richter et al. 2019). The literature outlines the possible advantages and difficulties of implementing AI in education, as well as the increasing interest in this field. It is hoped that more research in this field will investigate the effects of artificial intelligence on education and create practical plans for putting it into practice (Boyd & Holton, 2018; Karsenti, 2019; Woolf et al., 2013).

The integration of artificial intelligence (AI) in education is revolutionizing how teaching and learning occur, with profound implications for the future of the educational system. AI technologies have the potential to transform traditional educational practices by enhancing personalization, automating administrative tasks, offering intelligent tutoring systems (ITS), and providing data-driven insights to improve learning outcomes. While the use of AI in education is still in its nascent stages, it is quickly gaining traction as more educational institutions and policymakers

recognize its potential to address existing challenges such as large class sizes, teacher shortages, and the need for individualized learning pathways (Luckin et al., 2016).

One of the most significant applications of AI in education is the development of intelligent tutoring systems (ITS), which offer personalized instruction and feedback to students. ITS are designed to mimic one-on-one tutoring by adapting to the learner's needs in real time, making adjustments to the content and pace based on student performance (VanLehn, 2011). Research has shown that ITS can be highly effective in improving student outcomes, particularly in subjects like mathematics and science, where the systems can provide immediate feedback and targeted exercises to address learning gaps (Ma et al., 2014). These systems rely on AI algorithms to analyze student behavior and performance, offering personalized pathways that would be difficult to achieve in a traditional classroom setting.

Beyond ITS, AI also enables personalized learning by leveraging machine learning algorithms to track and analyze student data, identifying patterns in their learning behaviors and preferences. This data-driven approach allows educators to design individualized learning experiences tailored to each student’s strengths, weaknesses, and learning styles (Kizilcec et al., 2017). For example, AI-powered learning management systems (LMS) can recommend specific resources, assignments, or activities based on a student’s past performance, helping to optimize learning outcomes. This level of personalization is particularly valuable in diverse classrooms where students may have varying levels of prior knowledge and different learning needs (Holmes et al., 2019). Moreover, personalization through AI can extend beyond academic content to include socio-emotional aspects of learning, such as identifying

students who may need additional emotional support or motivation (Hwang et al., 2020).

In addition to enhancing personalization, AI is being used to automate administrative tasks in educational institutions, freeing up time for educators to focus on teaching and student interaction. For instance, AI can automate grading for assignments and exams, particularly in objective subjects like mathematics and science (Yao et al., 2020). Automated grading systems use natural language processing (NLP) and machine learning algorithms to assess student work, offering feedback that is consistent and timely. While there are concerns about the limitations of AI in grading more subjective assignments, such as essays or creative work, ongoing advancements in NLP are making it possible for AI systems to evaluate more complex forms of student output (Zawacki-Richter et al., 2019).

Generative AI is also transforming the field of educational research by providing powerful tools for data analysis and predictive modeling. Educational data mining (EDM) and learning analytics (LA) are two fields that have benefited significantly from AI technologies. EDM uses AI algorithms to discover patterns in large educational datasets, while LA focuses on using these patterns to improve teaching and learning processes (Siemens, 2013). Through the use of AI-driven analytics, educators and researchers can gain insights into student performance, engagement, and learning outcomes, allowing them to make data-informed decisions that enhance the educational experience (Aldowah et al., 2019). For example, predictive models can identify students at risk of dropping out or failing a course, enabling early interventions to support those students (Wong & Li, 2020).

In addition to supporting traditional classroom-based education, AI is playing an essential role in the development of online learning platforms. Massive open online courses (MOOCs) and other e-learning platforms are increasingly using AI to enhance the online learning experience. AI technologies such as adaptive learning, chatbots, and virtual teaching assistants are being employed to make online education more interactive and personalized (Noroozi et al., 2019). Adaptive learning systems adjust the content and difficulty of lessons in real-time based on the learner's progress, ensuring that they are challenged at an appropriate level while preventing frustration (Pane et al., 2014). Similarly, AI-driven chatbots can provide immediate assistance to students, answering questions, providing feedback, or guiding them through complex topics without the need for human intervention (Ouyang et al., 2021).

Moreover, AI technologies are contributing to inclusive education by providing support for students with disabilities or special needs. AI-powered assistive technologies, such as speech-to-text, text-to-speech, and real-time language translation tools, are helping to create more accessible learning environments for students who may face barriers in traditional educational settings (Alqahtani & Kavakli-Thorne, 2020). For instance, AI tools can assist students with visual impairments by converting text into speech or by providing audio descriptions for visual content. Similarly, AI-driven translation tools help break down language barriers for students who are non-native speakers, enabling them to access educational content in their preferred language (Tzafestas, 2018). These technologies play a critical role in promoting equity and inclusion in education, ensuring that all students have equal opportunities to succeed, regardless of their abilities or backgrounds.

Despite the many benefits of AI in education, there are also challenges and ethical considerations that need to be addressed. One of the most pressing concerns is data privacy. AI systems in education often rely on vast amounts of student data to function effectively, raising concerns about the security and privacy of this information (Slade & Prinsloo, 2013). Educational institutions must ensure that they comply with data protection regulations, such as the General Data Protection Regulation (GDPR) in the European Union, and implement robust security measures to protect student data from unauthorized access or misuse (West, 2019). In addition to privacy concerns, there is also the issue of algorithmic bias in AI systems. AI models are only as good as the data they are trained on, and biased data can lead to biased outcomes, potentially disadvantaging certain groups of students (Baker & Hawn, 2021). For example, if an AI system is trained on historical data that reflects existing inequalities in education, it may inadvertently reinforce those inequalities by offering less favorable outcomes to underrepresented students.

Another ethical consideration is the potential impact of AI on the role of teachers in the educational process. While AI can enhance the efficiency and effectiveness of teaching, there is concern that it could lead to the dehumanization of education by reducing the importance of human interaction in the learning process (Luckin et al., 2016). Teachers play a crucial role not only in delivering content but also in fostering relationships, providing emotional support, and inspiring students. AI systems, no matter how advanced, cannot replicate the empathy and understanding that human teachers bring to the classroom (Holmes et al., 2019). Therefore, it is essential that AI is used to complement, rather than replace, human teachers, ensuring that the human element remains at the core of education.

The implementation of AI in education also raises questions about the digital divide. Access to AI technologies requires reliable internet access, modern devices, and digital literacy, all of which may be lacking in underserved communities (Williams et al., 2021). The unequal distribution of technological resources could exacerbate existing educational inequalities, with students from low-income or rural areas being left behind as their peers in more affluent areas benefit from AI-enhanced learning experiences. To address this issue, policymakers and educational institutions must ensure that AI technologies are accessible to all students, regardless of their socioeconomic status or geographic location (Holmes et al., 2019).

Looking to the future, the potential of AI in education is vast, with ongoing research and development expected to lead to even more advanced applications. For example, AI could be used to develop more sophisticated forms of personalized learning, incorporating factors such as a student's emotional state, motivation, and cognitive load into the design of learning experiences (Zawacki-Richter et al., 2019). AI-driven virtual reality (VR) and augmented reality (AR) technologies could also be used to create immersive learning environments that enhance student engagement and understanding of complex topics (Chen et al., 2020). These technologies hold the promise of making education more interactive, engaging, and effective, transforming the way students learn and teachers teach.

Moreover, AI is likely to play an increasingly important role in supporting lifelong learning, as the demand for continuous upskilling and reskilling grows in the face of rapid technological change (Hwang et al., 2020). AI-driven learning platforms can offer personalized learning pathways for adult learners, helping them acquire new skills and knowledge at their own pace and according to their specific needs. These platforms can

provide targeted recommendations for courses or learning resources, based on a learner's goals, interests, and prior knowledge, ensuring that they receive the most relevant and effective learning experiences (Wong & Li, 2020). As the workforce continues to evolve, AI-powered lifelong learning platforms will be crucial in helping individuals stay competitive in the job market and adapt to new challenges.

2.4 Generative AI in Research

Artificial intelligence (AI) has rapidly evolved, becoming a pivotal tool in research across various disciplines. The application of AI in research is transforming the landscape of knowledge production, innovation, and data analysis. AI technologies, including machine learning (ML), natural language processing (NLP), and deep learning, are utilized to process large datasets, simulate complex models, automate repetitive tasks, and enhance predictive capabilities. The growing integration of AI in research is seen as a potential to increase the efficiency, precision, and depth of scientific exploration while presenting challenges such as ethical concerns, data privacy, and the need for transparency in AI algorithms.

One of the most significant contributions of AI to research is in data analysis, particularly in fields where big data is prevalent. AI algorithms can process vast amounts of data much faster than traditional methods, enabling researchers to uncover patterns, trends, and correlations that would have been difficult to identify manually (Jordan & Mitchell, 2015). For instance, in genomics, AI is used to analyze genetic data, leading to new discoveries about genetic diseases and potential treatments (Topol, 2019). Similarly, in social sciences, AI tools help researchers analyze large datasets from social media, surveys, and other sources, offering insights into human behavior and societal trends (Van Atteveldt et al., 2021).

In addition to data analysis, AI plays a crucial role in automating repetitive and time-consuming tasks in research. AI-driven tools like robotic process automation (RPA) can handle tasks such as data entry, literature reviews, and even hypothesis generation, freeing researchers to focus on more complex and creative aspects of their work (Niu et al., 2020). Moreover, AI-powered tools like citation managers and plagiarism checkers are becoming indispensable in academic research, improving the quality and integrity of scholarly work (Berendt & Preibusch, 2017).

AI's contribution to research is also evident in the field of predictive modeling and simulations. AI models, particularly deep learning models, have been used to predict outcomes in various fields, including climate science, medicine, and economics. For instance, in climate science, AI models help simulate the effects of climate change by analyzing historical data and making projections about future climate conditions (Rolnick et al., 2019). In medicine, predictive AI models are used to forecast disease outbreaks, patient outcomes, and the efficacy of treatments (Shickel et al., 2018). These models not only enhance the accuracy of predictions but also help in making data-driven decisions that can have a significant impact on society.

Furthermore, AI has revolutionized the way research is conducted in fields like drug discovery and material science. Traditional drug discovery methods are often slow and expensive, but AI can streamline the process by identifying potential drug candidates faster and more cost-effectively (Zhavoronkov et al., 2019). AI algorithms can predict how different compounds will interact with biological systems, reducing the need for time-consuming and costly laboratory experiments. In material science, AI is used to design new materials with specific properties by analyzing vast datasets of chemical and physical properties (Schmidt et al., 2019).

The integration of AI in research is not without challenges. One of the most pressing concerns is the ethical implications of using AI in research, particularly regarding issues of bias, transparency, and accountability. AI algorithms are only as good as the data they are trained on, and biased data can lead to biased results, which can have serious consequences, especially in fields like healthcare and criminal justice (Obermeyer et al., 2019). There is also the issue of transparency, as many AI algorithms, particularly deep learning models, operate as "black boxes" where it is difficult to understand how they arrive at their conclusions (Rudin, 2019). This lack of transparency can undermine trust in AI-driven research and make it difficult for researchers to justify their findings. Data privacy is another significant concern in AI research, particularly when dealing with sensitive information like medical records or personal data. Researchers must ensure that their AI models comply with data protection regulations, such as the General Data Protection Regulation (GDPR) in the European Union, to avoid legal and ethical violations (Taddeo & Floridi, 2018). The use of AI in research also raises questions about the ownership of data and the intellectual property of AI-generated discoveries, which are issues that researchers and policymakers are still grappling with.

Despite these challenges, the potential benefits of AI in research are immense. AI is enabling researchers to tackle complex problems that were previously beyond the reach of human capability. For instance, AI is being used to develop personalized medicine, where treatments are tailored to individual patients based on their genetic makeup, lifestyle, and other factors (Kourou et al., 2015). This approach has the potential to revolutionize healthcare by making treatments more effective and reducing side effects. AI is also transforming the way research is disseminated and consumed. AI-powered search engines, such as Google Scholar, use NLP to index and retrieve academic papers more efficiently, helping researchers find relevant literature faster (Beel et al., 2016).

AI is also being used to summarize research papers, making it easier for researchers to stay up-to-date with the latest developments in their fields (Cohan et al., 2020). These tools are particularly useful in an era where the volume of published research is increasing exponentially, and keeping up with the literature has become a daunting task for many researchers.

Moreover, AI is facilitating interdisciplinary research by enabling collaboration between researchers from different fields. AI tools can bridge the gap between disciplines by providing a common platform for analyzing data, modeling systems, and sharing findings (Cao et al., 2021). For example, AI is being used in projects that combine neuroscience and computer science to develop brain-computer interfaces, which have the potential to revolutionize fields like rehabilitation, communication, and entertainment (Lebedev & Nicolelis, 2017). In education research, AI is contributing to the development of intelligent tutoring systems (ITS) that adapt to the needs of individual learners, providing personalized feedback and instruction (VanLehn, 2011). These systems are being used to improve learning outcomes in subjects ranging from mathematics to language learning, particularly for students who struggle in traditional classroom settings (Ma et al., 2014). AI-driven educational tools are also being used to analyze student data to identify at-risk students and provide targeted interventions to help them succeed (Smith et al., 2019).

AI is also being used to enhance the peer review process, which is a critical component of academic research. AI algorithms are being developed to assist human reviewers in evaluating the quality and validity of research papers by flagging potential issues such as methodological flaws, plagiarism, and statistical errors (Yang et al., 2020). While AI

is not yet capable of replacing human reviewers, it can serve as a valuable tool to improve the efficiency and fairness of the peer review process.

Finally, the future of AI in research looks promising, with ongoing developments in AI technologies that could further revolutionize the way research is conducted. Quantum computing, for instance, has the potential to exponentially increase the computational power available for AI research, enabling the analysis of even larger datasets and the simulation of more complex models (Biamonte et al., 2017). AI-driven research is also expected to play a critical role in addressing global challenges such as climate change, pandemics, and food security by providing innovative solutions that were previously unimaginable (Rolnick et al., 2019).

