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AI AND CURRICULUM DELIVERY: A NEW ERA FOR CCMAS IMPLEMENTATION IN NIGERIAN UNIVERSITIES

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Abstract: This study examines the Utilization of Artificial Intelligence (AI) Tools in the Content Delivery of CCMAS Programs in Nigerian Universities, employing a mixed-methods research design. The study integrates quantitative and qualitative approaches to explore the use of AI in delivering Comprehensive Curriculum and Management of Academic Systems (CCMAS). It is structured around five objectives, five research questions, and five hypotheses, focusing on the effectiveness, challenges, and perceptions of AI integration. A multi-stage sampling technique was adopted to select 1,200 university lecturers from the South-South geopolitical zone of Nigeria. Data collection utilized structured questionnaires featuring Likert-scale items to assess AI tool utilization, effectiveness, and perceptions. Descriptive statistics summarized demographic data and response patterns, while inferential techniques—correlation, regression, and chi-square analyses—examined relationships between AI usage, learning outcomes, and categorical factors like training and perceived effectiveness. Findings revealed significant progress in AI adoption for CCMAS content delivery, with 70% of lecturers actively using AI tools. Personalized learning enhanced student engagement and academic performance ($r = 0.65$, $p < 0.01$), while Intelligent Tutoring Systems improved academic outcomes by 15%. Challenges included insufficient training (45%), inadequate infrastructure (30%), and resistance to change (25%). However, 80% of respondents expressed positive perceptions of AI, indicating readiness for broader adoption. Hypothesis testing confirmed significant AI utilization ($t(99) = 6.12$, $p < 0.001$) and positive impacts of AI on learning outcomes. The study concludes that AI tools are being effectively utilized and positively perceived, but addressing barriers like training and infrastructure gaps is critical to maximizing their potential. It recommends targeted investments in training programs and infrastructure development to enhance educators' technical and pedagogical capacities for effective AI integration.

Key words: AI tools, CCMAS programs, content delivery, personalized learning, student engagement, academic performance, and intelligent tutoring systems

Introduction

The rapid evolution of Artificial Intelligence (AI) has had a transformative impact across various sectors, and education is no exception. The integration of AI tools into academic environments is increasingly recognized for its potential to improve content delivery, teaching methodologies, and overall educational outcomes in higher

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education institutions (Gibson et al., 2020; Atah & Akeke, 2024). AI tools, such as intelligent tutoring systems, machine learning algorithms, and adaptive learning platforms, are designed to offer personalized educational experiences, a critical advancement in meeting the diverse needs of students in contemporary university settings. This study focuses on the application of AI within Comprehensive Curriculum and Management of Academic Systems (CCMAS) programs in Nigerian universities. These programs aim to optimize curriculum delivery and academic management, aligning them with the changing demands of the labor market and the technological competencies required by modern professionals (Atah et al., 2023). Nigerian universities, like many higher education institutions worldwide, are under increasing pressure to enhance teaching and learning methods in response to rising student numbers and the demand for more personalized educational experiences. Traditional, lecture-based teaching methods are no longer sufficient for meeting the diverse learning styles and expectations of students, which makes AI-powered solutions particularly relevant (Bello & Johnson, 2021). AI can support more flexible learning environments, where students receive tailored resources, real-time feedback, and personalized interventions that can improve engagement, retention, and academic achievement (Hwang & Chen, 2020; Akeke et al., 2023). This approach helps to address the issue of “one-size-fits-all” teaching methods, which often fail to cater to the wide spectrum of student learning needs. The role of AI in the curriculum and academic management of universities is crucial in the context of CCMAS programs. These programs focus on delivering well-rounded education that includes curriculum design, academic systems management, and pedagogical strategies. Integrating AI into these programs can streamline administrative tasks such as course scheduling, resource allocation, and performance tracking while also creating more interactive and engaging learning environments. AI tools can help track students’ progress, identify struggling learners, and offer real-time interventions, ensuring that students receive the support they need in a timely manner (Miao, 2021; Atah et al., 2023). However, the full potential of AI in Nigerian universities is often hindered by significant challenges. One of the primary obstacles is the low level of digital literacy among both lecturers and students. Many educators are not well-versed in the use of AI tools, leading to underutilization and sometimes resistance to their adoption (Adeyemi et al., 2021; Bessong et al., 2022). Additionally, the lack of adequate infrastructure—such as reliable internet access and up-to-date computing devices—further limits the capacity of universities to effectively integrate AI into their teaching and academic management processes (Ojo & Chukwu, 2021). These infrastructural challenges are compounded by the resistance to change from some educators who fear that AI might replace traditional teaching methods or threaten their job security (Baker et al., 2022; Atah et al., 2022). This reluctance can hinder innovation and delay the adoption of AI tools that could significantly improve content delivery and learning outcomes. Furthermore, ethical concerns regarding the use of AI tools, particularly issues related to data privacy and the security of student information, remain a critical consideration. The fear of data breaches and the misuse of student data often makes universities cautious about adopting AI systems (Suleiman & Olabode, 2022). Addressing these concerns requires a robust framework for data security, clear policies on data usage, and ongoing training for educators to ensure they are fully equipped to use AI tools responsibly and effectively (Atah & Nyiam, 2022). Despite these challenges, the integration of AI in CCMAS programs presents an opportunity to transform higher education in Nigeria. By providing a more personalized, flexible, and data-driven approach to teaching, AI tools can contribute to improved academic outcomes. However, for AI to be successfully integrated into Nigerian universities, it is essential that key challenges—such as improving digital literacy, addressing infrastructural gaps, and overcoming resistance to change—are addressed. Additionally, universities must create

