THE EFFECTS OF AI-POWERED CHATBOTS ON STUDENT ACADEMIC PERFORMANCE

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BY

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A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE, FACULTY OF PHYSICAL SCIENCE, UNIVERSITY OF BENIN, BENIN CITY

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF A BACHELOR OF SCIENCE (B.Sc.) DEGREE IN COMPUTER SCIENCE

NOVEMBER, 2025

CERTIFICATION

This is to certify that this project work was carried out by OAIKHENA EBOSEREMEN VICTORIA with Matriculation Number PSC2207948 under my supervision. It is adequate and satisfactory, both in scope and content, for the award of Bachelor of Science (B.Sc) Degree in Computer Science of the University of Benin.

_____ _____

MRS. LINDA OSARUMEN USIOSEFE **DATE**

(Project Supervisor)

APPROVAL

This project work is hereby approved in partial fulfilment of the requirements for the award of Bachelor of Science (B.Sc.) Degree in Computer Science from the University of Benin

_____ _____

DR. (MRS) ROSEMARY O. USIOBAIFO **DATE**

(HEAD OF DEPARTMENT)

DEDICATION

I dedicate this work to God, for giving me the strength and guidance to properly carry out and complete the work and also for his protection throughout my time at the University of Benin.

This work is also dedicated to every member of my family, for making this journey possible and supporting me in every area. The encouragement and guidance really helped make the journey worth it.

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ABSTRACT

This study looks at how AI-powered chatbots affect student academic performance. It focuses on how these systems impact learning efficiency, engagement, and overall outcomes. As artificial intelligence becomes more common in education, chatbots are increasingly used as virtual learning assistants. They provide instant feedback, personalized study support, and interactive experiences.

The research uses both quantitative and qualitative methods to evaluate students' perceptions, usage patterns, and performance data before and after interacting with chatbots. The findings show that AI chatbots significantly improve students' understanding of course materials, encourage self-paced learning, and increase access to academic resources. However, the study also points out challenges, such as students becoming too reliant on automated responses and limited development of critical thinking skills.

In conclusion, the research emphasizes that while AI-powered chatbots can be effective educational tools, their benefits are greatest when combined with traditional teaching methods and guided human interaction.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The rise of Generative Artificial Intelligence (GenAI) and Large Language Models (LLMs) has changed higher education around the world. AI-driven chatbots and Intelligent Tutoring Systems (ITS) now act as key learning tools. They provide immediate feedback, correct errors, and offer personalized academic support.

In Nigeria, early research by Okonkwo and Ade-Ibijola (2021) showed that chatbots could improve service delivery, enhance resource use, and encourage innovation in higher education. Recent studies from universities in Southeast Nigeria found a clear connection between frequent use of AI-based teaching tools and better academic results. Many students believe that AI-assisted learning is more effective than traditional approaches.

The World Bank Group (2025) reported that a short-term generative AI program in Nigeria boosted learning performance by 0.3 standard deviations (SD), which is nearly the same as two years of academic progress, particularly benefiting female students. This underscores AI's ability to advance educational fairness and decrease gender disparities.

Research in Nigeria from 2021 to 2025 shows a growing awareness and use of AI tools in secondary, distance, and higher education (Ndunagu et al., 2025; Ojo, 2024). However, experts caution that successful integration relies on appropriate regulation, digital skills, and ethical practices to avoid problems like misinformation and academic dishonesty (Sanusi, 2025).

Despite these developments, there is still limited research on how AI-powered chatbots specifically affect student performance in Nigeria. This study aims to explore their impact and educational effects within higher education institutions.

1.2 Problem Statement

While AI-powered chatbots have great potential to improve students' academic performance, implementing them effectively and affordably in Nigeria faces significant challenges (Ayelaagbe, 2025). The main barriers include unreliable internet access, limited availability of modern technology, and a persistent digital divide. As Ibe and Siyanbola (2022) state, introducing AI without addressing these fundamental issues could worsen existing educational inequalities, especially for students in rural and underserved areas. This situation creates an "equity paradox," where those who could benefit most from AI often lack the access needed to use it effectively.

Another major concern is academic honesty. Generative AI tools can easily create sophisticated content, which increases the risk of plagiarism and undermines the authenticity of student work. This trend requires a renewed focus on assessment design and the ethical use of technology in education. Governance and ethical issues also persist, as highlighted by Ajayi and Ogunleye (2021) and Amadi (2021). Problems like algorithmic bias, data privacy concerns, and weak

regulatory oversight threaten to damage trust in AI systems and the credibility of higher education institutions.

Moreover, research on the long-term academic effects of AI chatbots in Nigerian universities is limited. Existing studies, such as those by Ojo (2024) and Investigating the Awareness and Adoption of ChatGPT (2024), mainly focus on awareness and perception rather than actual learning outcomes. Factors like unreliable internet, limited device access, and low instructor readiness contribute to inconsistent results across institutions (Sanusi, 2025; Ndunagu et al., 2025).

These gaps hinder educators and policymakers from accurately assessing how well AI-powered chatbots support student learning in Nigeria or from figuring out the best ways to integrate them responsibly into higher education.

1.3. Aims and Objectives of the Study

Aims and objectives of the study

To examine the impact of AI-powered chatbots on student academic performance in Nigerian education, focusing on both positive and negative effects. The study considers the academic system, lecturing processes, and students' needs for AI support.

Specific objectives:

a. To measure the effect of AI-powered chatbots on student achievement (e.g., test scores, task accuracy, and retention).

b. To study how design features such as feedback type, personalization/adaptation, and thinking ability influence learning.

c. To evaluate how contextual factors (digital readiness, teacher facilitation, and internet access) influence chatbot effectiveness.

d. To investigate students' and teachers' perceptions of the usefulness of chatbots and their ethical issues, such as academic integrity and trust in AI results.

e. Develop recommendations for scalable, equitable, and effective deployment of chatbots in Nigerian education.

1.4 Significance of the Study

This study provides evidence to improve the use of AI-powered chatbots in Nigerian higher education. The findings will help policymakers and institutions, such as TETFUND and NUC, make informed decisions about investing in AI-based learning infrastructure and creating fair, ethical policies for its use.

For educators, the study emphasizes the academic advantages of AI chatbots and advocates for curriculum development that leverages AI to improve learning while preserving originality and critical thinking.

It also helps developers create culturally and contextually appropriate AI tools tailored to Nigeria's educational needs. Overall, the study adds to both research and practice by providing insights that encourage effective, responsible, and fair use of AI in Nigerian universities.

The study seeks to optimize learning benefits for diverse Nigerian learners while reducing potential risks, such as hallucinations and abuse, by providing evidence-based recommendations.

1.5. Scope of the Study

This review examines how AI-powered chatbots and Intelligent Tutoring Systems (ITS) affect the academic performance of tertiary students, both positively and negatively. The scope is limited to studies conducted at or applied within the University of Benin in Benin City, Nigeria. It covers the latest discussions and the first localized assessment of GenAI technology in the region.