Few studies use AI to help their research on this topic, despite the increasing attention that AI is receiving in the context of innovation (Mariani et al., 2023). The application of AI in academic research on innovation is highlighted in the Mariani et al. (2023) publication, although it is clear that the use of AI as a research tool is still in its infancy. This disparity between the study of AI and its actual use in academic research points to the necessity of incorporating AI more deeply into cutting-edge research techniques in order to fully utilize its potential to expedite discoveries and streamline procedures. Theoretically, a plethora of digital platforms exist now that make use of practical AI approaches to find papers, books, proceedings, and editorial remarks in any field of study (George and Scott, 2016). These tools enable researchers in defining the right theory for their work, organizing and synthesizing information, and providing summaries and trends on any subject. material (Musib & Associates, 2017). AI's revolutionary impact demonstrates how quickly it can findings and streamline procedures in innovation research, highlighting the necessity of incorporating AI more

deeply into research techniques. AI has proven to be a useful tool for data analysis and reviews of the literature, including Systematic Literature Reviews (SLR) (Burger et al., 2023).

Furthermore, (von Krogh and Gruber, 2023) describe how AI may help find and utilize new research possibilities, especially in the field of management. The most popular generative AI approaches in methodological challenges are deep learning, supervised learning, and unsupervised learning. Regressions, for instance, are widely used algorithms in supervised learning to describe the connection between variables (Bzdok and Krzywinski 2018). Artificial neural networks are deep learning algorithms that simulate complicated interactions and are frequently used for tasks like image identification, natural language processing, and time series prediction. They are inspired by the structure and function of the human brain (Hinton & In 2006, Salakhutdinov). Transformer models, a type of neural network design, have gained attention recently and have the potential to disrupt industries like advertising, entertainment, and the arts. They can also be integrated across other industries to enhance processes (Vaswani et al., 2017).

Furthermore, there are research that use AI in novel ways to examine data and decipher real-world behavior. As an illustration, consider Momtaz's (2021) work, which quantified CEO emotions from public photos taken during initial coin offerings using emotional AI. (ICOs) and investigated the effects of these feelings on company valuations. Another example is the use of supervised learning by Miric, Jia, and Huang (2023) to recognize texts on a broad scale, with the aim of identifying AI-related patents that demonstrate their capacity for classification and quantification. unstructured textual data, offering perceptions into technological advancements in AI. Furthermore,

Alshater (2022) investigated how AI, more especially ChatGPT, might enhance academic achievement; this is something that scholars would want to look into. The release of ChatGPT, an application built on GPT-3.5, has garnered a lot of interest lately, demonstrating how GPT-3 and related models can be applied to enhance search (Dwivedi et al., 2023). In certain cases, a GPT derivative was included as a coauthor, demonstrating the increasing acceptance of artificial intelligence in academia (e.g., Transformer and Zhavoronkov, 2022; Transformer et al., 2022). AI has also been applied to qualitative research as a general-purpose voice transcription model; one example of this is the technology that Kung et al. (2022) demonstrated in their analysis of ChatGPT's effectiveness on the USMLE exam, suggesting a possible use of artificial intelligence in medical education. Similar to this, Datt et al. (2023) address ChatGPT-4's function for medical researchers, highlighting the expanding significance of AI in this field of study. Furthermore, ethical concerns surrounding AI are crucial since they deal with both the moral standing of the machines and the assurance that they do not hurt people or other morally significant beings (Bostrom & Yudkowsky, 2018).

2.5 Theoretical Framework

2.5.1 Technology Acceptance Model

There has been a lot of interest in the integration of ICT into academia, including a variety of ICTs for teaching, learning, and assessment (Granić, 2023). Important fields of study encompass e-learning, mobile learning, MOOCs, learning methods, personal learning environments, and auxiliary technologies such as social media, VR/AR, assistant robots, and simulators. Leading studies in this area have primarily concentrated on how students use new technology (Abdullah & Ward, 2016; Granić & Marangunić, 2019), with a few studies also engaging faculty members at universities. The most often used model in acceptance research is the Technology Acceptance Model

(TAM) (Al-Emran & Granić, 2021; Granić & Marangunić, 2019), whereas in this situation the UTAUT model is also widely regarded and applied.

As previously mentioned, a number of theoretical models have been proposed to investigate and explain the variables that lead people to embrace, reject, or keep using new technology (Ajzen 1985; Ajzen & Fishbein 1980; Venkatesh and Davis 2000; Venkatesh et al. 2003). Davis (1989) created and developed the technology acceptance model (TAM), building on the Theory of Reasoned Action (TRA) model of Ajzen and Fishbein. This model offered a theoretical framework for understanding the link between attitudes, intentions, and behavior. Empirical evidence has been provided to support the TAM's parsimonious and robust predictions about technology adoption and acceptance. To "provide an explanation of the determinates of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while at the same time being both pragmatic and theoretically justified," Davis et al. (1989) stated that TAM developed from the TRA. TRA's subjective norm component is absent from TAM, though. It is difficult to disentangle direct effects of SN on BI from indirect effects via A, to (Davis,1989). Similar to TRA, TAM asserts that behavioral intent (BI) determines real technology use. The TAM clarifies that a person's behavioral intention to carry out a specific task determines how well they execute a given action. It is hypothesized that perceived utility and perceived ease of use are the two key characteristics that determine user acceptability.

Perceived ease of use, perceived usefulness, attitude toward use, behavioral intention to use, and actual usage are the five variables that make up the TAM. Perceived ease of use, or the assumption that effort won't be necessary, and perceived utility, or the

opinion that the technology improves job performance, are the two most important components in the model. The two variables that make up the core elements of TAM are attitude toward use and these two variables. Both theory of planned behavior to use it and actual usage are outcome factors. Crucially, although behavioral control predicts use, there may also be a reciprocal link because behavioral intents can be determined by a favorable user experience. Lastly, supportive conditions, computer self-efficacy, and subjective norm are examples of external variables (Scherer et al. 2019).

2.5.1.1 Perceive Usefulness

Perceived usefulness refers to an individual's belief in the ability of a given technology to improve their performance at work (Davis 1989). According to Davis (1989), "people prefer to utilize or not employ the tool to the degree they think it could assist them complete their job better." This finding forms the basis of perceived usefulness (PU). PU effects behavior intention to use the system indirectly and directly affects attitude about using it. Although a tool is thought to be beneficial, people will only use it if they believe it to be simple to use—that is, if the advantages of using it outweigh the difficulties. Additionally, PU directly affects behavioral intention (BI). Realistic usage of the system follows behavioral intention to utilize. Individuals typically base their decision to use or not use an application on how much they think it will improve their performance at work. Thus, a user's attitude toward computer use—whether good or negative—is influenced by how they see the value of technology in education.

2.5.1.2 Perceived Ease of use

The variable known as perceived ease of use (PEOU) characterizes the user's belief on the ease of use of the system. According to the approach, behavioral intention to use (BI) and attitude toward using (AI) are both directly influenced by PU. Davis (1989)

creates and evaluates a scale for these variables. PEOU affects both PU and Attitude. PEOU affects how people feel about using the system. The extent to which an individual believes utilizing the technology would be effortless is known as user satisfaction of use (Davis 1989). Additionally, the purpose to use is directly impacted by perceived utility, but the intent to use is indirectly influenced by facilitating conditions of use through attitude.

According to Sumak Hericko et al. (2011), one element that has a direct impact on students' attitudes is perceived ease of use. The technology acceptance model has been used by various scholars to study the motivation in relation to the use of new media technologies. For example, Boateng (2024) submits how new media platforms like Facebook has been embraced by public universities to market the services and products through the lens of technology acceptance model. On the other hand, Scholars such as Cai &Zheng, (2017) explained the phenomenon of using digital libraries using a theory of reasoned action which is one of the components of Technology Acceptance Model (TAM). Their study's findings demonstrated that the theory of reasoned action was a suitable hypothesis to explain why consumers chose digital libraries. Also, Sheldon (2016) investigated the factors influencing professors' and students' intentions to add each other as friends on social media, specifically Facebook, using the Theory of Reasoned Action. Subjective norm was the most significant predictor of students' intention to add professors as Facebook friends, while personal attitude was the strongest significant predictor among faculty members. These findings demonstrated consistency with the theory of reasoned action, as intention was the strongest predictor that allowed them to add each other.

In reference to the TAM model, recent research has employed TAM to study technology adoption. Teeroovengadum et al. (2017) evaluated the factors that influence educators' adoption of ICT and found that PU and PEOU significantly influenced educators' adoption of ICT, while Patil (2016) looked at the factors that influence the adoption of the Internet of Things and found that PU, PEU, trust, attitude, behaviors control, and subjective norms were predictors of adopting ICT. Additionally, TAM was utilized in a number of recent research to investigate the factors that influence acceptance of online instruction and the use of learning management systems (Wingo et al, 2017; Khoa1 et al, 2017). Aliaño et al. (2019) carried out a similar study to investigate the factors that influence the adoption of mobile learning in a university setting. All of this research demonstrated the need of using various models and theories to investigate and comprehend the elements that significantly impact users' adoption of diverse technologies. These studies highlighted above established that various reasons including ease of use, usefulness among others influenced people to use new communication technologies. Therefore, by using the technology acceptance model, this study is able describe what motivate postgraduate students especially at University of Education, Winneba to use artificial intelligence in their academic research and studies. The use of technology acceptance model enables this study to analyze and explain how including the motivations that drive the sample students to accept, adapt and adopt new communication technology, particularly artificial intelligence in their academic endeavors.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The methodology emphasized the significant of social interactions in forming attitudes and behaviors and concentrate on the in-depth investigation of a particular topic (Alharahshe & Pius, 2020;2008). In doing so, the research approach, design, sampling techniques and size, data collection and analysis that are employed in the study are discussed. The research design will be covered in full in this chapter, along with an explanation of the qualitative approach's justification. Details are given regarding the participants, setting, and role of the researcher. The methods that were used are also described, along with specifics about data gathering and analysis. Validation techniques and ethical considerations are covered.

3.1 Research Approach

Qualitative inquiry is valuable in exploring new, contextualized phenomena, which makes it appropriate for the current study. Cresswell & Cresswell (2022) suggest that the research methodology may involve qualitative, quantitative, or combined approaches. A qualitative research approach entails investigating phenomena using an inductive style that draws themes and individual meanings from data, highlighting the need of documenting a phenomenon's intricacies, Cresswell & Cresswell, (2022). Conversely, the quantitative research methodology is described by Cresswell and Cresswell (2022) as a method of evaluating theories through the analysis of numerical data and the correlations between variables as well as group comparisons. Creswell and Poth (2018) explained that qualitative research is useful when a problem needs to be explored and “a complex, detailed understanding of the issue is needed”. Further,

qualitative researchers seek to study the ordinary to understand what it means (Stake, 2010). To gain a comprehensive understanding of how postgraduate students at the University of Education, Winneba use artificial intelligence tools in their academic research and learning, this study exclusively employs a qualitative research approach. Stake (2010) explained that qualitative research is interpretive in nature, and therefore, the researcher is viewed as the instrument because interpretation is dependent on the researcher's defining and redefining the data to locate meaning. The research reflected the researcher's background and influences as is characteristic of qualitative research (Creswell & Poth, 2018; Lindlof & Taylor, 2019).

In order to address the intricacies and nature of a social problem, qualitative research employs probing questions to explore the meanings that individuals and communities assign to it (Cresswell & Cresswell, (2022)). Stake (2010) explained that qualitative research is interpretive in nature, and therefore, the researcher is viewed as the instrument because interpretation is dependent on the researcher's defining and redefining the data to locate meaning). According to Cresswell and Cresswell, (2022), qualitative research is carried out in order to investigate a problem or topic and create a nuanced story that is understandable to a wide audience. Once more, Cresswell (2013) emphasizes that a researcher may be drawn to qualitative research due to the necessity of gaining a comprehensive and in-depth understanding of a certain occurrence, which is mostly dependent on the researcher's imagination and the body of current information in the subject (Braun & Clarke,2014). Hennink et al. (2020) posit that qualitative researchers witness people in their natural habitats in order to identify certain experiences and patterns of behavior (social, political, cultural, economic, and physical) that characterize the world in which they live.

According to Yin (2017), qualitative research allows researchers to conduct in-depth analyses of a broad range of (natural) contextual situations. According to Yin (2017), the aims of a qualitative research study may differ based on the specific project goals. According to Saldana (2011), in a similar vein, the results of qualitative research consist of critical portrayals of the key conclusions drawn from the analytical synthesis of data. These conclusions may include documentation of cultural observations, fresh perspectives and insights into the complexity of the individual and society, assessments of the success of policies or programs, creative interpretations of human meanings, criticism of the social orders that currently exist, and the introduction of social justice. The explanation above supports the use of a qualitative research approach in order to better understand how postgraduate students at the University of Education, Winneba use artificial intelligence tools for their academic research and learning, as well as why they chose to use them.

In order to investigate postgraduate students at the University of Education, Winneba's motivation for using artificial intelligence tools in their academic research and learning, this study used a qualitative methodology. In addition, because the study focuses on a unique occurrence in a rapidly evolving digital context, it requires the flexibility that comes with research to capture emergent themes. This selected qualitative methodology, which emphasizes the cooperative This chapter will provide a thorough description of the research strategy and the rationale for the qualitative approach. Information is provided on the subjects, environment, and researcher's role. The methods and techniques that were employed are also detailed, along with specifics concerning data gathering and analysis. Validation procedures and ethical issues are covered innovation through interactive processes, remains in line with the construction ontology of this study. Qualitative research can be flexible within the parameters of the

selected methodology to build upon existing theories while maintaining a strong foundation in them (Dubois & Gadde, 2002; Kovac & Spens, 2005 & Timmermans; Tavory, 2012).

This study takes a qualitative approach in order to adequately address the difficulties. A qualitative approach to data gathering and analysis was used in the application of qualitative research designs. Since qualitative inquiry is useful in analyzing fresh features, qualities, and contextualized occurrences, it is pertinent to this study. This implies that when a topic needs to be studied and "a complicated, deep grasp of the issues is needed," qualitative research might be useful. Similar to what this study aimed to achieve, Cresswell and Poth (2018) found that the qualitative research approach allowed for the elicitation of perspectives and explanations regarding students' experiences with artificial intelligence for the purpose of analyzing and comprehending the giving phenomenon in academic research. According to Stake (2010), qualitative research is analytical in nature and the researcher is consequently seen as such, fitting into the research objectives and the issues that this study addresses. Interpretation depends on the researcher's definition and reinterpretation of the data to find meaning. To put it another way, the qualitative approach taken in this study addressed a gap in the literature about the methodologies used in the primarily quantitative prior studies of digital technology in higher education (Peterson, 2019).