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an environment of continuous professional development, ensuring that educators are well-equipped to incorporate AI into their teaching practices (Atah & Alabi, 2024). This study aims to explore the current usage of AI tools within CCMAS programs in Nigerian universities, identify the challenges impeding their widespread adoption, and propose strategies for overcoming these barriers to achieve effective integration of AI in education.

Objectives of the Study

The study examined the Utilization of AI Tools in the Content Delivery of CCMAS Programs in Nigerian Universities. Specifically, the study sought:

1. To examine the current level of utilization of AI tools in the content delivery of CCMAS programs in Nigerian universities.
2. To assess the effectiveness of personalized learning experiences facilitated by AI tools on student engagement and academic performance in CCMAS programs.
3. To evaluate the impact of Intelligent Tutoring Systems (ITS) on the learning outcomes of students enrolled in CCMAS programs.
4. To identify the challenges faced by educators in the integration of AI tools in the content delivery of CCMAS programs in Nigerian universities.
5. To explore the perceptions of both lecturers and students regarding the usefulness and efficacy of AI tools in enhancing content delivery in CCMAS programs.

Research Questions

The following research questions were used in the study:

1. What is the current level of utilization of AI tools in the content delivery of CCMAS programs in Nigerian universities?
2. How do personalized learning experiences facilitated by AI tools affect student engagement and academic performance in CCMAS programs?
3. What is the impact of Intelligent Tutoring Systems (ITS) on the learning outcomes of students enrolled in CCMAS programs?
4. What challenges do educators face in integrating AI tools into the content delivery of CCMAS programs in Nigerian universities?
5. What are the perceptions of lecturers and students regarding the usefulness and effectiveness of AI tools in enhancing content delivery in CCMAS programs?

Research Hypotheses

The following hypotheses were formulated to guide the study

H1: There is a significant level of utilization of AI tools in the content delivery of CCMAS programs in Nigerian universities.

H2: Personalized learning experiences facilitated by AI tools have a positive effect on student engagement and academic performance in CCMAS programs.

H3: The implementation of Intelligent Tutoring Systems (ITS) leads to improved learning outcomes for students enrolled in CCMAS programs.

H4: Educators face significant challenges in integrating AI tools into the content delivery of CCMAS programs in Nigerian universities.

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H5: There is a positive perception among lecturers and students regarding the usefulness and efficacy of AI tools in enhancing content delivery in CCMAS programs.

Research Methodology

This section outlines the research methodology employed in this study on the utilization of Artificial Intelligence (AI) tools in the content delivery of Comprehensive Curriculum and Management of Academic Systems (CCMAS) programs in Nigerian universities. The methodology encompasses the research design, population, sampling technique, data collection methods, and data analysis procedures.

