

**ARTIFICIAL INTELLIGENCE IN NURSING EDUCATION: KNOWLEDGE AND
UTILIZATION AMONG STUDENTS OF MAKURDI COLLEGE OF NURSING
SCIENCES, BENUE STATE, NIGERIA.**

AUTHOR

SAAWUAN, STEPHEN TORKUMA

saawuantorkuma@gmail.com

**A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF NURSING
SCIENCE, FACULTY OF BASIC MEDICAL SCIENCES, COLLEGE OF HEALTH
SCIENCE, BENUE STATE UNIVERSITY, MAKURDI IN PARTIAL FULFILMENT OF
THE REQUIREMENTS OF NURSING AND MIDWIFERY COUNCIL OF NIGERIA
FOR THE AWARD OF BACHELOR OF NURSING DEGREE AND REGISTERED
NURSE CERTIFICATION (BNS.C, RN)**

SUPERVISOR

MR. VALENTINE TERHEMBA PIUS

JULY, 2025

DECLARATION

I, Saawuan, Stephen Torkuma, of the Department of Nursing Science, Faculty of Basic Medical Sciences, College of Health Sciences, Benue State University, Makurdi, with matriculation number BSU/BM/NUR/18/1036, hereby declare that this research project was duly carried out by me under the supervision of Mr. Valentine Terhemba Pius. All information sourced from other references has been duly cited, and no part of this research has been submitted or accepted elsewhere for the award of any higher degree or diploma.

Additionally, Artificial Intelligence (AI) tools were utilized to enhance the clarity, structure, and flow of sentences during the writing and editing process, without altering the originality or authenticity of the research content.

Saawuan, Stephen Torkuma

8th July, 2026

CERTIFICATION

This is to certify that this research project titled: Artificial Intelligence in Nursing Education: Knowledge and Utilization Among Students of Makurdi College of Nursing Sciences, Benue State, Nigeria was carried out by Saawuan, Stephen Torkuma, a student of the Department of Nursing Science, Faculty of Basic Medical Sciences, College of Health Sciences, Benue State University, Makurdi, with matriculation number: BSU/BM/NUR/18/1036. The research was conducted under my supervision and is hereby certified as meeting the requirements for the award of a Bachelor of Nursing Science (BN. Sc) degree. To the best of my knowledge, the content of this project is original and has not been submitted elsewhere for the award of any degree or diploma.

Mr. Valentine Terhemba Pius
(Project Supervisor)

Department of Nursing Science, Benue State University Makurdi, Benue State, Nigeria.

Dr. Daniel K. Ajio (Ph.D., FWAPCNW)
(HOD, Nursing Science)

Department of Nursing Science, Benue State University Makurdi, Benue State, Nigeria.

Prof. Oluwatoyin A. Ogunyewo
(External Supervisor)

Department of Nursing Science, University of Jos, Plateau State, Nigeria.

DEDICATION

This research work is dedicated to the Almighty God and to the family of Mr. Saawuan James Akeren and Mrs. Nguavese Saawuan.

ACKNOWLEDGEMENTS

My unreserved gratitude goes to God Almighty, whose loving, gracious, and merciful nature enabled me to carry out this project successfully. He not only gave me the strength and wisdom but also guided and provided the resources needed to make this publication a reality.

My sincere appreciation goes to my supervisor, Mr. Valentine Terhemba Pius, for his invaluable guidance and support throughout the course of this project. More than a supervisor, he has been a mentor to me and to many other nursing students at Benue State University, Makurdi.

I remain deeply grateful to all the lecturers in the Department of Nursing Science who contributed to my academic journey. I wish to especially thank the Head of Department, Dr. Daniel K. Ajio, along with Dr. Pauline Atser, Mrs. Rose Adobe, Mrs. Sandra Ortserga, and all the non-academic staff who work tirelessly to ensure that everything runs smoothly. May God bless you all abundantly.

To my dear parents, Mr. Saawuan Akeren James and Mrs. Nguavese Saawuan, thank you for nurturing me from birth and supporting me throughout this journey. Mr. and Mrs. Joseph Iyongu, I am grateful for the opportunity to have grown under your care, fed and trained with the Word of God, which has shaped who I am today. Words fail to fully express my appreciation to my immediate elder brother, Engr. Kater Akeren Dahks, who has always stood by me. I am truly thankful. To my other family members, thank you for believing in me, I am grateful. Ivim Joseph, thank you for being both a brother and a friend.

My heartfelt thanks also go to my covenant brothers: Peter Terkuma Atule, Eric Washima Matu (Mr. Angio), Kiishi Nicholas, Ayom Sesugh, Sonter Chia, Goodness Tsume, Terhemmen Joseph, and Chia Justice. To my friends Beauty Peter, Felecia Onoja, Faith Chiana, Nora Ternenge, Julius Emmanuel, Richard Terngu, and the Angio Family thank you for being some of the kindest people I have had the privilege of knowing. Special thanks to Gospel Tsume (my data analyst, CEO of G-

Lite, brother, and friend) your support has been deeply appreciated. And to my mentors while on campus; Dr. Tahav Joshua Kachina and DR. Nondu Benjamin, I want to say thank you beyond words could express.

Finally, I extend my warmest greetings to my campus fellowship, FCN-BSUM. You have truly been a family to me, and I do not take it for granted. May the Almighty God reward you all richly.

Thank you.

TABLE OF CONTENTS

DECLARATION	i
CERTIFICATION	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	ix
LIST OF FIGURES.....	x
ABSTRACT.....	xi
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background to the Study	1
1.2 Statement of Problem	5
1.3 Aims and Objectives of the Study	6
1.4 Research Questions.....	7
1.4.1 Research Hypothesis	7
1.5 Significance of the Study	8
1.6 Scope of the Study	9
1.7 Operational Definitions	10
CHAPTER TWO	12
LITERATURE REVIEW	12
2.1 Conceptual Review.....	12
2.1.1 Concept of Artificial Intelligence	12
2.1.2 Kinds of AI based on Capability.....	13
2.1.3 Types of AI based on Functionality	13
2.1.4 Applications of AI in Nursing Education	15
2.1.5 Benefits of AI in Nursing Education.....	20
2.1.6 Challenges of AI Adoption in Nursing Education.....	23
2.1.7 Ethical Considerations of AI in Nursing Education	25
2.1.8 Knowledge and Utilization Among Nursing Students	26
2.1.9 Implication for Makurdi College of Nursing Sciences.....	27
2.2 Theoretical Framework	28
2.2.1 Overview of Technology Acceptance Model (TAM)	28

2.2.2 Relevance of TAM to AI Adoption in Nursing Education	30
2.2.3 Implications for Makurdi College of Nursing Sciences	33
2.3 Empirical Framework	33
CHAPTER 3	40
RESEARCH METHODOLOGY.....	40
3.0 Introduction	40
3.1 Research Design	40
3.2 Research Setting.....	40
3.3 Target Population	41
3.4 Sample Size Determination	42
3.4.1 Sampling Technique	43
3.5 Instrument for Data Collection.....	44
3.6 Validity of Instrument	44
3.7 Reliability of Instrument.....	44
3.8 Method of Data Collection	45
3.9 Method of Data Analysis	45
3.10 Ethical Consideration	46
CHAPTER FOUR	49
RESULTS.....	49
4.0 Introduction	49
4.1 Data Presentation and Analysis.....	49
4.2 Answering Research Questions.....	53
4.2.1 Answering of Research Hypothesis	60
CHAPTER FIVE	62
DISCUSSION OF FINDINGS.....	62
5.0 Introduction	62
5.1 Discussion of Key Findings	62
5.2 Implication of Findings to Nursing	70
5.3 Limitations of the Study	72
5.4 Summary of the Study.....	73
5.5 Conclusion.....	74
5.6 Recommendations	75
5.7 Suggestions for Further Studies	76
REFERENCE.....	78

APPENDIX I	86
APPENDIX II	87
APPENDIX III	91
APPENDIX IV	95
APPENDIX V	96
APPENDIX VI	
APPENDIX VII	

LIST OF TABLES

Table 4. 1.1: Demographic Characteristics of Respondents	50
Table 4. 1.2: An Independent t-Test analysis to compare mean scores between the sex of students on AI knowledge	51
Table 4.1.3: One-Way ANOVA analysis to compare mean scores among students' academic level and students on AI perception.....	52
Table 4.1.4: Pearson's Correlation analysis to examine the relationship between AI utilization and students' perception of AI in nursing education.....	53
Table 4.2.1: Knowledge of AI in Nursing Education.....	54
Table 4.2.2: Utilization of AI in Nursing Education	55
Table 4.2.3: Challenges and Barriers to the Adoption of AI in Nursing Education	57
Table 4.2.4: Perceptions and Attitudes of Nursing Students on AI	59

LIST OF FIGURES

Figure 1. The Technology Acceptance Model (TAM)	30
Figure 2. Theoretical Framework for AI Adoption in Nursing Practice Based on the Technology Acceptance Model (TAM).....	32

ABSTRACT

This study examined the knowledge and utilization of artificial intelligence (AI) among nursing students at Makurdi College of Nursing Sciences (MCONS), Benue State, Nigeria. A descriptive cross-sectional design was employed, and data were collected from 146 students using structured questionnaires administered electronically via Google Forms. The data were analyzed using SPSS version 25. Hypotheses were tested regarding the influence of gender and academic level on AI knowledge and perception, as well as the correlation between AI utilization and perception. Findings revealed no significant differences in AI knowledge and perception across gender and academic levels. However, there was a statistically significant moderate positive correlation between AI utilization and perception, suggesting that increased use of AI is associated with more favorable attitudes. Students demonstrated a high level of knowledge about AI in nursing education (cluster mean = 4.36) and a moderate extent of AI tool utilization (cluster mean = 3.29). They also reported a moderate level of barriers to AI adoption (cluster mean = 3.27) and held a strong positive perception of AI integration in education and clinical practice (cluster mean = 4.01). Respondents acknowledged the potential of AI to support clinical decision-making and reduce workload through tools such as ChatGPT and medical AI software. However, the study identified gaps in structured AI training and challenges related to infrastructure and accessibility. Based on these outcomes, the study recommends incorporating comprehensive AI education into the nursing curriculum, enhancing faculty training, improving infrastructure, and promoting AI as a supportive—not replacement—tool in nursing care. Addressing cost and access issues and pursuing further research are also advised. Overall, the study highlights the preparedness of future Nigerian nurses to adopt AI and stresses the importance of strategic interventions to facilitate its effective integration into nursing education and professional practice.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

“Artificial intelligence (AI) will not replace humans, but humans equipped with the knowledge and tools of AI technologies will replace those without them in our contemporary society”. The above statement was made by Karim (2023) in the Harvard Business Review (HBR) article *The New World of Work* during his interview on AI and Generative AI. The influence of artificial intelligence's (AI) and digital platforms on our daily lives often go unnoticed, right from the onset of programmed algorithms that support our smartphones and driverless vehicles to the medical diagnostic systems used by health professionals. The decision- making tasks that were traditionally performed by humans are increasingly decided often times by AI today. According to Cleary et al., (2024), while AI is enhancing human efficiency, the shift has also introduced reams of ethical and legal uncertainties that demand our attention. The uncertainties include, among others, data security, information privacy, authenticity, transparency, and integrity of AI-Generated material and inherent AI biases.

According to Velibor, (2024), the field of healthcare is constantly evolving, driven by technological advancements and the need to provide quality care in an ever-changing horizon. One such technology that has gained significant attention and potential in healthcare is Artificial Intelligence. AI, a branch of computer science that simulates intelligent behavior in machines, has found applications in various sectors, including nursing education. There has been a growing interest in integrating AI into nurse education to prepare nursing students for the future of healthcare in recent years. AI has the potential to transform nursing education by offering innovative teaching and learning methods, enhancing clinical decision-making skills, and

improving patient outcomes. However, the successful integration of AI in nurse education requires careful consideration of several factors, including curriculum design, ethical considerations, faculty development, and student readiness. Artificial intelligence looms large as a transformative force in the contemporary landscape of healthcare delivery (Nassef & Zeid, 2024). Despite its significance, literatures addressing the implications of AI in nursing education particularly in Nigeria is notably scant. This has prone the profession with daunting hurdles in knowledge and understanding the need for integration of AI into nursing education and healthcare delivery in Nigeria. As health care in the nursing profession continues to evolve and become increasingly complex, nursing education must also integrate to keep pace with the changing horizon. The integration of artificial intelligence (AI) technology, which has the potential to transform education by providing more personalized and efficient learning experiences for students has been the one significant development in higher education (Bozkurt et al, 2021).

According to the report by Standard University (2016), the integration of AI technology into higher education has a long history that dates back to the 1950s, which emerged as a niche area of research with limited interest. Artificial intelligence (AI) gained popularity in the 1970s and 1980s due to the development of modern computing technology (Bozkurt et al, 2021). In the 1960s, researchers investigated the use of computer-assisted instruction, whereas, the advent of natural language processing which has improved through self-play and was one of the first instances of a working machine learning system begun in the late 1960s, (De Bruyckere & Kirschner, 2020). The use of computer-assisted instruction gained growth in the 1970s, which resulted in the creation of early computer-based teaching materials, as follows; multimedia learning resources, interactive simulations, and online tutorials. The above forecasted the potential of artificial intelligence to improve experiences of teaching and learning (Bozkurt et al, 2021). The use of AI-generated data through learning analytics and intelligent tutoring systems was introduced and demonstrated

improved student performance in the 1990s, (Bozkurt et al, 2021). These early experiments made it possible to provide personalized learning experiences and active learning (Ouyang et al, 2022). In recent years, the emergence of Chat “Generative Pre-trained Transformers” (ChatGPT), which has the potential to generate a variety of mock simulation cases; patient interviews, job interviews, providing interactive learning experiences while saving educators time, automation of assessment grading while allowing nursing faculty to focus on other aspects of teaching are applicable examples of artificial intelligence (AI) in nursing education (Sun & Hoelscher, 2023). The systematic optimization of AI in higher education and research has gained global attention. Artificial intelligence is a global endeavor, while the United State of America (USA) and China considerably are attracting attention to their contributions to AI globally, countries across the globe are experimenting with this technology to mention a few based on the overall innovations, AI research and development, the value of private investment, startup community, and government spending as follows; USA, China, United Kingdom (UK), Israel, Canada, France, India, Japan, Germany, and Singapore (Tim, 2024). South Korea is leading an exemplary AI transition in dedicating significant resources to developing AI education and training to prepare AI workforce with the mindset of building human capacity as a blueprint for labour market changeover (Kyunghye, 2022). AI talent is being fostered to build human capacity through measures such as increasing the number of AI graduate schools, operating short-term intensive educational programmes for example; the innovation academy, equipping all citizens with basic educational programmes for improving AI skills by operating software schools and AI-oriented schools and providing online education content available. The above will enhance citizens adaptability in response to the emerging technologies labour market transformation.

Undoubtedly, Artificial Intelligence (AI) is radically changing the landscape of industries worldwide and is now fully integrated into education. The numerous challenges faced in the

Nigerian education, such as inadequate infrastructure, lack of qualified teachers, and inconsistent access to learning resources. The aforementioned significant gaps can be bridged by the potentiality of AI (Sule, 2024). The need for adapting global technological trends into the higher education of Nigeria has been acknowledged by the National Universities Commission (NUC) in 2022 as part of its efforts towards the revitalization of the Nigerian University System (NUS) (NUC, 2022). The nation seeks to position itself as a technological hub. To achieve this vision, Nigerian universities are challenged to synchronize their curricula to equip students with the skills demanded by a rapidly advancing technological landscape (NUC, 2020). The concept and reality of AI is gaining recognition world-wide day after day, but to Nigeria is a nuance in the adoption to the educational system, wherein nursing education is not an exception.

Therefore, AI has come to stay and will continue to progress and gain followers regardless of whether the nursing profession acknowledges it or not (Archibald & Clark, 2023). The Nursing and Artificial Intelligence Leadership Collaborative, a group of nursing and technology experts. Recognized imperatively why the nursing profession should actively involve in the way AI is developed and implemented, so as to lead and drive how AI is used across the health system in recognition of AI's influence (Ronquillo et al., 2021).

Thus, this study sources to elucidate the global trend “Artificial Intelligence” and its implication in nursing education in Nigeria, assess the current degree of knowledge and utilization of AI technologies among Nigerian students at Makurdi College of Nursing Sciences (MCONS) Benue State, identify barriers hindering the integration of AI into the Nigerian educational system narrowed down to nursing education, and evaluate nursing students perception of the benefits and challenges of utilizing AI tools.

1.2 Statement of Problem

A multi-country artificial intelligence survey conducted by Ipsos, a Paris-based research firm, for Google (2024) in a study titled *“Our Life with AI: From Innovation to Application”* indicated that Nigeria's leveraging and leveling up with AI stand at 95%, while 59% of people globally believe that AI will benefit individuals like them. Nigeria's online population is leading the global adoption of generative artificial intelligence (AI), with 70% of respondents reporting usage, far exceeding the global average of 48% (Juliet, 2025). According to Oxford insights (2023), on Government AI Readiness Index, which evaluates 193 countries globally based on 39 indicators across 10 dimensions under 3 pillars; Government, Technology Sector, Data and Infrastructure. The above insights showcased that Nigeria ranked 103rd out of 193 countries. The report indicated that Nigeria scored 44.94% in the Government pillar, 24.49% in the Technology Sector pillar, and 50.21% in Data & Infrastructure, resulting in an overall AI Readiness Index score of 39.88% adoption. The finding of a study conducted by Ukeh & Anih, (2024) showed that the degree of utilization of artificial intelligence-based tools for teaching among lecturers in Federal University Otuoke, Bayelsa State was very low. This finding provides insights into the current state of technology adoption in the context of teaching at Federal University Otuoke, Bayelsa State, indicating a need for further exploration and potential integration strategies of AI tools in the Nigerian educational sector. Existing research suggests that while AI has the potential to enhance educational practices, its adoption in Nigerian educational institutions is still developing. Recommending that educational institutions in Nigeria should consider further exploration and integration of artificial intelligence technologies to enhance teaching, research, and student learning within educational administration and planning programs (Niyi et al, 2024).

Despite the increasing knowledge and awareness of AI and its benefits among average Nigerian students, the extent to which nursing students are aware of and utilize AI in their education and practice remains unclear. The integration of AI in nursing education is still at a developing stage in Nigeria, and infantile at Makurdi College of Nursing Sciences, Makurdi, Benue State. Many students may have limited knowledge about AI applications in healthcare, while others may struggle to effectively utilize AI tools due to a lack of training, infrastructure, or institutional support. The gap between technological revolution and students' readiness to embrace AI raises concerns about their preparedness for modern nursing practice in Nigeria. There is little research on its awareness and usage among nursing students in this region (Benue State and Nigeria) despite the increasing global adoption of AI in healthcare education. If this gap is not properly looked into, nursing students may be deprived of the benefits AI offers in enhancing personalized learning experiences, access to updated medical knowledge, patient care simulations, improved decision-making and clinical thinking. Therefore, this study seeks to assess the knowledge and utilization of AI among nursing students at Makurdi College of Nursing Sciences, identifying barriers and opportunities for effective AI integration in nursing education.

1.3 Aims and Objectives of the Study

The integration of artificial intelligence into the Nigerian nursing education is to re-emphasize the benefits AI offers in enhancing improved health care delivery. Below are the specific objectives of this study;

1. To assess the level of knowledge and extent of utilization of Artificial Intelligence (AI) tools, including chatbots, among nursing students at Makurdi College of Nursing Sciences (MCONS).

2. To identify the challenges and barriers facilitating the hurdles to AI adoption in nursing education at Makurdi College of Nursing Sciences, Benue State, Nigeria.
3. To examine MCONS students' perceptions and attitudes toward AI integration in their education and practice.

1.4 Research Questions

1. What is the level of knowledge and extent of utilization of Artificial Intelligence (AI) tools, including chatbots and virtual simulations, among nursing students at Makurdi College of Nursing Sciences (MCONS)?
2. What challenges and barriers affect the adoption and effective use of AI-driven technologies in nursing education at MCONS?
3. What are the perceptions and attitudes of nursing students at MCONS toward the integration of AI in their learning and clinical practice?

1.4.1 Research Hypothesis

Hypothesis 1

Null Hypothesis (H₀): There is no significant difference in the mean knowledge scores of Artificial Intelligence between male and female nursing students at Makurdi College of Nursing Sciences.