3.2 Research Design

It can be used to address research questions through the use of supporting documentation, data, and evidence (Cohen et al, 2017). Put differently, "the research design is the logical sequence that connects the empirical to study's initial research questions, and ultimately to its conclusion," (Yin, 2017). Furthermore, Yin, (2017)

highlights that a research design extends above a schedule of work in order to prevent situations in which the evidence does not answer the research questions that have been expressed and does not address problems that make sense.

The research design is centered on gathering, analyzing, and writing data; yet, it starts with a fundamental idea and continues throughout the entire research process (Cresswell, 2014). When designing a study, a researcher may choose to examine people (phenomenology, narrative), investigate activities and events (case studies), develop grounded theories, discover the cultural contexts of a certain group of people, or examine persons (ethnography) (Cresswell, 2013). Research design is defined by Braun and Clarke (2013) as something that encompasses the justification for the study's theoretical framework, research question, ethical considerations, and the procedures used in obtaining and processing the data collected. This definition goes beyond what has been defined by other academics.

Research design describes the process used to obtain data from subjects or participants in a study (Duodu & Asamoah-Gyimah,2007). In general, it outlines the strategy for gathering or collecting information to address the different research topics, objectives and questions. There are various forms of design such as case study, survey, ethnography and phenomenology among others. Case study design is employed in this study. This strategy entails a thorough investigation of a specific instance, event, or phenomena, usually in the context of its real-world occurrence (Baxter & Jack, 2008).

3.3 Case study

A case study offers the chance to gain a thorough grasp of the dynamics and intricacies of artificial intelligence use in the particular setting, as well as its motivations (Lindvall, 2007). For this research, a case study makes sense for a number of reasons. It makes it

possible to investigate the issue in-depth in University of Education, Winneba setting (Baxter & Jack, 2008). Using the case study design, Jacobsen et al. (2002) explored the external components of phenomenon. Also, Krusenvik, 2016) utilized it from several research angles; while Merriam, (2009) employed it to discover unexpected information; and Stake, (1978) applied it to investigate increased humanistic experience; and more innate data gathering from individuals (Gomm et al., 2000). Since artificial intelligence is still in its infancy, real-world examples aid in increasing awareness and illuminating both its educational potential and drawbacks. Therefore, using a case study helped the study to establish existing theories in respect to research as well as guidelines for artificial intelligence incorporation and policy creation in relation to technology in higher education and research (Krusenvik, 2016).

As the goal of this study was to comprehend and explain experiences and events in relation to students, the explanatory case study was used in line with the qualitative research approach (Yin, 2014). Studying how or why a situation or intervention has affected a person, group, organization, or community is aided by case studies. The study examines experiences in relation to artificial intelligence usage in the Ghanaian context (Shanks, Robson, & Gray 2012). A single-case study is suitable for a common instance where the objective is to comprehend the circumstances of a typical situation (Yin,2018). The goal of this study was aligned with a case study research design. Case study research is the detailed examination of a case that is placed "within an authentic, contemporary context or setting," (Creswell & Poth (2018)).

A case study is "an empirical method that explores a current phenomenon (the 'case') in-depth and then within its real-world context," (Yin, 2018). Case study research emphasizes a number of characteristics, such as the purpose of the case and its

limitations. This kind of research is in-depth; hence, the case study analysis produces a detailed account that leads to reasonable claims or findings (Creswell & Poth, 2018). Researchers gather information for the case study from a variety of sources, such as records, documents, interviews, and observations (Creswell & Poth, 2018). A case study is appropriate to use, when researchers want to research on the experiences of a person or group of people at a certain moment in time (Terrell,2016). The situational nature of the case study shed light on a universal trait (Stake, 2010; Yin, 2018). Stressing on this, Yin (2018) claims that case study research aims to contextualize a real-world scenario. This underpinned the choice of this research design for this qualitative study regarding the use of artificial intelligence in academic research by postgraduate students at universities, especially Ghana.

Despite its usefulness, a case study has several drawbacks, such as reduced generalizability because of the particular setting wherein the study is undertaken, which may make it unrepresentative of the general public (Flyvbjerg, 2006). Furthermore, the subjectivity of interview subjects and researchers may have an impact on the quality and interpretation of findings (Flyvbjerg, 2006; Guba & Lincoln, 1994). To reduce the possibility of bias in the findings and data, it is crucial to take these restrictions into account and guarantee honest research methods. By using the case study design, this study was also to focus on the particular issues of postgraduate students at the university of Education, Winneba to analyze their perspectives regarding the acceptance of artificial intelligence as wide spread technology in learning and research.

3.4 Sampling

Sampling helps researchers gain a better knowledge of an issue they are studying, particularly in qualitative research (Black, 2012; Stacks, 2011). Given (2008) defined a

sample as a subset of real data sources selected from a greater population of possible data sources. Given (2008) states that probability sampling and non-probability sampling are the usual sources of selection techniques. Selecting real data sources from a wider range of options is the process of sampling (Given, 2008). According to Lindolf & Taylor, (2008), no qualitative investigation is able to record every incident as it happens. Therefore, it is necessary to purposefully choose a specific set of data for the investigation. Respondents having knowledge of a phenomenon of interest were chosen using a purposive sample technique (Cresswell & Plano Clark, 2011). Purposive sampling is a non-probability sampling technique where participants are selected based on their relevance to the research question and objectives (Patton, 2015).

Purposive sampling allows the researcher to deliberately select postgraduate students from the five faculties who are likely to have experience with generative AI, ensuring that the sample is relevant to the research question (Creswell, 2014). Also, Purposive sampling enables the researcher to identify and select information-rich cases, providing in-depth insights into postgraduate students' use of generative AI (Patton, 2015). Again, the researcher can select participants who are knowledgeable about generative AI and can provide valuable perspectives, increasing the study's validity (Yin, 2018). However, purposive sampling might not reach all relevant participants, especially those with unique experiences or perspectives (Patton, 2015). Thus, snowball sampling complements purposive sampling by accessing participants through social networks, increasing the sample's diversity and richness (Noy, 2008). Snowball sampling can helped access hard-to-reach participants through referral from initial participants (Ting et al., 2025).

The authors stress that with the least amount of work, a proper sampling strategy enables researchers to systematically monitor a communication phenomenon (Lindlof & Taylor, 2018). Kruger and Mitchell, (2005) classify purposive sampling as the most important method for non-probability sampling as it provides researchers the opportunity to rely on their experience, ingenuity and/or previous research findings to deliberately obtain units of analysis in such a manner which can then be regarded as being representative of the relevant population. Purposive sampling, according to Cresswell (2014), allows the researcher to select study sites (documents or visual materials) and participants because the latter can consciously aid in comprehending the study's fundamental event. Criterion sampling was employed in this study. Criterion sampling involves selecting participants who meet specific criteria or possess certain characteristics relevant to the research question (Patton, 2015). In this study, the criteria for selecting participants include: being a postgraduate student at UEW, being enrolled in one of the five selected faculties, having experience with generative AI tools, by using criterion sampling, the researcher ensure that the selected participants have the necessary knowledge and experience to provide valuable insights into the use of generative AI in academic research. A population is a range of possible participants to which the study's findings are intended to be broadly applicable (Maxwell & Chmiel 2014).

Since students with experience with regards to AI usage were required to participate in a particular mode of technology usage and acceptance, University of Education, Winneba postgraduate students made up of the population of this study. UEW is a university focused on education, making it a relevant context for studying the use of generative AI in academic research, particularly among postgraduate students who are

likely to be involved in educational research (Adu-Gyamfi, 2019). Again, UEW postgraduate students come from diverse academic backgrounds, providing a representative sample of students from various disciplines and increasing the generalizability of the study's findings (Creswell, 2014). Also, UEW is accessible to the researcher, facilitating data collection and increasing the feasibility of the study (Yin, 2018).

These students' population was also chosen because the study's goal was to ascertain the knowledge, usage, and perceptions of students regarding the acceptance of generative artificial intelligence in learning and academic research.

3.5 Sample Size

A portion of the population selected to serve as a representative sample of the overall population (Acharya et al. 2013). Sampling is the process of choosing certain individuals from a group to estimate the population characteristics and draw statistical conclusions from them (Mugo, 2002). The process of sampling and sample selection allows the study to focus on selected people to participate in research. The task required a thorough understanding of students' experiences with artificial intelligence. According to Tailor (2018), qualitative studies allow the researcher to choose the sample size that best fits the needs of the investigation. In this case, the study employed purposive sampling of five (5) postgraduate students selected from five (5) faculties at the University of Education, Winneba. One postgraduate student was selected from each of the five (5) faculties that were sampled for the study. In addition to the five (5) sampled postgraduate students, five (5) groups with each comprising of five (5) students were selected from the five (5) faculties for focus group discussion to complement interviews. The sample size of 1 student per faculty for individual interviews and 5

students per faculty for FGDs is likely to reach the saturation point, where no new information or themes emerge (Guest, 2006). This sample size is manageable for data analysis, allowing the researcher to conduct in-depth analysis and maintain data quality (Miles & Huberman, 1994). The Selection of 1 student from each faculty for individual interviews allows for in-depth, detailed insights into their experiences and perceptions of using generative AI (Kvale, 2007). Also, the Choice of 5 students from each faculty for FGDs provides a representative sample of students' views and opinions, enabling the researcher to capture a range of perspectives (Krueger, 2014). More so, using both individual interviews and FGDs enables data triangulation, increasing the validity and reliability of the findings (Denzin, 2017). Also, Stake (2016) recommended that researchers consider multiple data collection sources during research process.

According to Cohen et al. (2017), purposive sampling is a sampling technique used in qualitative research when researchers choose which instances to include in the sample based on their evaluation of the cases' typicality or possession of the desired features. As the name suggests, the study's sample is being chosen for a certain purpose, that is, to engaged postgraduate students who has the experience of using generative AI.

3.6 Data Collection Method

The process of gathering data is the start of the journey to address the problem of the research. The researcher must be knowledgeable about the various steps involved in this research journey (Rowley, 2002). The research featured emergent design, which means that data collection and analysis methods were flexible and evolved as the study took place and the researcher interacted with participants, resulting in richer data (Creswell & Poth, 2018; Stake, 2010). As mentioned earlier qualitative case study design allows the researcher to employ different data collection methods. Stake, (2010)

recommended that researchers consider multiple data collection sources during the research process. Given this, this study employed interviews and focus group discussion in collecting qualitative data from the group of sampled postgraduate students from five (5) faculties at University of Education, Winneba. Sampling five faculties provide a representative sample of the university's academic disciplines, allowing for a more comprehensive understanding of postgraduate students' use of generative AI (Creswell, 2014). Also, five faculties capture diverse perspectives and experiences of postgraduate students from different academic backgrounds, increasing the study's validity and generalizability (Patton, 2015). Again, Sampling five faculties can be a feasible and practical approach, given the researcher's resources and time constraints (Creswell, 2014).

Multiple methods of data collection allowed for the triangulation of data, substantiating the findings and ensuring a more dependable analysis (Yin, 2018). The individual interviews and focus group discussion lasted not more than one hour and thirty minutes. In as much as interviews are similar, they provide their unique information and data that complement each source.

3.6.1 Interview

For qualitative research, interviews are the main method of gathering data (Creswell & Poth, 2018; Yin, 2018). According to Lindlof and Taylor (2019), research interview unfolds as a social process, and what emerges from that process is a richly expressive inter-view that neither person could have produced alone" (p. 220; emphasis in original), presenting the idea of the qualitative interview as a chance for the researcher and study participants to connect in a meaningful way. Therefore, qualitative interviews constitute an effort by the researcher to comprehend the participants lived experiences

(Creswell & Poth, 2018). Case studies in particular are the cornerstone of qualitative research since they are crucial sources of information on human affairs or activities (Yin, 2018). The greatest method for learning more about the topic and comprehending the subtleties and individual experiences seemed to be a qualitative approach (Robson, 2011). Interviews are thought to be the most effective way to gather data for research projects (Ghauri & Grønhaug ,2005). By using interviews as a technique for data collection and analysis, a researcher can easily obtain rich and substantial amounts of data from a wide range of individuals. With this information, the researcher can review and analyze the data using a variety of statistics (Wimmer & Dominick, 2013).

Interviews are an option for researchers when it is not possible to watch a participant in person (Creswell,2014). Once more, Creswell (2014) lists a number of interview formats, including in-person, over the phone, focus group, online, and email interviews. A researcher conducting an interview can also ask follow-up questions that may naturally come up during the qualitative interview (Johnson & Christensen,2019). The length of a typical qualitative interview might range from thirty minutes to an hour. Nonetheless, the interviewer and the interviewee need to establish a connection based on mutual respect and warmth (Johnson & Christensen, 2019; Wellington, 2015).

A digital recorder was used to capture the interviews in order to facilitate transcription. As a backup or addition to the recordings, the researcher concurrently wrote a few notes throughout each participant's interview (Creswell & Creswell, 2022). Furthermore, Yin (2018) believes that the use of recording devices during face-to-face or focus group talks with participants is a question of preference for the researcher. Nonetheless, compared to the researcher choosing note-taking, audio recording offers a more thorough or accurate representation of the interview (Yin, 2018). Before beginning the

in-person interviews, the selected participants completed informed consent papers, and the researcher got their verbal authorization to record any conversations between them and the study. Yin (2018) asserts that in the event that an interviewee declines to give consent or becomes uneasy when these devices are seen, it is essential that audio devices utilized during the interviewing processes be prohibited.

This is covered by the informed consent form that the respondents signed, which said they would not suffer any damage and that they could leave the study at any point while it was being conducted.