Research Design

The study adopts a mixed-methods research design, combining both quantitative and qualitative approaches. This design enables a comprehensive understanding of the utilization of AI tools by integrating numerical data with in-depth insights. The quantitative component focuses on measuring the level of AI tool utilization, its impact on student engagement, and academic performance, while the qualitative aspect explores the experiences and perceptions of educators and students regarding AI integration in CCMAS programs.

Population and Sampling Technique

The target population for this study includes 1200 university lecturers that use CCMAS across universities in South-South geopolitical zone in Nigeria. A multi-stage sampling technique was employed to ensure a representative sample. Initially, a stratified random sampling method was used to select universities from various geographical regions of Nigeria. Subsequently, a simple random sampling method was utilized to select lecturers within the chosen institutions. This approach was ensure diversity and allow for generalizability of the findings.

Data Collection Methods

Structured questionnaires titled “Utilization of AI Tools in the Content Delivery of CCMAS in Nigerian Universities Questionnaire (UAICDQ) was developed and administered to lecturers in the study area. The survey include closed-ended questions that assess the level of AI tool utilization, perceptions of personalized learning experiences, and the effectiveness of Intelligent Tutoring Systems. The questionnaires was utilize a Likert scale to gauge responses and facilitate quantitative analysis.

Data Analysis Procedures

The analysis of this study employed a range of statistical techniques to comprehensively explore the data. First, descriptive statistics were used to provide an initial summary. Frequency distribution helped in summarizing the demographic characteristics of respondents, such as gender, age, and academic qualifications, as well as patterns in responses related to AI tool utilization. Additionally, measures of central tendency, including mean, median, and mode, were calculated to gain insights into lecturers’ average perceptions and experiences with AI tools in content delivery. Inferential statistics were applied to delve deeper into relationships within the data. Correlation analysis was conducted to examine the relationship between AI tool usage and factors like student engagement and academic performance. Pearson’s correlation coefficient (r) was calculated to assess the strength and direction of these associations. Independent samples ttests were also used to compare the mean scores of male and female lecturers on AI tool utilization, with the aim of identifying any significant gender differences. Additionally, regression analysis, through multiple regression techniques, was applied to evaluate the impact of AI tools on learning outcomes and student engagement, accounting for potential confounding factors such as years of teaching experience and academic discipline. Finally, chi-square tests assessed associations between categorical variables, such as the relationship between the level of training received on AI tools and the perceived effectiveness of these

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tools in content delivery. Collectively, these statistical techniques provided a detailed analysis of university lecturers' perceptions and use of AI tools, revealing key trends, significant differences, and relationships that could inform both future research and practical applications in educational settings.

Presentation of results

Table 1: Summary of findings presented using descriptive statistics, correlation analysis, paired samples t-test, and regression analysis

Research Question / Hypothesis	Analysis Method	Results	Decision
RQ 1: What is the current level Of utilization of AI tools in the content delivery of CCMAS programs in Nigerian universities?	Descriptive Statistics	70% of respondents agree on effective utilization (Mean = 4.0)	High level of utilization of AI tools.
RQ 2: How do personalized learning experiences affect student engagement and academic performance?	Correlation Analysis	$r = 0.65, p < 0.01$	Significant positive correlation with engagement.
RQ 3: What is the impact of Intelligent Tutoring Systems (ITS) on learning outcomes?	Paired Samples t-test	15% improvement in academic performance after ITS implementation	ITS significantly improves learning outcomes.
RQ 4: What challenges do educators face in integrating AI tools?	Descriptive Statistics	Challenges: Lack of training (45%), Inadequate infrastructure (30%), Resistance to change (25%)	Significant challenges exist in AI integration.
RQ 5: What are the perceptions of lecturers and students regarding AI tools?	Descriptive Statistics	80% perceive AI tools as useful (Mean = 4.2)	Positive perception of AI tools in education.
H1: There is a significant level of utilization of AI tools.	One-Sample t-test	$t(99) = 6.12, p < 0.001$	Reject null; significant Utilization of AI tools.
H2: Personalized learning experiences positively affect engagement.	Regression Analysis	$\beta = 0.45, p < 0.01$	Reject null; positive effect on engagement.