Alternative Hypothesis (H₁): There is a significant difference in the mean knowledge scores of Artificial Intelligence between male and female nursing students at Makurdi College of Nursing Sciences.

Hypothesis 2

Null Hypothesis (H₀): There is no significant difference in the perception scores of AI integration in nursing education among nursing students across different academic levels (Year 1, 2, and 3).

Alternative Hypothesis (H1): There is a significant difference in the perception scores of AI integration in nursing education among nursing students across different academic levels.

Hypothesis 3

Null Hypothesis (H0): There is no significant correlation between the extent of AI utilization and the perception of AI among nursing students at Makurdi College of Nursing Sciences.

Alternative Hypothesis (H1): There is a significant positive correlation between the extent of AI utilization and the perception of AI among nursing students.

1.5 Significance of the Study

Without doubts, the integration of AI tools into the Nigerian education has the potential to transform the educational landscape by providing outstanding solutions to existing challenges and improving the quality and accessibility of education (Fawaz, 2023). Therefore, the nursing profession in Nigeria is now better positioned than ever to leverage these technologies for more efficient and effective healthcare delivery.

To the nursing profession, the significance of this study highlights how AI can improve nursing training through personalized learning, virtual simulations, and clinical decision support tools. Bridging the knowledge gaps by identifying students AI level of awareness which will aid in Curricula development of AI-driven learning environment. AI-driven skill development is essential in its utilization, which is important in building future nurses with critical thinking technological-driven abilities in decision making.

To the healthcare providers, AI in nursing education ensures that graduates increasingly become efficient in clinical documentation, drugs administration, reduce workload and errors. At the same time in active utilization of AI-Power diagnostic tools, electronic health records (EHRs) for

efficient patient outcome. This is sacrosanct in addressing healthcare shortages, increasing technical know-how, and producing competent nurses.

To the society, well-trained AI-empowered nurses will contribute massively to the implementation of public health for all ages according the SDG Goal 3 by 2030, (United Nations, 2015). This is possible because, AI-driven healthcare reduces costs by minimizing errors, optimizing resources, and improving healthcare delivery in prevention, diagnosis, and treatment of public health global issues.

1.6 Scope of the Study

Makurdi houses several higher institutions, including Makurdi College of Nursing Sciences (MCONS), which was established in 2021 with the aim of training and qualifying God-fearing men and women to fill the gap that exist in the health sector in Benue State and Nigeria at large. This makes it a suitable location to assess AI knowledge and utilization in nursing education. The presence of hospitals and clinics, such as Benue State University Teaching Hospital (BSUTH) and Federal Medical Centre (FMC) Makurdi, provides a real-world setting where nursing students can apply AI-driven healthcare technologies. While Makurdi is gradually adopting digital innovations, the level of AI awareness and integration in healthcare education remains an area that needs exploration.

The study focuses specifically on the nursing students enrolled in various levels of study at Makurdi College of Nursing Sciences. This research will be evaluating students' knowledge level of AI concepts in nursing education, examining AI-driven tools utilization in learning and clinical practice, investigating students' perception and attitude of AI in nursing education and healthcare, and identifying obstacles preventing the effective adoption of AI in the Nigerian nursing education

at MCONS during the academic session of 2024/2025. Nevertheless, potential constraints of this study may include; limitation of students' exposure to AI tools in their curriculum, there could be a lack of available AI-driven resources in the Makurdi College of Nursing Sciences.

1.7 Operational Definitions

The following key terms in the study "Artificial Intelligence (AI) in Nursing Education: Knowledge and Utilization Among Students of Makurdi College of Nursing Sciences, Benue State, Nigeria, are defined operationally:

Artificial Intelligence (AI): Artificial intelligence refers to computer systems capable of performing complex tasks that historically only a human could do, such as reasoning, making decisions, or solving problems which saves time, cost, and energy.

Nursing Education: Nursing education is the structured process of training individuals to acquire theoretical knowledge, practical skills, and professional competencies necessary for providing quality healthcare services which encompasses classroom instruction, laboratory simulations, clinical practice, and continuous professional development to prepare nurses for diverse healthcare settings.

Knowledge of AI in Nursing Education: The knowledge of AI in nursing education encompasses understanding its applications, benefits, and ethical implications, as well as the ability to critically evaluate AI-generated content and integrate AI tools into clinical practice and learning experiences in the profession.

Utilization of AI in Nursing Education: Utilization refers to the extent to which nursing students actively engage with AI tools in their learning and clinical practice. AI-driven systems assist nurses in monitoring patients' vital signs, predicting deteriorations, and optimizing care plans. Intelligent monitoring devices and wearables facilitate real-time data collection, enabling student nurses to

make informed decisions appropriately and accurately without fear of causing harm on the patients.

Perceptions and Attitudes Toward AI Integration: Perceptions refer to how nursing students view or the student's standpoint on the role of AI in their education. Attitudes indicate students' receptiveness or defiance to adopt AI in learning and clinical settings. These factors influence the adoption of AI-driven technologies in nursing training.

Makurdi College of Nursing Sciences (MCONS): MCONS is a tertiary nursing institution located in Makurdi, Benue State, Nigeria, responsible for training professional nurses through both theoretical and practical instruction. The College was established in 2021 with the aim of training and qualifying God-fearing men and women to fill the gap that exist in the health sector in Benue State and Nigeria at large. The college serves as the study site for this research.

Perceived Usefulness (PU) in Nursing Education: AI can provide personalized learning experiences, adapt to individual student needs, and offer immediate feedback, potentially improving comprehension and retention of complex nursing concepts. AI-driven simulations can create realistic clinical scenarios, allowing students to practice and hone their skills in a controlled, risk-free environment preparing them for patient care in real time cases under-pressured.

Perceived Ease of Use (PEU) in Nursing Education: User-Friendly Interfaces play a crucial role in their adoption. If the AI systems are intuitive and easy to navigate, students are more likely to engage with them. Adequate training and ongoing technical support can alleviate apprehensions and reduce the perceived complexity associated with AI technologies.

CHAPTER TWO

LITERATURE REVIEW

Artificial Intelligence (AI) is taking over the tasks that were originally performed by humans across all spheres of human endeavor, including healthcare and education. Innovative approaches to teaching and learning, improving both theoretical knowledge and clinical practice are the benefits AI offers in nursing education. Awareness, understanding, and familiarity is key in the knowledge of AI in nursing education (McGonigle & Mastrian, 2021). It is worthy of note to state that complex tasks that historically only a human could do are being performed today by AI (Coursera, 2024). This chapter focuses on the review of related literature. The conceptual review examines the integration of AI in nursing education, focusing on the knowledge and utilization among students at Makurdi College of Nursing Sciences, Makurdi, Benue State. Theoretical review of the study examines relevant theories that support the research topic, providing a structured foundation for understanding the variables in the study. Empirically, the study examines existing empirical (data-based) studies, analyzing their findings, and identifying research gaps.

2.1 Conceptual Review

2.1.1 Concept of Artificial Intelligence

By definition, AI refers to computer systems designed to perform tasks that typically require human intelligence, such as learning, reasoning, and problem-solving. According to Copeland, (2025), AI is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. AI encompasses technologies such as machine learning, natural language processing, and AI-driven clinical

decision-support tools used in nursing education. In nursing education, AI encompasses tools and applications that facilitate learning, simulate clinical scenarios, and support decision-making processes. These technologies aim to enhance educational outcomes and prepare students for real-world clinical environments. Understanding the kinds and types of AI is essential in shaping the knowledge, understanding, and utilization of AI-driven technological tools among the next generation nurses currently in training at various schools of nursing, colleges (MCONS), and departments of nursing sciences littered across Benue State, Nigeria, and Africa to the world.

2.1.2 Kinds of AI based on Capability

1. Artificial Narrow AI: Artificial Narrow Intelligence (Weak AI) is the only type of AI that exists today (IBM, 2023). Any other form of AI is theoretical. It can be trained to perform a single or narrow task, often far faster and better than a human mind can. However, it cannot perform outside of its defined task. Instead, it targets a single subset of cognitive abilities and advances in that spectrum. Examples of Narrow AI include; Siri, Amazon's Alexa and IBM.
2. General AI: Artificial General Intelligence (AGI), also known as Strong AI, is still a theoretical concept. AGI can use previous learnings and skills to accomplish new tasks in a different context without the need for human intervention. This ability allows AGI to learn and perform any intellectual task that a human being can execute.
3. Super AI: Super AI is commonly referred to as artificial superintelligence. If ever realized, Super AI would think, reason, learn, make judgements and possess cognitive abilities that surpass those of human beings.

2.1.3 Types of AI based on Functionality

According to Arinze, (2016) there are four types of Artificial Intelligence as follows;

1. **Reactive Machines:** Reactive machines are the most basic type of artificial intelligence. They respond to immediate requests and tasks, but not capable of storing memory, learning from past experiences or improving their functionality through experiences. Additionally, reactive machines can only respond to a limited combination of inputs (Sunny, 2024).
Examples; IBM Deep Blue and Netflix Recommendation Engine
2. **Limited Memory AI:** Limited memory AI can store past data and use that data to make predictions. It actively builds its own limited, short-term knowledge base and performs tasks based on that knowledge. The core of limited memory AI is deep-learning. It functions like the neurons in the human brain. This allows a machine to absorb data from past histories and learn from them, helping it improve the accuracy of its actions over time. Today, the limited memory model represents the majority of AI applications. Limited Memory AI examples include; Chatbots and Virtual Assistants (as users interact more with these systems, they learn from this data and remember details about the user, allowing them to provide relevant and personalized responses), and Self-Driving Cars.
3. **Theory of Mind AI:** As updated clearly by Matthew, (2024), theory of mind in AI refers to the ability to recognize and interpret the emotions of others. It is borrowed term from psychology, describing humans' ability to read the emotions of others and predict future actions based on that information. Even though it has not been actualized yet, theory of mind would be a substantial milestone in AI's development.
4. **Self-Aware AI:** Self-aware AI refers to the hypothetical stage of artificial intelligence where machines possess self-awareness. Often referred to as the "AI point of singularity". Self-Aware AI represents a stage beyond theory of mind and is one of the ultimate goals in AI development. It is thought that once self-aware AI is achieved, AI machines will go beyond the control of the creator (Humans), because they will have a sense of self as well.

Therefore, Artificial Intelligence has come to stay, whether the nursing profession in Nigeria adopts it or not. Its rapid growth and exchange of expertise are a wake-up call for Nigerian education.

2.1.4 Applications of AI in Nursing Education

Artificial intelligence integration into nursing education displays through various applications. This education is provided to student nurses by experienced nurses and other medical professionals who have qualified or experienced for educational tasks, traditionally in a type of professional school known as a nursing school or college of nursing or the department of nursing science through the university (American Association of Colleges of Nursing, 2022). Below is the application of AI in nursing education.

1. Clinical Virtual Simulation:

The emergence of COVID-19 Pandemic necessitates the importance of simulation as an education method for meeting the challenges that were posed by the time (Foronda & Armstrong, 2020). According to the *Healthcare Simulation Dictionary* published by the Agency for Healthcare Research Quality (AHRQ), defines clinical virtual simulation as the recreation of reality portrayed on computer screens, involving real people operating simulated systems and playing key roles in performing skills, engaging in decision-making or communication (Loice, 2020). Virtual simulation refers to the use of computer-based, immersive environments that replicate real-world clinical scenarios, allowing nursing students to practice skills, make decisions, and interact with virtual patients in a safe, controlled setting. These simulations enhance critical thinking, clinical reasoning, and hands-on experience without the risks associated with real-life patient care. According to Foronda et al., (2020), it can be an effective pedagogy in nursing education to

improve acquisition of knowledge, skills, critical thinking, self-confidence, and learner satisfaction.

Examples of Virtual Simulation in Nursing Education

1. **Virtual Reality (VR) Simulations:** Oxford Medical Simulation (OMS), is a VR-based platform that immerses nursing students in realistic clinical situations, such as emergency care, patient assessment, and resuscitation with the use of VR headsets in interactive scenarios.
2. **Augmented Reality (AR) in Patient Care Training:** with the use of HoloLens by Microsoft, nursing students can visualize 3D anatomical structures, practice surgical procedures, or simulate patient assessment techniques which enhance bedside learning and diagnostics.
3. **High-Fidelity Manikin-Based Simulation:** Laerdal's SimMan 3G, a lifelike manikin that responds to nursing interventions in real-time (e.g., changes in vitals, breathing, or heart rate based on treatment). Used in emergency response training, CPR, medication administration, and ICU care.
4. **Web-Based Virtual Patient Simulations:** vSim for Nursing (Developed by Wolters Kluwer & Laerdal Medical). A digital simulation platform that presents interactive patient case scenarios where students can assess symptoms, diagnose conditions, and administer virtual treatments. Available for specialties like pediatrics, geriatrics, medical-surgical, and psychiatric nursing.
5. **AI-Powered Chatbots for Clinical Decision-Making:** SimX AI Virtual Nurse Assistant. An AI-driven chatbot that interacts with nursing students, asking clinical questions and guiding them through patient care scenarios.

The benefits of virtual reality in nursing education include; safety, individualization, fill-in-gaps, engagement, and standardization (University of Texas at Arlington [UTA], 2021).

2. Personalized Learning

AI programmed algorithms can assess individual learning styles and progress, tailoring educational content to meet each student's unique needs. This personalized approach promotes effective learning and skill acquisition. In nursing education, personalized learning helps students develop clinical competencies by providing adaptive learning experiences that align with their strengths, weaknesses, and career goals. Beyond simulations, adaptive learning platforms and virtual teaching assistants AI tools are revolutionizing nursing education by offering tailored learning experiences and support (Chang et al., 2022). Available studies have shown that nursing students hold a favorable attitude towards the use of AI in nursing education (Labrague et al., 2023a) and demonstrate readiness to embrace these tools (Labrague et al., 2023b). More so, other results of a research study conducted by Jian, (2023), titled 'Personalized Learning through AI', which quantitatively and qualitatively concluded as shown below:

Quantitative Findings: Students in the AI-driven personalized learning group showed a statistically significant improvement in their grades compared to those in the traditional learning group. Moreover, these students were more consistent in their performance, suggesting that AI tools provided them a steadier learning curve.

Qualitative Findings: A majority of students felt the AI tools made learning more engaging and catered to their individual learning needs. They appreciated the real-time feedback and tailored content, which helped them understand and retain concepts better. Educators, on the other hand, valued the insights provided by AI-driven analytics, aiding them in identifying students who needed extra attention. However, some educators expressed reservations regarding over-reliance on AI, citing concerns about reducing the human touch in teaching. This enthusiasm further supports the potential for AI technologies to enhance learning experiences and contribute to the evolution of nursing education in Nigeria.

The key features of personalized learning in nursing education are as follows;

1. **Adaptive Learning Platforms:** AI-driven platforms analyze students' performance and adjust the difficulty level and content accordingly. For example; Elsevier Adaptive Quizzing customizes questions based on student responses.
2. **Competency-Based Education (CBE):** Focuses on mastering specific nursing skills rather than just completing coursework. For example; Nurse Think® for Students offers case studies and clinical judgment exercises based on competency levels.
3. **Self-Paced Learning:** Students can progress at their own speed, revisiting complex topics as needed. For example; Coursera and Udemy Nursing AI Courses allow students to set their learning schedule.
4. **Data-Driven Progress Tracking:** AI analytics track learning habits, assessment scores, and clinical skills development. For example; ATI Nursing Education provides real-time feedback to students and instructors.

The benefits of personalized learning in nursing education eliminates the common problem in traditional classroom where everyone is taught the same thing. As such by aligning lessons with students' interests and needs, which is a main focus on students' strength and weaknesses (Lara, 2025).

3. Intelligent Tutoring Systems

Artificial intelligence (AI) is remodeling how students learn and interact with course materials today, among which intelligent tutoring systems (ITS) is the most notable advancements in this realm with the help of AI to deliver personalized instruction. By adapting to individual student needs, providing real-time feedback, and tailoring content, ITS is making nursing students learning a more fertile ground. They enhance outcomes while making education more accessible — creating new opportunities for both students and educators (Park University, 2025). These AI-powered

systems can offer students instant assistance with assignments, projects and coursework that helps the students remain on track with their learning.

Intelligent tutoring systems provides personalized learning for diverse students and nursing students inclusive. These systems utilize artificial intelligence to analyze a student's current knowledge, learning pace and preferred learning style. This is possible through the continuous assessment of student performance by adjusting the difficulty level of tasks, offer targeted feedback and suggest resources tailored to the learner's specific requirements. This approach ensures that each student receives tailored instruction that is both challenging and achievable, promoting deeper understanding and retention of the material (Park University, 2025).

The architecture of an ITS typically comprises four key components:

1. The domain model: encompasses the knowledge and skills to be taught, serving as the foundation for the system's instructional content.
2. The student model: tracks the student's progress, identifying strengths and weaknesses.
3. The tutoring model: determines the most effective teaching strategies based on data from the domain and student models.
4. The user interface model: facilitates interaction between the student and the system, presenting information and receiving input in an engaging manner.

The benefits of Intelligent Tutoring Systems (ITS) in nursing education include; personalized learning, immediate feedback, and scalability and data insights. However, ITS is not free of challenges as follows;

1. System developing and technological research cost is substantial.
2. ITS may also struggle with nuances such as emotional intelligence, often lacking the personal touch that human tutors can provide. This limitation may impact students' ability to develop soft skills or receive the emotional support that a teacher could offer.

3. The risk of over-reliance potentially reducing valuable face-to-face interactions between students and teachers which is an impediment to the learners' social skills.

4. Chat Generative Pre-Trained Transformers (ChatGPT)

Chat Generative Pre-Trained Transformers (ChatGPT), has potential to generate a variety of mock simulation cases; patient interviews, job interviews, providing interactive learning experiences while saving educators time, automation of assessment grading while allowing nursing faculty to focus on other aspects of teaching are applicable examples of artificial intelligence (AI) in nursing education (Sun & Hoelscher, 2023). Nurse educators can strategically leverage ChatGPT to enhance critical thinking in nursing students through assignments like care plan development, study guides notes, practice quizzes and examination. Nevertheless, a recent study discussed the effects of ChatGPT on nurse education, the authors highlight the potential challenges and benefits of Integrating artificial intelligence language models (Nassef & Zeid, 2024). Therefore, ChatGPT is to complement, not replace, human interaction in nursing education (Choi et al., 2023).

2.1.5 Benefits of AI in Nursing Education

Like many aspects of the society, AI has the potential to revolutionize nursing education for students, instructors, and educational institutions. Closely, let us examine the most important ways artificial intelligence is poised to transform how nurses are taught and trained.

1. AI-Enhanced Curriculum Development: To ensure each generation of nurses is better-prepared than the last, ongoing evaluation of training programs is an essential part of nursing education. Analyzing nursing curricula with the aid of AI can help teaching materials remain current in a fast-evolving healthcare industry (Provo College, 2023). Potentially, AI can aid in developing lesson plans and test questions, and to provide significant time savings with grading assignments and other time-consuming tasks which

is essential to nursing educators. By streamlining nursing educators' workloads, AI-enhanced platforms can give them more opportunities to build personal connections with their students.

2. **Personalized Learning and Adaptive Assessment:** One of the greatest challenges in any educational setting is preparing study material to suit different learning styles, pace, and individuals. AI-assisted learning shows great promise in doing just that. AI algorithms can help tailor educational content to individual students and their learning styles. AI-driven assessment platforms can also offer real-time feedback during assignments, quizzes, or tests. This is useful in helping students master the material, as they receive tailored guidance while the subject is still top-of-mind, rather than waiting until their assignment is graded by an overworked instructor (Provo College, 2023).
3. **Simulation and Virtual Reality (VR) Training:** Immersive simulations are very effective in refining hands-on skills and clinical decision-making, and AI has the potential to make training platforms even more advantageous for nursing students. When nursing students are exposed to realistic clinical scenarios during their education via VR Training prepares newly trained nurses to perform under pressure when working in a real patient-care environment. (Provo College, 2023). AI-powered platforms can introduce new variables and difficulty levels into training scenarios to develop nurses' skills, instincts, and clinical reasoning abilities. Training in realistic simulations without putting patients at risk helps nursing students build confidence and emotional resilience and prepares them for success during their supervised clinical rotations.
4. **Predictive Analytics for Students Success:** Whether it is due to life circumstances or academic difficulties, many students with the potential to become great nurses need a little extra support during their education. AI-powered predictive analytics platforms can help

identify students who may be at risk of dropping out and connect them with the resources they need to overcome their challenges. By using AI algorithms to analyze data points like attendance, assignment participation, and access to tutoring resources, educational institutions can provide non-judgmental interventions that help students stay on track. Educational institutions that use analytics to keep students engaged in achieving their goals have experienced higher graduation rates and improved student retention. In real-world examples, the Georgia State University has been a leader in using predictive analytics to improve student retention. By analyzing data on student demographics, academic performance, and engagement, the university has been able to identify at-risk students and provide targeted interventions. As a result, the university has seen a 23% increase in graduation rates and a 5% decrease in the achievement gap between white and minority students. The University of Arizona has also had success with predictive analytics. By analyzing data on student engagement, the university was able to identify students who were at risk of dropping out and provide them with personalized interventions. As a result, the university saw a 7% increase in retention rates and a 10% increase in graduation rates (Emily, 2024). Empowering nursing students to succeed with the latest learning technology not only creates life-changing career opportunities, it is a critical part of addressing the ongoing healthcare staffing shortage.