When conducting interviews, researchers adhere to a set protocol. The format of an interview can be divided into three categories, according to Treadwell and Davis (2019): (a) unstructured interviews, in which the interviewer asks open-ended questions to gain an understanding of a communication phenomenon in the words of the informant; (b) semi-structured interviews, in which the interviewer and the interviewee are given some freedom to "go with the flow"; and (c) fully structured interviews, in which the interviewer has predetermined the questions to be asked, their formats, and the sequence of presentation (Treadwell & Davis, 2019). Yin (2018), distinguishes between two categories of interviews: qualitative interviews and structured interviews. Yin (2018) defines a structured interview as a type of pre-written interview guide. An interviewer and participant will engage in conversation in this.

First, using a formal questionnaire with a list of all the questions to be asked, the researcher scripts this exchange. During qualitative interviews, the researcher can pretend to be the interviewer and try to get the interviewee to ask questions. According to Treadwell and Davis's (2019) comments, structured interviews were used in this study. The researcher used a pre-drafted interview guide to pose questions to the

informants, which is one of the reasons they were asked to participate in a fully structured interview rather than one of the other interview forms. As opposed to other interview types, qualitative interviews "are likely to be the overwhelmingly dominant mode of interviewing in qualitative research,"(Yin, 2018).

Depending on the researcher's goal for conducting a study, interviews provide a platform for examining an interviewee's thoughts, ideas, and sentiments as well as an account of situations about which they are knowledgeable **(**Wellington, 2015; Tracy, 2019). A researcher conducting interviews for a qualitative study must have an interview guide. Given, (2008) states that an interview guide enumerates the topics that researchers discuss with interview subjects. On the other hand, an interview guide may be quite vague, resulting in "less structured" interviews that are essentially intended to get the participant's viewpoint on the research question. On the other hand, in order to guarantee that the researcher's subjects of interest are fully addressed, interview guidelines may have complex specifications (Given, 2008). Having said that, in order to gain a comprehensive grasp of the research, the study developed a semi-structured interview guide (see appendix) to extract a range of viewpoints from the participants regarding the topics and goals of the study.

Even while using a semi-structured interview guide was practical (as shown in the appendix), doing structured interviews could lead to a researcher asking the same questions of each subject and adopting the same tone of voice (Yin, 2018). On the other hand, in a qualitative interview, the researcher's goal is to gain insight into the participant's world, which may entail focused attempts to learn the meanings of the participant's words and phrases. Conducting interviews is a dialogue technique where information is generated by an interviewee or group of interviewees interacting with an

interviewer. In contrast to casual talks, research interviews are typically conducted to further the goals of the researcher, which are usually not related to the subject matter being discussed (such as learning more about a particular subject or aspect of human experience) (Given, 2008).

A qualitative interview provides a means of meaningfully connecting the researcher and study (Lindelof & Taylor 2019). Lindelof and Taylor (2019) explain that the process of conducting interview research is social in nature and results in a richly eloquent data that could not have been produced by either party alone. Thus, the purpose of qualitative interviews could help the researcher to better comprehend the participants' actual experiences regarding phenomenon (Creswell & Poth,2018). The study used a semi-structured form of interview in collecting data from respondents for discussion and analysis. Participants in the study were asked insightful and interesting questions to gather detailed information about their understanding and acceptance or usage of Artificial Intelligence technologies in research and learning activities among others. The need for an interview guide in data collection has many advantages and disadvantages. One of its advantages is that, it is highly adaptable, enabling the researcher to consider spoken, verbal and nonverbal multisensory routes or pathways to discover data (Cothen & Morrison, 2007).

3.7 Focus Group Discussion

Focus groups, as described by Kitzinger (1995) are a form of group interview which capitalizes on communication between research participants in order to generate meaningful data. Focus Group Discussions (FGDs) emerged in the behavioral sciences research area as a distinctive member of the qualitative family, which also includes individual depth interviewing, participant observation and other projective methods

(Stewart & Shamdasani 2015). As mentioned, the individual qualitative interviews conducted by the author in the study were complemented by focus group discussions with five different groups of five (5) postgraduate students from five selected faculties (Communication, Business Studies, Foreign languages, Sciences Education and Social Science) at University of Education, Winneba. Similar to the individual interviews, the focus group discussions were guided by interview guide. A focus group study is a carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment. Each group is conducted with five (5) people by a skilled interviewer. Group members influence each other by responding to ideas and comments of others (Krueger &Casey, 2000). Focus group research may be relatively structured and focused to generate data that are easily comparable between different groups; it may also be largely unstructured and broadly focused where the research is more exploratory and the issues unknown (David and Sutton, 2004). The combination of interviews and focus group discussion did not only produce comprehensive and rich data, but also enable the study to compare data from multiple sources to prove or dispute findings.

3.8 Data Collection Procedure

The process of gathering data is the start of a research journey to address research issues; therefore, the researcher must be knowledgeable about the various steps involved in this journey and its activities (Rowley 2002). The methods utilized to get in touch with the sample group and get answers to the research questions are referred to as the data collection methodology (Habib 2021). This involves scientific procedure that has to be followed to ethically obtain data from respondents and participants in research. This feature illustrates and clarifies the process that was used to complete the collection of data and empirical evidence to support the study and its arguments and

findings. Every one of the students-three focus groups from each of the five faculties sampled for the study (Communication, Business studies, Physical sciences, foreign languages and social science) was contacted who willingly and voluntarily decided to participate in the study. The interview questions were answered by these individuals, and their responses were recorded, then examined. Students received guarantees of privacy and anonymity by the study by representing them with pseudonyms to protect their identities from the research. Hence, the respondents in the study were five (5) individual interviews were transcribed as participants; P1, P2, P3, P4 and P5 in the study. The five (5) focus groups that the studies had discussions with were also represented as FCG1, FCG2, FCG3, FCG4 and FCG5.The representation with these coded labels secured the confidentiality and anonymity of participants in the study and data collection.

Direct communication with the individuals that is sampled postgraduate studies allowed the researcher to obtain qualitative data and digitally recorded interviews with the participants' consent so that the study data collected could be processed and coded for discussion and analysis. Each of the individual interviews conducted by the study with sampled postgraduate students lasted at least forty (40) minutes. These individual interviews were complemented by discussion with focus group of postgraduate students purposively sampled by the study. The responses were recorded, which enabled the data to be transcribed by the researcher for analysis. Following transcription, only the most important and interesting information remained or considered as key themes. To make data and findings meaningful and understandable, the thematic analytical framework of Braun and Clarke (2006) was employed to analyze responses in respect to the research questions and objectives.

3.8.1 Data Analysis

Qualitative data analysis in its simplified form is the production of knowledge which involves the breaking-down, categorizing and prioritizing of data into a useful system (Schmidt & Brown,2014). Also, Braun and Clarke's (2014) thematic analysis approach was selected for the data analysis. Boyatzis, (1998) describes thematic analysis in this manner: “Thematic analysis – a process for encoding qualitative information – can be thought of as a bridge between the languages of qualitative and quantitative research”. Braun and Clarke, (2006); Van Breda, (2018) share this sentiment in stating: Thematic analysis is a method for identifying, analyzing and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail. Using this tried-and-true method made sure that our analysis fully grasps the intricacy and depth of the data, offering a comprehensive comprehension of all pertinent elements (Nowell et al., 2017). The process of coding, classifying, revising, and tabulating accumulated data to a manageable size, creating summaries, and looking for patterns of relationships between data groupings is known as data analysis (Kothari, 2004). A technique for finding, examining, and interpreting themes in qualitative data is called thematic analysis (Caulfield, 2022; Terry et al., 2017). It provides an organized and methodical approach to understanding people's opinions, ideas, and awareness around a particular subject (Braun & Clarke.2019).

Thematic analysis was used to analyze the data from the interview sessions with the selected respondents, who were graduate students, and group the questions and answers into common themes. Similar to how Dawson (2019) describes thematic analysis as simply analyzing data by themes, Braun and Clarke (2006) describe thematic analysis as a method of finding, evaluating, and reporting patterns (themes) within data. When conducting qualitative research and using thematic analysis to analyze the interviews

and documents, the researcher needs codes. Finding recurring patterns and meanings in texts, focus groups, interviews, and data sets is necessary for thematic analysis (Braun & Clarke, 2006). The themes that arise from the data are not imposed upon by the researcher, allowing for simultaneous data collection and analysis, highly inductive (Dawson, 2009)

Furthermore, Creswell and Creswell (2022) point out that a researcher's ideal number of themes for qualitative research is between five and seven. Furthermore, according to Creswell and Creswell (2022), these subjects form the primary foundation for the overall research findings that function as the headings for the study sections. Braun and Clarke (2006) describe the steps that comprise the thematic analysis method as follows: the themes that emerged from the coding were carefully examined to make sure that each theme could address the research questions of the study. In order to provide a thorough and detailed explanation of the study's main conclusions, the researcher used the themes in relation to pertinent theories, literature, and excerpts from the interviews. Following the collection of the data segment through interviews with respondents, the data analysis process commenced with a careful listening to the audio recordings of the interviews, (Daymon & Halloway, 2010). The entire text of the interviews then needs to be transcriptional. In light of this, the author meticulously wrote the data transcriptions from the interview tapes to guarantee correctness. As stated by Daymon and Halloway (2010), transcription of an audio recording is completed during the first phase of data analysis when arranging the data, as stated by Creswell & Creswell (2022). The researcher literally recorded and transcribed the data in order to obtain rich and thorough data.

Particularly, the researcher double-checked that the interview transcriptions had been supplied in the proper typed-word format and arranged the data and information to assure uniformity. As previously indicated, the researcher listened to the audio transcription in order to interpret the data and concepts that the participants had submitted for analysis and discussion (Creswell & Crewell, 2022). After completing this process, the transcribed data are coded into the relevant themes in the second step of the data analysis process. Coding gave the researcher the ability to organize, synthesize, and understand the data. Daymon and Halloway (2010) highlighted that codes are crucial in reducing and simplifying the evidence to help give it meaning, as supported by the literature. The study also coded the data, which is defined by Creswell and Creswell (2022) as the process of structuring the data by bracketing sections, compiling data, and categorizing paragraphs according to participant language. The process of coding affords the researcher the ability to group participant responses into themes for subsequent examination.

3.8.2 Ethical consideration

There are ethical issues with every research design that must be resolved. In general, the case study method is a thorough, drawn-out design investigation. Yin (2018, p.3), conducting case study research is among the most difficult social science tasks. To obtain information from various sources and develop a thorough grasp of the subject, case study research takes a lot of time. Prior to starting the analysis, a thorough understanding of the participants' experiences is required. The interaction between the participants and the researcher is one possible ethical dilemma for the ongoing investigation. The researcher made an effort to manage the intricate relationship with the participants and the final analysis with the institution where the data was collected. Social research must be carried out with ethics and integrity in order to safeguard

participants and enable the collection of rich data. Building trust with participants will be facilitated by ethical and successful practices. Before the research and interviews began, informed, written agreement was acquired, informing participants that the study carries very minor risks. Additionally, participants could leave the research at any moment. Verification by members guaranteed that participants were accurately represented. With password restrictions for digital file access, care was taken to ensure the data is safe and secure. Lastly, the identities of the respondents were changed before being included in the final report.

It is imperative that ethical considerations be acknowledged and addressed in research, particularly in qualitative approach (Farquhar, 2012). All participants gave their informed consent and permission after being made aware of the nature, goal, and possible risks of the study (Farquhar, 2012). Encrypting and password-protecting interview details was one way to ensure anonymity and secrecy, were used to safeguard the identities of participants in the study. Establishing a cozy interview setting reduced power disparities between the participant and the researcher (Ganga & Scott, 2006). The study took into account the possible effects on participants, allowing them time to think about their answers and provide assistance if needed. Compliance with moral standards and laws.

3.8.3 Credibility

Credibility was established in the study through multiple strategies to ensure that findings authentically represented participants' perspectives. Member checking was one of the approaches utilized, allowing participants to review their responses and verify the accuracy of the transcription, ensuring that the interpretations aligned with their intended meanings. In addition, triangulation methods, such as comparing individual

interview responses with focus group discussions, were employed to validate insights and reduce bias. The involvement of diverse participant groups across various faculties further enhanced credibility, as it provided a broader and more accurate representation of experiences related to the research topic. These steps were vital in substantiating the study's credibility by confirming that the findings were an accurate reflection of the participant's actual perspectives and experiences.

3.8.4 Transferability

The study addressed transferability by providing a comprehensive description of the research context, participants, and methodology. By detailing the study's design and the rationale behind participant selection and data collection methods, the researcher allowed readers to evaluate the applicability of the findings to similar contexts. The study also emphasized context-specific variables, such as the academic and technological environment of the University of Education, Winneba, to clarify the study's scope and relevance to other educational settings. This thorough contextualization aids in determining the extent to which the findings could be applicable or adaptable to different educational institutions or similar populations.

3.8.5 Dependability

Dependability was reinforced in the study by maintaining consistency in data collection, coding, and analysis processes. Detailed records of each methodological step, including the interview guides, data transcription, and thematic coding techniques, were documented to provide transparency and replicability. The study also conducted regular peer debriefing sessions, where external experts reviewed the data collection and analysis processes, offering feedback to enhance reliability. This approach ensured

that the findings were consistent and reliable, and it helped verify that the research procedures were systematically followed throughout the study.

3.8.6 Confirmability

Confirmability was addressed through strategies that minimized researcher bias and established objectivity. The researcher employed reflexive journaling to document any personal biases or assumptions that might influence data interpretation. The study also included an audit trail, where all research decisions, raw data, and analytical notes were meticulously recorded. This audit trail allowed external reviewers to trace the research process and validate that the findings emerged directly from the data rather than from researcher bias. These measures ensured that the results were shaped by the participants' responses and supported by verifiable data.

Through these methodological rigour strategies, the study demonstrates a commitment to producing credible, transferable, dependable, and confirmable research findings that contribute valuable insights to the field.