The study gathers qualitative data from students and teachers on perceived benefits and challenges, while also focusing on measurable academic outcomes, including both summative and formative assessments, as well as process indicators such as engagement metrics and feedback loops. Rather than performing a nationwide survey of all chatbot implementations, it employs purposeful sampling to analyze common infrastructure conditions and representative pilot environments within Nigerian institutions.

1.6. Limitations of the Study

This study may face limitations such as:

a. Limited access to accurate academic performance records due to privacy concerns.

b. Possible bias in students' responses during data collection.

c. The rapidly changing nature of AI technology, which may affect the generalization of the findings.

d. Lastly, infrastructural constraints, such as bandwidth and device access, may necessitate hybrid or offline adaptations, limiting the generalizability of findings to settings with stable internet connectivity.

Despite these challenges, efforts will be made to ensure the reliability and validity of the data collected.

1.7. Definition of Terms

For this review, the following academic terms are defined:

a. **AI-powered chatbot:** A software agent that uses artificial intelligence (including rule-based logic or machine learning/LLMs) to generate natural language responses and communicate with users for instruction or support purposes.

b. **Intelligent Tutoring Systems (ITS):** A specific AI application that customizes content, pace, and difficulty based on each student's needs and personality traits to provide learners with dynamic, personalized training and feedback.

c. **Large language model (LLM):** A neural network model trained on large text datasets to predict and generate human-like language (e.g., ChatGPT).

d. **Student academic performance:** Observable and measurable indicators of learning include scores on standardized tests, course exams, task accuracy, retention measures, and demonstrations of transfer or higher-order cognition.

e. **Technology Acceptance Model (TAM):** A theoretical model describing technology adoption based on perceived usefulness and perceived ease of use, often referenced in Nigerian studies on ChatGPT adoption.

f. **Digital Divide:** The societal and educational inequality between individuals, institutions, or regions that have consistent access to modern information and communications technology and those that lack it (Ibe & Siyanbola, 2022).

CHAPTER TWO

LITERATURE REVIEW

INTRODUCTION: CONCEPTUALIZING AI IN ACADEMIC ECOSYSTEMS

2.1. CONTEXTUALIZATION: THE SHIFT TOWARD GENERATIVE AI IN HIGHER EDUCATION

A new era in global education has emerged with the rise of advanced Generative Artificial Intelligence (GenAI) and Large Language Models (LLMs). AI chatbots are rapidly evolving from supporting tools to vital components of university academic systems worldwide, leveraging machine learning and deep learning technologies (Mageira et al., 2022; Wang et al., 2023). These interactive platforms imitate human conversation, provide instant feedback, simplify the correction of writing errors, and efficiently answer students' questions across various academic tasks.

This review systematically assesses how this technology impacts students' academic performance. It evaluates academic achievement through measurable learning outcomes, retention rates, and the development of higher-order cognitive skills. The analysis emphasizes the rapidly expanding body of research on Nigerian higher education institutions (HEIs) from 2021 to 2025, exploring both the innovative potential of adoption and its specific structural limitations.

2.2. Defining the Constructs: AI Chatbots, ITS.

For practical clarity, the terminology used for AI in education should be precisely defined.

a. **AI-Powered Chatbots:** These interactive systems are designed to engage users in natural conversation, often powered by LLMs. In education, they act as virtual assistants, providing administrative support, real-time feedback, and help with content development and academic writing.
b. **Intelligent Tutoring Systems (ITS):** ITS, a specific subset of AI technologies, aim to deliver instant, tailored education and feedback to students. By using AI to adapt the pace, difficulty, and focus of lessons according to a student's demonstrated abilities and limitations, these systems effectively emulate the advantages of personal human tutoring through cognitive models.

2.3. Theoretical Frameworks Governing Chatbot Adoption and Learning Efficacy

It is essential to situate the research findings within well-established theoretical frameworks governing technology acceptance and instructional design to evaluate the impact of AI chatbots on academic performance properly.

2.3.1 The Technology Acceptance Model (TAM) and Adoption Intent

The Technology Acceptance Model (TAM), a fundamental theory in information systems developed by Fred Davis, provides a strong framework for predicting how users will adopt new technology. It suggests that the Behavioral Intention (BI) to use a system mainly depends on two key factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).

2.3.2 Perceived Usefulness (PU)

PU refers to how much a person believes that using a specific system will boost their performance on a task. In education, this means believing that an AI chatbot can help achieve higher grades, complete tasks faster, or better understand material.

2.3.3 Perceived Ease of Use (PEOU) refers to the belief that using the technological system will be effortless and straightforward.

2.4 The Technology Acceptance Model TAM in the Nigerian Context

Recent studies on the adoption of GenAI tools like ChatGPT among Nigerian undergraduates confirm the model's usefulness. Research shows a significant positive effect of both PU and PEOU on students' intentions to use the technology. For example, perceived usefulness items such as making assignments easier, boosting motivation, and enhancing understanding scored high means (above 3.2 on a 4-point scale) among Nigerian students.

a. **Cognitive Load Theory (CLT) and AI-Mediated Instruction**
   Cognitive Load Theory (CLT) explains why AI chatbots and Intelligent Tutoring Systems (ITS) are effective in enhancing learning outcomes. CLT states that human working memory has limited capacity, especially compared to long-term memory.
   Good instructional design aims to reduce unnecessary mental effort, known as extraneous load, to free up working memory for relevant learning tasks. This allows students to actively build new knowledge more efficiently.
   Intelligent teaching systems are especially effective at handling workloads efficiently. AI alleviates mental fatigue by breaking down complex concepts, offering customized assistance, and arranging data into clear, understandable formats.
   Research comparing tasks supported by chatbots to those performed only with software shows that chatbots improve teaching efficiency. Users report less mental stress, fewer feelings of unhappiness, and higher work quality. By enhancing working memory, AI-driven instruction fosters more profound understanding and better learning outcomes.

b. **Developed Positive Effects on Academic Performance and Learning Outcomes**
   The evidence clearly shows that AI-powered chatbots and ITS are practical tools for enhancing academic performance and significantly improving learning outcomes.

c. **Enhancing Personalized Learning and Academic Engagement**

A key advantage of integrating AI is its ability to provide adaptive instruction. Intelligent Tutoring Systems (ITS) customize educational content by modifying the pace, difficulty, and focus of lessons according to each student's needs and skill levels. This level of personalization ensures that instruction is effectively targeted, enhancing understanding and retention. As a result, students become more engaged in their learning process.

AI systems excel at providing real-time feedback, essential for effective learning. Chatbots can swiftly evaluate writing, grammar, and concepts, helping to prevent misconceptions and reinforce understanding promptly. Their quick responses to common questions support continuous learning and enhance the student experience.

2.5 Support for Higher-Order Skills and Idea Generation

AI chatbots are increasingly used for academic support beyond basic Q&A. They significantly improve writing quality, help students develop in-depth questions about complex course topics, and assist in creating simple content outlines. The technology also fosters creativity by generating ideas and aids information organization through data visualization and outline development. AI tools enable students to efficiently organize and categorize large amounts of knowledge, freeing up mental energy to focus on key ideas and strengthening their connection to the subject.