5. AI in Clinical Decision Support: Artificial Intelligence cannot replace the expertise, instincts, and observation skills of experienced nurses. But it can provide them with powerful tools to help safeguard patients and maintain a safe and efficient care environment. Therefore, AI has the potential to assist nurses in making better-informed care decisions by analyzing large quantities of patient information. AI-assisted clinical decision support systems have the potential to recommend next steps, calculate the odds of

a patient's condition deteriorating, or provide information about safety concerns. These insights can help nurses develop their clinical decision-making skills, learn to connect the dots between various indicators, and reduce the risk of medication errors, misdiagnosis, or other common mistakes that can compromise patient safety (Provo College, 2023).

2.1.6 Challenges of AI Adoption in Nursing Education

In Nigeria, where nursing education faces challenges such as unequal resource distribution, limited access to clinical training, and scalability issues, artificial intelligence (AI) has emerged as a transformative force (Jiang, 2024). While AI has many fascinating potential applications for nurses and nursing students, it is not without its challenges and concerns, as follows;

1. **Potential Erosion of the Human Touch in Patient Care:** Nursing is deeply rooted in empathy, compassion, and the ability to form meaningful connections with patients (Ahmed, 2023). The introduction of AI could lead to a loss of the human element, potentially affecting patient satisfaction and overall well-being.
2. **High Implementation Costs:** AI-powered tools, virtual reality (VR) simulations, and adaptive learning platforms require substantial investment in hardware, software, and training. Many institutions, particularly in developing countries, struggle to secure the necessary funding,
3. **Limited AI Literacy Among Educators and Students:** Nursing educators often lack adequate training in AI technologies, making it difficult to integrate AI-driven tools effectively. Students may also struggle to navigate AI-driven platforms, limiting their engagement and learning outcomes.

4. **Resistance to Change:** Traditional nursing education relies heavily on hands-on clinical practice and human interactions. The shift towards AI-driven education is often met with resistance from educators and students who prefer conventional teaching methods.
5. **Data Privacy and Security Risks:** Generative AI poses several privacy concerns for nursing educators and students. According to Ahmed, (2024), AI systems rely heavily on patient data, which raises questions about how this information is collected, stored, and shared. Ensuring that patient data remains confidential and is used responsibly is essential to building trust in AI-powered nursing interventions. Personal identifiable information, such as names, addresses, and contact information, as well as health information, may be collected during interactions with AI tools. This may result in unintended exposure or misuse of sensitive information (Murdoch, 2021). Compliance with data protection laws like HIPAA (Health Insurance Portability and Accountability Act) and GDPR (General Data Protection Regulation) is crucial to mitigate security threats.
6. **Bias and Algorithmic Discrimination:** AI algorithms are trained and programmed by humans, who are subject to many forms of conscious and unconscious bias (Provo College, 2023). There is a risk of algorithmic bias, where AI systems may inadvertently perpetuate existing healthcare disparities (Pailaha, 2023). If not properly trained and validated on diverse datasets, AI algorithms could lead to unequal treatment recommendations or diagnoses, disproportionately affecting marginalized populations. It is imperative to address this issue to ensure equitable healthcare for all.
7. **Ethical and Legal Uncertainties:** AI in nursing education raises several ethical and legal questions: Who is accountable if AI provides incorrect guidance? Can AI replace human educators in clinical decision-making? Addressing these concerns requires clear policies and guidelines for AI governance in education (Morley et al., 2020).

2.1.7 Ethical Considerations of AI in Nursing Education

According to Kusterbeck, (2024) AI offers unprecedented opportunities to enhance patient care and improve outcomes — but there are also significant ethical concerns. AI in nursing is no exception as seen below;

1. **Patient privacy and data security:** The use of patient sensitive information, including medical histories and personal identifiers raises ethical implications of data privacy and security in AI applications. AI make use of vast data volume to function effectively. Therefore, the risk of data breaches increases with the volume of data being processed. Ensuring robust cybersecurity measures is crucial to protect patient information from unauthorized access (Kusterbeck, 2024)
2. **Clinical Decision-Making:** AI algorithms can accidentally perpetuate biases that exist in data the systems are trained on. To avoid any discriminate scenarios against any patient group or population, nurses should use AI as clinical decision-support systems rather than decision-makers which is ethical imperative (Kusterbeck, 2024)
3. **Patient Autonomy:** AI systems must be designed to enhance, rather than undermine, patient autonomy. Patients have the right to make informed decisions about their care process, which necessitates transparency and comprehensive information regarding the use of AI and its implications in their treatment (CDC, 2024).
4. **Trust and the Nurse-Patient Relationship:** Nursing has long been grounded in empathy, compassion, and meaningful human interaction. As such, the integration of AI into nursing education and practice should serve to support, not substitute, the essential human element of care. For AI tools to earn the trust of both nurses and patients, they must demonstrate high levels of accuracy and reliability. Any errors or inconsistencies in AI-generated

recommendations can compromise trust and potentially result in harmful outcomes for patients (Hallas, 2023).

5. Ethical use of AI Technologies: It is worthy of note to state that, clear lines of accountability must be established for AI systems in nursing practice and education. If an AI tool makes an error, it must be clear who is responsible. Is it the developers, the healthcare institution, or the nurse using the tool? Right from the programming process to its final consumption, AI systems should be designed with ethical principles in mind, including fairness, transparency, and respect for patient rights. Any AI tools utilized in nursing must be continuously evaluated for ethical implications and performance. This includes regular audits to identify and mitigate biases (Kusterbeck, 2024).

2.1.8 Knowledge and Utilization Among Nursing Students

A background understanding of nursing students' knowledge and utilization of AI is crucial for effective integration. Issues on awareness level inclusive of the use of ChatGPT on nursing education, perceived competences, and attitudinal factors are considered as follows:

1. Awareness Level: Regarding the perception of digital variables, the findings of a research study conducted by Abou Hashish & Alnajjar, (2024) revealed that nursing students demonstrated good knowledge and awareness of digital transformation services, as these services are easy to use and have positive impacts on various aspects of such services. They also possess positive attitudes, good digital skills applicable in daily life and the job market, commendable digital health literacy, and positive attitudes toward artificial intelligence. These results emphasize the critical need to engage students with digital healthcare technologies to enhance their digital competency, ensuring their readiness for the evolving healthcare landscape and their future careers.

2. **Perceived Competences:** The findings of a research study by Labrague et al., (2023) suggest that student nurses had favorable perceptions of AI utilization in nursing practice, expressed high intentions to adopt AI technology, and held positive attitudes towards AI. Furthermore, student nurses' perceptions of AI utilization in nursing practice influenced their attitudes towards AI, which, in turn, affected their intentions to adopt AI technology.
3. **Attitudinal Factors:** Positive attitudes towards AI correlate with higher utilization rates, highlighting the importance of addressing misconceptions and promoting the benefits of AI in nursing education. As stated earlier by Labrague et al., (2023), the study adds to the expanding body of knowledge concerning the attitudes and intentions of student nurses towards AI technology in the context of nursing practice. The findings highlight the importance of cultivating positive attitudes and high intentions among student nurses to adopt AI technology in their nursing practice.

2.1.9 Implication for Makurdi College of Nursing Sciences

For Makurdi College of Nursing Sciences, understanding the current state of AI knowledge and utilization among students is essential in Benue State and Nigeria for:

1. **Curriculum Development:** Integrating AI-related competencies into the curriculum to prepare students for technological advancements in healthcare.
2. **Faculty Training:** Ensuring educators are equipped with the necessary skills to teach and support AI applications in nursing education.
3. **Resource Allocation:** Investing in AI infrastructure and tools to enhance the learning experience and keep pace with global educational trends.

2.2 Theoretical Framework

Artificial Intelligence (AI) in Nursing Education: Knowledge and Utilization Among Makurdi College of Nursing Sciences Students, Makurdi, Benue State, theoretical framework help explains how AI is perceived, adopted, and utilized in nursing education. Therefore, the Technology Acceptance Model (TAM) serves as a valuable lens to assess the factors influencing nursing students' acceptance of AI technologies.

2.2.1 Overview of Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), originally proposed by Davis, (1989) and later extended by Venkatesh & Davis (2000), (Venkatesh & Davis, 2000; Venkatesh et al., 2003) is a pivotal framework for understanding how users come to accept and utilize technology. The technology acceptance model (TAM) explains the acceptance of information systems by individuals. TAM postulates that the acceptance of technology is predicted by the users' behavioral intention, which is, in turn, determined by the perception of technology usefulness in performing the task and perceived ease of its use (Marikyan & Papagiannidis, 2024). Its primary goal was to provide a theoretical framework for successful technology adoption and guide practitioners in implementing systems effectively. TAM, based on the Theory of Reasoned Action, linked external system characteristics to actual system use by incorporating psychological perspectives on user behavior, which were previously lacking in Information Systems (IS) literature (Davis, 1989; Davis, 1993).

The second step in developing the Technology Acceptance Model (TAM) was to identify and validate key variables influencing system use. Based on empirical studies in human behavior and information systems management, perceived ease of use (PEU) and perceived usefulness (PU) were established as fundamental determinants of user acceptance (Johnson & Payne, 1985; Payne,

1982; Robey, 1979). Research suggested that individuals adopt technology by weighing expected benefits against the effort required (Johnson & Payne, 1985). Perceived usefulness refers to the belief that technology enhances performance, drawing from Bandura's concept of outcome judgment (Bandura, 1982). Perceived ease of use reflects the belief that a system is effortless to use, rooted in self-efficacy theory, which links confidence in task execution to decision-making (Davis, 1989; Bandura, 1982). Additionally, PEU aligns with the complexity factor in innovation diffusion theory, where difficult-to-use innovations face adoption barriers (Mahajan, 2010). TAM's validity was confirmed through organizational studies, showing strong correlations between PU, PEU, intention, and actual system use. The validated scales demonstrated high reliability and predictive strength, solidifying TAM as a robust model for understanding technology acceptance (Davis, 1989).

The Technology Acceptance Model (TAM) describes technology acceptance as a three-stage process where external factors (e.g., system design) influence cognitive responses (perceived ease of use and perceived usefulness), which then shape affective responses (attitude and behavioral intention), ultimately determining use behavior (Davis, 1989; Davis, 1993). Therefore, Perceived usefulness (PU) directly influences actual use, making it a crucial predictor of technology adoption. Perceived ease of use (PEU) does not directly impact use behavior but enhances PU, making a system more likely to be adopted (Davis, 1993). Behavioral intention (BI), initially a predictor of use, was later linked to attitude toward behavior, showing that positive affective responses increase adoption likelihood (Ajzen, 2011). The model has practical value, allowing researchers to evaluate user motivation and IS usability across various technologies (Hwang, 2005; Gefen, Karahanna, & Straub, 2003; Araújo & Casais, 2020). TAM has provided validated subjective measures to assess cognitive and affective factors influencing technology adoption, bridging a critical gap in previous research (Davis, 1989).

Below is the diagrammatic representation of the Technology Acceptance Model (TAM) by Fred D. Davis.

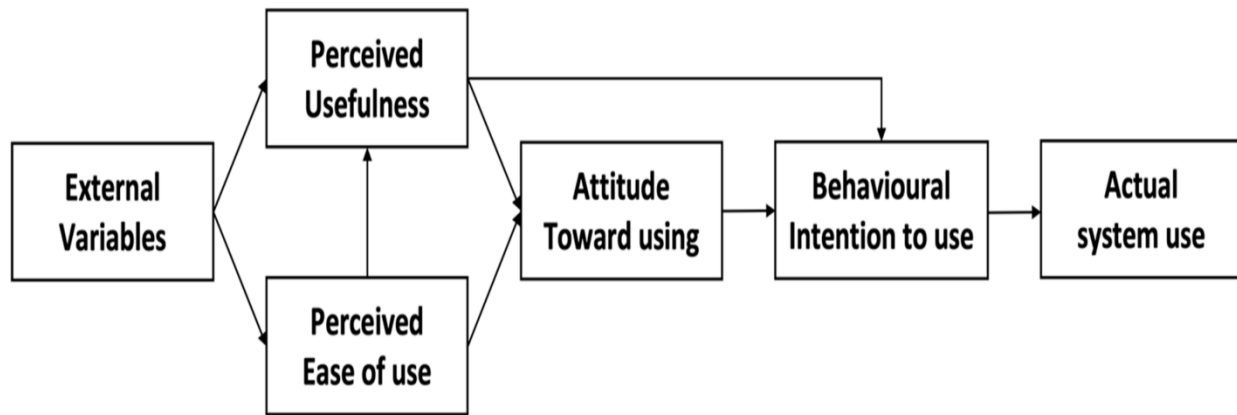


Figure 1. The Technology Acceptance Model (TAM)
<https://www.mdpi.com/2075-5309/12/2/90#B37-buildings-12-00090>

The explanations for the above model components are as follows, as postulated by Davis (1989):
External Variables: Factors like system design, training, and user experience influence users' perceptions. Perceived Usefulness (PU): The belief that using AI (or any technology) will improve performance. Perceived Ease of Use (PEU): The belief that AI is easy to use and does not require excessive effort. Attitude Toward Use: A positive or negative feeling toward AI adoption in education. Behavioral Intention to Use: The likelihood of students actively using AI tools in nursing education. Actual System Use: The real adoption and utilization of AI technologies.

2.2.2 Relevance of TAM to AI Adoption in Nursing Education

The development of the Technology Acceptance Model for AI in Nursing (TAM-AIN) represents a significant theoretical contribution to the field (Ramadan et al., 2024). According to Peng et al., (2023) TAM-AIN extends beyond traditional technology acceptance models by specifically addressing nursing practice's unique contexts and challenges, providing a more comprehensive

framework for understanding and facilitating AI adoption in healthcare settings. Applying TAM to the adoption of AI in nursing education involves evaluating how nursing students perceive the usefulness and ease of use of AI technologies in their learning processes.

Perceived Usefulness (PU) in Nursing Education: AI can provide personalized learning experiences, adapt to individual student needs, and offer immediate feedback, potentially improving comprehension and retention of complex nursing concepts. AI-driven simulations can create realistic clinical scenarios, allowing students to practice and hone their skills in a controlled, risk-free environment preparing them for patient care in real time cases under-pressured.

Perceived Ease of Use (PEU) in Nursing Education: User-Friendly Interfaces play a crucial role in their adoption. If the AI systems are intuitive and easy to navigate, students are more likely to engage with them. Adequate training and ongoing technical support can alleviate apprehensions and reduce the perceived complexity associated with AI technologies.

However, recognizing the unique context of nursing and the complex nature of AI technologies, this study may extend beyond the traditional TAM framework, potentially contributing to an expanded model of technology acceptance specific to AI in nursing (Ramadan et al., 2024). Recently, a qualitative study conducted in Saudi Arabia by Ramadan et al., (2024) explored registered nurses' perspectives on AI adoption. The study proposed extensions to the original TAM to better capture the nuances of AI adoption in nursing practice.

Incorporating additional factors provides a more comprehensive understanding of the elements influencing AI adoption in nursing contexts. It is essential to ensure that AI applications adhere to ethical standards and respect patient privacy. Additionally, organizational readiness refers to the extent to which an institution is prepared to implement and support AI technologies. Finally, it is crucial not to overlook perceived threats to professional autonomy (Ramadan et al., 2024)

Below is the TAM theoretical framework of AI adoption in nursing.

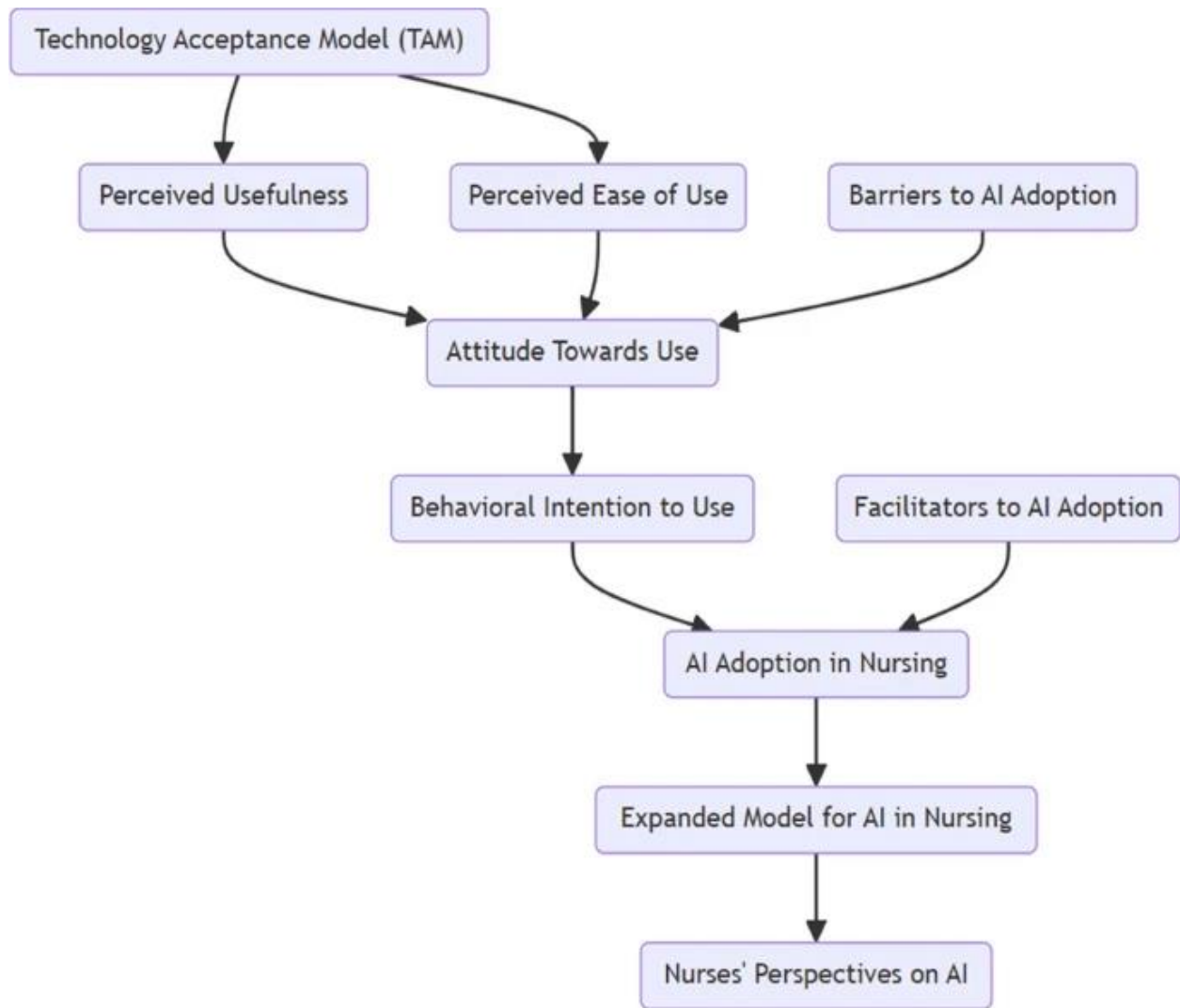


Figure 2. Theoretical Framework for AI Adoption in Nursing Practice Based on the Technology Acceptance Model (TAM)
<https://link.springer.com/article/10.1186/s12912-024-02571-y/figures/1>

2.2.3 Implications for Makurdi College of Nursing Sciences

By the application of Technology Acceptance Model (TAM), educators and administrators at Makurdi College of Nursing Sciences can identify and address factors that influence students' acceptance of AI technologies. Strategies may include:

Promoting Usefulness: Showcasing the tangible benefits of AI in enhancing learning outcomes and preparing students for technologically advanced healthcare environments at MCONS and Nationwide. Ensuring Ease of Use: Selecting AI tools that are user-friendly and providing comprehensive training to build confidence and competence among students studying at MCONS.