3.8.7 Trust worthiness

The study employed several strategies to enhance the trustworthiness of its findings, following the qualitative approach. Trustworthiness in qualitative research refers to the rigor applied to establish the credibility, transferability, dependability, and confirmability of the findings. By focusing on these criteria, the study aimed to produce reliable and insightful results. The researcher ensured trustworthiness through systematic data collection and analysis, including the transcription and careful thematic coding of interviews to represent participant perspectives accurately. Furthermore, to maintain objectivity, data were meticulously cross-checked and reviewed to confirm patterns and themes that genuinely represented participant views. Techniques such as

reflexivity and documentation of biases were applied to mitigate researcher influence on data interpretation. Through these methods, the study substantiated the research outcomes as being grounded in participants' actual responses and validated the themes identified during analysis.

3.8.8 Chapter Summary

This chapter examined the methods and techniques used to collect the data required to meet the study's research goals and address questions. The qualitative research approach was used as part of the research methodology, which allowed the researchers to gather insightful data about the experiences of postgraduate students regarding the usage of generative AI tools in their learning engagements and academic research. It investigated the use of primary and secondary data when gathering participants data using a recorder and analyzing with existing literature on the topic understudy. In order to produce useful data for interpretation, the study discussion the data analysis process employed, which included sorting the data and classifying the responses of the various participants according to the recurring themes. The findings and discussion are covered in the following chapter, which is chapter four.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.0 Introduction

The chapter focuses on the analysis and discussion of the data collected during this study, highlighting themes derived through thematic analysis. The chapter begins with participants' biographical data, followed by thematic sections exploring their perceptions of generative AI's ease of use, efficiency, and potential benefits for postgraduate education. By employing Braun and Clarke's thematic analysis framework, this chapter uncovers patterns and insights from the participants' experiences, attitudes and perceptions of AI integration into their academic practices. This approach provides a robust basis for interpreting findings and connecting them to the research questions and objectives. The results contribute to understanding how generative AI technologies shape higher education, addressing key challenges and institutional roles. This chapter aims to offer actionable insights for enhancing generative AI adoption and aligning it with students' academic needs.

The key findings from the individual and focus group data are presented. The following sections provided insights into the identified themes and their related subthemes that address the problem and research questions; providing a structured and comprehensive overview of the results. The findings include the relevant data interpretations and explanation through sub-themes and quotes to provide thick descriptions of the data. The interviews and focus group discussions elicited responses that produced themes discussed to address the study's research questions, which include the following:

1. What do postgraduate students at University of Education, Winneba use generative Artificial Intelligence (AI) in academic research for?

2. What motivates the use of generative Artificial Intelligence (AI) tools by postgraduate students at the University of Education, Winneba in academic research?
3. What is the perception of postgraduate students about the use of generative AI in their academic research?

The discussion of the findings is presented under key themes to enhance understanding in relation to research questions. These themes include Easy access to Information, Checking Plagiarism, Reference Academic Work and Generating and Analyzing themes.

4.1 Research Question 1: What do postgraduate students at University of Education, Winneba use Artificial Intelligence (AI) in academic research for?

The study's first research question aimed to investigate the usage of generative artificial intelligence (AI) in academic research, particularly by postgraduate students at the University of Education, Winneba. The purpose of this study was to learn about the viewpoints of postgraduate students in using artificial intelligence (AI) in their scholarly especially research work. Data gathered on the ground revealed that artificial intelligence makes life easier for individuals to obtain knowledge, less stressful, more convenient, and requiring less time to read numerous research articles and other publications linked to their studies. Following a thorough and repeated review of the data obtained, the researcher coded and conducted a thematic network analysis of the transcripts of the interviews, ultimately identifying a few themes related to research question one. These include: Easy access to Information, Checking Plagiarism, Reference Academic Work, Generating and Analyzing themes and summarizing and paraphrasing.

4.1.1 Easy access to information

Artificial intelligence enables people including researchers to easily access information on any topic of interest. Theoretically, a plethora of digital platforms exist now that make use of practical AI approaches to find papers, books, proceedings, and editorial remarks in any field of study (George et al, 2016). Artificial Intelligence has been widely used at educational institutions across a range of administrative roles, but its impacts have not yet been evaluated or broadly analyzed. Teacher efficacy and efficiency have been enabled and/or enhanced by AI, leading to richer or higher-quality instruction (Chen et al, 2020).

The assumptions above are not different from what scholars like Musib et al. (2017) submitted. These technologies enable researchers in their efforts to define the right theory for their projects, organize and synthesize content, and provide summaries and trends on any subject. These tools and applications also evaluate data. Similarly, the responses from the participants show that generative artificial intelligence (AI) contributes to the research and learning activities of postgraduate students, especially those interrogated at University of Education, Winneba. For example, from the individual interviews conducted, this is what one respondent (P2) shared in respect of how artificial intelligence provided them with access to information for academic work.

> There is no doubt that, generative artificial intelligence (AI) tool promotes research activities because, it has become a major source where we especially masters and PhD students go to for information and suggestions for research. These artificial intelligence (AI) tools provide me information and knowledge from different sources, which shape my research direction and objectives (P2).

The emphasis on how these technologies is transforming access to information validates the assertion by scholars, for example, according to von Krogh and Gruber (2023), artificial intelligence (AI) can make it easier to find and take advantage of new

research possibilities, especially in management. Artificial intelligence improves their learning and research capacity as these tools provide generative intelligence and information to support research. From another angle, this is what other respondents explained with regard to the use and benefit of using artificial intelligence in academic and research activities as follows; “For example, I have been using generative AI as application and platforms to access literature in many ways. Apart from using them to gather information and literature for my research projects.” (participant 1). Another respondent said “I use generative AI tools to seek advice and suggestions on which information is relevant and required for inclusion in my work” (participant 2).

This is also what another respondent narrated during the individual interviews:

> The generative AI tools provide quick responses to questions at any time and any day. This makes information already accessible and available once you have the application and supporting internet service among others. This provides more options in terms of reading and gathering articles for research (participant 3).

The responses from the individual interviews have not been entirely different from what the study gathered through focus group discussion with various collective students from the faculties at the University of Education, Winneba. From the groups, one student from the group of graduate students in selected faculties (FG2) said the following:

> As graduate students, we rely so much on Artificial Intelligence for our learning activities and research works. Artificial Intelligence (AI) help us in easy crafting or construction of sentences and finding answers to assignments. Through AI tools we have been able to access information in our field for our research work and projects especially for literature review activities and writing.

The responses from both individual and focus group interviews are in line with what George et al, (2016) highlighted in their studies that artificial intelligence (AI) ensures students in higher education institution to do. This is in line with the Technology

acceptance model, which highlighted that, what users derive from technology, according to Sheldon (2016), influenced the likelihood of a person or organization adopting a new technology including the ability of generative artificial intelligence (AI) especially in gaining or getting access to information for academic research consistent with the assertions and emphasis on the significance of these new forms of communication platforms and application in transforming the research and learning of students (Boateng,2021). Also, the Technology Acceptance Model (TAM) helps understand how postgraduate students at UEW adopt Generative AI for academic research. Students perceived generative AI as useful and easy to use, facilitating access to information and enhancing research productivity. Technology Acceptance Model (TAM) is widely accepted model for predicting technology adoption, and applying it to generative AI use in academic research provide insights into students' behaviour and preferences (Sheldon,2016).

4.1.2 Checking plagiarism

Artificial Intelligence (AI) helps people to check plagiarism in their research work or study (Popenici,2023). The emergence of Artificial Intelligence (AI) tools like Turn it in has made it possible for academic institutions and researchers to check the rate of plagiarism in people's studies. This helps reduces the rate of intellectual dishonesty in the academic space. Several AI tools and platforms allow users to use them to check and prevent plagiarism in research. This acknowledgement is in line with what scholars such as Popenici, (2023) said about Artificial Intelligence (AI). For example, it is less proficient in subjects demanding higher level thinking (Susnajk, 2022; Ventayen, 2023). Concerns have been raised about AI being utilized for academic dishonesty. Hence, Popenici (2023), for example, warns about the dangers of using AI, such as the possibility of discrimination and the amplifying of prejudices, despite its usefulness in

research. The above discussions are in line with what the researcher found in the data gathered from the study. Below is what the respondents shared: for example, participant 3 narrated as follows:

> In the past, it was very difficult to determine whether what I was writing in my research and academic paper was plagiarized or not. At times I had to ask friends in other places to check the plagiarism rates in my work for me. However, with many AI applications and tools available, I am now able to check my write up to save me from any academic dishonesty in research.

Also, participant 5 narrated as follows:

> I use to spend much time in correcting grammatical mistakes that occurred in my research work or study but with advent of AI tools like Grammarly, it takes me less time to correct most of the grammatical mistakes in my research work

The responses given by the above participants are in line with the what scholars such as Popenici, (2023) said about it that artificial intelligence (AI). Additionally, ethical issues surrounding AI are vital since they address the devices' moral position as well as the guarantee that they do not cause damage to people or other morally significant beings (Bostrom & Yudkowsky, 2018).

The response from the focus group interview is similar to the individual interview with the various students selected from the faculties. A postgraduate student from one of the groups (FG3) of selected faculties said;

> Artificial intelligence (AI) tools help us as postgraduate students to check our work to reduce, plagiarism. However, we are always careful when we are using these tools and applications in order not to lead us to any unethical issues and dishonesty. Artificial intelligence tools like quilbot among others have helped us to reduce plagiarism and summarize our research work and projects.

The responses from both individual interview and focus group discussion corroborated what scholars like Bostrom & Yudkowsky, (2018), highlighted in their studies about the use of Artificial Intelligence (AI) regarding the moral position and requirements in

academic research with re-echoes the use of tact and intelligence in the use of such generative technologies in transforming the learning of students. Postgraduate students at UEW use generative AI to ensure academic integrity and avoid plagiarism. Perceive usefulness and perceive ease of use influence students' intention to use generative AI for checking plagiarism. The Technology Acceptance Model (TAM) helps understand how postgraduate students at UEW adopt generative AI for checking plagiarism. Students perceive generative AI as useful and easy to use, facilitating academic integrity and reducing plagiarism risk. Technology Acceptance Model (TAM) is a widely accepted Model for predicting technology adoption and applying it to generative AI use in plagiarism checking provides insights into students' behaviour and preferences (Sheldon,2016).

4.1.3 Reference Academic Work

Generative AI tools help academics and researchers to be able to reference their academic work without much stress and difficulty. This phenomenon makes it possible for researchers to finish their works on time and easily cite other authors to support their work. The literature below supports the above assertion.

Various generative Artificial Intelligence tools like Mendeley are used for easy referencing of academic studies (Iskanda,2019). Most Artificial Intelligence referencing tools like Mendeley makes referencing less stressful for students. Mendeley is a desktop and web reference management tool that is free of cost (Iskanda,2019). The assertions above are similar to the responses that were obtained from both the individual interview and focus group discussion with the postgraduate students at University of Education, Winneba. For example, from the individual interview, this is what

respondents had to say about how artificial intelligence is assisting them in the citation and referencing in their academic research especially project:

> One issue that has baffled students especially postgraduate researchers like myself is with respect to referencing in my work. It is challenging, but with the emergence of AI tools and application like Mendeley, this stressful exercise has been easy. I only need to supply the names and other details and AI does the rest just as same or even better than I could do with a long period of time. (Participant 4)

The response from participant 4 is not largely different or perhaps summarized by participant 3 who briefly indicated that "In short artificial intelligence tools like Mendeley has improved the way I reference, both intext and bibliography in my research work and publication" The literature below supports the above data. In order to accomplish their objectives, it assists users in streamlining their reference management routine (Hudriati, Patak, & Basri,2018).

The focus group discussion responses and the individual interview responses are not very dissimilar. This was the response gathered from one of the focus groups (FG2) in the discussion:

> There is no doubt that Artificial Intelligence help us in accessing reference materials instead of going to the library to read a lot of books before getting a scanty information. In addition to this, we are able to use AI tools like Mendeley to identify missing authors in our work, as well as arrange them in their right order alphabetically in any style particularly in APA style without much difficulty like the past.

The findings above from the interviews and discussions demonstrate how AI is transforming the intellectual capacity, academic and research space, as noted by scholars such as George, Osinga, Lavie & Scott, (2016) among others. Therefore, generative AI is perceived as useful for referencing and citation management. Generative AI tools are easy to use, automating citation formatting and reducing error. Perceive usefulness and perceive ease of use influenced postgraduate students at UEW

intention to use generative AI for academic referencing. Postgraduate students perceived generative AI as useful and easy to use, facilitating accurate and efficient citation management.

4.1.4 Generating and analyzing themes

This theme highlighted what the selected postgraduate students at the University of Education, Winneba use Artificial Intelligence to generate themes for their studies. In addition to generating and analyzing themes. The above findings are consistent with scholars like Musib et al. (2017) who explained how AI enables researchers to analyze data. According to Musib et al. (2017), these Artificial Intelligence tools enable researchers in defining the optimal theory for discussion and analysis of their projects, organizing material, generating themes, and synthesizing or analyzing content. These AI tools such as quill bot and perplexity also provide summaries, indicate patterns on any subject of study or under discussion, and analyze data. The responses from the individual interviews show that Artificial Intelligence tools and applications could generate themes for discussion and analysis in academic research. For example, this is what some respondents had to say to that effect:

> One opportunity that artificial intelligence provides me in my academic and research activities is their ability to enhance the thematic analysis process in my project and studies at the postgraduate level. Any time I am in doubt I just key in my questions on AI platforms, and within a few seconds various themes are suggested for me as a guide to help me in discussing my data and findings (participant 1).

On the other hand, another participant in the individual interviews reiterated. “I am particular about how these AI help to thematize and analyze documents and content of my data gathered in addition to explaining concepts in my research work as an emerging researcher” (participant, 4)

From the perspective of one of the groups interviews, this was gathered from them:

> There is this assumption that artificial intelligence makes students lazy, but that is not the case because these tools rather know more especially about how that are conducted in academic research. As graduate students, we take advantage of AI tools in that regard. (FG3)

The responses from both individual and focus group interviews are consistent with what Musib et al. (2017) emphasized in their study, that, these Artificial Intelligent tools help scholars not only to figure out the best theory for their work and arrange their materials, but also come up with themes, and synthesize their findings in relation to literature. Generative AI is perceived as useful for generating and analyzing themes in qualitative data. Generative AI tools are easy to use, automating theme identification and analysis. Perceive usefulness and perceive ease of use influences UEW postgraduate students' intention to use generative AI for theme generation and analysis.