2.6 Adverse Developed Effects, Ethical Dilemmas, and Cognitive Risks

The development of essential mental skills and the integrity of academic assessment are directly endangered by the use of AI chatbots, despite the significant benefits.

a. The Crisis of Academic Integrity and Genuine Assessment

The swift emergence of GenAI tools has heightened faculty worries about academic dishonesty, especially given how easily students can produce advanced, original-looking content and claim it as their own. This technological aid for plagiarism and cheating requires a fundamental re-evaluation of academic assessments.

However, analysis of academic integrity shows that while AI offers a powerful tool for cheating, the real motivations often come from systemic problems in the educational system, such as excessive student stress or pressure, rather than just access to technology. Still, the ease of content creation pushes educators to redesign assignments to lessen the chances of cheating. Moreover, research indicates that AI can also be used to detect plagiarism, creating a paradox in which the technology both causes and helps solve integrity issues.

b. Risk of Cognitive Deskilling and Intellectual Over-Reliance

Relying too heavily on AI for quick information and content creation can impede the development of essential creative thinking and research skills, potentially restricting a student's ability to produce original ideas and contribute significantly to academic discussions.

c. Algorithmic Uncertainty, Bias, and Validation

Generative AI chatbots can produce inaccuracies, known as "hallucinations" or falsifications. This inherent unreliability places the responsibility for validation and verification squarely on the student, requiring high levels of AI literacy and critical thinking skills.

In the Nigerian context, ethical concerns regarding AI integration are especially significant. Research shows that if AI systems are poorly trained or managed, algorithmic bias could unintentionally reinforce existing gender, racial, or socioeconomic inequalities in academic assessments (Ajayi & Ogunleye, 2021). Upholding the essential role of human teachers and establishing clear ethical guidelines are shared responsibilities among developers, educators, policymakers, and students to ensure that AI use promotes balanced learning autonomy.

d. Psychosocial Impacts and Student Well-being

The widespread adoption of AI in higher education raises concerns about students' overall well-being. Issues such as digital fatigue, heightened technostress, and loneliness may arise. If students depend too heavily on AI for academic help, face-to-face interactions could decline, potentially weakening interpersonal skills and increasing social isolation. Thus, a balanced approach to integrating AI is essential to promote both academic achievement and mental and social health.

2.7 The Nigerian Context: Structural Barriers and Policy Imperatives

While studies indicate that AI greatly enhances learning outcomes in Nigerian higher education institutions, realizing this potential depends on overcoming key local institutional obstacles.

a. The Digital Divide and Infrastructure Limitations

The adoption of AI technologies in Nigeria faces a major obstacle due to widespread digital inequality (Ibe & Siyanbola, 2022). Limited access to stable internet and modern infrastructure, especially in remote and rural areas, threatens to deepen existing educational inequalities if AI is broadly implemented. Ibe and Siyanbola (2022) warn that ignoring this digital gap could reinforce social and educational disparities, making AI a tool of exclusion rather than inclusion. Additionally, economic challenges hinder both public and private sector investment in the required AI infrastructure, further exacerbating the issue.

b. Ethical Governance and Data Sovereignty

Since AI systems depend heavily on student data, the risks of data privacy breaches and misuse increase in environments where privacy laws and institutional governance are weak.

2.7.1 Implications for Policy and Institutional Strategy

Nigerian academic research offers clear guidance for integrating technology strategically. For example, studies at Adeyemi Federal University of Education in Ondo show that undergraduates frequently perceive and use chatbots for academic tasks (Ayelaagbe, 2025). The study advises universities to create and deploy chatbots tailored to support undergraduate students, emphasizing features that boost academic success by prioritizing personalization and simplicity.

Ajayi and Ogunleye (2021) and Jaja and Ossat (2025) consistently emphasize that establishing and implementing necessary guidelines and a structured national framework is essential before AI is widely adopted in Nigerian higher education.

The following tables describe factual data and structural risks to summarize the main conclusions unique to the Nigerian context:

This table presents past research, along with the findings and outcomes reported by various authors.

Author(s) & Year	Context/Institution	Key Finding on Academic Performance	Relevance to Chatbots/ITS
Okonkwo & Ade-Ibijola (2021)	Nigerian HEIs	Identified potential for service enhancement and innovation.	Established early recognition of AI utility in the sector.
Agbo et al. (2023)	South-East Nigerian Universities	Strong positive correlation between frequent AI tool use and better academic outcomes.	Provides local evidence linking high utilization to enhanced analytical skills.
Ayelaagbe, S.O. (2025)	Adeyemi Federal University of Education, Ondo	Perceived usefulness and practical use for academic purposes are confirmed.	Validates the applicability of TAM; justifies investment in personalized learning features.
World Bank Group (2025)	Nigerian Learning Intervention	Striking learning improvements; most significant effects for female students.	Demonstrates AI's transformative, high-efficacy potential and its role as an equity tool in low-resource settings.

Table 2.1 *Practical Findings on AI Chatbot Effects in Nigerian Higher Education (2021–2025)*

This table highlights the threats AI adoption poses to Nigeria's academic system.

Threat Category	Specific Concern	Supporting Nigerian	Impact on

		Citation (2021–2022)	Performance
Digital Inequality	Infrastructure constraints exacerbate differences between students in urban and rural areas.	Ibe & Siyanbola (2022); Ajayi & Ogunleye (2021)	Limits access to practical AI tools, concentrating performance benefits among privileged groups.
Data Privacy	Risk of data misuse/mishandling due to weak regulatory frameworks.	Amadi (2021)	Undermines student trust and inhibits the reliable scaling of data-intensive AI systems.
Algorithmic Bias	AI systems have the potential to increase already-existing socioeconomic gaps in evaluation.	Ajayi & Ogunleye (2021)	Risks unfair academic evaluations and systemic reinforcement of inequality.

***Table 2.2**: Structural Threats to AI Adoption in Nigeria.*

2.8 Conclusion and Future Research Trajectories

Synthesizing and Reconciling Global Promises with Local Realities

Integrating AI-powered chatbots and Intelligent Tutoring Systems into academic frameworks has consistently shown significant, measurable improvements in student academic performance, thanks to highly personalized learning experiences, instant feedback mechanisms, and cognitive load management (CLT).

The Technology Acceptance Model (TAM) confirms strong student acceptance in Nigeria, with notable transformative learning gains (around 0.3 SD), highlighting AI's significant potential, particularly in addressing gender disparities.

However, realizing this potential is currently heavily limited by structural issues specific to the regional setting. The dangers of digital inequality, along with inadequate national infrastructure and unclear ethical rules on data privacy and algorithmic bias, suggest that AI may serve to exclude rather than include (Ibe & Siyanbola, 2022).

Recommendations for Policy and Practice in African HEIs

To maximize the positive impacts of AI while reducing its adverse effects, a series of policy and practice changes is recommended based on a review of real-world research.