Understanding and leveraging the principles of TAM of AI in nursing can facilitate stress free integration of AI into the Nigerian nursing curriculum, ultimately enhancing the educational experience and readiness of nursing students.

2.3 Empirical Framework

The study titled "Digital proficiency: assessing knowledge, attitudes, and skills in digital transformation, health literacy, and artificial intelligence among university nursing students" was conducted at a nursing college in Saudi Arabia by Hashish & Alnajjar, (2024). The study utilized a descriptive cross-sectional design and was conducted at the College of Nursing-Jeddah (CON-J), an institution that enrolls female students and operates under King Saud bin Abdul-Aziz University for Health Sciences, National Guard Health Affairs, in Jeddah, Saudi Arabia. The research involved a convenience sample of undergraduate nursing students in the third and fourth academic session during 2022/2023, with preparatory year students excluded. Although the Raosoft Sample Size Calculator recommended a minimum of 169 participants based on the following parameters; population of 300, a 5% margin of error, and a 95% confidence interval, all eligible students were invited to participate to minimize missing data. Ultimately, 266 students

provided responses. A structured questionnaire consisting of six sections was used, covering personal information, knowledge, skills and attitudes toward digital transformation, digital skills, Digital Health Literacy (DHL), and attitudes toward AI. Descriptive statistics and Pearson correlation were employed for data analysis. The data were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Nursing students at CON-J Saudi Arabia demonstrated a solid understanding of digital transformation services and maintained a positive attitude toward them. The students showcased strong digital skills, along with commendable digital health literacy (DHL) and a favorable outlook on artificial intelligence (AI). The results revealed significant positive relationships between knowledge of digital transformation services and all assessed digital variables ($p < 0.05$). Additionally, senior students exhibited higher levels of digital knowledge and a more positive attitude toward AI. The study recommends an innovative undergraduate curriculum that integrates opportunities for hands-on experience with digital healthcare technologies to enhance their digital literacy and skills.

A Cross-sectional study on the role of artificial intelligence literacy and innovation mindset in shaping nursing students' career and talent self-efficacy was conducted by El-Sayed et al., (2025) in Egypt. The research study aimed to examine the moderating effect of AI literacy on the associations between an innovation mindset and nursing students' career and talent self-efficacy. Data were collected during the academic year 2023-2024 from 596 nursing students who were enrolled in the College of Nursing at Alexandria University, Egypt. Three scales, namely, innovative thinking competencies, assessment of nonexperts' AI literacy and career and talent development self-efficacy, were used. Hypotheses were tested via correlation and regression analyses. The study found that nursing students exhibited moderate levels of AI literacy, innovation mindset, and career and talent self-efficacy. Their career and talent self-efficacy were strongly influenced by both their innovation mindset and AI literacy. Additionally, AI literacy played a

significant role in enhancing the positive relationship between students' innovation mindset and their career and talent self-efficacy. The study highlighted that fostering awareness with AI-driven tools could cultivate innovative thinking among nursing students and augment confidence in their talents. Implicatively, the study underscores that encouraging nursing talent and career aspirations requires the integration of AI literacy and innovative thinking as core competencies in nursing curricula.

A qualitative narrative inquiry of a research study “Exploring the Experience and Perception of Artificial Intelligence Utilization Among Students of the Department of Nursing, Bayero University, Kano” was conducted by Rajah, et al., (2025) in Nigeria. The study aimed to explore the nuanced experiences and perceptions of nursing students at Bayero University, Kano, in relation to the use of AI in their academic and clinical environments. The qualitative study employed a narrative inquiry design and focus group discussion was used to collect data from the participants. Narrative inquiry was selected for its ability to capture participants’ personal experiences with AI. Thematic analysis was employed to identify and interpret themes related to their experiences and perceptions of AI. The study identified that the majority of students used AI technologies primarily for academic purposes, such as researching assignments and accessing clinical information. However, they demonstrated limited awareness of nursing-specific AI tools. Significant challenges related to network connectivity and data access, which hindered their use of AI were identified among the participants. Despite these challenges, the overall perception of AI was positive, with students acknowledging its potential to improve nursing education and practice. Concerns about technical errors, over-reliance, and job displacement were also noted. Nursing students at Bayero University, Kano, recognize the potential benefits of AI in education and clinical practice but face significant challenges due to infrastructural limitations. The student’s positive perception of AI suggests an openness to its integration into nursing, provided that

technological and educational barriers are addressed. The findings highlight the need for improved technological infrastructure, targeted training on AI applications in nursing, and a balanced approach to integrating AI with human expertise.

A qualitative study utilizing focus group discussions on facilitators and barriers to AI adoption in nursing practice: a qualitative study of registered nurses' perspectives was conducted by Ramadan et al., (2024) with 48 registered nurses from four major healthcare facilities in Al-Kharj, Saudi Arabia. The first site was a large general hospital with 246 beds and approximately 300 nurses, provided a broad range of services, including internal medicine, surgery, pediatrics, and rehabilitation. Its diverse specialties provided insights into AI adoption across acute care and rehabilitation contexts. The second facility being a specialized hospital serving Ministry of Defense personnel and their families, had 100 beds and around 150 nurses. It focused on emergency care, surgery, and general medical services, allowing for an exploration of AI integration in specialized healthcare settings. The third site, a maternal and child health hospital with 150 beds and approximately 200 nurses, was dedicated to obstetrics, pediatrics, and neonatal care, highlighting the role of AI in improving outcomes in maternal and child health nursing. The last but not the least site, a university hospital with 200 beds and about 250 nurses, offered outpatient clinics in various specialties and provided unique perspectives on AI adoption in nursing education and research as a teaching hospital institution. The study intent was to explore registered nurses' perspectives on the facilitators and barriers to AI adoption in nursing practice in Saudi Arabia and to propose an extended Technology Acceptance Model for AI in Nursing (TAM-AIN). Thematic analysis, guided by the Technology Acceptance Model framework, was employed for data analysis. Results highlighted that the major facilitators of AI adoption included perceived benefits to patient care (85%), strong organizational support (70%), and comprehensive training programs (75%) while the primary barriers involved in the adoption of AI in nursing was technical

challenges (60%), ethical concerns regarding patient privacy (55%), and fears of job displacement (45%). These findings led to the development of TAM-AIN, an extended model that incorporates additional constructs such as ethical alignment, organizational readiness, and perceived threats to professional autonomy. It was concluded that AI adoption in nursing practice requires a holistic approach that addresses technical, educational, ethical, and organizational challenges. The proposed TAM-AIN offers a comprehensive framework for optimizing AI integration into nursing practice, emphasizing the importance of nurse-centered implementation strategies. This model provides healthcare institutions and policymakers with a robust tool to facilitate successful AI adoption and enhance patient outcomes.

The study on nursing students' perceptions and use of generative artificial intelligence in nursing education conducted by Han et al., (2025) employed an online survey with open-ended questions to gain insights into participants' unique perspectives on Generative AI in nursing education. The participants were recruited using convenience sampling among 99 undergraduate associate nursing degree students from a college in New York City, United States. The inclusion criteria were nursing students enrolled in the Nursing Program for at least one semester, a willingness to participate in research, and aged 18 years or above. The exclusion criteria were students who were not enrolled in the nursing program at degree level in the college at New York City. Following approval from the Institutional Review Board of the first author's college and permission from the chair of the Health Science Department, data was collected online through self-report measures using semi-structured, open-ended questions and was analyzed using content analysis as described by Elo and Kyngäs, (2008). Most participants (92%) used GenAI tools to access accurate information, clarify nursing concepts, and support clinical tasks such as diagnoses and health assessments, as well as schoolwork, grammar checks, and health promotion. They valued GenAI as a quick, accessible resource that simplified complex information and supported learning through definitions, practice

questions, and writing improvements. However, the participants noted drawbacks, such as subscription costs, over-reliance, information overload, and accuracy issues, leading to trust concerns. The participants suggested financial support, early guidance, and instructional modules to better integrate AI into nursing education. The results indicated that Generative AI positively impacted nursing education and indicated the need for guidelines on critical evaluation. To integrate GenAI effectively, educators should consider introductory sessions, support programs, and a GenAI-friendly environment, promoting responsible AI use and preparing students for its application in nursing education.

A descriptive literature review approach conducted by Nassef and Zeid, (2024) to explore existing research on the integration of artificial intelligence in nursing education. By analyzing previously published data, the study synthesizes findings from multiple sources. Data collection was conducted using four key databases: CINAHL, ScienceDirect, PubMed, and MEDLINE. A total of 13 articles were selected for content analysis. Comprehensive searches were performed using keywords such as artificial intelligence, virtual reality, nursing, nursing education, and AI technologies across global databases. Relevant studies meeting the inclusion criteria were reviewed, analyzed, and summarized to identify patterns in AI utilization, its benefits, and existing gaps in the literature. The findings of the thesis showed that artificial Intelligence (AI) technologies like virtual assistants, extended reality, chatbots, and virtual reality simulations offer a promising approach to enhancing nursing education outcomes. These innovations can improve students' performance, strengthen clinical competency in complex nursing procedures, and foster critical thinking skills. Although AI offers potential benefits, its integration into nursing education must be carefully managed due to ethical concerns such as privacy issues and academic integrity. This study highlights the importance of ongoing research to assess AI's effectiveness and role in nursing education, particularly in addressing implementation challenges and ensuring adherence to ethical

standards. Additionally, investing in faculty training and developing comprehensive instructional programs that blend traditional teaching methods with AI-driven innovations is crucial for maintaining best pedagogical practices. Ultimately, AI has the potential to transform nursing education, better preparing future nurses for the complexities of modern healthcare. However, maximizing its benefits while mitigating risks requires careful consideration of educational, practical, and ethical factors.

Summary of the Literature Review

Conceptually, AI computers are designed to perform tasks that typically require human intelligence, such as learning, reasoning, and problem-solving. Theoretically, the Technology Acceptance Model (TAM), proposed by Davis (1989) and later extended by Venkatesh and Davis (2000), was employed to further examine AI in Nursing Education: Knowledge and Utilization Among Students of Makurdi College of Nursing Sciences, Benue State, Nigeria. However, recognizing the unique context of nursing and the complex nature of AI technologies, an expanded model of technology acceptance specific to AI in nursing was used as proposed by Ramadan et al. (2024), who extended the original TAM to better capture the nuances of AI adoption in nursing practice. This was explored through a qualitative study conducted in Saudi Arabia, which examined registered nurses' perspectives on AI adoption. Empirically, six studies were reviewed across three continents: Asia (specifically in Saudi Arabia), Africa (specifically in Egypt and Nigeria), and North America (specifically in New York). Descriptive research conducted using secondary databases such as CINAHL, ScienceDirect, PubMed, and MEDLINE was reviewed to better understand the AI in nursing education.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

This chapter navigates the research methodology used to explore the knowledge and utilization of AI in nursing education among nursing students at Makurdi College of Nursing Sciences (MCONS). The research design, setting, target population, sampling, sampling technique, instrument for data collection, validity of instrument, reliability of instrument, method of data collection, method of data analysis and ethical considerations are presented.

3.1 Research Design

This research employed a descriptive cross-sectional design to explore Artificial Intelligence in nursing education: knowledge and utilization at Makurdi College of Nursing Sciences. A descriptive cross-sectional design is appropriate for this study as it allows for observation and analysis of collected data from a population at a single point in time according to Wang & Cheng (2020). This approach will enable the researcher to assess the knowledge, utilization, challenges, and the perceptions of AI adoption among students at MCONS.

3.2 Research Setting

Makurdi Local Government Area (LGA) is the capital of Benue State, Nigeria, and serves as the administrative, educational, and economic hub of the state. It was founded in the early 1920s and gained prominence in 1927 and Makurdi became the capital of Benue state in the year 1976 following the division of Benue-Plateau into two distinct states (Peter et al., 2022). Geographically, Makurdi is situated on the south bank of the Benue River, the city's coordinates are approximately 7°44'1.50" North latitude and 8°31'17.00" East longitude according to Global Positioning System

(GPS) of Makurdi Satellite Map. The LGA spans latitudes 7°33'00" N to 7°47'00" N and longitudes 8°27'00" E to 8°48'00" E. It is bordered by Guma LGA to the north, Gwer-East LGA to the south, Gwer-West LGA to the west, and Doma LGA of Nasarawa State to the northwest covering 804 km² land mass in a 16km radius circle (Peter et al., 2022). According to the current metro area population of Makurdi in 2025 is 490,000, a 3.81% increase from 2024 (Macrotrends [United Nations], 2025). The city predominantly populated by the Tiv ethnic group, other minority ethnic groups in the city include Idoma, Igede, Jukun, Agatu, Etulo, and Alago.

Makurdi houses several higher institutions, including Makurdi College of Nursing Sciences (MCONS), which was established in 2021 with the aim of training and qualifying God-fearing men and women to fill the gap that exist in the health sector in Benue State and Nigeria at large. It is located at Plot No. 9969, Gboko Road, opposite Benue State University (BSU), Makurdi, Benue State, Nigeria. This makes it a suitable location to assess AI knowledge and utilization in nursing education. The presence of hospitals and clinics, such as Benue State University Teaching Hospital (BSUTH) and Federal Medical Centre (FMC) Makurdi, provides a real-world setting where nursing students can apply AI-driven healthcare technologies. While Makurdi is gradually adopting digital innovations, the level of AI awareness and integration in healthcare education remains an area that needs exploration.

3.3 Target Population

The target population for this study comprises of 230 matriculated students across different levels at Makurdi College of Nursing Sciences, Benue State, Nigeria. This includes 100 first-year students, 77 second-year students, and 53 third-year students. This criterion ensures that participants are familiar with the research environment and are students of the institution.

3.4 Sample Size Determination

In the course of this research on Artificial Intelligence (AI) in Nursing Education: Knowledge and Utilization among Students at Makurdi College of Nursing Sciences (MCONS), it is essential to determine an appropriate sample size that ensures the validity and reliability of the findings. The target population for this study consists of 230 matriculated students across three academic levels during the 2024/2025 academic session. To achieve a representative sample, the Taro Yamane formula was applied with a 5% margin of error, yielding a sample size of 146 students. The Taro Yamane formula is commonly used to determine an appropriate sample size for a given population. The formula is as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where:

n = Sample size

N = Total population size

e = Margin of error (commonly 0.05 for a 95% confidence level)

Therefore,

$$n = \frac{N}{1+N(e)^2}$$

$$n = \frac{230}{1+230(0.05)^2}$$

$$n = \frac{230}{1.575}$$

$$n = 146$$

To ensure the aim of this research is achieved by fair representation, the sample was proportionally distributed among the three academic levels based on their willingness to participate in the research study. This approach enhances the generalizability of the study's findings, allowing for a balanced understanding of students' knowledge, utilization, experiences (hurdles), perceptions and attitudes toward AI integration in nursing education.

3.4.1 Sampling Technique

This study employed a proportional stratified random sampling technique. Since the target population is divided into distinct academic levels (year one, year two, and year three), proportional stratified random sampling is ideal for this study seeing that it is important to ensure that each group is adequately represented in the sample.

Inclusion Criteria:

1. Only matriculated students who are currently enrolled in nursing program at MCONS across the three levels from year one to three respectively.
2. Participants must be 18 years and above to ensure that consent is legally valid and given voluntarily.

Exclusion Criteria

1. Non-Matriculated students who are not officially enrolled in the nursing program at MCONS.
2. Students who are unable to provide informed consent, either due to legal, cognitive, or health reasons.

3.5 Instrument for Data Collection

This study utilized a structured questionnaire designed using Google Forms (electronically) for data collection. The questionnaire consists of five sections: Section A – Demographic Information, Section B – Knowledge of AI in nursing education, Section C – Utilization of AI in nursing education, Section D – Challenges of AI adoption in nursing education, and Section E – Perception/Attitude toward AI in Nursing Education.

The statements were presented in a Likert scale format with the following response options:

- **Agreement Scale:** Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1).
- **Frequency Scale:** Very Frequent (5), Frequent (4), Occasionally (3), Rarely (2), and Never (1).

3.6 Validity of Instrument

The validity of the questionnaire was established through content and face validity by the research supervisor. The questionnaire was reviewed to ensure that the questions are appropriate, clear, and comprehensive enough to capture the necessary data in alignment with research objectives.

3.7 Reliability of Instrument

A test-retest reliability format was used to assess the reliability of the instrument. The instrument reliability was pre-tested through pilot study in a similar setting at the Department of Nursing Science, College of Health Sciences, Benue State University Makurdi, among ten (10) final-year (Year 5) nursing students and the feedbacks were positive. Notwithstanding, Cronbach's Alpha Test was used to assess the internal consistency of the Likert scale items. A value of 0.7 or higher indicates good reliability (Creswell, 2022).

3.8 Method of Data Collection

A letter of introduction was obtained from the Head of the Department, Department of Nursing Science, College of Health Sciences, Benue State University, Makurdi. Following this, ethical clearance was obtained from the Research and Ethics Committee of the College of Health Sciences, Benue State University, Makurdi. Upon arrival at the research setting, due procedures were followed to allow the students to participate in the data collection process. The questionnaire link was electronically distributed to participants via WhatsApp groups through the Class Representatives across the different academic levels at Makurdi College of Nursing Sciences (MCONS). This method ensured wide reach, convenience, and ease of response, as participants could complete the survey using their smartphones, tablets, or laptops. A high response rate was encouraged through periodic reminders, and participation was voluntary, with all responses treated with strict confidentiality by the researcher.

3.9 Method of Data Analysis

The data analysis process in this research involves several key steps, including data collection, preparation, statistical analysis, and interpretation. The goal is to extract meaningful insights regarding knowledge, utilization, challenges, and perceptions of AI in nursing education at MCONS. Below is a detailed discussion of the process:

The Google Forms Responses were downloaded as an Excel file and exported for analysis. Data were then transferred to statistical software SPSS (Statistical Package for the Social Sciences) version 25. for cleaning and analysis. Prior to analysis, the dataset underwent cleaning to ensure accuracy and consistency: Removal of incomplete responses (any questionnaires with significant missing data were excluded). Data coding (Likert scale responses were assigned numerical values:

Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1. Very Frequent = 5, Frequent = 4, Occasionally = 3, Rarely = 2, Never = 1. Categorical variables (e.g., academic level, gender, age group, access to technology, and internet access) were also coded numerically for statistical analysis. Next step was descriptive analysis following the measures for data summary: Frequencies and Percentages (to summarize categorical variables). Mean and Standard Deviation (to determine the average response and variability within Likert scale items). Graphs and Charts (bar charts and pie charts were used to visually represent distributions). Inferential statistics were employed to examine relationships between variables as follows:

- Independent t-Test: To compare mean scores between two groups (e.g., male vs. female students on AI knowledge).
- One-Way ANOVA: To compare mean scores among three or more groups (e.g., Year 1, Year 2, and Year 3 students on AI perception).
- Pearson's Correlation: Examined the relationship between AI utilization and students' perception of AI in nursing education.

The data analysis results were presented and interpreted through tables and charts, comparison with literature, and the discussion of implications.

3.10 Ethical Consideration

This study adheres to the highest ethical standards to protect the rights and welfare of the participants. A letter of introduction for the researcher was obtained from the Office of the Head of Department (HOD), Department of Nursing Sciences, College of Health Sciences, Benue State University, Makurdi, for the purpose of obtaining ethical clearance. Ethical approval was obtained

from the Research and Ethics Committee, College of Health Sciences, Benue State University, Makurdi, before data collection. The following ethical considerations were observed:

1. Informed Consent: Detailed information was made available for the participants about the study, including its purpose, procedures, potential risks, and benefits. Voluntary consent individually was obtained before participating, with the option to withdraw at any time without consequences.
2. Confidentiality and Anonymity: Participants' personal information was not shared with unauthorized persons and was kept strictly confidential. The questionnaire responses were collected anonymously, with no identifying details recorded.
3. Ethical Approval: Ethical clearance was obtained from the Research and Ethics Committee, College of Health Sciences, Benue State University, Makurdi, before data collection.
4. Data Protection: Data collected was securely stored and used solely for research purposes.
5. Voluntary Participation: Participation was completely voluntary, with no coercion or pressure to participate. Participants could refuse to answer any question or withdraw from the study at any point.
6. Non-Maleficence (Avoidance of Harm): The study ensured that no physical, psychological, or emotional harm was inflicted on participants through the design of the questionnaire where sensitive or distressing questions were avoided
7. Fair and Equal Treatment: All participants were treated equitably, regardless of gender, academic level, or background. No discrimination or bias was introduced in the research process.