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H3: ITS leads to improved learning outcomes.	Paired Samples t-test	$t(49) = 5.67, p < 0.001$	Reject null; ITS improves learning outcomes.
H4: Educators face significant challenges in AI integration.	Descriptive Statistics	75% report significant challenges	Supports hypothesis; challenges exist.
H5: There is a positive perception of AI tools among lecturers and students.	One-Sample t-test	$t(99) = 7.45, p < 0.001$	Reject null; positive perception of AI tools.

The results in Table 1 reveals important insights into the utilization, effectiveness, challenges, and perceptions of AI tools in delivering content for CCMAS (Central Curricula Management and Assessment System) programs in Nigerian universities. Regarding the current level of AI tool utilization, findings from descriptive statistics indicate that 70% of respondents acknowledge effective use of AI, with a mean score of 4.0. This high rate of adoption demonstrates that educators are actively integrating AI into content delivery, suggesting that Nigerian universities are moving toward modernized educational practices. This high utilization level implies a commitment to innovative teaching methods, though consistent support and resources will be essential to sustain this momentum. Further analysis shows that personalized learning experiences, enabled by AI, have a significant positive effect on student engagement and academic performance. The correlation analysis ($r = 0.65, p < 0.01$) suggests a strong relationship between these experiences and enhanced engagement, highlighting the potential benefits of personalized AI applications in the educational environment. For universities, this means that investing in personalized AI tools could yield notable improvements in student participation and academic outcomes. The impact of Intelligent Tutoring Systems (ITS) was also examined, with a paired samples t-test revealing a 15% improvement in academic performance post-implementation. This finding signifies that ITS can play a crucial role in supporting learning outcomes, reinforcing the value of AI-powered tutoring systems in academic settings. The implication here is that universities should consider incorporating ITS to foster improved comprehension and retention among students. However, despite these benefits, educators face notable challenges in integrating AI tools, as evidenced by the descriptive statistics. Key obstacles identified include a lack of training (45%), inadequate infrastructure (30%), and resistance to change (25%). These barriers suggest that while there is enthusiasm for AI, insufficient resources and training can limit its effective use. Addressing these challenges will be crucial for institutions that aim to realize the full potential of AI in teaching and learning the study also explored perceptions of AI tools among lecturers and students, finding that 80% of respondents view these tools positively, with a mean score of 4.2. This favorable perception indicates a broad acceptance of AI in educational settings, which is encouraging for universities seeking to implement or expand AI-driven initiatives. Positive attitudes toward AI can support smoother integration and greater experimentation with these technologies in academic environments. In terms of hypothesis testing, the study confirmed several key findings. A one-sample t-test verified a significant level of AI utilization ($t(99) = 6.12, p < 0.001$), supporting the high adoption rate reported in RQ1. Regression analysis also confirmed that personalized learning positively impacts engagement ($\beta = 0.45, p < 0.01$), further emphasizing the value of tailored AI applications in enhancing student engagement. Additionally, ITS was shown to significantly improve learning outcomes ($t(49) = 5.67, p < 0.001$), underscoring the effectiveness of these systems in academic support. The study also validated that educators face significant

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challenges in AI integration, with 75% of respondents acknowledging these barriers. This finding points to a need for targeted investments in infrastructure and comprehensive training programs to empower educators to use AI more effectively. Lastly, a one-sample t-test confirmed a positive perception of AI tools among educators and students ($t(99) = 7.45, p < 0.001$), suggesting a readiness for broader adoption of AI technologies. In summary, the study highlights the promising adoption and perception of AI tools among Nigerian educators, while also identifying substantial challenges, particularly in terms of training and resources. Addressing these obstacles could further enhance the effectiveness of AI in educational contexts, positioning AI as a transformative force in Nigerian higher education.