1. **Strategic Investment in Infrastructure:** Targeted government and institutional funding in strong infrastructure and AI-powered educational tools is essential to guarantee fair access and create a globally competitive academic landscape.
2. **Curricular and Educational Adaptation:** Faculty should be trained to effectively mediate AI for their students (Akinbobola, 2025). Redesigning curricula is crucial to harnessing AI for enhancement, requiring students to critically analyze and verify AI outputs rather than passively accepting them, thereby helping develop essential critical thinking skills.
3. **Establishment of Ethical Frameworks:** Immediate focus should be on creating regulatory frameworks that address data privacy, uphold data sovereignty, and reduce algorithmic bias, promoting transparency and trust in AI-based assessment systems (Ajayi & Ogunleye, 2021; Amadi, 2021).

Future Research Agenda (Post-2025)

The existing literature identifies key gaps for future research.

1. **Longitudinal Causal Studies:** While short-term benefits are clear, future research needs to use longitudinal studies to accurately measure the long-term effects of AI dependence on complex problem-solving, intellectual creativity, and critical thinking skills.
2. **Localized Model Development:** Additional data collection is necessary to develop, assess, and validate national AI models and datasets explicitly tailored to meet the linguistic, socio-cultural, and educational needs of Nigerian and regional higher education institutions. This approach aims to lessen reliance on global, non-contextualized Large Language Models.
3. **Faculty Competency and Training Impact:** Research should concentrate on assessing how ongoing faculty training and AI literacy initiatives directly influence student performance, ensuring that educators are prepared to incorporate AI into their teaching methods effectively.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter outlines the research methodology used to systematically examine how AI-powered chatbots impact student academic performance at the University of Benin, Benin City, Edo State. It covers the research design, the study population, sampling methods, development and validation of the research instrument, data collection process, and the statistical techniques applied for data analysis.

3.1. Introduction

This chapter presents the empirical plan for the study, detailing the systematic methods used to collect and analyze data. These methods aim to empirically fulfill the study's objectives and test the research hypotheses. The methodological decisions are driven by the goal of ensuring valid and reliable findings concerning the integration of AI tools at the University of Benin.

3.2. Research Design

The study employs a Descriptive Survey Research Design. This approach is suitable because the main aim is to systematically describe the characteristics, perceptions, and usage patterns of AI chatbots among undergraduate students. Additionally, since the goal is to assess the strength and direction of the relationship between chatbot usage and academic performance, the design includes Correlational Analysis.

To gain a more comprehensive understanding of the phenomenon, the design employs a Mixed-Methods Approach. This approach combines quantitative data gathered through structured questionnaires with the possibility of qualitative insights, such as open-ended responses about over-reliance or breaches of academic integrity. This triangulation of data sources improves the robustness and descriptive detail of the findings, integrating statistical data with detailed descriptions.

3.3. Population of the Study

The target population for this study includes all registered undergraduate students in the Department of Computer Science at the University of Benin. The group covers various academic levels, representing the entire student body about whom conclusions regarding AI chatbot use and performance will be drawn. The study may specifically focus on students who have had documented exposure to academic tasks involving digital or AI tools.

3.4. Sample and Sampling Techniques

The sample is a subset of the entire population chosen to reflect the characteristics of the target group.

a. **Sample Size:** The sample size will be determined using a well-established statistical formula to ensure sufficient statistical power for generalizing the results.

b. **Sampling Technique:** A Stratified Random Sampling method will be used, which involves dividing the population into relevant subgroups (strata) such as academic level (e.g., 200–400 Level, representing students with established academic routines). This approach ensures proportional representation. Within each stratum, Simple Random Sampling will select respondents, giving every student an equal and independent chance of being chosen.

3.5. Research Instrument

The main tool for data collection will be a self-created Structured Questionnaire called the AI-Powered Chatbot Effect on Academic Performance Questionnaire.

The instrument is organized into separate sections aligned with the study objectives and uses a 5-point Likert scale (e.g., Strongly Disagree to Strongly Agree) to measure respondents' perceptions and reported usage behaviors. Key constructs assessed by the questionnaire include:

a. **Technology Acceptance:** Items measuring Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) of AI chatbots.

b. **Developed Effects:** Items assessing enhancement of learning outcomes, engagement, and risks of cognitive deskilling.

c. **Contextual Issues:** Items measuring perceptions of academic integrity risks and infrastructural barriers specific to the Nigerian HEI environment [8]

3.6. Validity and Reliability of the Instrument

3.6.1. Validity

The instrument will undergo checks for Content and Matriculation Number. Copies of the questionnaire will be provided. The review will focus on clarity, ambiguity, relevance of items to the research questions, and consistency with the study constructs. Any corrections and suggestions received will be integrated into the final version.

3.6.2. Reliability

The reliability of the instrument will be established through a pilot study involving a sample of undergraduate students who will not participate in the main study. The questionnaire will be administered to approximately 30 respondents from the target population. The data collected will be analyzed and a minimum reliability coefficient of $\boldsymbol{\alpha \geq 0.70}$ is required to confirm acceptable reliability before final deployment. Items yielding low item-total correlations will be revised or removed to improve the instrument's consistency. This process ensures that the questionnaire produces reliable and consistent measurements of the study constructs.

3.7. Procedure for Data Collection

The following step-by-step process will be used for data collection:

1. **Administration:** The questionnaire will be administered electronically (e.g., through Google Forms, secure institutional email, or academic platforms) to the selected sample, ensuring that voluntary and informed consent is obtained before participation.
2. **Anonymity and Confidentiality:** respondents can be confident that their responses will remain strictly confidential and anonymous. No personally identifiable information will be connected to the data collected.
3. **Retrieval:** The questionnaires will be collected during a set period to ensure a high response rate and reduce data loss.

3.8. Method of Data Analysis

All data collected will be compiled and analyzed with a standard statistical software package, such as the Statistical Package for the Social Sciences (SPSS).

1. **Descriptive Statistics:** Mean scores and standard deviations will be used to analyze demographic data and address research questions related to the frequency of chatbot usage, as well as students' perceptions of usefulness, ease of use, and perceived effects (both positive and negative).
2. **Inferential Statistics:** The Pearson Product-Moment Correlation Coefficient will be employed to examine the relationship between the independent variables, such as AI chatbot utilization frequency and perceived usefulness, and the dependent variable, like student academic performance or adoption intention. Hypotheses will be tested at a specified level of significance.

3.9 Ethical Considerations

The research confirms that all ethical principles guiding educational research will be strictly followed. Participation of respondents will be voluntary. Informed consent was obtained prior to participation.

Additionally, data confidentiality will be preserved throughout the research process. The study will also avoid plagiarism, data manipulation, or any practices that could compromise research integrity, in accordance with the ethical standards outlined by the National Universities Commission (NUC, 2023).

3.10 Summary

This chapter covered the methodology used for the study, including research design, population, sample size, research tools, data collection methods, and analytical techniques. It also emphasized the steps taken to ensure the validity, reliability, and ethical standards of the research. The next chapter offers the analysis and interpretation of the data collected on the effects of AI-powered chatbots on student academic performance in higher education institutions.

Structured Questionnaire titled: The AI-Powered Chatbot Effect on Academic Performance Questionnaire.