8. Accurate Reporting and Integrity: The findings were reported truthfully and accurately, without manipulation or fabrication of data. Proper referencing and citations were used to acknowledge sources and avoid plagiarism.

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents the results of the data collected from nursing students at Makurdi College of Nursing Sciences (MCONS) regarding their knowledge and utilization of Artificial Intelligence (AI) in nursing education. The purpose of this chapter is to analyze and interpret the data in relation to the research objectives and questions stated earlier in the study. A total of 146 responses gathered through structured questionnaire have been systematically presented using descriptive statistical tools and analyzed using statistical package for social sciences (SPSS) version 25. The analysis is structured to reflect the major components of the research objectives: the level of knowledge and understanding of AI among students, the extent of AI tools utilization in learning and clinical training, and students' perceptions and barriers to AI adoption.

4.1 Data Presentation and Analysis

A total of 146 sample size of nursing students participated in the study out of 230 research population, representing a response rate of 100% are presented below in the tables.

Table 4. 1.1: Demographic Characteristics of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Academic Level	Year 1	27	18.5
	Year 2	67	45.9
	Year 3	52	35.6
Total		146	100%
Gender	Male	24	16.4
	Female	122	83.6
Age	18–21 years	65	44.5
	22–25 years	60	41.1
	26–29 years	11	7.5
	30 years and above	10	6.8
Total		146	100%
Access to Technology	Smartphone	114	78.1
	Laptop	30	20.5
	Tablet	2	1.4
Total		146	100%
Internet Accessibility	Always Available	89	61.0
	Sometimes Available	55	37.7
	Rarely Available	2	1.4
Total		146	100%

Description: Table 4.1.1 summarized the demographic characteristics of the 146 nursing students surveyed. It includes variables such as academic level, gender, age, access to technology, and internet accessibility.

Table 4. 1.2: An Independent t-Test analysis to compare mean scores between the sex of students on AI knowledge

Group Statistics for AI Knowledge by Gender:

Gender	N	Mean	Std. Deviation	Std. Error Mean
Male	24	22.33	2.43	0.50
Female	122	21.71	2.28	0.21

Independent Samples Test for AI Knowledge by Gender:

Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Sig.	t
Equal variances assumed	0.96	0.33	1.21
Equal variances not assumed			1.16

Description: Table 4.1.2 an independent samples t-test was conducted to compare AI knowledge scores between male and female students in MCONS.

Table 4.1.3: One-Way ANOVA analysis to compare mean scores among students' academic level and students on AI perception

Descriptive Statistics for AI Perception Scores by Year of Study

Year	N	Mean	Std. Deviation	Std. Error	95% CI Lower	95% CI Upper	Min	Max
Year 1	27	20.41	2.37	0.46	19.47	21.35	17.0	25.0
Year 2	67	20.81	2.73	0.33	20.14	21.47	16.0	25.0
Year 3	52	20.00	2.79	0.39	19.22	20.78	12.0	25.0
Total	146	20.45	2.70	0.22	20.00	20.89	12.0	25.0

One-Way ANOVA Summary Table

Source	SS	df	MS	F	p
Between Groups	19.07	2	9.53	1.32	.272
Within Groups	1037.00	143	7.25		
Total	1056.06	145			

Description: Table 4.1.3 a one-way between-subjects ANOVA was conducted to examine whether there were statistically significant differences in AI perception scores among students at different academic levels (Year 1, Year 2, and Year 3) at Makurdi College of Nursing Sciences (MCONS).

Table 4.1.4: Pearson's Correlation analysis to examine the relationship between AI utilization and students' perception of AI in nursing education.

Correlation Between Students' AI Utilization and Perception

	STUDENTS_AI_ UTILISATION	STUDENTS_AI_ PERCEPTION
STUDENTS_AI_UTILISATION	1	.316**
Sig. (2-tailed)	—	.000
N	146	146
STUDENTS_AI_PERCEPTION	.316**	1
Sig. (2-tailed)	.000	—
N	146	146

Correlation is significant at the 0.01 level (2 tailed)

Description: Table 4.1.4 a Pearson product-moment correlation was conducted to examine the relationship between students' AI utilization and their perception of AI.

4.2 Answering Research Questions

This section presents the findings of the study in relation to the specific research questions formulated and inferred hypotheses in Chapter One.

Research Question 1: What is the level of knowledge and extent of utilization of Artificial Intelligence (AI) tools, including chatbots and virtual simulations, among nursing students at Makurdi College of Nursing Sciences (MCONS)?

Table 4.2.1: Knowledge of AI in Nursing Education

S/N	Item	SA	A	N	D	SD	$\bar{X}$	Std	Remark
1	I have heard about AI and its applications in nursing education.	72	64	8	-	2	4.40	0.719	High Extent
2	AI can assist in nursing training through simulations and virtual learning.	68	74	4	-	-	4.44	0.551	High Extent
3	AI-powered applications can improve nursing diagnostics and decision-making.	50	76	20	-	-	4.21	0.664	High Extent
4	AI tools such as ChatGPT and medical AI software can enhance my learning experience.	76	66	4	-	-	4.49	0.554	Very High Extent
5	I understand how AI works and its relevance in healthcare and nursing.	60	69	15	2	-	4.28	0.702	High Extent
	Cluster Mean						4.36		

Decision rule: A mean score between 1.0 – 1.45 = Very Low Extent; 1.46 – 2.55= Low Extent; 2.56 – 3.45 = Moderate Extent; 3.46 – 4.45 = High Extent; 4.46 – 5.00 = Very High Extent

Table 4.2.2: Utilization of AI in Nursing Education

S/N	Item	VF	F	O	R	N	$\bar{X}$	Std	Remark
1	I use AI-powered tools for studying nursing concepts.	23	65	48	4	6	3.65	0.922	High Extent
2	I have used AI-powered simulations or virtual labs in my training.	16	35	46	22	27	2.94	1.255	Moderate Extent
3	I rely on AI tools such as ChatGPT, medical AI apps, or nursing chatbots for research	32	49	37	21	7	3.53	1.127	High Extent
4	AI is integrated into my nursing coursework and assignments.	34	48	40	20	4	3.60	1.073	High Extent
5	I have received training on how to effectively use AI in nursing education.	12	44	27	18	45	2.73	1.387	Moderate Extent
	Cluster Mean						3.29		

Decision rule: A mean score between 1.0 – 1.45 = Very Low Extent; 1.46 – 2.55= Low Extent; 2.56 – 3.45 = Moderate Extent; 3.46 – 4.45 = High Extent; 4.46 – 5.00 = Very High Extent

The study assessed the level of knowledge and extent of utilization of Artificial Intelligence (AI) tools among nursing students at Makurdi College of Nursing Sciences (MCONS).

In Table 4.2.1 the result revealed that nursing students demonstrated a high extent of knowledge regarding AI in nursing education. Participants agreed that they had heard about AI and its applications ($M = 4.40$, $SD = 0.719$), that AI can assist in nursing training through simulations and virtual learning ($M = 4.44$, $SD = 0.551$), and that AI-powered applications can improve nursing diagnostics and decision-making ($M = 4.21$, $SD = 0.664$). Additionally, they believed that AI tools

such as ChatGPT and medical AI software could enhance their learning experience ($M = 4.49$, $SD = 0.554$) and reported an understanding of how AI works and its relevance in healthcare and nursing ($M = 4.28$, $SD = 0.702$). The overall cluster mean was 4.36, indicating a high extent of knowledge.

Regarding the extent of utilization, Table 4.2.2 the results showed a moderate to high extent of use among the students. Respondents indicated that they used AI-powered tools for studying nursing concepts ($M = 3.65$, $SD = 0.922$), relied on AI tools such as ChatGPT, medical AI apps, or nursing chatbots for research ($M = 3.53$, $SD = 1.127$), and reported that AI was integrated into their coursework and assignments ($M = 3.60$, $SD = 1.073$), all representing a high extent. However, the use of AI-powered simulations or virtual labs ($M = 2.94$, $SD = 1.255$) and receiving training on the effective use of AI ($M = 2.73$, $SD = 1.387$) reflected a moderate extent of utilization. The overall cluster mean for utilization was 3.29, indicating a moderate extent of AI tool usage among the nursing students.

Thus, the findings indicate that while the students have a high level of knowledge about AI and make substantial use of AI tools in their learning, there is still room for improvement in areas like AI simulation experiences and formal training programs in the integration of AI in the Nigerian nursing education and practice at MCONS.

Research Question 2: What challenges and barriers affect the adoption and effective use of AI-driven technologies in nursing education at MCONS?

Table 4.2.3: Challenges and Barriers to the Adoption of AI in Nursing Education

S/N	Item	SA	A	N	D	SD	$\bar{X}$	Std	Remark
1	Lack of internet access limits my ability to use AI tools.	68	53	15	8	2	4.21	0.934	High Extent
2	AI applications are too complex and difficult to understand.	5	15	28	73	25	2.33	0.990	Low Extent
3	13. There is insufficient training on AI utilization in nursing education.	17	55	40	27	7	3.33	1.058	Moderate Extent
4	14. The cost of AI-powered applications is a major barrier to adoption.	14	53	31	34	14	3.13	1.164	Moderate Extent
5	15. I worry that AI might replace human nurses in the future.	35	44	21	28	18	3.34	1.354	Moderate Extent
	Cluster Mean						3.27		

Decision rule: A mean score between 1.0 – 1.45 = Very Low Extent; 1.46 – 2.55= Low Extent; 2.56 – 3.45 = Moderate Extent; 3.46 – 4.45 = High Extent; 4.46 – 5.00 = Very High Extent.

The study investigated the challenges and barriers influencing the adoption and effective use of AI-driven technologies in nursing education at MCONS.

As presented in Table 4.2.3, the results showed that students experienced a moderate extent of barriers to AI adoption. A majority agreed that lack of internet access limited their ability to use AI tools ($M = 4.21$, $SD = 0.934$), indicating a high extent of challenge. However, the perception that AI applications were too complex and difficult to understand was rated lower ($M = 2.33$, $SD = 0.990$), reflecting a low extent of concern in this area. Furthermore, insufficient training on AI utilization in nursing education was reported at a moderate level ($M = 3.33$, $SD = 1.058$), as was the cost of AI-powered applications as a barrier ($M = 3.13$, $SD = 1.164$). Additionally, concerns about AI potentially replacing human nurses in the future was also rated at a moderate extent ($M = 3.34$, $SD = 1.354$). The overall cluster mean for this section was 3.27, indicating that, generally, students perceived moderate barriers to the adoption and effective use of AI-driven technologies in their nursing education.

Research Question 3: What are the perceptions and attitudes of nursing students at MCONS toward the integration of AI in their learning and clinical practice?

Table 4.2.4: Perceptions and Attitudes of Nursing Students on AI

S/N	Item	SA	A	N	D	SD	$\bar{X}$	Std	Remark
1	AI is a valuable tool that can enhance nursing education.	53	80	13	-	-	4.27	0.616	High Extent
2	AI should be fully integrated into nursing education at MCONS.	37	61	33	13	2	3.81	0.964	High Extent
3	AI will positively impact nursing practice in the future.	42	72	30	-	2	4.04	0.787	High Extent
4	I am confident in using AI-powered tools in my nursing education.	25	74	45	-	2	3.82	0.758	High Extent
5	AI should only be used as a support tool and not as a replacement for traditional learning.	85	55	3	-	3	4.50	0.736	Very High Extent
	Cluster Mean						4.01		

Decision rule: A mean score between 1.0 – 1.45 = Very Low Extent; 1.46 – 2.55= Low Extent; 2.56 – 3.45 = Moderate Extent; 3.46 – 4.45 = High Extent; 4.46 – 5.00 = Very High Extent

The study also explored the perceptions and attitudes of nursing students toward the integration of AI in their education and clinical practice.

As presented in Table 4.2.4, students demonstrated an overall highly positive perception of AI integration. They strongly agreed that AI is a valuable tool that can enhance nursing education (M

= 4.27, SD = 0.616) and that AI should be fully integrated into nursing education at MCONS (M = 3.81, SD = 0.964). Students also believed that AI would positively impact nursing practice in the future (M = 4.04, SD = 0.787) and expressed confidence in using AI-powered tools in their education (M = 3.82, SD = 0.758). Notably, students emphasized that AI should be used primarily as a support tool rather than as a replacement for traditional learning (M = 4.50, SD = 0.736), indicating a very high extent of agreement with this viewpoint. Overall, the cluster mean reflected a high extent of positive attitudes toward the integration of AI in nursing education and practice.

4.2.1 Answering of Research Hypothesis

Based on the analysis provided in (Table 4.1.2, Table 4.1.3, and Table 4.1.4) of the study, the answers to the inferred research hypotheses are as follows:

1. Hypothesis 1: Difference in AI Knowledge Scores between Male and Female Nursing Students

Result: The independent samples t-test indicated no statistically significant difference in AI knowledge scores between male (M = 22.33, SD = 2.43) and female (M = 21.71, SD = 2.28) students, $t(144) = 1.21$, $p = .23$, Cohen's $d = 0.27$.

Conclusion: Fail to reject the null hypothesis. There is no significant difference between male and female nursing students in their AI knowledge scores. Gender does not significantly influence AI knowledge at MCONS.

2. Hypothesis 2: Difference in AI Perception Scores among Students of Different Academic Levels (Year 1, Year 2, and Year 3)

Result: The one-way between-subjects ANOVA showed no statistically significant difference in AI perception scores among Years 1, 2, and 3 students, $F(2, 143) = 1.32$, $p = .272$.

Conclusion: Fail to reject the null hypothesis. Students' academic year does not significantly affect their perception of AI in nursing education.

3. Hypothesis 3: Correlation between AI Utilization and AI Perception among Nursing Students

Result: The Pearson product-moment correlation analysis found a statistically significant moderate positive correlation between AI utilization and AI perception, $r = .316$, $p < .001$ (0.01 level).

Conclusion: Reject the null hypothesis. There is a significant positive relationship between how much students utilize AI and their perception of AI. Increased utilization is associated with more favorable perception, and vice versa.

Therefore, gender differences do not significantly impact AI knowledge among nursing students, academic level does not significantly influence AI perception, and a significant moderate positive correlation exists between AI utilization and perception implying mutual reinforcement between these variables. These findings indicate that factors such as gender and academic year are less influential than actual experience and engagement with AI when it comes to shaping perceptions and knowledge about AI among nursing students at MCONS

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.0 Introduction

The results of the descriptive cross-sectional study of 146 sample size at MCONS as presented in chapter four analyzed using SPSS version 25, revealed insights into the demographic profiles, knowledge and extent of utilization, challenges and barriers, and perceptions of AI adoption in the Nigerian nursing education at MCONS. This discussion interprets the results comparatively with the existing literatures, proposes actionable recommendations, and outlines their significance for nursing practice in improving the integration of AI in nursing education and practice in Nigeria.

5.1 Discussion of Key Findings

1. Demographic Characteristics of Respondents

Findings: Table 4.1.1, a total of 146 nursing students participated in the study. Academic level, 18.5% were in Year 1 (n = 27), 45.9% were in Year 2 (n = 67), and 35.6% were in Year 3 (n = 52). In terms of gender, the majority of respondents were female (83.6%, n = 122), while males comprised 16.4% (n = 24) of the sample. Concerning age distribution, 44.5% of participants were between 18 and 21 years old (n = 65), 41.1% were aged 22 to 25 years (n = 60), 7.5% were aged 26 to 29 years (n = 11), and 6.8% were 30 years and above (n = 10). Regarding access to technology, most students reported owning a smartphone (78.1%, n = 114), followed by laptops (20.5%, n = 30) and tablets (1.4%, n = 2). Internet accessibility was reported as always available by 61.0% of respondents (n = 89), sometimes available by 37.7% (n = 55), and rarely available by 1.4% (n = 2).

Interpretation: The study involved 146 nursing students, with the majority in Year 2 (45.9%), followed by Year 3 (35.6%) and Year 1 (18.5%), indicating a predominantly intermediate to advanced academic population. Females constituted the majority of respondents (83.6%), reflecting the gender distribution typical in nursing education. Most participants were young adults aged 18–25 years (85.6%), suggesting a digitally inclined group. In terms of technology access, a high percentage (78.1%) owned smartphones, while fewer owned laptops (20.5%) or tablets (1.4%). Internet access was generally good, with 61.0% reporting constant availability, though a notable portion (37.7%) experienced intermittent connectivity. These demographics suggest that while students are generally well-positioned to engage with digital tools like AI, disparities in device ownership and internet reliability may affect consistent utilization.

Generally, the demographic characteristics agrees with the WHO that globally, 67% of the health and social workforce are women compared to 41% in all employment sectors. Nursing and midwifery occupations represent a significant share of the female workforce (WHO, 2024). Ogolodom et al. (2022) also identified lack of internet access and unstable or slow internet connections by 22.2% as a challenge to e-learning adoption in the Nigerian education.

2. An Independent t-Test analysis to compare mean scores between the sex of students on AI knowledge.

Findings: Table 4.1.2, an independent samples t-test was conducted to compare AI knowledge scores between male and female students in MCONS. Levene's test indicated that the assumption of equal variances was met, $F(1, 144) = 0.96, p = .33$. The analysis revealed no statistically significant difference in AI knowledge scores between male ($M = 22.33, SD = 2.43$) and female

students ($M = 21.71$, $SD = 2.28$), $t(144) = 1.21$, $p = .23$, Cohen's $d = 0.27$. These findings suggest that gender does not significantly influence students' knowledge of artificial intelligence.

Interpretation: An independent samples t-test showed no significant difference in AI knowledge scores between male and female students at MCONS. Levene's test confirmed equal variances, and although males had a slightly higher mean score (22.33 vs. 21.71), the difference was not statistically significant ($p = .23$) and had a small effect size (Cohen's $d = 0.27$), indicating limited practical relevance. These findings suggest that gender does not significantly influence students' knowledge of artificial intelligence.

According to Iddrisu et., al (2025), no significant differences were found between male and female students on perceived effectiveness of AI writing tools, and both male and female students perceived AI tools as being effective in Tamale, Ghana. According to Rajah, et al., (2025), reported that nursing students at Bayero University, Kano, recognize the potential benefits of AI in education and clinical practice but face significant challenges due to infrastructural limitations. The study did not report any notable gender-based disparities in AI usage or perceptions. However, research involving a large sample of Norwegian Higher Education Institutions students revealed that male students engaged more frequently with generative AI chatbots across various applications and exhibited greater interest in AI tools, while female students expressed more concerns regarding critical thinking and the use of AI (Møgelvang, et., 2024). The contrast in literatures suggest further research on the concept of gender and AI utilization.

3. One-Way ANOVA analysis to compare mean scores among students' academic level and students on AI perception

Findings: Table 4.1.3, a one-way between-subjects ANOVA was conducted to examine whether there were statistically significant differences in AI perception scores among students at different academic levels (Year 1, Year 2, and Year 3) at Makurdi College of Nursing Sciences (MCONS). As shown in Table 4.1.3 the descriptive statistics, the mean AI perception score was 20.41 (SD = 2.37) for Year 1 students, 20.81 (SD = 2.73) for Year 2 students, and 20.00 (SD = 2.79) for Year 3 students. The ANOVA test result was $F(2, 143) = 1.32$, with a $p = .272$.

Interpretation: The ANOVA results indicated that there was no statistically significant difference in AI perception scores among the three academic levels, $F(2, 143) = 1.32$, $p = .272$. This result implies that students' year of study did not significantly influence their perceptions and attitudes toward the integration of AI in nursing education. In other words, this suggests that whether a student is in Year 1, 2, or 3 does not meaningfully affect how they perceive artificial intelligence.

According to research conducted by Migdadi et., (2024) among nursing students in Jordan reported no significant differences found in the levels of AI ethical awareness, attitudes toward AI technology, anxiety to use AI, and intention-to-use AI based on gender and study year ($p < 0.01$). The above supports the claims of this study stating that there was no statistically significant difference in AI perception scores among the three academic levels, $F(2, 143) = 1.32$, $p = .272$. This add up to the fact that AI literacy and mindset, rather than academic year, are more influential in shaping nursing students' attitudes and confidence regarding AI (El-Sayed et al., 2025).