4.1.5 Summarizing and paraphrasing

The ability to summarize concepts from articles relevant to one's work using technologies like Quill Bot is another noteworthy feature of artificial intelligence. The application of AI to compile extensive literature that scholars believe is pertinent to their research. In addition to determining themes and analyzing them, artificial intelligence tools also enable postgraduate students to have also used these applications in paraphrasing of texts in research work. The participant responses demonstrate how artificial intelligence (AI) supports postgraduate students' academic learning and research, particularly at the University of Education, Winneba. For example, the respondents to the one-on-one interviews revealed the following on how AI tools assist them in paraphrasing their ideas from other articles related to their work. For example, participants shared these:

> I have been using generative AI tools to paraphrase some of the literature and materials for my research work. I use platforms such as quill bot, ChatGPT, Mendeley, and Boardi among others. This helps me in so many

> ways not only to restructure my work. This is all possible because of artificial intelligence (AI) tools (participant 4)

The emphasis on how these technologies is making writing easier validates the assertion by scholars like Miric, Jia, and Huang (2023), that Artificial Intelligence (AI) allows for the categorization of texts using supervised learning in general to locate patents connected to synthetic intelligence that demonstrate the classification and quantification capabilities of this technology.

The focus group discussion provided responses are comparable to those from the individual interview. Students in Focus Group four (4) made the following statements:

> Another way by which we rely on generative AI for our research is in respect of its feature that allow us to paraphrase and use or cite sources appropriately. We use Artificial Intelligence (AI) tools like Quill bot to paraphrase and summarize our study to make it standard.

Given the various uses of artificial intelligence (AI) in academic research which are consistent with what has been established regarding their utility by several scholars, for example, George, Osinga, Lavie and Scott, (2016), it is necessary to interrogate what motivates them to adopt and adapt them in their research and learning activities. Postgraduate students perceive generative AI as useful and easy to use, facilitating efficient text processing and comprehension. Therefore, perceive usefulness and perceive ease of use influence postgraduate students at UEW intention to use generative AI for summarizing and paraphrasing. Technology Acceptance Model (TAM) helps understand what motivates UEW postgraduate students to use generative AI in their academic research.

4.1.6 Research Question 2: What motivates the use of Artificial Intelligence (AI) tools by postgraduate students at the University of Education, Winneba in academic research?

The purpose of artificial intelligence (AI) utilization in academic research by postgraduate students at the University of Education, Winneba is the subject of this inquiry. In an effort to address this question, the study came up with four major themes, which are as follows: the influence of artificial intelligence, easiness regarding usage, significance of artificial intelligence, and Artificial Intelligence (AI) experience.

4.1.7 The influence of artificial intelligence

The first pattern to show up in the data relates to what motivate generative Artificial intelligence (AI) adoption as a learning tool the most. This theme covers how students accept Artificial intelligence (AI) technology due to peer pressure and curiosity, how they put up with possible negatives because they recognize the benefits, and how the practicality and ease of use of AI tools inspire them to use them. This theme focuses on the elements that exist in the pre-adoption stage, providing context for the fundamental reasons why students might begin their academic journey with generative Artificial Intelligence (AI) enhancements. To varied degrees, students seem to have incorporated Artificial Intelligence (AI) into their learning processes. Factors outside the scope of our study, such as students past technological experiences, unique learning styles, time constraints, or cultural considerations, may have an impact on this variance in usage patterns and adoption habits. Additionally, Sumak Hericko et al. (2011) noted that whereas attitude-based use-facilitating factors have an indirect effect on the intent to use, perceived utility has a direct impact on the purpose of use.

The aforementioned hypotheses align with the findings of the individual interview concerning the rationale behind the implementation of generative Artificial Intelligence (AI) tools in graduate education, specifically at the University of Education, Winneba. As an illustration, respondents stated the following: “Artificial Intelligence (AI) is fast, convenient and useful. It helps me to explain themes and concepts easily” (participant 1). Adding to this, another participant said “It has made it easier for graduate students in terms of writing, referencing, searching for papers and even learning” (Participant 4).

The idea that students use generative Artificial Intelligence (AI) most heavily for work that would save the greatest time derives from the interview data, which supports this. Due to the fact that each user possesses a unique set of skills—or lack thereof—different weights are assigned to the many reasons why a user might become an adopter. It became evident that these benefits even outweigh the functional and technological difficulties when combined with the generally positive aspects (such the simplicity of use) that collectively give rise to this theme. As a result, this makes it more evident why a student might want to use AI and/or stick with it. The assertions from the data above corroborated what scholars like Van Atteveldt et al., (2021) submitted. According to Van Atteveldt et al., (2021) AI tools help researchers analyze large datasets from social media, surveys, and other sources, offering insights into human behavior and societal trends. It is also in line with (Davis,1989) theory of reason action under the technology acceptance model. Perceived usefulness refers to an individual's belief in the ability of a given technology to improve their performance at work (Davis 1989). According to Davis (1989), "people prefer to utilize or not employ the tool to the degree they think it could assist them complete their job better.

Also, the responses of the focus group discussions from two focus groups regarding the motivation behind the use of Artificial intelligence at the University of Education, Winneba, among the postgraduate students in academic research are presented below: “Artificial Intelligence (AI) has made it easier for us, in our personal learning and analysis of our data when undertaking a study” (FG3). Another Focus Group participant/discussant said “Artificial Intelligence (AI) has made our studies easier as postgraduate students because, due to Artificial Intelligence (AI) writing our thesis has been very fast” (FG4).

One reason why people are motivated to use Artificial Intelligence (AI) tools in their academic study is that the results from focus groups two (3) and three (4) are similar to the individual interviews. Scholars such as Davis (1989) have supported this, arguing that the degree to which an individual feels that utilizing technology will be beneficial is a measure of the user's pleasure of usage. Additionally, Sumak Hericko et al. (2011) noted that whereas attitude-based use-facilitating factors have an indirect effect on the intent to use, perceived utility has a direct impact on the purpose of use. One element that directly influences students' opinions is perceived ease of usage.

4.1.8 Flexibility and convenience to use

The results of this study demonstrated that people are driven to use generative artificial intelligence (AI) tools because they are simple to use, particularly postgraduate students at the University of Education, Winneba, who are conducting research for their academic projects. In education research, AI is contributing to the development of intelligent tutoring systems (ITS) that adapt to the needs of individual learners, providing personalized feedback and instruction (VanLehn, 2011). These tools enable researchers in defining the right theory for their work, organizing and synthesizing

information, and providing summaries and trends on any subject material (Musib & Associates, 2017). From the above explanation, it can be implied that Artificial Intelligence involves training and advancement of computers to carry out tasks requiring human intelligence, including such speech processing, outcome, visual perception, language understanding, conversing, and emotional states, (Irizarry-Nones, Palepu & Wallace, 2017). In medicine, predictive AI models are used to forecast disease outbreaks, patient outcomes, and the efficacy of treatments (Shickel et al., 2018). For instance, in climate science, AI models help simulate the effects of climate change by analyzing historical data and making projections about future climate conditions (Rolnick et al., 2019). Similarly, in social sciences, AI tools help researchers analyze large datasets from social media, surveys, and other sources, offering insights into human behavior and societal trends (Van Atteveldt et al., 2021)

Below are the findings from the data from the individual interview of the participants: "It has made it easier for me in terms of writing, referencing, searching for papers and even studying" (Participant 1). Also, another respondent said "AI has made it easier for me in my personal learning and analysis of my data in thesis writing" (Participant 2). Again, this respondent said that "Generative AI helps me in the explanation of themes and concepts easily. It has made my studies easier as a graduate student because, due to AI my research has been very faster" (Participant 4). These respondents concurred that the reason for this is that individuals are more likely to utilize Generative Artificial Intelligence technologies that make searching for information easier or stress-free. This is in line with the technology acceptance model. Sheldon (2016) claims that the technology acceptance model (TAM) was created to predict the possibility that an individual or organization may adopt a new technology. This method originated from the theory of reasoned action, which proposed that three elements impacted behavior:

the motivation for the action, the attitude towards the action, and the social pressure to act. According to Turner et al. (2010), the Technology Acceptance Model (TAM) asserted that future acceptance of the technology could be forecasted by using the model at the time the technology was first used. The responses obtained from focus groups of students from different faculties at the University of Education, Winneba are not wholly different from the responses obtained from individual interviews. In one focus group, a student from the focus group of students selected faculties (FG 2) stated the following:

> We rely on artificial intelligence tools for our academic research because, it makes research faster and easier.AI tools make it easier for us to search for article or papers in relation to a particular topic. We also use it to structure our writings and also to correct some grammatical errors without much stress.

According to Davis (1989), "people prefer to utilize or not employ the tool to the degree they think it could assist them complete their work better," the results from focus groups and individual interviews support this literature.

4.1.9 Efficiency and Productivity

The efficiency and productive nature of generative AI as a tool for tailored learning is also another theme to emerge from the data. This subject encapsulates how students view and interact with AI to improve their educational experiences, give themselves more self-efficacy by delegating complicated jobs to them, and encourage creativity through organization, criticism, idea production, and encouragement. The following responses below are what emerged from the individual interviews with the postgraduate students of University of Education, Winneba: For example, participant (2) narrated that

“Generative AI ensures quick generation of ideas for my analysis and improve my writings as expected of academicians and researchers that is not different from other

participants, as one laid emphasis on how it helps to overcome issues of plagiarism and help him to paraphrase great chank of information for my work".

This how he put "It helps me to be abreast with a topic of project work and theories to be used to do my research work effectively since the generative AI can provide me with information needed" (participant 4). Adding to the discussion on the efficiency and productive, this is what another respondent among the interviewees reported "It increases my speed at studies and also produce more quality presentation. It has helped me to easily understood concepts that were not well explained at lectures" (participant 1).

As stated clearly in the responses above, many students hold the view that there are benefits of using generative Artificial Intelligence (AI) tools in academic research. These sentiments shows that people are aware of the potential significant impact that generative AI tools have on the way that education is provided and experienced. Students support generative Artificial Intelligence (AI) incorporation into the instructional framework in addition to realizing its potential. This highlights the necessity of redesigning educational programs to more effectively use AI tools.

According to Musib & Associates, (2017) these tools enable researchers in defining the right theory for their work, organizing and synthesizing information, and providing summaries and trends on any subject material. Jordan and Mitchell, (2015) submit that AI algorithms can process vast amounts of data much faster than traditional methods, enabling researchers to uncover patterns, trends, and correlations that would have been difficult to identify manually. The findings support technology acceptance model. Davis (1989) created and developed the technology acceptance model (TAM), building on the Theory of Reasoned Action (TRA) model of Ajzen and Fishbein. This model offered a

theoretical framework for understanding the link between attitudes, intentions, and behavior.

In addition, during the study's focus group discussion interview with postgraduate students at the University of Education, Winneba, two focus group participants (FG 2 and FG 3) offered remarks that were similar to the individual interview. Below are some of these responses of the sampled focus groups. Members of these groups had these interesting findings to share, that is “It helps enhance our research capabilities by providing us with powerful AI tools for data analysis and knowledge discovery. It also helps us to increase efficiency and productivity” (FG 2). Another group in the discussion also explained that “It has improved our writings and studies skills since every academician is expected to write well to be able to produce a very good scholarly work” (FG3).

The respondents expressed optimism on the potential of digital and generative AI tools to facilitate their academic development in both the individual and focus group discussion, which was by far the most common issue. The students who think these Artificial intelligence tools like ChatGPT are helpful for studying and other similar technologies to get clarification on study-related issues that they were unable to fully understand or that they believed were not adequately described by professors or aca demic texts. From an educational standpoint, what may be more worrisome is that, aside from using these tools to elucidate concepts, students are primarily using generative AI-powered tools to come up with ideas for assignments, essays, or when they are stuck on a particular subject. Postgraduate at University of Education, Winneba consider spelling, grammar, paraphrase, and essay structure assistance to be essential components of academic writing. Summaries of lengthy or complex scholarly books

are the last notable application of these techniques to ease students' academic burdens. Like using ChatGPT and comparable tools to better understand assignment instructions or important topics, respondents think it should be acceptable to utilize digitally aided tools in this manner.

To some extent, students seem to have incorporated generative AI tools into their learning processes and research. The benefits that these aspects might yield, such as previous encounters using information technology, particular ways of learning, time, or socioeconomic factors, may have an impact on the difference in patterns of use and adoption habits. The respondents expressed optimism on the potential of digital and generative AI tools to facilitate their academic development in both the individual and focus group discussion, which was by far the most common issue. The students who think these generative Artificial intelligence tools are efficient and productive for studying and other similar technologies to get clarification on study-related issues that they were unable to fully understand or that they believed were not adequately described by professors or academic texts.

This is in line with one of the key components of Technology acceptance model (TAM) submitted by Davis, (1989) known as Perceived Usefulness (PU). It is the degree to which a user believed that a technology will improve their performance or achieved their goal. The theory sees the user as rational and therefore makes decisions based on the perceived benefits and cost of using a technology. The data supported the finding made by Musib & Associates, (2017). According to Musib & Associates, (2017), these tools enable researchers in defining the right theory for their work, organizing and synthesizing information, and providing summaries and trends on any subject material. Due to the fact that each user possesses a unique set of skills—or lack thereof—different

weights are assigned to the many reasons why a user might become an adopter. It was shown that these benefits even outweigh the functional and technological difficulties when combined with the generally positive aspects (such as the simplicity of usage) that give rise to this theme. As a result, this makes it more evident why a student might want to use generative AI tools and/or stick with them.

It is evident that generative AI has the ability to increase productivity by optimizing processes and completing jobs that don't call for a lot of creativity or critical thinking, like formatting a text, freeing up educators and learners to concentrate on more crucial facets of their work (Zhai, 2022). Through market research, social media monitoring, brand monitoring, employee voice, and brand monitoring, generative AI will give input to service providers across many industries in order to improve service quality (Mesevage, 2020). This study and the literature demonstrate the potential of AI tools to improve learning and productivity despite concerns about academic integrity (Quadir, 2022; Rudolph et al., 2023; Susnjak, 2022; Ventayen, 2023; Zhai, 2022; Zhang 2023). Theoretically, a plethora of digital platforms exist now that make use of practical generative Artificial Intelligence (AI) approaches to find papers, books, proceedings, and editorial remarks in any field of study (George and Scott, 2016). These innovations provide summaries, highlight patterns in any field, and examine data, aiding scholars in identifying the most appropriate theory for their work, organizing the information, and synthesizing material (Musib & Associates, 2017).