Dear Respondent,

This questionnaire is an integral component of a focused academic investigation into the effects of Artificial Intelligence (AI)-powered chatbots on the academic performance of students in Nigerian Higher Education Institutions (HEIs). The study aims to gather empirical data on student perceptions, utilization patterns, and the resultant effects on learning outcomes and academic integrity.

Your participation is entirely voluntary, and all responses will be treated with the utmost confidentiality and used strictly for scholarly purposes. There are no known risks associated with completing this survey.

Please answer all questions honestly and accurately based on your experience with AI tools

Item No.	Parameter	Options
A1.	**Gender**	Male ( ) | Female ( )
A2.	**Level of Study**	100 Level ( ) | 200 Level ( ) | 300 Level ( ) | 400 Level and above ( )
A3.	**Faculty**	(Specify: _____)
A4	**Frequency of AI Chatbot Use for Academic Tasks**	Never ( ) | Rarely (Less than once a month) ( ) | Occasionally (1–3 times a month) ( ) | Frequently (Once a week or more) ( ) | Very Frequently (Daily) ( )

Section B: Technology Acceptance and Utilization (TAM Constructs)

This section measures your perception of the AI Chatbot's utility and ease of use, grounded in the Technology Acceptance Model (TAM).

Instructions: Please rate your agreement with the following statements using the scale below:

Scale Point	1	2	3	4	5
Rating	Strongly Disagree (SD)	Disagree (D)	Neutral (N)	Agree (A)	Strongly Agree (SA)

Statement (AI Chatbot Use)

1. Using AI chatbots significantly enhances the overall quality of my academic work.
2. AI chatbots make complex assignments easier to complete and manage.
3. AI chatbots assist me in improving my comprehension and understanding of difficult course materials.
4. Using AI chatbots contributes directly to achieving better grades or academic results.
5. I find AI chatbots easy to interact with and utilize for academic purposes.
6. It requires minimal mental effort or frustration to effectively use AI chatbots in my studies.
7. The time required to learn how to use AI chatbots is minimal.

Section C: Positive Developed Effects on Learning Outcomes

This section assesses the specific educational benefits derived from AI chatbot interaction.

Instructions: Please rate your agreement with the following statements using the 5-point Likert scale (1=SD to 5=SA)

Statement (Learning Enhancement)

8. AI chatbots provide real-time, instantaneous feedback that helps me correct errors immediately.
9. Intelligent Tutoring Systems (ITS) and chatbots tailor content to my specific learning needs, optimizing instruction.
10. AI tools help me manage large volumes of information by structuring and organizing complex research materials.
11. Utilizing AI chatbots enhances my engagement and motivation toward challenging academic tasks.
12. AI tools help me generate initial ideas and develop outlines for essays and research papers.

Section D: Adverse Effects, Academic Integrity, and Cognitive Risks

This section explores the negative impacts and ethical challenges associated with AI use.

Instructions: Please rate your agreement with the following statements using the 5-point Likert scale (1=SD to 5=SA).

Statement (Risks and Challenges)

13. The use of AI chatbots makes cheating and plagiarism significantly easier in assessments.
14. Over-reliance on AI chatbots for problem-solving risks diminishing my critical thinking skills (Cognitive Deskilling).
15. I frequently have to verify the content generated by AI chatbots due to concerns about inaccuracies ("hallucinations").
16. My use of AI for academic purposes reduces my overall face-to-face interaction with lecturers and peers.
17. I feel pressure or anxiety (Technostress) when constantly having to learn and adapt to new AI tools.

Section E: Structural Constraints and Policy Environment

This section assesses the localized operational challenges and policy readiness within the institution.

Instructions: Please rate your agreement with the following statements using the 5-point Likert scale (1=SD to 5=SA).

Statement (Contextual Factors)

18. Unreliable internet access or poor network quality often prevents me from utilizing AI chatbots effectively for my studies.
19. The university has provided clear, comprehensive guidelines on the ethical use of AI chatbots in my courses.
20. I am concerned about the privacy and security of my personal and academic data when using AI chatbots.
21. I believe the university should invest more resources in providing equitable access to AI tools for all students, regardless of location or economic background.

Conclusion

Thank you for your valuable input.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the analysis and interpretation of data collected from undergraduate students in the Department of Computer Science at the University of Benin, Benin City, Edo State. The data was gathered using a structured questionnaire titled "The AI-Powered Chatbot Effect on Academic Performance Questionnaire," which was administered electronically to the sampled respondents.

A total of 86 questionnaires were distributed and all 86 were retrieved, representing a 100% response rate. The data collected were analyzed using descriptive statistics (frequency counts, percentages, mean scores, and standard deviations) as outlined in the research methodology. The findings are presented in tables, followed by detailed interpretations aligned with the research questions and objectives.

4.2 Demographic Characteristics of Respondents

This section presents the demographic profile of the respondents, including gender distribution, level of study and frequency of AI chatbot usage.

Gender	Frequency
Male	58
Female	28
Total	86

Table 4.2.1: Gender Distribution of Respondents

Interpretation: Table 4.2.1 reveals that the majority of respondents were male students, accounting for 67.4% (58 students) of the sample, while female students constituted 32.6% (28 students). This gender distribution reflects the typical enrollment pattern in Computer Science departments in Nigerian universities, where male students tend to outnumber their female counterparts.

Level of Study	Frequency	Percentage (%)
100 Level	14	16.3
200 Level	20	23.3
300 Level	23	26.7
400 Level and above	29	33.7
Total	86	100.0

Table 4.2.2: Level of Study Distribution

Interpretation: Table 4.2.2 shows the distribution of respondents across different academic levels. The largest group of respondents came from 400 Level and above (33.7%), followed by 300 Level (26.7%), 200 Level (23.3%), and 100 Level (16.3%). This distribution indicates adequate

representation across all undergraduate levels, ensuring that perspectives from students at different stages of their academic journey were captured.

Department	Frequency	Percentage (%)
Computer Science	86	100.0
Total	86	100.0

Table 4.2.3: Faculty Distribution

Interpretation: As shown in Table 4.2.3, all respondents (100%) were from the Department of Computer Science, which is consistent with the defined population of the study.

Frequency of Use	Frequency	Percentage (%)
Never	6	7.0
Rarely (Less than once a month)	14	16.3
Occasionally (1-3 times a month)	23	26.7
Frequently (Once a week or more)	29	33.7
Very Frequently (Daily)	14	16.3
Total	86	100.0

Table 4.2.4: Frequency of AI Chatbot Use for Academic Tasks

Interpretation: Table 4.2.4 reveals that the majority of respondents (93.0%) use AI chatbots for academic tasks with varying degrees of frequency. Specifically, 33.7% use them frequently (once a week or more), 26.7% use them occasionally (1-3 times a month), 16.3% use them very frequently (daily), and 16.3% rarely use them. Only 7.0% reported never using AI chatbots. This distribution indicates substantial adoption and integration of AI chatbot technology.

4.3 Analysis of Research Questions

This section presents detailed analysis of responses to the research instrument, organized according to the key constructs of the study.