4. Pearson's Correlation analysis to examine the relationship between AI utilization and students' perception of AI in nursing education.

Findings: Table 4.1.4, a Pearson product-moment correlation was conducted to examine the relationship between students' AI utilization and their perception of AI. The Pearson correlation coefficient (r) between AI utilization and AI perception is 0.316, marked with "***" indicating it is statistically significant at the 0.01 level ($p < .01$).

Interpretation: The results showed a significant, moderate positive relationship between how much students utilize AI and their perception of it. In practical terms, this suggests that students who use AI more frequently tend to have a more favorable perception of its role in nursing education. It may also imply that positive perceptions of AI encourage its increased use significantly, $r(144) = .316$, $p < .001$. This suggests that as students' perception of AI increases their utilization of AI also tends to increase.

The acceptance of new technologies categorically could possibly be achieved by perceived usefulness (PU) and perceived ease of use (PEU) as postulated by Davis (1989). Therefore, this suggests that greater engagement with AI tools is associated with better perceptions.

5. Knowledge of AI in Nursing Education

Findings: In Table 4.2.1 the result revealed that nursing students demonstrated a high extent of knowledge regarding AI in nursing education. Participants agreed that they had heard about AI and its applications ($M = 4.40$, $SD = 0.719$), that AI can assist in nursing training through simulations and virtual learning ($M = 4.44$, $SD = 0.551$), and that AI-powered applications can improve nursing diagnostics and decision-making ($M = 4.21$, $SD = 0.664$). Additionally, they believed that AI tools

such as ChatGPT and medical AI software could enhance their learning experience ($M = 4.49$, $SD = 0.554$) and reported an understanding of how AI works and its relevance in healthcare and nursing ($M = 4.28$, $SD = 0.702$). The overall cluster mean was 4.36, indicating a high extent of knowledge.

Interpretation: These findings corroborate existing literature indicating that modern nursing students are not only aware of AI but also appreciate its utility in education and practice. This suggests that integrating AI into nursing curricula is both timely and supported by student readiness. The above agrees with Makhoul et al., (2024) that there was a highly statistically significant improvement in nurses' knowledge-based chatbot systems post-intervention ($p = 0.001$) on the effectiveness of designing a knowledge-based artificial intelligence chatbot system into a nursing training program: A quasi-experimental design.

The above agree with Hashish & Alnajjar, (2024) in their research on Digital proficiency: assessing knowledge, attitudes, and skills in digital transformation, health literacy, and artificial intelligence among university nursing students. The results revealed significant positive relationships between knowledge of digital transformation services and all assessed digital variables ($p < 0.05$).

6. Utilization of AI in Nursing Education

Findings: Regarding the extent of utilization, Table 4.2.2 the results showed a moderate to high extent of use among the students. Respondents indicated that they used AI-powered tools for studying nursing concepts ($M = 3.65$, $SD = 0.922$), relied on AI tools such as ChatGPT, medical AI apps, or nursing chatbots for research ($M = 3.53$, $SD = 1.127$), and reported that AI was integrated into their coursework and assignments ($M = 3.60$, $SD = 1.073$), all representing a high extent. However, the use of AI-powered simulations or virtual labs ($M = 2.94$, $SD = 1.255$) and

receiving training on the effective use of AI ($M = 2.73$, $SD = 1.387$) reflected a moderate extent of utilization. The overall cluster mean for utilization was 3.29, indicating a moderate extent of AI tool usage among the nursing students.

Interpretation: These findings suggest that while students are incorporating AI into their learning to a fair degree, more structured training and exposure to advanced AI tools could enhance their overall utilization.

The above agree with Rajah, et al., (2025), which identified that the majority of students have engaged with AI technologies primarily for academic purposes, such as researching assignments and accessing clinical information at Bayero University, Kano.

7. Challenges and Barriers to the Adoption of AI in Nursing Education

Findings: As presented in Table 4.2.3, the results showed that students experienced a moderate extent of barriers to AI adoption. A majority agreed that lack of internet access limited their ability to use AI tools ($M = 4.21$, $SD = 0.934$), indicating a high extent of challenge. However, the perception that AI applications were too complex and difficult to understand was rated lower ($M = 2.33$, $SD = 0.990$), reflecting a low extent of concern in this area. Furthermore, insufficient training on AI utilization in nursing education was reported at a moderate level ($M = 3.33$, $SD = 1.058$), as was the cost of AI-powered applications as a barrier ($M = 3.13$, $SD = 1.164$). Additionally, concerns about AI potentially replacing human nurses in the future was also rated at a moderate extent ($M = 3.34$, $SD = 1.354$). The overall cluster mean for this section was 3.27, indicating that, generally, students perceived moderate barriers to the adoption and effective use of AI-driven technologies in their nursing education.

Interpretation: The results suggest that while technical and infrastructural challenges, particularly internet accessibility pose real obstacles, students are not discouraged by the complexity of AI itself. Addressing access and providing targeted training could significantly reduce these perceived barriers.

As stated earlier by Ramadan et al., (2024), the primary barriers to AI adoption in nursing include; technical challenges (60%), ethical concerns about patient privacy (55%), and fears of job displacement (45%). These findings informed the creation of the TAM-AIN Model, an extended version of the Technology Acceptance Model that integrates additional factors such as ethical alignment, organizational readiness, and perceived threats to professional autonomy. The study concludes that successful AI adoption in nursing practice demands a holistic strategy that addresses not only technical and educational needs but also ethical and organizational dimensions. Therefore, the above agrees with this research study.

8. Perceptions and Attitudes of Nursing Students on AI

Findings: As presented in Table 4.2.4, students demonstrated an overall highly positive perception of AI integration. They strongly agreed that AI is a valuable tool that can enhance nursing education ($M = 4.27$, $SD = 0.616$) and that AI should be fully integrated into nursing education at MCONS ($M = 3.81$, $SD = 0.964$). Students also believed that AI would positively impact nursing practice in the future ($M = 4.04$, $SD = 0.787$) and expressed confidence in using AI-powered tools in their education ($M = 3.82$, $SD = 0.758$). Notably, students emphasized that AI should be used primarily as a support tool rather than as a replacement for traditional learning ($M = 4.50$, $SD = 0.736$), indicating a very high extent of agreement with this viewpoint. Overall, the cluster mean reflected a high extent of positive attitudes toward the integration of AI in nursing education and practice.

Interpretation: Nursing students at MCONS demonstrated a strong and positive perception of AI integration, recognizing its importance in enhancing education and improving future nursing practice. Its adoption was supported at MCONS with expressed confidence in using AI tools. However, emphasis was made that AI should complement not replace traditional learning.

The above results agree with a study by Han et al. (2025). The study found that nursing students generally hold favorable attitudes toward AI, recognizing its potential to enhance nursing education and practice. It highlighted students' perception about AI as a valuable tool that can support their learning and improve clinical decision-making.

5.2 Implication of Findings to Nursing

The findings have significant implications to nursing practice and education, particularly in Nigerian educational sector, the nursing education and practice, which is essential in training the future general of nurses that are sound in emerging technologies such as AI in patient care, telehealth etc. The implication of the study to nursing includes:

1. **Need for Structured AI Training in Nursing Education:** Reflecting on the overall cluster mean for utilization, 3.29 (Table 4.2.2), indicated a moderate extent of AI tool usage among the nursing students. This implies that while students are open to using AI tools, they lack sufficient training in their effective use. Therefore, nursing institutions in Benue State, Nigeria and beyond must integrate AI training into their curricula to ensure that future nurses are equipped with the necessary skills to leverage AI tools in both educational and clinical settings.
2. **AI as a Supportive Tool, not a Replacement System:** Notably, students emphasized that AI should be used primarily as a support tool rather than as a replacement for traditional learning where, ($M = 4.50$, $SD = 0.736$) as stated in Table 4.2.4, indicating a very high

extent of agreement with this viewpoint that AI should complement, not replace, human judgment and interaction in nursing. Therefore, nursing profession should embrace AI as an augmented tool to enhance clinical decision-making and education, while ensuring that human expertise remains central to patient care (McGrow, 2025).

3. Addressing Barriers to AI Adoption: As presented (Table 4.2.3), the overall cluster mean was 3.27, indicating that, generally, students perceived moderate barriers to the adoption and effective use of AI-driven technologies in their nursing education including lack of internet access, ethical concerns about patient privacy, job displacement fears, insufficient training etc. Therefore, policymakers and healthcare institutions should work to improve access to reliable internet and AI tools. Additionally, ethical frameworks, patient privacy and job displacement should be to address to eradicate concerns about ensuring that nurses see AI as an ally rather than a threat to their roles. Continuous education and ethical training on AI's role in healthcare could help alleviate fears.
4. Holistic Approach to AI Integration: The TAM-AIN model highlighted the need for a holistic approach to AI adoption, addressing technical, ethical, organizational, and educational challenges. As stated by Peng et al., (2023) TAM-AIN extends beyond traditional technology acceptance models by specifically addressing nursing practice's unique contexts and challenges, providing a more comprehensive framework for understanding and facilitating AI adoption in healthcare settings. Therefore, Healthcare organizations should develop an AI integration strategy that encompasses not only technology but also ethical considerations, organizational readiness, and training for nursing professionals. A multi-dimensional approach would ensure smoother AI integration, benefiting both nurses and patients.

5. **Positive Perception and Readiness for AI:** As captured in (Table 4.2.4), the cluster mean of 4.01 reflected a high extent of positive attitudes toward the integration of AI in nursing education and practice. This suggest that future nurses are ready to embrace AI and see its potential in enhancing nursing practice. Therefore, the Nursing and Midwifery Council of Nigeria (NMCN) leadership should leverage this enthusiasm to build a culture of innovation in the profession AI-wise.
6. **Potential for AI in Clinical Decision-Making:** The belief that AI will positively impact nursing practice in the future suggests a growing acceptance of AI as a valuable tool for improving clinical outcomes. As reported in (Table 4.2.4), Students also believed that AI would positively impact nursing practice in the future ($M = 4.04$, $SD = 0.787$). Therefore, AI can help nurses make more informed decisions by providing data-driven insights and improving diagnostic accuracy.
7. **AI's Role in Reducing Workload:** (Table 4. 2.1) students believed that AI tools such as ChatGPT and medical AI software could enhance their learning experience ($M = 4.49$, $SD = 0.554$) which suggests a desire for AI to alleviate some of the workload and enhance learning outcomes.

5.3 Limitations of the Study

1. **Limited Generalizability:** The study focused solely on nursing students from a single institution, Makurdi College of Nursing Sciences (MCONS), which restricts the applicability of findings to broader nursing populations across different regions, institutions, or countries.

2. **Self-Reported Data Bias:** Reliance on questionnaires for data collection may introduce bias, as students' self-assessment of their AI knowledge, usage, and perceptions can be affected by social desirability or inaccurate self-evaluation.
3. **Cross-Sectional Design:** Data were gathered at one point in time, limiting the ability to examine how students' knowledge, utilization, and attitudes toward AI evolve over time.
4. **Limited Practical Exposure:** Many participants had minimal real-world interaction with clinical AI tools beyond general platforms like ChatGPT, implying that responses might reflect theoretical understanding rather than practical experience.
5. **Rapidly Evolving AI Technologies:** The fast pace of AI development in healthcare may quickly render the study's observations and conclusions outdated, affecting its long-term relevance.
6. **Infrastructure and Resource Constraints:** Challenges such as limited internet access and insufficient training may have affected students' ability to fully engage with AI tools, potentially influencing responses and findings.

These limitations suggest the need for longitudinal, multi-institutional studies with mixed-methods approaches to enhance the accuracy and generalizability of findings related to AI integration in nursing education.

5.4 Summary of the Study

This research explored the knowledge, utilization, challenges, and perceptions related to Artificial Intelligence (AI) adoption among nursing students at Makurdi College of Nursing Sciences (MCONS), Benue State, Nigeria. Using a descriptive cross-sectional design, data were collected from 146 nursing students via structured questionnaires administered electronically and analyzed with SPSS version 25.

Key findings revealed that students demonstrated a high level of AI knowledge and a moderate to high extent of AI tool utilization, including platforms like ChatGPT and medical AI applications, primarily for studying nursing concepts, research, and coursework integration. Despite recognizing AI's potential to enhance nursing education and clinical decision-making, students reported relatively lower use of advanced AI tools such as simulations or virtual labs.

The study identified significant barriers to AI integration, including inadequate formal training, infrastructural constraints such as limited internet access, and insufficient institutional support. Ethical considerations like data privacy were maintained throughout data collection. Demographic analyses showed no significant differences in AI knowledge or perceptions based on gender or academic level, though a positive correlation existed between AI utilization and positive perception.

Overall, the study underscores the readiness of Nigerian nursing students to embrace AI technologies while highlighting the need for strategic interventions such as curriculum integration, faculty development, and infrastructure investment to overcome challenges and maximize AI's benefits in nursing education and healthcare delivery in Nigeria.

5.5 Conclusion

This study has demonstrated that nursing students at Makurdi College of Nursing Sciences (MCONS), Benue State, Nigeria, possess a high level of knowledge about Artificial Intelligence (AI) and moderately to highly utilize AI tools, such as ChatGPT and medical AI applications, in their education and training. The findings revealed a strong positive perception of AI integration in nursing education and practice, emphasizing its potential to enhance clinical decision-making, diagnostics, and workload management. Nevertheless, several challenges hinder full AI adoption, including inadequate formal training, infrastructural limitations, and insufficient institutional

support. Despite these barriers, the students' readiness to embrace AI highlights an important opportunity to strategically incorporate AI education and resources into the nursing curriculum. Addressing the identified challenges through comprehensive AI training programs, faculty development, improved infrastructure, and ethical safeguards will be essential for effective AI integration in nursing education. Furthermore, fostering a balanced view of AI as a supportive tool rather than a replacement for human judgment is critical for maintaining quality patient care. Overall, this study underscores the promising role of AI in transforming nursing education in Nigeria, while calling for coordinated efforts to facilitate sustainable adoption. Future research employing longitudinal and multi-institutional designs is recommended to build on these findings and ensure ongoing evaluation of AI's impact on nursing education and healthcare delivery.

5.6 Recommendations

The recommendations emerging from this research study include:

1. **Integration of Structured AI Training in Nursing Curricula:** Nursing institutions, particularly at Makurdi College of Nursing Sciences and across Nigeria, should incorporate comprehensive AI education into their curricula. This will equip nursing students with essential skills to effectively utilize AI tools in both academic and clinical settings, improving their competence in emerging technologies such as AI-driven patient care and telehealth.
2. **Enhancement of Training and Faculty Development:** Educators and faculty members should receive targeted training to build their capacity to teach and support AI applications in nursing education. Faculty development programs will ensure that educators remain updated with evolving AI tools and methodologies, thereby facilitating better student learning experiences.

3. **Investment in Infrastructure and Resources:** Adequate infrastructural support, including reliable internet access and access to AI-powered applications and tools, must be prioritized to overcome barriers currently limiting AI adoption among students. Institutions should allocate resources to provide AI-enabled learning environments and technological infrastructure to support seamless integration.
4. **Promotion of AI as a Supportive, Not Replacement, Tool:** The nursing profession should advocate for using AI primarily as an augmenting tool to enhance clinical decision-making and education while maintaining human expertise and judgment at the core of patient care. This will help alleviate concerns about AI replacing human nurses and foster positive perceptions toward AI adoption.
5. **Addressing Cost and Accessibility Challenges:** Institutions and policymakers should explore ways to reduce the cost and improve the accessibility of AI tools and applications for nursing students to mitigate financial barriers to adoption.
6. **Future Research and Continuous Evaluation:** Ongoing research should be encouraged to monitor AI knowledge, usage, and emerging challenges among nursing students to continuously improve AI integration strategies and curricula responsiveness to technological advancement.

These recommendations aim to enhance AI adoption in nursing education, ultimately advancing the quality of nursing practice and healthcare delivery in Nigeria.

5.7 Suggestions for Further Studies

The study suggests several areas for further research to deepen understanding and improve AI integration in nursing education:

1. Longitudinal Studies on AI Adoption: Conduct longitudinal research tracking nursing students' development of AI knowledge, skills, and utilization over time to assess the long-term impact of AI training on clinical competence and patient care outcomes.
2. Faculty Perspectives and Readiness: Investigate the knowledge, attitudes, and preparedness of nursing educators regarding AI adoption to inform targeted faculty development programs and curricular design.
3. Evaluation of Specific AI Tools and Applications: Examine the effectiveness, usability, and educational impact of different AI-powered tools and platforms within various nursing education contexts to identify best practices and user preferences.
4. Barriers to AI Adoption in Rural and Resource-Poor Settings: Explore infrastructural, financial, and socio-cultural challenges specific to rural or underserved Nigerian regions to develop tailored strategies for equitable AI integration.
5. Ethical, Legal, and Social Implications: Study ethical concerns and regulatory frameworks related to AI use in nursing education and practice, ensuring adherence to professional standards and patient safety.
6. Comparative Studies Across Institutions and Countries: Compare AI knowledge, utilization, and challenges among nursing students across different Nigerian institutions or internationally to contextualize findings and foster collaborative solutions.

These suggestions aim to build a comprehensive evidence base guiding effective, ethical, and inclusive integration of emerging AI technologies into nursing education and practice in Nigeria and beyond.

REFERENCE

- About Hashish, E. A., & Alnajjar, H. (2024). Digital proficiency: Assessing knowledge, attitudes, and skills in digital transformation, health literacy, and artificial intelligence among university nursing students. *BMC Medical Education*, 24. <https://bmcmmededuc.biomedcentral.com/articles/10.1186/s12909-024-05482-3>
- Ahmed, S. K. (2023). The impact of ChatGPT on the nursing profession: Revolutionizing patient care and education. *Annals of Biomedical Engineering*. <https://doi.org/10.1016/j.ejon.2024.102510>
- Ahmed, S. K. (2024). Artificial intelligence in nursing: Current trends, possibilities, and pitfalls. *Global Medicine*. <https://doi.org/10.1016/j.glmedi.2024.100072>
- Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. *Psychology & Health*, 26(9), 1113-1127.
- American Association of Colleges of Nursing. (2022). *The essentials: Core competencies for professional nursing education*. AACN Publications.
- Ankita, S. (2024). Revolutionizing patient care: Artificial intelligence applications in nursing. *Asian Journal of Nursing Education and Research*, 14(2), 100-112. <http://dx.doi.org/10.52711/2349-2996.2024.00021>
- Araújo, T., & Casais, B. (2020). Customer acceptance of shopping-assistant chatbots. *Marketing and Smart Technologies*.
- Archibald, M. M., & Clark, A. M. (2023). ChatGPT: What is it and how can nursing and health science education use it? *Journal of Advanced Nursing*, 79(10), 3648–3651. <https://doi.org/10.1111/jan.15643>
- Arend, H. (2016). Understanding the four types of AI, from reactive robots to self-aware beings. *The Conversation*. <https://theconversation.com/understanding-the-four-types-of-ai-from-reactive-robots-to-self-aware-beings-67616>
- Bozkurt, A., Karadeniz, A., Baneres, D., Guerrero-Roldán, A. E., & Rodríguez, M. E. (2021). Artificial intelligence and reflections from the educational landscape: A review of AI studies in half a century. *Sustainability*, 13, 800.