4.2 Artificial Intelligence Experience

The Learning Experience Component explores the impact AI technologies have on learners' emotions and cognitive abilities. This dimension focuses on the internal experiences of the Postgraduate students, which are frequently disregarded in the

technical conversation about artificial intelligence (AI). In doing so, it validates how crucial it is to take learners' mental states into account. In education research, AI is contributing to the development of intelligent tutoring systems (ITS) that adapt to the needs of individual learners, providing personalized feedback and instruction (VanLehn, 2011). Theoretically, a plethora of digital platforms exist now that make use of practical AI approaches to find papers, books, proceedings, and editorial remarks in any field of study (George et al, 2016). Teacher efficacy and efficiency have been enabled and/or enhanced by AI, leading to richer or higher-quality instruction (Chen et al. 2020). Respondents explained their experiences in using AI tools in their studies at the graduate school of University of Education, Winneba. From the individual interviews, respondents further explained that;

> Yes, generative AI has helped me in my studies and researches. I use AI to get more explanations on points that I did not understand in class to compare my reviews in general. I also use generative AI tools for learning and doing assignments. Generative AI tools are also currently helping me to understand most of the things I am doing in my thesis writing (Participant 7)

Throwing more light on what the above interviewee narrated, another graduate student elaborated below:

> Generative AI technologies help me in easy crafting or construction of sentences and finding answers to assignments given. There has been an instance where a colleague used generative AI for an assignment during M.Phil. and those of us who had gotten the opportunity to check how close the answers were. I ended up adopting AI for my studies (Participant 9).

The evidence from the two respondents shows how the experiences of students with generative AI is transforming academic work and research. For her part, a master's student in her second year added:

> I would say it is good way to learn and write information. In terms of schooling this time AI has been good to me because anything I do not understand in class, generative AI helps me. I use AI to do research, paraphrase my work and also check plagiarism as well as check the grammatical errors (Participant 5).

The above assumptions of the respondents are consistent with what scholars like Davis, (1989) asserted in his study. According to (Davis 1989), Perceived usefulness refers to an individual's belief in the ability of a given technology to improve their performance at work. Individuals typically base their decision to use or not use an application on how much they think it will improve their performance at work. Thus, a user's attitude toward computer use—whether good or negative—is influenced by how they see the value of technology in education. The extent to which an individual believes utilizing the technology would be effortless is known as user satisfaction of use (Davis 1989).

The study's focus group discussions with distinct groups of students from the faculties at the University of Education, Winneba produced similar findings to those from the individual interviews. The following is what two (2) students' groups from different faculties at the University said: "AI technologies help us in easy crafting or construction of sentences and finding answers to assignments given. AI tools also help us to learn on our own" (FGD 2). This is what another group said:

> It has helped us get necessary documents for our studies especially our thesis work. Also, AI helps us to ease up with the search of documents regarding learning. AI technologies are quick in generating ideas related to the various directives by the user. However, such information is not enough which need to be supplemented (FGD 3).

Additionally, the purpose to use is directly impacted by perceived utility, but the intent to use is indirectly influenced by facilitating conditions of use through attitude. According to Sumak Hericko et al. (2011), one element that has a direct impact on students' attitudes is perceived ease of use. Thus, adding this dimension is crucial to the process of creating a comprehensive image of the role of generative AI in higher education, especially at the Postgraduate level. It encourages the development of supportive environments since it addresses both the cognitive and emotional aspects of learning. It also emphasizes how vital it is to continue researching and talking about

how generative AI tools affect users. As generative artificial intelligence (AI) permeates higher education, it is imperative to address potential disparities to guarantee that every student gains from the advances in technology and enhances their digital literacy. The importance is obvious: implementing generative AI requires a variety of methodologies. Despite worries regarding academic integrity, our analysis and the literature support the potential of generative AI tools to improve productivity and learning (Quadir, 2022; Rudolph et al., 2023; Susnjak, 2022; Ventayen, 2023; Zhai, 2022; Zhang 2023).

It also provides guidance for the design of interventions meant to support successful generative AI adoption. It emphasizes the need for developing educational settings where beneficial outcomes and advantages of generative AI usage can be appreciated and that bolsters individual self-efficacy. It reveals the notion that generative AI's acceptance in higher education depends on factors other than its perceived value or technical prowess. It also depends on how well it aligns with students' personal experiences. Therefore, postgraduate students at UEW with AI experience are more likely to use AI tools in academic research. Perceive usefulness and perceive influence students' intention to use AI tools, with experience enhancing perceived usefulness and ease of use.

4.2.1 Research Question 3: What is the perception of postgraduate students about the use of generative AI in their academic research?

The question addresses postgraduate students' opinion about the use of Artificial intelligence tools at University of Education, Winneba. Four key themes emerged from the third research question in an attempt to answer this research question which include:

Challenges of usage, Ethical Issues and Responsibility, Lack of support and training and Dependance and Over-reliance.

4.2.2 Challenges of usage

This focuses on the technological and functional challenges that students have while using AI tools for academic research, but they are prepared to take on these challenges due to the benefits. This includes limitations related to operations, such as traffic-induced unavailability, as well as limitations related to irregular reliability, inappropriate reference provision, repetitive and redundant output from the tool, and so on. As much as Postgraduate Students at University of Education, Winneba relied on generative Artificial Intelligence (AI) for information, they are also mindful of the fact that, not all information that emanated from Artificial Intelligence (AI) tools are accurate. This phenomenon guides them to be careful with some of the Artificial Intelligence tools that they employ in their academic research. Evidence of this is shown below in individual interview responses of Postgraduate Students at University of Education, Winneba. One respondent in the individual interviews stated that: "Sometimes the information generative AI provided me may not be factual. AI tools mostly give wrong references and Some students failed to verify references generated by AI to be sure of its existence" (Participant 3). For his part, another interviewee said "I sometimes see AI as shallow in terms of the information and sources it provides and usually AI tools like CHATGPT goes beyond what you are demanding or searching for" (Participant 8).

The preceding focus on the difficulties associated with generative Artificial Intelligence (AI) technologies is based on the findings of Susnajk (2022) and Ventayen (2023) in their respective studies. It is less proficient in subjects demanding higher level thinking,

(Susnajk, 2022& Ventayen, 2023). Concerns exist that Artificial Intelligence (AI) could be utilized for academic dishonesty, as was previously indicated. Popenici (2023) warns us about the dangers of Artificial Intelligence (AI) use, such as the possibility of discrimination and the exacerbation of biases.

The responses from the individual interviews are similar to the focus group discussion from the selective faculties of the collective group at the University of Education Winneba. From two groups of Postgraduate students from selected faculties, this is what they had to report: “generative Artificial Intelligence tools do not necessarily provide clear references for further studies. Since academic writings normally goes with referencing, most Artificial Intelligence ideas do not provide reliable reference sources” (FG2). In addition to this, members in the other focus group noted this during the discussion: “Generative Artificial Intelligence is shallow in terms of the information and sources it provides and sometimes go beyond what you are demanding or searching for” (FG5)

The similarities in the responses in both individual interviews and focus group discussion are consistent with the studies of Chen et al., (2020) and Quadir, (2022) in their study. According to the study, these worries coincide with those raised in the literature review by Chen et al. (2020) and Quadir (2022). As they investigated this theme, the writers came across a phenomenon known as the "AI in education paradox" (Lynch et al., 2020). This is consistent with the "disruptive innovation" idea Christensen, (1997), which highlights the need to take, information safety, and possible discrimination in AI algorithms into account when evaluating students' concerns. As previously said, students would frequently give instances of how they used digital and AI-driven tools while also acknowledging that using these tools could be viewed as

"cheating" and that one shouldn't "copy and paste" from them. Students' primary worry appears to be that using these instruments could result in plagiarism and impede learning since they will no longer be able to think critically or would become lazy. In response to concerns about accountability and authorship in academic research, Elsevier (2020), for example, has decided that generative AI and AI-assisted tools cannot be attributed as authors on published work. Additionally, the corporation issues a warning regarding the potential for data breaches and privacy violations related to the use of AI in academic writing, particularly in cases where researchers submit academic literature to internet-required platforms like ChatGPT Elsevier (2020). In Chan and Hu's (2023) study on students' perception of generative AI, researchers found that students preferred to use generative AI for supporting their learning, with reservations about its negative implications. The technology acceptance model (TAM) helps understand postgraduate students' perception of generative AI in academic research. While students perceive generative AI as useful and easy to use, they face challenges related to accuracy, bias, and over-reliance, influence their adoption and use

4.2.3 Ethical Issues and Responsibility

Postgraduate students are aware that providing inaccurate information or references in their academic research might be considered academic dishonesty, particularly at the University of Education, Winneba. The study does indicate that they continue to utilize generative Artificial Intelligence tools in their research even if they are aware of its limitations, indicating that they think the benefits of utilizing AI—like easy learning and quick access to knowledge—outweigh any potential drawbacks. The aforementioned presumption is in line with what Ventayen (2023) stated in his investigation of the moral dilemmas surrounding artificial intelligence (AI).

According to Ventayen (2023), content generated by artificial intelligence (AI) tools like ChatGPT can currently avoid plagiarism and AI-generated content detection systems like Turnitin and GPT Zero, seriously jeopardizing the authenticity of writing-intensive assignments in higher education. The application of artificial intelligence (AI) in postgraduate student academic research at the University of Education, Winneba, also poses ethical questions, according to participant replies. For example, the following is what the responses stated about the moral concerns surrounding the use of AI tools in academic research based on the individual interviews that were conducted: "I think that some students fail to verify references generated by Artificial Intelligence (AI) to be sure of its existence because, I realize that some of the references provided by AI are not accurate" (Participant 3). There were other issues that were identified by interviewees at the University of Education Graduate school. For example, one graduate student said: "My observation of Artificial Intelligence (AI) is that, AI does not necessarily provide clear references for further studies and even Artificial Intelligence (AI) tools sometimes give inaccurate information" (Participant 10)

The focus on the moral dilemmas brought up by the application of artificial intelligence (AI) capabilities lends support to views of (Bostrom and Yudkowsky, 2018). According to Bostrom and Yudkowsky (2018), ethical concerns surrounding artificial intelligence (AI) are crucial because they deal with both the assurance that these machines will not harm people or other morally significant beings as well as the moral standing of the machines themselves. This shows that nonhuman animals must also be taken into account when making moral decisions regarding AI.

The response of a postgraduate student from the collective groups of the chosen faculties at the University of Education, Winneba regarding their opinions on the moral

dilemmas surrounding the application of artificial intelligence (AI) in their scholarly research is also included below.

> Yes, since academic research writings normally go with referencing, some of the ideas suggested by Artificial Intelligence (AI) in certain cases do not provide reliable reference source where the information emanates from. So sometimes we struggle to locate and identify these not reference writings and statements in the project (FG2)

The responses from both individual interviews and focus group discussions are in consistent with what Ventayen (2023) and Zhang (2023) found in their study. Also, Ventayen, (2023) and Zhang, (2023), using a more thorough human and technological approach would promote novel techniques for assessment that could focus on imagination and critical thinking features and skills that AI is not easily able to replace. The potential for dishonesty necessitates the development of novel assessment methodologies misinformation and disinformation. The increased use of educational technology, including AI-based technology, in training and education at all levels, the increased amount of data being collected in educational settings, and the influx of companies participating in surveillance capitalism into the educational ecosystem have made ethical issues much more urgent these days (Williamson, 2018). Taking a more comprehensive approach, it would be noted that unfamiliar methods of evaluation could concentrate on critical thinking and imagination, which are critical features and skills that AI cannot easily substitute (Ventayen, 2023; Zhang 2023). The possibility for dishonesty requires the creation of new evaluation styles. Also, both the individual and focus group responses are in line with the study of (Ventayen, (2023); Zhang (2023)). These opportunities carry possible risks as well as ethical ramifications. Experts are aware of this and have often stressed how crucial it is to create moral frameworks for the use of AI in education (Baker et al., 2019; Russel & Norvig, (2016). Ensuring the ethical and transparent application of AI is crucial, as is addressing worries about the

technology's potential to worsen already-existing educational disparities (Owoc et al., 2021). This means that, ethical, educational, social, cultural, and economic requirements of artificial intelligence could be disregarded or infringed upon, which has to be considered in their usage (Zawacki-Richter et al., 2019). The Technology Acceptance Model (TAM) helps understand postgraduate students' perception of generative AI in academic research. While students perceive generative AI as useful and easy to use, they raise ethical concerns about authorship, plagiarism and responsibility, influencing their adoption and use.

4.2.4 Lack of Support and Training

The results demonstrated that University of Education, Winneba postgraduate students are excited with the use of generative artificial intelligence (AI) tools in their research and are inspired to suggest that the University of Education, Winneba graduate school use these tools for official integration into their academic research activities. During the interviews the postgraduate students at the University of Education, Winneba, provided various suggestions on how to improve the use of generative AI by supporting them. For example, one of the interviewees said "In my view, the University should organize seminars on how to effectively and efficiently employ generative Artificial Intelligence without reducing the quality of students thesis and other papers" (Participant 4). Another respondent supported the assertion of the first respondent by saying: "I think that, there should be workshops organized to sensitize lecturers and students on the use of generative Artificial Intelligence to help us to make better use of them" (Participant 5). The other postgraduate student also said: "I think they should organize seminars on how properly to use generative Artificial Intelligence (AI) to write academic research" (Participant 3). In conclusion, participant five concurred by saying that "University of Education, Winneba should develop generative Artificial Intelligence (AI) focus

courses or integrate Artificial Intelligence concepts and applications into existing Postgraduate programs and also introduce Artificial Intelligence tools and platforms and sensitize the students about it" (Participant 5)

Buttressing the data from the individual interview, one of the focus groups in the study responded as follows:

> We think that, the world is broadly changing and there is the need for universities around the country including University of Education, Winneba to begin to leverage technologies generative like Artificial Intelligence in their academic activities. With generative Artificial Intelligence (AI), academic activities are highly increase and a certain quality standard is set once it is used rightly (FGD 4).