4.3.1 Technology Acceptance and Utilization (TAM Constructs)

This subsection examines students' perceptions of AI chatbots based on the Technology Acceptance Model (TAM), specifically measuring Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).

S/N	Statement	SA	A	N	D	SD	Mean	Interpretation
1	Using AI chatbots significantly enhances the	34	37	9	4	2	4.13	High

	overall quality of my academic work							
2	AI chatbots make complex assignments easier to complete and manage	32	40	9	4	1	4.14	High
3	AI chatbots assist me in improving my comprehension and understanding of difficult course materials	29	37	11	6	3	3.97	High
4	Using AI chatbots contributes directly to achieving better grades or academic results	26	34	17	6	3	3.86	High
	Cluster Mean						4.03	High

Table 4.3.1: Perceived Usefulness of AI Chatbots

Key: SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

Decision Rule: 1.00-1.49 = Very Low; 1.50-2.49 = Low; 2.50-3.49 = Moderate; 3.50-4.49 = High; 4.50-5.00 = Very High

Interpretation: Table 4.3.1 presents students' perceptions of the usefulness of AI chatbots for academic purposes. The cluster mean of 4.03 indicates a high level of perceived usefulness. Specifically, students strongly agreed that AI chatbots make complex assignments easier (Mean = 4.14), enhance the quality of their academic work (Mean = 4.13), improve comprehension of difficult materials (Mean = 3.97), and contribute to better academic results (Mean = 3.86). These findings suggest that students recognize significant practical value in using AI chatbots for their academic endeavors.

S/N	Statement	SA	A	N	D	SD	Mean	Interpretation
5	I find AI chatbots	37	34	9	4	2	4.16	High

	easy to interact with and utilize for academic purposes							
6	It requires minimal mental effort or frustration to effectively use AI chatbots in my studies	29	37	11	6	3	3.97	High
7	The time required to learn how to use AI chatbots is minimal	32	37	9	6	2	4.06	High
	Cluster Mean						4.06	High

Table 4.3.2: Perceived Ease of Use of AI Chatbots

Interpretation: As shown in Table 4.3.2, respondents perceive AI chatbots as easy to use, with a cluster mean of 4.06. Students found the chatbots easy to interact with (Mean = 4.16), having a short learning curve (Mean = 4.06), and requiring minimal mental effort (Mean = 3.97). This high perceived ease of use is particularly significant for the Computer Science student population, as it suggests that technical barriers to adoption are minimal, facilitating widespread integration into academic workflows.

4.3.2 Positive Developed Effects on Learning Outcomes

This subsection examines the educational benefits that students derive from AI chatbot interaction.

S/N	Statement	SA	A	N	D	SD	Mean	Interpretation
8	AI chatbots provide real-time, instantaneous	32	37	9	6	2	4.06	High

	feedback that helps me correct errors immediately							
9	Intelligent Tutoring Systems (ITS) and chatbots tailor content to my specific learning needs, optimizing instruction	26	40	11	6	3	3.93	High
10	AI tools help me manage large volumes of information by structuring and organizing complex research materials	29	34	11	9	3	3.90	High
11	Utilizing AI chatbots enhances my engagement and motivation toward challenging academic tasks	26	37	11	9	3	3.86	High
12	AI tools help me generate initial ideas and develop outlines for	32	43	9	9	2	3.99	High

	essays and research papers							
	Cluster Mean						3.95	High

Table 4.3.3: Learning Enhancement Through AI Chatbots

Interpretation: Table 4.3.3 reveals that students perceive significant positive effects on their learning outcomes from using AI chatbots, with a cluster mean of 3.95. The highest-rated benefits include real-time feedback (Mean = 4.06) and assistance with generating ideas and outlines (Mean = 3.99). Students also acknowledged that AI chatbots provide personalized instruction (Mean = 3.93), help with information management (Mean = 3.90), and enhance engagement and motivation (Mean = 3.86). These findings demonstrate that AI chatbots are perceived as valuable educational tools that support various aspects of the learning process.

4.3.3 Adverse Effects, Academic Integrity, and Cognitive Risks

This subsection explores the negative impacts and ethical challenges associated with AI chatbot use.

S/N	Statement	SA	A	N	D	SD	Mean	Interpretation
13	The use of AI chatbots makes cheating and plagiarism significantly easier in assessments	23	31	17	12	3	3.69	High
14	Over-reliance on AI chatbots for problem-solving risks diminishing my critical thinking skills (Cognitive Deskilling)	26	34	14	9	3	3.83	High
15	I frequently have to verify the content generated by AI chatbots due to concerns about inaccuracies ("hallucinations")	29	31	14	9	3	3.86	High

16	My use of AI for academic purposes reduces my overall face-to-face interaction with lecturers and peers	20	34	17	12	3	3.65	High
17	I feel pressure or anxiety (Technostress) when constantly having to learn and adapt to new AI tools	17	29	23	14	3	3.50	High
	Cluster Mean						3.71	High

Table 4.3.4: Risks and Challenges of AI Chatbot Use

Interpretation: Table 4.3.4 indicates that students are significantly aware of the risks and challenges associated with AI chatbot use, with a cluster mean of 3.71. The most prominent concerns include the need to verify AI-generated content due to potential inaccuracies (Mean = 3.86) and the risk of cognitive deskilling through over-reliance (Mean = 3.83). Students also acknowledged that AI chatbots facilitate academic dishonesty (Mean = 3.69), reduce face-to-face interaction (Mean = 3.65), and cause technostress (Mean = 3.50). These findings reveal a mature understanding among students of the nature of AI technology in education.

4.3.4 Structural Constraints and Policy Environment

This subsection assesses the institutional and infrastructural challenges affecting AI chatbot utilization.

S/N	Statement	SA	A	N	D	SD	Mean	Interpretation
18	Unreliable internet access or poor network quality often prevents me from utilizing AI chatbots effectively for my studies	32	29	11	9	5	3.86	High
19	The university	9	17	23	23	14	2.72	Moderate

	has provided clear, comprehensive guidelines on the ethical use of AI chatbots in my courses							
20	I am concerned about the privacy and security of my personal and academic data when using AI chatbots	29	31	11	12	3	3.83	High
21	I believe the university should invest more resources in providing equitable access to AI tools for all students, regardless of location or economic background	40	29	6	9	2	4.12	High
	Cluster Mean						3.63	High

Table 4.3.5: Contextual Factors Affecting AI Chatbot Use

Interpretation: Table 4.3.5 reveals significant contextual challenges affecting AI chatbot adoption at the University of Benin, with a cluster mean of 3.63. The most critical issue is the strong demand for institutional investment in equitable access to AI tools (Mean = 4.12), followed by infrastructural barriers such as unreliable internet access (Mean = 3.86), and privacy and security concerns (Mean = 3.83). Notably, students rated the availability of institutional guidelines on ethical AI use as only moderate (Mean = 2.72), indicating a significant policy gap. These findings underscore the need for improved infrastructure, clearer policies, and greater institutional support for AI integration.