- Centers for Disease Control and Prevention. (2024). Health Equity and Ethical Considerations in Using Artificial Intelligence in Healthcare. *Preventing Chronic Disease*, 21. Retrieved from https://www.cdc.gov/pcd/issues/2024/24_0245.htm
- Chang, C. Y., Kuo, S. Y., & Hwang, G. H. (2022). Chatbot-facilitated nursing education. *Educational Technology & Society*. <https://www.jstor.org/stable/48647027>
- Choi, E. P. H., Lee, J. J., Ho, M., Kwok, J. Y. Y., & Lok, K. Y. W. (2023). Chatting or cheating? The impacts of ChatGPT and other artificial intelligence language models on nurse education. *Nurse education today*, 125, 105796. Available at: <https://doi.org/10.1016/j.nedt.2023.105796>.
- Cleary, M., Kornhaber, R., Le Lagadec, D., Stanton, R., & Hungerford, C. (2024). Artificial intelligence in mental health research: Prospects and pitfalls. *Issues in Mental Health Nursing*, 45(2), 1–5. <https://doi.org/10.1080/01612840.2024.2341038>
- Copeland, B. J. (2025). *Artificial intelligence*. *Encyclopedia Britannica*. <https://www.britannica.com/technology/artificial-intelligence>
- Coursera Staff. (2024). What is artificial intelligence? Definition, uses, and types. *Coursera*. <https://www.coursera.org/articles/what-is-artificial-intelligence>
- Creswell, J. W. (2022). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). *Sage Publications*.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319. <https://open.ncl.ac.uk/theories/1/technology-acceptance-model/>
- Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions, and behavioral impacts. *International Journal of Man-Machine Studies*, 38(3), 475-487. <https://open.ncl.ac.uk/theories/1/technology-acceptance-model/>
- De Bruyckere, P., & Kirschner, P. A. (2020). Computer-assisted learning. In A. Tatnall (Ed.), *Encyclopedia of Education and Information Technologies* (pp. 348–355). Springer International Publishing.
- Effoduh, J. O. (2021). Factsheet on artificial intelligence in Nigeria. *Paradigm Initiatives*. <https://paradigmhq.org/wp-content/uploads/2021/10/Factsheet-on-Artificial-Intelligence-in-Nigeria.pdf>

- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. <https://doi.org/10.1111/j.1365-2648.2007.04569.x>
- El-Sayed, B. K. M., El-Sayed, A. A. I., Alsenany, S. A., & Asal, M. G. R. (2025). The role of artificial intelligence literacy and innovation mindset in shaping nursing students' career and talent self-efficacy. *Nurse Education in Practice*, 82, 104208. <https://doi.org/10.1016/j.nepr.2024.104208>
- Emily, C. (2024). Using predictive analytics to improve student retention. *Go Further Blog*. <https://www.gofurther.com/blog/using-predictive-analytics-to-improve-student-retention>
- Fawaz, O. I. (2023). The impact of emerging AI technologies on Nigerian education. *Sustainable Africa*. <https://susafrica.com/2023/04/05/the-impact-of-emerging-ai-technologies-on-nigerian-education/>
- Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly*, 27(1), 51–90.
- Global Positioning System (GPS) of Makurdi Satellite Map. <https://maps.google.com/maps?q=7.73375,8.52139&ll=7.73375,8.52139&t=k&hl=en&z=8>. Retrieved on 31st March, 2025).
- Google/Ipsos. (2025). Our life with AI: From innovation to application. https://static.googleusercontent.com/media/publicpolicy.google/en//resources/ipsos_google_our-life-with-ai_2024_25.pdf
- Hallas, D. (2023). Artificial Intelligence and Nursing: It's All About Trust. *Journal of Pediatric Health Care*, 37(5), 461-462. Retrieved from [https://www.jpeds.org/article/S0891-5245\(23\)00173-6/fulltext](https://www.jpeds.org/article/S0891-5245(23)00173-6/fulltext)
- Han, S., Kang, H. S., Gimber, P., & Lim, S. (2025). Nursing Students' Perceptions and Use of Generative Artificial Intelligence in Nursing Education. *Nursing reports (Pavia, Italy)*, 15(2), 68. <https://doi.org/10.3390/nursrep15020068>
- Hwang, Y. (2005). Investigating enterprise systems adoption: Uncertainty avoidance, intrinsic motivation, and the technology acceptance model. *European Journal of Information Systems*, 14(2), 150-161.
- Iddrisu, H. M., Iddrisu, S. A., & Aminu, B. (2025). Gender Differences in the Adoption, Usage, and Perceived Effectiveness of AI Writing Tools: A Study Among University for Development Studies

- Students. *International Journal of Educational Innovation and Research*, 4(1), 110–111.
<https://doi.org/10.31949/ijeir.v4i1.11717>
- Jian, M.J.K.O. (2023). Personalized learning through AI. *Advances in Engineering Innovation*, 5, 16-19.
- Jiang, Y. (2024). Artificial intelligence in nursing education: Challenges and opportunities in the Chinese context. *Open Journal of Social Sciences*, 12, 55-66.
<https://doi.org/10.4236/jss.2024.1211004>
- Johnson, E. J., & Payne, J. W. (1985). Effort and accuracy in choice. *Management Science*, 31(4), 395-414. <https://doi.org/10.1287/mnsc.31.4.395>
- Juliet, U. (2025). Nigeria surpasses global average with 70% AI adoption rate – Report. *Vanguard*.
https://www.vanguardngr.com/2025/01/nigeria-surpasses-global-average-with-70-ai-adoption-rate-report/?utm_source=chatgpt.com
- Karim, L. (2023). AI won't replace humans — But humans with AI will replace humans without AI. *Harvard Business Review*. <https://hbr.org/2023/08/ai-wont-replace-humans-but-humans-with-ai-will-replace-humans-without-ai>
- Kusterbeck, S. (2023). The ethical implications of AI in nursing. *Nurse.com*. Retrieved from
<https://www.nurse.com/blog/ethical-implications-ai-nursing-nsp>
- Labrague, L. J., Aguilar-Rosales, R., Yboa, B. C., & Jeanette, B. S. (2023a). Student nurses' attitudes, perceived utilization, and intention to adopt artificial intelligence (AI) technology in nursing practice: A cross-sectional study. *Nurse Education in Practice*, 73.
<https://doi.org/10.1016/j.nepr.2023.103815>
- Labrague, L. J., Aguilar-Rosales, R., Yboa, B. C., & Jeanette, B. S. (2023b). Factors influencing student nurses' readiness to adopt artificial intelligence (AI) in their studies and their perceived barriers to accessing AI technology: A cross-sectional study. *Nurse Education Today*. <https://doi.org/10.1016/j.nedt.2023.105945>
- Lara, N. (2025). The role of personalized learning in modern education. *AFA Education Blog*.
<https://afaeducation.org/blog/the-role-of-personalized-learning-in-modern-education>
- Macrotrends. (2025, March 31). *Makurdi, Nigeria metro area population 1950-2025*.
<https://www.macrotrends.net/cities/23539/makurdi/population>
- Mahajan, V. (2010). Innovation diffusion. <https://doi.org/10.1002/9781444316568.wiem01026>

- Makhlouf, E., Alenezi, A., & Shokr, E. A. (2024). Effectiveness of designing a knowledge-based artificial intelligence chatbot system into a nursing training program: A quasi-experimental design. *Nurse Education Today*, 137, 106159. <https://doi.org/10.1016/j.nedt.2024.106159>
- Makurdi College of Nursing Sciences. (2021). Makurdi College of Nursing Sciences. <https://www.mcons.edu.ng/>
- Marikyan, D., & Papagiannidis, S. (2024). Technology acceptance model: A review. In S. Papagiannidis (Ed.), *TheoryHub Book*. Available at <https://open.ncl.ac.uk> / ISBN: 9781739604400
- Matthew, U. (2024). 7 Types of Artificial Intelligence. *built in* <https://builtin.com/artificial-intelligence/types-of-artificial-intelligence>
- McGonigle, D., & Mastrian, K. (2021). Nursing informatics and the foundation of knowledge (5th ed.). Jones & Bartlett Learning.
- McGrow K. (2025). Artificial intelligence in nursing: A journey from data to wisdom. *Nursing*, 55(4), 16–24. <https://doi.org/10.1097/NSG.0000000000000165>
- Migdadi, M. K., Oweidat, I. A., Alost, M. R., Al-Mugheed, K., Alabdullah, S. A., & Abdelaliem, S. F. (2024). The association of artificial intelligence ethical awareness, attitudes, anxiety, and intention-to-use artificial intelligence technology among nursing students. *Digital Health*, 10. <https://doi.org/10.1177/20552076241301958>
- Møgelvang, A., Bjelland, C., Grassini, S., & Ludvigsen, K. (2024). Gender Differences in the Use of Generative Artificial Intelligence Chatbots in Higher Education: Characteristics and Consequences. *Education Sciences*, 14(12), 1363. <https://doi.org/10.3390/educsci14121363>
- Morley, J., Floridi, L., Kinsey, L., & Elhalal, A. (2020). From what to how: An initial review of publicly available AI ethics tools, methods, and research to translate principles into practices. *Science and Engineering Ethics*, 26, 2141-2168. <https://link.springer.com/article/10.1007/s11948-019-00165-5>
- Murdoch, B. (2021). Privacy and artificial intelligence: Challenges for protecting health information in a new era. *BMC Medical Ethics*. [https://doi.org/10.1186/s12910-021-00687-](https://doi.org/10.1186/s12910-021-00687-3)

- Nassef, E., & Zeid, I. A. (2024). Artificial intelligence in nursing education: A descriptive literature review of the evidence. <https://urn.fi/URN:NBN:fi:amk-2024050810012>
- Nassef, E., & Zeid, I. A. (2024). Artificial intelligence in nursing education: A descriptive literature review of the evidence. *CENTRIA UNIVERSITY OF APPLIED SCIENCES Bachelor of Health Care, Nursing*. <https://www.theseus.fi/handle/10024/854294>
- National Universities Commission. (2020). *Strategic plan 2020-2022*. Abuja, Nigeria.
- National Universities Commission. (2022). *NUC holds sensitization workshop on ICT development in NUS*. <https://www.nuc.edu.ng/nuc-holds-sensitization-workshop-on-ict-development-in-nus/>
- Niyi, J. O., Godwin, I., & Peter, T. (2024). Artificial intelligence and implementation of educational administration and planning programmes in Nigerian tertiary institutions. *International Journal of Academic Integrity and Curriculum Development*, 1(1), 41–45. <https://doi.org/10.xxxxx/xxxxx>
- Ogolodom, M. P., Mbaba, A. N., Okpaleke, M. S., Chukwueze, I. O., Okankwu, E. A., Joseph, D. Z., Alazigha, N., Orevaoghene, O. E., & Brownson, E. E. (2023). Online Learning in Nigerian Universities During COVID-19 Pandemic: The Experiences of Nursing and Radiography Undergraduate Students. *Journal of radiology nursing*, 42(1), 128–135. <https://doi.org/10.1016/j.jradnu.2022.08.012>
- Ouyang, F., Zheng, L., & Jiao, P. (2022). Artificial intelligence in online higher education: A systematic review of empirical research from 2011 to 2020. *Education and Information Technologies*, 27, 7893–7925.
- Oxford Insights. (2023). Government AI readiness index 2023. <https://oxfordinsights.com/wp-content/uploads/2023/12/2023-Government-AI-Readiness-Index-1.pdf>
- Oyewole, S., Salami, A., Palmer, E., & Nmeribe, C. (2024). Spotlight on AI development in Nigeria. <https://www.dlapiperafrica.com/en/nigeria/>
- Pailaha, A. D. (2023). The impact and issues of artificial intelligence in nursing science and healthcare settings. *SAGE Open Nursing*, 9, 23779608231196850. <https://doi.org/10.1177/23779608231196847>
- Park University. (2025). AI in education: The rise of intelligent tutoring systems. <https://www.park.edu/blog/ai-in-education-the-rise-of-intelligent-tutoring-systems>

- Payne, J. W. (1982). Contingent decision behavior. *Psychological Bulletin*, 92(2), 382-402.
- Peng, X., Ye, Y., Ding, X., & Chandrasekaran, A. (2023). The impact of nurse staffing on turnover and quality: An empirical examination of nursing care within hospital units. *Journal of Operations Management*, 69, 1124–1152.
- Peter, Ikyapa & Abdulhamid, Adnan & Rilwanu, Tasi'U & Daura, Mala & Alogo, Philip. (2022). Appraisal of Socio-economic, Infrastructural and Environmental Impacts of Flood in Makurdi Local Government Area of Benue State. 1. 210-217.
- Provo College. (2023). 5 ways AI is transforming nursing education: Useful applications from the classroom to the clinic. <https://www.provocollege.edu/blog/ways-ai-is-transforming-nursing-education>
- Rajah, A. S., Sardauna, M. Z., & Ladan, M. A. (2025). Exploring the experiences and perceptions of artificial intelligence utilization among students of the department of nursing, Bayero University, Kano. *Journal of Practical Nurse Education and Practice*, 5(1), 2–18. <https://doi.org/10.29173/jpnep43>
- Ramadan, O. M. E., Alruwaili, M. M., Alruwaili, A. N., Elsehrawy, M. G., & Alanazi, S. (2024). Facilitators and barriers to AI adoption in nursing practice: A qualitative study of registered nurses' perspectives. *BMC Nursing*, 23(1), 891. <https://doi.org/10.1186/s12912-024-02571-y>
- Robey, D. (1979). User attitudes and management information system use. *Academy of Management Journal*, 22(3), 527-538. <https://doi.org/10.2307/255742>
- Ronquillo, C. E., Peltonen, L. M., Pruinelli, L., Chu, C. H., Bakken, S., Beduschi, A., Cato, K., Hardiker, N., Junger, A., Michalowski, M., Nyrup, R., Rahimi, S., Reed, D. N., Salakoski, T., Salanterä, S., Walton, N., Weber, P., Wiegand, T., & Topaz, M. (2021). Artificial intelligence in nursing: Priorities and opportunities from an international invitational think-tank of the Nursing and Artificial Intelligence Leadership Collaborative. *Journal of Advanced Nursing*, 77(9), 3707–3717. <https://doi.org/10.1111/jan.14855>
- Sample Size Calculator. *Calculator.net* Retrieved from on 7th April 2025. <https://www.calculator.net/sample-size-calculator.html>
- Song, K. (2022). Korea is leading an exemplary AI transition: Here's how. *OECD AI Policy Observatory*. <https://oecd.ai/en/wonk/korea-ai-transition>

- Stanford University. (2024). One-hundred-year study on artificial intelligence (*AI100*). <https://ai100.stanford.edu/2016-report/appendix-i-short-history-ai>
- Sule, J. (2024). Integrating artificial intelligence into education in Nigeria. *The Cable*. <https://www.thecable.ng/integrating-artificial-intelligence-into-education-in-nigeria/>
- Sun, G. H., & Hoelscher, S. H. (2023). The ChatGPT storm and what faculty can do. *Nurse Educator*. <https://doi.org/10.xxxx/xxxxx>
- Sunny, B. (2024). 7 types of artificial intelligence. *BuiltIn*. <https://builtin.com/artificial-intelligence/types-of-artificial-intelligence>
- The University of Texas at Arlington [UTA]. (2021). Benefits of virtual reality and simulation in nurse education. <https://academicpartnerships.uta.edu/healthcare-nursing-online-programs/msn/education/virtual-reality-in-nurse-education/>
- Tim, K. (2024). Top 10 countries leading in AI research & technology in 2024. *Techopedia*. <https://www.techopedia.com/top-10-countries-leading-in-ai-research-technology>
- Ukeh, B. O., & Anih, A. A. (2024). Utilization of artificial intelligence-based tools for teaching and research among lecturers in Federal University Otuoke, Bayelsa State, Nigeria. *Sustainable Futures Journal of Education and Social Science*, 1(1), 1-15. <https://www.sfjesgs.com/index.php/SFJESGS/article/download/508/508>
- United Nations. (2015). *Goal 3: Ensure healthy lives and promote well-being for all at all ages*. <https://www.un.org/sustainabledevelopment/health/>
- Velibor, B. (2024). Artificial intelligence in nurse education. http://dx.doi.org/10.1007/978-3-031-50300-9_9
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.
- Wang, X., & Cheng, Z. (2020). Cross-sectional studies: Strengths, weaknesses, and recommendations. *Chest*, 158(1, Suppl), S65–S71. <https://doi.org/10.1016/j.chest.2020.03.012>
- World Health Organization (WHO), 2024. Nursing and midwifery. <https://www.who.int/news-room/fact-sheets/detail/nursing-and-midwifery>

APPENDIX I

Department of Nursing Sciences,
College of Health Sciences,
Benue State University,
Makurdi.
14th April, 2025.

Dear Respondent.

LETTER OF INTRODUCTION

I am an undergraduate student at Benue State University, Department of Nursing Science, College of Health Sciences, Makurdi, conducting a research study as part of the requirements for the award of a Bachelor of Nursing Science (BNSc) degree.

This questionnaire is designed to gather information on "Artificial Intelligence in Nursing Education: Knowledge and Utilization Among Students at Makurdi College of Nursing Sciences, Benue State, Nigeria.

All information provided will be kept strictly confidential and used solely for academic purposes. Kindly read the questions carefully and provide honest responses.

Thanks!

SAAWUAN, STEPHEN TORKUMA

BSU/BM/NUR/18/1036

APPENDIX II

Section A: Demographic Information

1. **Academic Level:**

☐ Year 1

☐ Year 2

☐ Year 3

2. **Gender:**

☐ Male

☐ Female

3. **Age Group:**

☐ 18 – 21 years

☐ 22 – 25 years

☐ 26 – 29 years

☐ 30 years and above

4. **Access to Technology (Select all that apply):**

☐ Smartphone

☐ Laptop

☐ Tablet

None

5. **Internet Accessibility:**

☐ Always available

☐ Sometimes available

☐ Rarely available

☐ Not available

Section B: Knowledge of AI in Nursing Education

Instruction: Tick (✓) the option that best represents your level of agreement.

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
1. I have heard about AI and its applications in nursing education.	☐	☐	☐	☐	☐
2. AI can assist in nursing training through simulations and virtual learning.	☐	☐	☐	☐	☐
3. AI-powered applications can improve nursing diagnostics and decision-making.	☐	☐	☐	☐	☐
4. AI tools such as ChatGPT and medical AI software can enhance my learning experience.	☐	☐	☐	☐	☐
5. I understand how AI works and its relevance in healthcare and nursing.	☐	☐	☐	☐	☐

Section C: Utilization of AI in Nursing Education

Instruction: Tick (✓) the option that best represents your level of agreement.

Statement	Very Frequently (5)	Frequently (4)	Occasionally (3)	Rarely (2)	Never (1)
-----------	------------------------	-------------------	---------------------	---------------	--------------

6. I use AI-powered tools for studying nursing concepts.	☐	☐	☐	☐	☐
7. I have used AI-powered simulations or virtual labs in my training.	☐	☐	☐	☐	☐
8. I rely on AI tools such as ChatGPT, medical AI apps, or nursing chatbots for research	☐	☐	☐	☐	☐
9. AI is integrated into my nursing coursework and assignments.	☐	☐	☐	☐	☐
10. I have received training on how to effectively use AI in nursing education.	☐	☐	☐	☐	☐

Section D: Challenges of AI in Nursing Education

Instruction: Tick (✓) the option that best represents your level of agreement.

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
11. Lack of internet access limits my ability to use AI tools.	☐	☐	☐	☐	☐
12. AI applications are too complex and difficult to understand.	☐	☐	☐	☐	☐
13. There is insufficient training on AI utilization in nursing education.	☐	☐	☐	☐	☐

14. The cost of AI-powered applications is a major barrier to adoption.	☐	☐	☐	☐	☐
15. I worry that AI might replace human nurses in the future.	☐	☐	☐	☐	☐

Section E: Perception and Attitude Towards AI in Nursing Education

Instruction: Tick (✓) the option that best represents your level of agreement.