From both the individual interview and focus group discussion, the responses are in line with (Alenezi & Faisal, 2020; Kasneci et al., 2023; Qadir, 2022; Rudolph et al., 2023; Susnjak, 2022; Zhai, 2022). Numerous scholarly works have indicated the necessity of expanding the understanding of AI tools like ChatGPT within the context of higher education, through direct and indirect means (Alenezi & Faisal, 2020; Kasneci et al., 2023; Qadir, 2022; Rudolph et al., 2023; Susnjak, 2022; Zhai, 2022). When creating and planning technology for learning, interested parties should be aware of the bigger picture and take into account the norms and goals of educators, educational technology structures, and educational conditions because factors and user experience are essential to the design of instructional technology (Earnshaw et al, 2018). Generally speaking, AI-based products and services have a wealth of pedagogical possibilities for creating intelligent learning support systems and fostering student progress in flexible settings (Zawacki-Richter et al., 2019). Authors may require training to effectively use generative AI tools, understanding their benefits, limitations, and ethical implications (Tlili et al., 2023; Chan, 2023).

Educational technology should be primarily developed to help students' improvement of this critical reasoning talent, as seen through the lens of evidential cognition in training (Sandoval et al. 2016). The fact that AI may be used to give students individualized feedback and direction on their learning paths is a crucial factor to take into account (Maier & Klotz, 2022). The application of AIs in faculty instruction and management has also received attention (Chen et al., 2020). Overall, by providing accurate prediction, assessment, and engaging students with online materials and environments, artificial intelligence (AI) has proven to improve interactive guidance, student engagement, streamline educational administration, increase learning, and improve the quality of instruction (Luckin et al., 2016; Ouyang et al. 2022; Yang et al., 2020; Zawacki-Richter et al. 2019).

This aligns with "Constructivist Learning Theory" (Vygotsky, 1978), which highlights the cooperative process of knowledge creation in learning. Therefore, the integration of AI in high education needs to prioritize active learning, critical thinking, and collaborative learning over just being convenient. Diverse student responses to AI result in a variety of mental and psychological impacts. Hassenzahl et al. (2010) claim that concerns about the negative impacts of learning for some people coexist with increased motivation and decreased stress for others, demonstrating the complex character of user experience. Therefore, going back to the need for a balanced approach that considers both the advantages and disadvantages for students' learning, this has significant ramifications for the creation of AI accommodation strategies. Postgraduate students perceive generative AI as useful for academic research. Postgraduate students' perception of ease of use could be influenced by available support and training. There is therefore, the need for technical support. Training on AI tool usage and limitations.

Guidance should be provided by the institution in order to properly integrate AI into academic research.

4.2.5 Dependance and Over-reliance

Another theme that emerged from the individual interview conducted is dependence and over-reliance on generative Artificial Intelligence. Additionally, it appears that, the possibility of inaccurate, plausible and incorrect responses remains a significant concern for participants. The inaccuracy of the tool is attributed to the fact that, while its knowledge is based on a wide range of sources, it does not accept updates with up-to-date information and is trained on events of a limited time span. Graduate students who were contacted asserted that, "sometimes AI gives wrong information and wrong references and citations." (Participant 2) "The references that are giving by AI are inaccurate and when unverified may lead to serious consequences." (Participant 3) The finding on citations aligns with similar findings of Sharun et al. (2023), who stated that some generative AI does not provide users with accurate academic sources. Th finding on wrong information aligns with the observation of Lim et al. (2023) on misinterpretation of queries.

Also, the focus group discussion has the following findings which are in line with the individual interview: "Over-reliance on AI makes students lazy and decrease their critical thinking ability." (FG2) "Often times, AI information, especially references and citations are not accurate" (FG3) Thes findings are in line with the scholars: Over-reliance on AI-generated content could hinder originality and human innovation (Hammad, 2023). Possibilities of biased or misleading information and the generation of inauthentic references raise credibility concerns (Meyer et al., 2023; Ariyaratne et al., 2023). Risk of spreading misinformation and disinformation, impacting the

credibility of generated content (Else, 2023). For these reasons, students are concerned that AI may contribute to the dissemination of inaccurate information, leading to the undermining of knowledge and its improper or irresponsible use for academic purposes. The Technology Acceptance Model (TAM) helped explained dependence and over-reliance. Users perceive technology as useful and easy to use, leading to adoption. When technology is user-friendly students rely and depend on it for their academic work. As users become more comfortable, they may become overly reliant leading to reduced their critical thinking and problem-solving skills, make them intellectual lazy.

4.3.6 Summary

The information obtained from focus groups and interviews about the use of generative artificial intelligence (AI) in academic research by postgraduate students at the University of Education, Winneba was evaluated and discussed in this chapter. The study examined the usage of generative artificial intelligence (AI) in academic research at the University of Education Graduate School and what drives postgraduate students to utilize it, based on the technology acceptance model. Data for the current study came from ten (30) students, one (1) student from each of the five faculties (faculty of business, faculty of social science, faculty of communication, faculty of foreign languages, and faculty of physical sciences), and five (5) focus groups from the five faculties that the University of Education, Winneba students were researching for their academic thesis. The results of the data analysis showed that Artificial Intelligence (AI) technologies make it easier for students to locate scholarly papers relevant to their research, check plagiarism, reference academic work, and generate and analyze themes.

The study also revealed the factors that encourage postgraduate students at the University of Education, Winneba to employ generative artificial intelligence (AI) in

their research: the influence of artificial intelligence, their exposure to AI, flexibility and convenience to use, Efficiency and productivity and artificial intelligence experience. Also, the findings reveal that, AI usage faces issues such as, challenges of usage, ethical issues and responsibility and lack of support and training. The use of generative artificial intelligence (AI) in academic research raises ethical and academic dishonesty concerns, but postgraduate students at the University of Education, Winneba have proposed steps to encourage the university to make sure generative AI is fully integrated. The study's summary, conclusion, and recommendations are contained in the next chapter.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This provides the study's final chapter. It wraps up the study, outlines some of the key findings and conclusion, and offers recommendations suggestions for future research practice and policy.

5.1 Summary

This study was informed by three objectives which are:1. to investigate how postgraduate students at university of Education, Winneba use generative artificial intelligence in academic research,2.to identify what motivate the use of generative artificial intelligence (AI) tools by postgraduate students at University of Education, Winneba in academic research and 3. to examine the perception of postgraduate students of UEW about the use of generative AI in their academic research . A qualitative study approach (Creswell & Creswell, 2022) with a case study (Yin, 2018) as its research design, was adopted for this research. The study which was underpinned by the Technology, Acceptance Model (TAM) also addressed ethical issues in respect to methods used in the collection of data.

This assisted the researcher in getting a better understanding of the present study of using Artificial intelligence (AI) in academic research by postgraduate students at University of Education, Winneba. The data obtained was through interviews and focus group discussion. To provide a better understanding of the responses elicited into rich data, the researcher thematically analyzed the data (Braun & Clark, 2006). In an attempt to answer the research questions of the study, which sought to address a gap in existing literature and concerns in higher education the study revealed some findings. These

findings of the study related to generative Artificial Intelligence (AI) in academic research by postgraduate students at University of Education, Winneba which provided new data and information to contribute to research. The study draws on technology acceptance model (Davis,1989), which enable the study to discuss and explain how postgraduate student at University of Education, Winneba are accepting artificial intelligence as disruptive technologies.

5.2 Key findings

This study found that the postgraduate students at University of Education, Winneba use generative artificial intelligence in academic research as a new source of inspiration for thoughtful and efficient academic progress. In order to keep up with contemporary global trends, postgraduate students are incorporating generative artificial intelligence technologies into several ways in various specialized areas of their studies.

Several cutting-edge tools and applications of generative artificial intelligence (AI) are used by postgraduate students at University of Education, Winneba in their academic research for various purposes. Generative Artificial intelligence helped them to reduce grammatical errors when writing articles or thesis by using artificial intelligence expertise in reference services, paraphrasing, classification, the use of indexing systematic literature search and acquisition, among others. Thus, the use of generative AI in academic research eliminates laborious and stressful tasks where humans especially postgraduate students make mistakes for fewer defects, facilitates access to research materials, eliminates the need for human intervention, and replaces it with instant feedback and interactions.

By looking at what postgraduate students use generative AI tools and how their experiences and perceptions affect their usage and how they affect academic research

and learning, study adds to the growing corpus of research on the use of generative AI in education. by examining perspectives on the incorporation of generative AI in higher education and interactions between students and generative AI tools which was established by this study. A better understanding of the dynamics at work in the increasingly AI-influenced educational environment particularly in academic research is given.

Postgraduate students, as well as instructors, and institutions involved in higher education can benefit from this study in real-world ways. In validating this, postgraduate students at University of Education, Winneba expressed the need for educators and institutions to balance and enhance the use of generative AI by students while being cautiously enthusiastic about the future. The postgraduate students emphasize the necessity of ongoing or continuous professional training and development; the tools they need to manage the changing generative AI environment in academic and research work. By better understanding the issues relating to the adoption of generative AI tools, this study makes accommodating, if not integrating, usage strategies more successful. The main drivers of adoption, according to the postgraduate students, are accessibility, easy to use, and significant.

This study discovered that interacting with generative AI in academic research by postgraduate students could be generally fun, which can enhance the educational process primarily by boosting motivation and inventiveness in studies. However, psychological and personal obstacles to its use were also found, which included possible negative effects on individuals'(postgraduate students) judgment and excessive dependence on the technology (AI) for everything which could make students lazy.

5.3 Recommendation of the study

It is advised that just as postgraduate students, UEW faculties focus on integrating generative artificial intelligence into their scholarly and academic endeavors in light of the listed findings. Some recommendations based on the findings are included below:

1. It is important to look at best practices for integrating generative AI in academic research as well as the role that educators and institutions play in the acceptance and effective use of generative AI and applications by postgraduate students. The focus on talks about academic integrity points to the necessity of developing ethical use policies and updating evaluation procedures to investigate negative impact of artificial intelligence.
2. To this end, UEW should organize seminars on the effective and efficient use of generative AI for postgraduate students without compromising on the standard of academic work. It is important to teach students how to utilize generative AI responsibly as well as how to avoid plagiarism, among others.
3. The university has to adopt a strong stance regarding the use of generative AI by postgraduate students and academics at all levels, especially when it comes to outlining the useful AI technologies that are permitted for use in their learning and research. This has to be incorporated and interpreted in the curriculum to imbibe the knowledge and skills in using AI tools and platforms.
4. To improve students' technical digital literacy, UEW should develop AI-focused courses by incorporating AI theories and applications into its post-graduate courses.
5. Generally, the various levels of the national education curriculum should incorporate artificial intelligence so that students and graduates of these

programs can work and apply their generative AI skills to the advancement of research and education in Ghana.

6. The UEW annual budget should include a yearly training components to empower graduate students and faculty members in departments to receive training on the application of generative AI in their academic research endeavors can increase publications for the University.

5.4 Suggestions for future study

1. Future studies could aim bigger and more diverse participant samples that reflect a broad range of demographics and academic institutions in order to extend the generalizability of findings.
2. The emergent phenomenon described in this work should be investigated using a different research methodology in future investigations, as the study adopted qualitative approach in its investigation.
3. Future research can also seek to examine how the University of Education, Winneba's faculty members are incorporating generative artificial intelligence (AI) in their teaching and other academic activities.

5.5 Study Limitation

The research provides a thorough analysis of the perception and acceptance of generative AI in higher education by looking at a number of relevant elements. The theoretical foundation is strengthened and comparison with other investigations is made possible by relying on the Technology Acceptance Model (TAM).

The study's limitations include, the non-inclusion of the faculty members to investigate how they incorporate generative artificial intelligence in their teaching and other academic activities. Furthermore, the University of Education, Winneba (UEW), the

only higher education institution where this study was done, which may not be a representative sample of respondents from other institutions. Due to time and budget constraints, the study was restricted to graduate students excluding undergraduate students. The study used a qualitative methodology, and the instruments for collecting and analyzing data gathered via interviews and focus group discussion with relatively small sample of participants and respondents.

5.6 Conclusion

The use of Generative AI-powered tools is growing among UEW postgraduate students who use these tools and applications to improve the quality of their research writing and to suit academic conventions. This enables the postgraduate students to gain writing confidence and ability to use generative AI tools like Grammarly, ChatGPT among others. As graduate students have acknowledged the usefulness and ease of use of communication technologies including artificial intelligence, they have taken advantage in their academic research and other learning activities irrespective of their concomitant issues related to them. Postgraduate students are aware that, artificial intelligence tools could compromise academic integrity, hence they take steps in addressing the challenges and uncertainties associated with these tools and their implication on their research and academic writing.

Given this, the postgraduate students studied posited that, to use artificial intelligence (AI) effectively, the University should provide more support in terms of training, instructions and guidance to encourage its use as suggested in the findings of previous studies such as Heaven (2023) and Okolo et al (2023). This research adds to the continuing discussion about the opportunities and challenges of using generative AI tools for education and learning by shedding light on how UEW postgraduate students

use these technologies in their research and academic engagements. This research conducted is significant because it emphasizes the opinions and voices of students or student-centered approach rather than focusing on faculty members. This is important because students' perspectives are frequently overlooked and undervalued in society when making decisions and developing policies related to technologies including artificial intelligence (AI) in higher Education.

In line with this, this study attempts to increase awareness among educators and students in the University environments of the value of including viewpoints from a variety of stakeholders regarding their acceptance and usage of generative AI tools.

Considering the above, this study recommends the improvement in the use of generative artificial intelligence tools and application in their academic research, while the Universities provide support and training in that regard to mitigate the effects of their usage in the academic and research endeavors. This is because artificial intelligence (AI) makes students knowledgeable and help them to know rather than making them lazy or enticing them to rely on authoritative sources of information.

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