4.4 Summary of Findings

Based on the data analysis presented in this chapter, the following key findings emerged:

1. **High Adoption Rate:** A significant majority (93.0%) of Computer Science students at the University of Benin use AI chatbots for academic tasks, with 33.7% using them frequently (weekly or more).

2. **Strong Technology Acceptance:** Students demonstrate high perceived usefulness (Mean = 4.03) and perceived ease of use (Mean = 4.06) of AI chatbots, consistent with the Technology Acceptance Model.

3. **Significant Learning Benefits:** Students recognize substantial positive effects on learning outcomes (Mean = 3.95), including real-time feedback, personalized instruction, information management, enhanced engagement, and assistance with ideation.

4. **Awareness of Risks:** Students exhibit high awareness of the risks associated with AI chatbot use (Mean = 3.71), including concerns about accuracy verification, cognitive deskilling, academic integrity violations, reduced social interaction, and technostress.

5. **Infrastructural and Policy Gaps:** Students face significant contextual challenges (Mean = 3.63), particularly unreliable internet access, inadequate institutional guidelines on ethical AI use, privacy concerns, and limited equitable access to AI tools.

6. **Gender Distribution:** The sample reflected a typical Computer Science enrollment pattern with 67.4% male and 32.6% female students.

7. **Cross-Level Representation:** Students from all undergraduate levels were represented, with the highest participation from 400 Level students (33.7%).

4.5 Conclusion

This chapter presented a comprehensive analysis of data collected from 86 undergraduate Computer Science students at the University of Benin regarding the effects of AI-powered chatbots on academic performance. The findings reveal a complex picture of high technology acceptance and recognition of learning benefits, balanced against significant awareness of risks and substantial infrastructural and policy challenges. The next chapter will discuss these findings in relation to existing literature, draw conclusions, and provide recommendations.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study, conclusions drawn from the research findings, and recommendations for various stakeholders in Nigerian higher education institutions. The chapter also identifies limitations of the study and suggests areas for future research. The conclusions and recommendations are based on the empirical data collected and analyzed in the previous chapter, addressing the study's objectives and research questions regarding the effects of AI-powered chatbots on student academic performance at the University of Benin.

5.2 Summary of the Study

This study investigated the effects of AI-powered chatbots on student academic performance in Nigerian Higher Education Institutions, with specific focus on the Department of Computer Science at the University of Benin, Benin City, Edo State. The research was guided by the Technology Acceptance Model (TAM) and employed a descriptive survey research design with a mixed-methods approach.

The study population comprised all registered undergraduate students in the Department of Computer Science at the University of Benin. A sample of 86 respondents was selected across different academic levels (100 to 400 Level). Data were collected using a structured questionnaire titled "The AI-Powered Chatbot Effect on Academic Performance Questionnaire," which was administered electronically. The questionnaire assessed four key constructs: Technology Acceptance and Utilization, Positive Effects on Learning Outcomes, Adverse Effects and Cognitive Risks, and Structural Constraints and Policy Environment.

The data collected were analyzed using descriptive statistics including frequency counts, percentages, mean scores, and standard deviations. The findings revealed that:

1. **High Adoption and Acceptance:** A significant majority (93.0%) of Computer Science students use AI chatbots for academic tasks, with strong perceived usefulness (Mean = 4.03) and ease of use (Mean = 4.06).

2. **Substantial Learning Benefits:** Students recognized significant positive effects on learning outcomes (Mean = 3.95), particularly in areas of real-time feedback, personalized instruction, information management, and enhanced engagement.

3. **Critical Awareness of Risks:** Students demonstrated mature understanding of potential risks (Mean = 3.71), including concerns about accuracy verification, cognitive deskilling, academic integrity violations, and reduced social interaction.

4. **Significant Contextual Challenges:** Students identified substantial infrastructural and policy gaps (Mean = 3.63), including unreliable internet access, inadequate institutional guidelines, and privacy concerns.

5.3 Conclusion

Based on the findings of this study, the following conclusions are drawn:

5.3.1 Technology Acceptance and Integration

The study concludes that AI-powered chatbots have achieved substantial acceptance among Computer Science students at the University of Benin. The high ratings for both perceived usefulness and perceived ease of use confirm the applicability of the Technology Acceptance Model in the context of AI chatbot adoption in Nigerian higher education. Students recognize AI chatbots as practical, accessible tools that enhance academic work quality, simplify complex assignments, and contribute to better academic outcomes. This acceptance suggests that AI chatbots have become integral components of the modern academic toolkit for Computer Science students.

5.3.2 Educational Benefits and Learning Enhancement

The study concludes that AI-powered chatbots provide substantial educational benefits that positively impact student learning outcomes. Students benefit from real-time feedback mechanisms, personalized instructional content, improved information management capabilities, enhanced motivation toward challenging tasks, and assistance with ideation and academic writing. These findings indicate that when appropriately utilized, AI chatbots serve as effective supplementary learning tools that complement traditional pedagogical approaches. The technology facilitates self-directed learning, provides immediate support for academic tasks, and helps students manage the increasing complexity of coursework in Computer Science education.

5.3.3 Risks and Challenges

The study concludes that while AI chatbots offer significant benefits, they also present serious risks that require careful management. Students are acutely aware of concerns regarding accuracy and reliability of AI-generated content, necessitating frequent verification. The risk of cognitive deskilling through over-reliance on AI for problem-solving poses a threat to the development of critical thinking skills a core competency in Computer Science education. Additionally, the ease with which AI chatbots facilitate academic dishonesty raises significant academic integrity concerns. The reduction in face-to-face interactions with lecturers and peers may undermine the social dimensions of learning, while technostress from constant adaptation to new AI tools affects student well-being.

5.3.4 Infrastructural and Policy Deficiencies

The study concludes that significant infrastructural and policy barriers hinder optimal utilization of AI chatbots at the University of Benin. Unreliable internet access and poor network quality

represent fundamental obstacles that prevent equitable access to AI-powered learning tools. The absence of clear, comprehensive institutional guidelines on ethical AI use creates ambiguity regarding acceptable practices and leaves students without proper guidance. Privacy and security concerns remain unaddressed, and there is strong student demand for greater institutional investment in providing equitable access to AI tools. These deficiencies suggest that institutional readiness has not kept pace with technological adoption.

5.3.5 Overall Conclusion

This study concludes that AI-powered chatbots represent a transformative technology in Nigerian higher education. While they offer substantial benefits for learning enhancement and academic support, their integration into the educational ecosystem requires careful management of risks, robust policy frameworks, improved infrastructure, and proactive institutional support. The success of AI integration depends not merely on technology availability but on creating an enabling environment that maximizes benefits while mitigating risks. Nigerian higher education institutions must adopt a balanced, strategic approach to AI integration that preserves academic integrity, promotes critical thinking, and ensures equitable access for all students.

5.4 Recommendations

Based on the findings and conclusions of this study, the following recommendations are proposed for various stakeholders:

5.4.1 Recommendations for University Management

1. **Develop Comprehensive AI Usage Policies:** The university should urgently develop and disseminate clear, comprehensive guidelines on the ethical use of AI chatbots in academic contexts. These policies should clearly define acceptable and unacceptable uses, provide examples, and specify consequences for violations.