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
16. AI is a valuable tool that can enhance nursing education.	☐	☐	☐	☐	☐
17. AI should be fully integrated into nursing education at MCONS.	☐	☐	☐	☐	☐
18. AI will positively impact nursing practice in the future.	☐	☐	☐	☐	☐
19. I am confident in using AI-powered tools in my nursing education.	☐	☐	☐	☐	☐
20. AI should only be used as a support tool and not as a replacement for traditional learning.	☐	☐	☐	☐	☐

APPENDIX III

DATA

S/NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	2	2	3	1	1	4	4	4	5	4	4	3	4	5	2	5	1	3	4	2	4	5	5	4	4
2	2	2	1	1	1	5	5	4	5	5	4	3	4	3	4	3	2	3	4	3	4	3	4	4	4
3	2	2	2	1	1	4	5	4	5	4	3	3	3	4	2	5	3	3	4	4	5	4	4	4	5
4	3	2	2	2	2	3	4	3	4	2	3	3	2	3	1	4	2	5	3	2	4	4	4	4	4
5	2	1	4	3	1	5	5	5	5	5	3	1	5	4	4	5	2	4	5	4	5	5	5	5	4
6	3	1	2	2	2	4	4	3	4	4	4	3	3	2	2	5	2	2	4	2	4	3	4	4	5
7	3	2	1	1	1	4	4	4	4	3	3	3	3	2	3	4	2	2	2	5	4	3	3	3	5
8	3	2	1	2	1	5	5	5	5	5	3	2	2	1	1	5	2	3	2	4	4	3	4	4	5
9	3	2	2	1	1	4	5	5	5	3	2	1	3	2	1	2	1	3	5	4	3	4	4	3	5
10	3	2	1	1	1	5	4	4	5	4	4	3	4	4	2	4	1	3	3	2	4	3	4	3	5
11	3	2	2	1	1	5	3	3	4	5	4	4	4	4	1	2	2	5	2	2	4	3	3	4	5
12	3	2	3	1	1	4	4	3	4	3	3	3	2	3	2	3	2	2	1	1	4	1	1	1	5
13	3	2	2	1	1	5	5	4	4	3	5	2	3	3	4	5	2	5	4	3	5	4	5	5	5
14	3	2	2	2	1	5	5	4	5	5	3	3	4	3	4	4	1	3	2	2	4	4	4	3	5
15	3	2	1	2	1	1	4	3	3	3	1	1	1	1	2	3	3	2	4	2	4	3	3	3	5
16	1	2	1	1	2	4	4	4	4	4	4	4	4	4	1	4	3	4	4	4	4	5	5	4	5
17	1	1	2	1	1	5	5	5	5	5	3	3	2	3	3	5	3	3	3	3	4	4	4	4	4
18	3	2	2	1	2	4	4	5	5	4	3	1	5	5	1	5	2	3	3	4	4	2	3	3	5
19	1	2	1	1	1	5	5	5	5	5	4	5	4	5	4	5	5	4	4	1	4	4	3	4	5
20	3	2	1	1	1	4	4	4	4	4	5	4	5	4	2	4	2	4	2	2	4	4	4	4	4
21	3	2	2	1	1	5	5	5	5	5	4	2	5	4	4	5	1	5	5	1	5	5	5	5	5
22	3	2	2	2	2	5	5	5	5	5	4	2	4	4	1	4	2	2	4	4	5	5	5	5	4
23	3	2	1	1	1	5	4	4	4	5	4	3	4	4	5	2	1	4	1	1	5	4	4	4	4
24	1	2	1	1	2	5	5	5	5	5	5	5	5	5	5	5	2	3	5	4	5	5	5	5	4
25	3	2	1	1	1	5	5	5	5	5	5	5	5	4	3	5	1	1	1	1	5	5	5	5	5
26	1	1	2	1	1	5	5	5	5	5	3	2	2	3	1	4	3	3	3	3	5	3	4	3	4
27	2	2	4	1	1	5	5	5	4	4	3	1	1	2	1	4	1	1	4	4	4	2	4	3	5
28	2	2	2	2	3	4	5	5	5	5	1	1	2	2	2	5	3	4	4	2	4	5	5	4	4
29	2	2	2	1	1	4	4	5	5	4	4	4	3	3	2	5	2	3	2	4	4	3	3	3	5
30	2	1	2	1	1	3	3	4	4	4	4	3	4	3	3	4	2	4	4	4	4	2	3	4	4
31	2	2	2	1	1	5	4	4	5	4	5	3	5	5	3	5	2	4	4	5	4	4	5	4	5
32	1	2	1	1	2	5	4	5	4	5	3	2	5	5	5	5	2	2	3	5	5	5	5	5	5
33	2	2	1	1	2	5	5	5	5	5	4	5	5	4	3	3	2	3	4	2	5	5	4	4	4
34	2	2	1	1	1	5	5	4	5	5	5	4	5	5	4	3	1	2	3	5	4	4	3	3	4
35	2	2	2	1	1	5	5	5	5	4	5	4	5	3	4	3	1	4	2	4	5	5	5	4	5
36	2	2	1	1	1	4	4	5	5	5	4	4	4	4	3	5	2	2	2	4	4	3	4	4	5
37	2	2	2	1	2	4	4	4	4	4	3	3	4	5	3	4	2	4	5	5	4	3	4	4	5
38	2	2	3	1	2	5	4	4	4	4	4	4	4	4	4	4	3	4	3	2	4	4	4	4	4
39	2	2	1	2	2	5	4	4	4	4	4	3	5	5	4	4	2	4	4	5	5	5	4	4	4
40	3	2	3	2	2	4	5	4	4	4	4	3	4	4	4	5	2	4	2	2	4	4	4	4	5
41	3	2	1	1	1	5	5	4	5	4	4	4	4	5	1	5	2	2	2	4	4	4	4	4	4
42	1	2	1	1	1	5	4	4	4	4	1	1	3	3	1	4	2	3	3	4	4	4	4	4	4
43	1	1	1	1	1	4	4	4	5	4	4	2	3	4	4	3	2	2	2	5	5	4	4	3	1
44	3	2	1	1	1	4	4	4	4	4	4	4	3	3	1	5	2	4	4	4	4	4	4	4	4

45	2	2	2	1	1	4	4	4	4	4	3	1	3	3	3	4	3	3	3	5	3	3	3	3	5
46	2	2	1	1	1	5	4	4	4	4	4	3	3	4	3	4	2	3	4	3	4	4	4	4	4
47	2	2	2	1	2	5	4	3	5	5	4	1	3	2	4	5	2	4	3	5	3	2	3	3	5
48	2	1	1	1	1	5	5	4	4	5	5	3	5	5	1	5	2	3	2	4	5	4	4	4	4
49	2	2	3	1	1	4	4	4	4	3	3	1	1	3	5	4	3	3	4	4	5	5	5	3	5
50	2	2	4	2	2	5	5	5	5	5	5	5	5	5	4	5	1	1	1	1	5	5	5	5	5
51	2	2	2	1	2	4	5	5	4	5	3	3	2	3	1	5	2	2	1	1	5	4	5	5	5
52	2	2	2	1	2	4	5	4	5	4	4	3	3	4	1	5	5	5	2	5	4	4	4	3	5
53	2	2	2	2	2	4	5	5	5	5	5	5	4	5	4	5	4	4	4	5	5	4	4	5	5
54	3	2	2	1	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
55	2	2	1	1	2	4	4	4	4	5	4	4	4	5	5	4	4	4	4	5	5	4	5	4	5
56	3	2	1	1	1	4	5	3	5	4	3	4	3	4	4	5	3	4	3	5	4	3	3	3	3
57	2	2	4	1	2	5	4	4	4	4	3	2	4	2	3	4	3	4	4	3	3	3	3	3	4
58	3	2	1	1	2	5	4	5	4	4	3	4	4	4	1	4	2	2	2	3	4	5	4	4	5
59	1	1	1	2	1	4	5	4	5	5	3	1	2	3	4	5	4	4	4	3	4	5	5	4	4
60	1	1	1	2	1	3	5	4	5	5	2	4	2	4	3	1	1	5	5	3	5	4	4	3	5
61	1	2	1	1	2	5	4	3	5	4	4	5	4	5	4	5	2	4	3	1	4	2	3	4	5
62	3	2	2	1	1	4	5	3	5	4	4	2	4	2	1	2	2	4	3	2	5	3	4	4	5
63	1	1	2	1	1	4	4	4	4	4	4	3	2	3	1	4	4	4	2	2	4	2	5	4	4
64	1	2	1	1	2	3	4	4	3	3	4	1	5	3	1	4	3	5	5	5	3	4	4	3	5
65	2	1	2	2	1	5	5	5	5	5	3	2	3	2	1	5	4	5	1	4	5	5	5	5	5
66	2	2	3	1	1	4	4	4	5	4	4	3	4	5	2	5	1	3	4	2	4	5	5	4	4
67	2	2	1	1	1	5	5	4	5	5	4	3	4	3	4	3	2	3	4	3	4	3	4	4	4
68	2	2	2	1	1	4	5	4	5	4	3	3	3	4	2	5	3	3	4	4	5	4	4	4	5
69	3	2	2	2	2	3	4	3	4	2	3	3	2	3	1	4	2	5	3	2	4	4	4	4	4
70	2	1	4	3	1	5	5	5	5	5	3	1	5	4	4	5	2	4	5	4	5	5	5	5	4
71	3	1	2	2	2	4	4	3	4	4	4	3	3	2	2	5	2	2	4	2	4	3	4	4	5
72	3	2	1	1	1	4	4	4	4	3	3	3	3	2	3	4	2	2	2	5	4	3	3	3	5
73	3	2	1	2	1	5	5	5	5	5	3	2	2	1	1	5	2	3	2	4	4	3	4	4	5
74	3	2	2	1	1	4	5	5	5	3	2	1	3	2	1	2	1	3	5	4	3	4	4	3	5
75	3	2	1	1	1	5	4	4	5	4	4	3	4	4	2	4	1	3	3	2	4	3	4	3	5
76	3	2	2	1	1	5	3	3	4	5	4	4	4	4	1	2	2	5	2	2	4	3	3	4	5
77	3	2	3	1	1	4	4	3	4	3	3	3	2	3	2	3	2	2	1	1	4	1	1	1	5
78	3	2	2	1	1	5	5	4	4	3	5	2	3	3	4	5	2	5	4	3	5	4	5	5	5
79	3	2	2	2	1	5	5	4	5	5	3	3	4	3	4	4	1	3	2	2	4	4	4	3	5
80	3	2	1	2	1	1	4	3	3	3	1	1	1	1	2	3	3	2	4	2	4	3	3	3	5
81	1	2	1	1	2	4	4	4	4	4	4	4	4	4	1	4	3	4	4	4	4	5	5	4	5
82	1	1	2	1	1	5	5	5	5	5	3	3	2	3	3	5	3	3	3	3	4	4	4	4	4
83	3	2	2	1	2	4	4	5	5	4	3	1	5	5	1	5	2	3	3	4	4	2	3	3	5
84	1	2	1	1	1	5	5	5	5	5	4	5	4	5	4	5	5	4	4	1	4	4	3	4	5
85	3	2	1	1	1	4	4	4	4	4	5	4	5	4	2	4	2	4	2	2	4	4	4	4	4
86	3	2	2	1	1	5	5	5	5	5	4	2	5	4	4	5	1	5	5	1	5	5	5	5	5
87	3	2	2	2	2	5	5	5	5	5	4	2	4	4	1	4	2	2	4	4	5	5	5	5	4
88	3	2	1	1	1	5	4	4	4	5	4	3	4	4	5	2	1	4	1	1	5	4	4	4	4
89	1	2	1	1	2	5	5	5	5	5	5	5	5	5	5	5	2	3	5	4	5	5	5	5	4
90	3	2	1	1	1	5	5	5	5	5	5	5	5	4	3	5	1	1	1	1	5	5	5	5	5
91	1	1	2	1	1	5	5	5	5	5	3	2	2	3	1	4	3	3	3	3	5	3	4	3	4
92	2	2	4	1	1	5	5	5	4	4	3	1	1	2	1	4	1	1	4	4	4	2	4	3	5
93	2	2	2	2	3	4	5	5	5	5	1	1	2	2	2	5	3	4	4	2	4	5	5	4	4
94	2	2	2	1	1	4	4	5	5	4	4	4	3	3	2	5	2	3	2	4	4	3	3	3	5

95	2	1	2	1	1	3	3	4	4	4	4	3	4	3	3	4	2	4	4	4	4	2	3	4	4
96	2	2	2	1	1	5	4	4	5	4	5	3	5	5	3	5	2	4	4	5	4	4	5	4	5
97	1	2	1	1	2	5	4	5	4	5	3	2	5	5	5	5	2	2	3	5	5	5	5	5	5
98	2	2	1	1	2	5	5	5	5	5	4	5	5	4	3	3	2	3	4	2	5	5	4	4	4
99	2	2	1	1	1	5	5	4	5	5	5	4	5	5	4	3	1	2	3	5	4	4	3	3	4
100	2	2	2	1	1	5	5	5	5	4	5	4	5	3	4	3	1	4	2	4	5	5	5	4	5
101	2	2	1	1	1	4	4	5	5	5	4	4	4	4	3	5	2	2	2	4	4	3	4	4	5
102	2	2	2	1	2	4	4	4	4	4	3	3	4	5	3	4	2	4	5	5	4	3	4	4	5
103	2	2	3	1	2	5	4	4	4	4	4	4	4	4	4	4	3	4	3	2	4	4	4	4	4
104	2	2	1	2	2	5	4	4	4	4	4	3	5	5	4	4	2	4	4	5	5	5	4	4	4
105	3	2	3	2	2	4	5	4	4	4	4	3	4	4	4	5	2	4	2	2	4	4	4	4	5
106	3	2	1	1	1	5	5	4	5	4	4	4	4	5	1	5	2	2	2	4	4	4	4	4	4
107	1	2	1	1	1	5	4	4	4	4	1	1	3	3	1	4	2	3	3	4	4	4	4	4	4
108	1	1	1	1	1	4	4	4	5	4	4	2	3	4	4	3	2	2	2	5	5	4	4	3	1
109	3	2	1	1	1	4	4	4	4	4	4	4	3	3	1	5	2	4	4	4	4	4	4	4	4
110	2	2	2	1	1	4	4	4	4	4	3	1	3	3	3	4	3	3	3	5	3	3	3	3	5
111	2	2	1	1	1	5	4	4	4	4	4	3	3	4	3	4	2	3	4	3	4	4	4	4	4
112	2	2	2	1	2	5	4	3	5	5	4	1	3	2	4	5	2	4	3	5	3	2	3	3	5
113	2	1	1	1	1	5	5	4	4	5	5	3	5	5	1	5	2	3	2	4	5	4	4	4	4
114	2	2	3	1	1	4	4	4	4	3	3	1	1	3	5	4	3	3	4	4	5	5	5	3	5
115	2	2	4	2	2	5	5	5	5	5	5	5	5	5	4	5	1	1	1	1	5	5	5	5	5
116	2	2	2	1	2	4	5	5	4	5	3	3	2	3	1	5	2	2	1	1	5	4	5	5	5
117	2	2	2	1	2	4	5	4	5	4	4	3	3	4	1	5	5	5	2	5	4	4	4	3	5
118	2	2	2	2	2	4	5	5	5	5	5	5	4	5	4	5	4	4	4	5	5	4	4	5	5
119	3	2	2	1	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
120	2	2	1	1	2	4	4	4	4	5	4	4	4	5	5	4	4	4	4	5	5	4	5	4	5
121	3	2	1	1	1	4	5	3	5	4	3	4	3	4	4	5	3	4	3	5	4	3	3	3	3
122	2	2	4	1	2	5	4	4	4	4	3	2	4	2	3	4	3	4	4	3	3	3	3	3	4
123	3	2	1	1	2	5	4	5	4	4	3	4	4	4	1	4	2	2	2	3	4	5	4	4	5
124	1	1	1	2	1	4	5	4	5	5	3	1	2	3	4	5	4	4	4	3	4	5	5	4	4
125	1	1	1	2	1	3	5	4	5	5	2	4	2	4	3	1	1	5	5	3	5	4	4	3	5
126	1	2	1	1	2	5	4	3	5	4	4	5	4	5	4	5	2	4	3	1	4	2	3	4	5
127	3	2	2	1	1	4	5	3	5	4	4	2	4	2	1	2	2	4	3	2	5	3	4	4	5
128	1	1	2	1	1	4	4	4	4	4	4	3	2	3	1	4	4	4	2	2	4	2	5	4	4
129	1	2	1	1	2	3	4	4	3	3	4	1	5	3	1	4	3	5	5	5	3	4	4	3	5
130	2	1	2	2	1	5	5	5	5	5	3	2	3	2	1	5	4	5	1	4	5	5	5	5	5
131	1	1	1	1	1	4	4	4	5	4	4	2	3	4	4	3	2	2	2	5	5	4	4	3	1
132	3	2	1	1	1	4	4	4	4	4	4	4	3	3	1	5	2	4	4	4	4	4	4	4	4
133	2	2	2	1	1	4	4	4	4	4	3	1	3	3	3	4	3	3	3	5	3	3	3	3	5
134	2	2	1	1	1	5	4	4	4	4	4	3	3	4	3	4	2	3	4	3	4	4	4	4	4
135	2	2	2	1	2	5	4	3	5	5	4	1	3	2	4	5	2	4	3	5	3	2	3	3	5
136	2	1	1	1	1	5	5	4	4	5	5	3	5	5	1	5	2	3	2	4	5	4	4	4	4
137	2	2	3	1	1	4	4	4	4	3	3	1	1	3	5	4	3	3	4	4	5	5	5	3	5
138	2	2	4	2	2	5	5	5	5	5	5	5	5	5	4	5	1	1	1	1	5	5	5	5	5
139	2	2	2	1	2	4	5	5	4	5	3	3	2	3	1	5	2	2	1	1	5	4	5	5	5
140	2	2	2	1	2	4	5	4	5	4	4	3	3	4	1	5	5	5	2	5	4	4	4	3	5
141	2	2	2	2	2	4	5	5	5	5	5	5	4	5	4	5	4	4	4	5	5	4	4	5	5
142	3	2	2	1	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
143	2	2	1	1	2	4	4	4	4	5	4	4	4	5	5	4	4	4	4	5	5	4	5	4	5
144	3	2	1	1	1	4	5	3	5	4	3	4	3	4	4	5	3	4	3	5	4	3	3	3	3

145	2	2	4	1	2	5	4	4	4	4	3	2	4	2	3	4	3	4	4	3	3	3	3	3	4
146	3	2	1	1	2	5	4	5	4	4	3	4	4	4	1	4	2	2	2	3	4	5	4	4	5

GENDER: 1 = Male, 2 = Female; ACADEMIC LEVEL: 1 = Year 1, 2 = Year 2, 3 = Year 3; AGE: 1 = 18-21, 2 = 22-25, 3 = 26-29, 4 = 30 Above; Access to Technology: 1 = smartphone, 2 = laptop, 3 = Tablet, 4 = none; INTERNET ACCESS: 1 = Always available, 2 = sometimes available, 3 = Rarely available, 4 = not available; KNOWLEDGE OF AI NURSING: 1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree; UTILISATION OF AI: 1 = Never, 2 = rarely, 3 = occasionally, 4 = frequently, 5 = very frequently; CHALLENGES OF AI: 1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree; PERCEPTION AND ATTITUDE: 1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

APPENDIX IV

Department Of Nursing Sciences,
Faculty Of Basic Medical Sciences,
College Of Health Sciences.
Benue State University.
Makurdi.
7TH April, 2025.

The Chairman,
Research and Ethical Committee,
College Of Health Sciences,
Benue State University,
Makurdi.

Sir,

REQUEST FOR ETHICAL APPROVAL

I wish to seek permission to carry out my final-year research among nursing students at the Makurdi College of Nursing Sciences, Makurdi, Benue State.

I am **Saawuan, Stephen Torkuma** with matriculation number **BSU/BM/NUR/18/1036**, conducting research on **"Artificial Intelligence in Nursing Education: Knowledge and Utilization Among Students of Makurdi College of Nursing Sciences, Benue State, Nigeria."**

Attached are copies of Chapters One to Three, the instruments for data collection, and a letter of introduction from the Head of the Department of Nursing Science, College of Health Sciences, Benue State University, Makurdi.

I would be grateful if my request is given due consideration.

Thank you.

Yours faithfully,

Saawuan, Stephen Torkuma

+234 906 039 1752 +234 812 882 3774

APPENDIX V

Department Of Nursing Sciences,
Faculty Of Basic Medical Sciences,
College Of Health Sciences.
Benue State University.
Makurdi.
14TH April, 2025.

The Chairman,
Research and Ethical Committee,
Makurdi College of Nursing Sciences,
Makurdi,
Benue State.

Sir/Ma

REQUEST FOR DATA COLLECTION

I am writing to seek permission to carry out my final-year research among nursing students at the Makurdi College of Nursing Sciences, Makurdi, Benue State.

My name is **Saawuan Stephen Torkuma**, with matriculation number **BSU/BM/NUR/18/1036**, currently conducting a research study titled: "**Artificial Intelligence in Nursing Education: Knowledge and Utilization Among Students of Makurdi College of Nursing Sciences, Benue State, Nigeria.**"

Attached to this letter are the following documents: A letter of introduction from the Head, Department of Nursing Science, ethical clearance approval from the Chairman, Research and Ethical Committee, College of Health Sciences, Benue State University, Makurdi, and a hard copy sample of the data collection instrument (questionnaire).

Data collection will be conducted electronically via **Google Forms** and will be used strictly for research and academic purposes only, in full compliance with ethical research standards.

I would be sincerely grateful if my request is granted.

Thank you for your kind consideration.

Yours faithfully,

Saawuan, Stephen Torkuma
+234 906 039 1752 +234 812 882 3774