2. **Invest in ICT Infrastructure:** University management should prioritize investment in robust internet connectivity and network infrastructure to ensure all students have reliable access to AI-powered tools, regardless of their location on campus or economic background.

3. **Enhance Data Privacy and Security:** Implement robust data protection measures and establish clear protocols for safeguarding student personal and academic information when using AI platforms.

5.4.2 Recommendations for Faculty and Lecturers

1. **Integrate AI Literacy into Curriculum:** Faculty should incorporate AI literacy training into course content, teaching students how to use AI tools effectively, critically evaluate AI-generated content, and recognize the limitations of AI systems.

2. **Design AI-Resistant Assessments:** Develop assessment methods that minimize opportunities for academic dishonesty through AI chatbots, such as oral examinations,

practical demonstrations, process-based assessments, and assignments requiring critical analysis rather than information reproduction.

3. **Promote Critical Thinking:** Emphasize teaching approaches that develop higher-order thinking skills, ensuring students use AI as a tool for learning rather than a substitute for thinking. Encourage students to verify, critique, and build upon AI-generated content.

4. **Provide Guidance on Appropriate Use**: Clearly communicate expectations regarding AI use in coursework, specify which tasks are appropriate for AI assistance and which require independent work, and model appropriate AI usage in teaching activities.

5. **Monitor and Support Students: Remain** vigilant for signs of over-reliance on AI tools, provide individual guidance to students struggling with appropriate AI use, and maintain regular face-to-face interaction to complement AI-enhanced learning.

5.4.3 Recommendations for Students

1. **Maintain Academic Integrity:** Students must recognize that using AI chatbots to complete assignments without proper attribution constitutes academic dishonesty. They should use AI as a learning aid rather than a shortcut to avoid intellectual effort.

2. **Balance AI Use with Traditional Learning:** Students should maintain a healthy balance between AI-assisted learning and traditional study methods, ensuring continued development of fundamental skills in problem-solving, critical thinking, and independent research.

3. **Seek Clarification:** When uncertain about appropriate AI use for specific assignments or courses, students should proactively seek clarification from lecturers rather than make assumptions.

4. **Preserve Social Learning:** Students should continue to engage actively in face-to-face interactions with lecturers and peers, recognizing that collaborative learning and social interaction are irreplaceable components of education.

5.4.4 Recommendations for the National Universities Commission (NUC)

1. **Develop National Guidelines:** The NUC should develop comprehensive national guidelines for AI integration in Nigerian universities, providing a framework that individual institutions can adapt to their specific contexts.

2. **Support Infrastructure Development:** Advocate for and support initiatives to improve ICT infrastructure across Nigerian universities, recognizing that reliable internet access is fundamental to equitable AI adoption.

3. **Facilitate Training Programs:** Organize training programs and workshops for university administrators, faculty, and staff on AI integration, ethical considerations, and best practices for AI-enhanced education.

4. **Encourage Research:** Support and fund research on AI in Nigerian higher education to build evidence-based understanding of impacts, challenges, and effective integration strategies specific to the Nigerian context.

5.4.5 Recommendations for Policy Makers and Government

1. **Invest in Digital Infrastructure:** Government should prioritize investment in national digital infrastructure, ensuring widespread, reliable internet access that supports AI-enabled education across all regions of Nigeria.

2. **Support AI Education Initiatives:** Provide funding and support for AI literacy programs in higher education, recognizing that AI competency is increasingly essential for workforce readiness.

3. **Develop Regulatory Frameworks:** Establish regulatory frameworks that balance innovation with protection, addressing issues of data privacy, academic integrity, and equitable access in AI-enabled education.

4. **Bridge the Digital Divide:** Implement policies and programs to reduce digital inequality, ensuring students from all socioeconomic backgrounds can benefit from AI-enhanced educational opportunities.

5.5 Contributions to Knowledge

This study makes several significant contributions to the existing body of knowledge:

1. **Empirical Evidence from Nigerian Context:** The study provides empirical data on AI chatbot effects in Nigerian higher education, addressing the gap in context-specific research from developing countries.

2. **Application of TAM in AI Education:** The study demonstrates the applicability of the Technology Acceptance Model in understanding student adoption of AI chatbots in Nigerian higher education institutions.

3. **Balanced Perspective:** The research provides a balanced view of both benefits and risks associated with AI chatbot use, moving beyond either purely optimistic or pessimistic perspectives.

4. **Identification of Contextual Challenges:** The study identifies infrastructure and policy challenges specific to Nigerian higher education that affect AI integration.

5.6 Limitations of the Study

This study acknowledges the following limitations:

1. **Small Sample Size:** The study was conducted with 86 respondents from a single department, limiting the generalizability of findings to the broader student population across other disciplines and universities.
2. **Cross-Sectional Design:** The study captured data at a single point in time, limiting the ability to assess changes in perceptions and effects over time.
3. **Limited Scope:** The study focused primarily on student perspectives and did not include faculty views or actual performance data to correlate with chatbot usage.
4. **Rapidly Evolving Technology:** Given the rapid evolution of AI technology, findings may become dated quickly as new capabilities and tools emerge.

5.7 Suggestions for Further Research

Based on the findings and limitations of this study, the following areas are suggested for future research:

1. **Large-Scale Quantitative Study:** Conduct a full-scale study with a larger, more representative sample across multiple departments and universities in Nigeria to enhance generalizability.
2. **Longitudinal Investigation:** Undertake longitudinal research to track changes in AI chatbot adoption, perceptions, and effects on academic performance over time.
3. **Correlation with Academic Performance:** Investigate the statistical relationship between frequency and nature of AI chatbot use and actual academic performance indicators such as GPA, examination scores, and graduation rates.
4. **Faculty Perspectives:** Conduct research examining faculty perceptions, experiences, and strategies for managing AI integration in teaching and assessment.
5. **Technical Skills Development:** Investigate how AI chatbot use affects the development of specific technical skills essential for Computer Science graduates.

5.8 Final Remarks

This study has demonstrated that AI-powered chatbots represent a significant technological development with profound implications for Nigerian higher education. While the technology offers substantial potential for enhancing learning outcomes, supporting student success, and modernizing educational delivery, it also presents serious challenges that require thoughtful, strategic responses from all stakeholders

The future of AI in Nigerian higher education depends on our collective ability to harness its benefits while actively mitigating its risks. This requires investment in infrastructure, development of robust policies, cultivation of critical thinking skills, and sustained commitment to academic integrity and educational excellence.

As AI technology continues to evolve at an unprecedented pace, Nigerian higher education institutions must remain adaptable, proactive, and committed to ensuring that technology serves human learning rather than replacing it. The goal is not to resist technological change but to guide it in directions that align with educational values, support student development, and prepare graduates for an increasingly AI-integrated world.

The findings of this study provide a foundation for informed decision-making and strategic planning as Nigerian universities navigate the complex landscape of AI integration in education. It is hoped that this research will stimulate further investigation, policy development, and practical initiatives that maximize the benefits of AI while safeguarding the fundamental purposes and values of higher education.

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