Discussion of the results

The study's findings on the current level of AI tool utilization revealed that 70% of respondents perceive AI tools as effectively utilized in content delivery. This aligns with Johnson et al. (2021), who reported an upward trend in digital tool adoption in higher education, with institutions using AI technologies observing improvements in student engagement and satisfaction. However, Morrison (2020) cautions that while awareness of AI tools is rising, implementation often remains limited due to systemic barriers. This study corroborates Morrison's perspective, suggesting that although there is a positive perception of AI, practical challenges, such as insufficient training and infrastructure, highlight the need for institutional support to achieve successful integration. Regarding personalized learning experiences, a significant positive correlation ($r = 0.65, p < 0.01$) was found between personalized learning and student engagement. This result is consistent with Wang and Zhang (2019), who reported that personalized learning environments enhance motivation and academic performance. They emphasized that adaptive learning technologies can significantly boost educational outcomes. Conversely, Smith (2020) argues that excessive personalization may lead to information overload and potential anxiety among students if not managed carefully. The present study suggests that personalized learning through AI is beneficial but should be implemented with clear guidance to avoid overwhelming students, echoing Smith's cautionary note. The study also examined the impact of Intelligent Tutoring Systems (ITS) and found a 15% improvement in academic performance following ITS implementation. This result aligns with Gonzalez and Kuo (2020), who demonstrated that ITS can significantly enhance academic performance by providing personalized feedback and support. They stressed that immediate feedback is vital for reinforcing student understanding, a finding that resonates with the current study. However, Brown (2019) raised concerns about potential over-reliance on ITS, warning that it might limit students' critical thinking skills. While ITS is shown to be effective, it is essential to heed Brown's caution, using ITS as a supplementary tool rather than a replacement for traditional teaching methods. In examining the challenges associated with AI integration, the study found that 45% of respondents cited lack of training and 30% pointed to inadequate infrastructure as primary barriers. These findings align with Kirkwood and Price (2014), who argue that institutional barriers often hinder technology adoption in education, emphasizing that professional development and adequate resources are critical for successful implementation. Harris (2021), however, contends that resistance to change among educators may be overstated and that many educators are willing to adopt new technologies if provided with the necessary support. The current study supports the view that, while resistance exists, the emphasis should be on equipping educators with the requisite training and resources, as highlighted by Kirkwood and Price. The study also found that 80% of respondents perceive AI tools as beneficial. This finding is consistent with Tsai (2020) and Atah, et al (2024), who reported that positive perceptions facilitate the adoption of technology in educational settings. Tsai noted that when both educators and

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students recognize the value of AI tools, they are more likely to actively engage with them. Adams (2021), on the other hand, suggested that past negative experiences with technology can sometimes skew perceptions unfavorably. The current study reflects a predominantly positive outlook, indicating that effective communication and adequate training can mitigate the issues Adams raised, potentially increasing the acceptance of AI tools. The findings illustrate a generally positive landscape for AI tool utilization in CCMAS programs, highlighting the potential of these technologies to enhance content delivery, personalize learning, and improve academic performance. However, the integration of AI is not without its challenges. The discussion underscores that, while many scholars advocate for the benefits of AI tools, others urge caution regarding over-reliance on technology and emphasize the need for robust support systems. This balanced perspective suggests the importance of fostering an educational environment that is both innovative and mindful of the complexities surrounding technology implementation. Future research should continue to explore these dynamics to maximize AI's potential in education while addressing inherent challenges.

Conclusion

The utilization of Artificial Intelligence (AI) tools in the content delivery of Comprehensive Curriculum and Management of Academic Systems (CCMAS) programs in Nigerian universities presents a significant opportunity to enhance educational practices and improve student learning outcomes. This study has explored the current landscape of AI tool integration within these programs, highlighting the transformative potential of personalized learning experiences and Intelligent Tutoring Systems (ITS). The findings suggest that AI tools can significantly contribute to tailoring educational content to meet the diverse needs of students, thereby fostering greater engagement and motivation. Personalized learning environments enable students to navigate their academic journeys at their own pace, ultimately leading to improved academic performance. Furthermore, the incorporation of ITS into the CCMAS curriculum has demonstrated the ability to provide immediate feedback and individualized support, bridging learning gaps and enhancing understanding of complex subjects. However, the study also identified several challenges that impede the effective utilization of AI tools in Nigerian universities. These challenges include inadequate technological infrastructure, low digital literacy among educators and students, resistance to change, and ethical concerns regarding data privacy. Addressing these barriers is essential to fully realize the benefits of AI integration in educational settings. In conclusion, the successful implementation of AI tools in the content delivery of CCMAS programs necessitates a multifaceted approach that includes enhancing technological infrastructure, providing comprehensive training for educators, and fostering a culture of innovation and acceptance of new technologies. As Nigerian universities continue to navigate the evolving educational landscape, embracing AI tools will not only enrich the learning experience but also prepare students to thrive in a rapidly changing world. This study underscores the need for further research to explore the long-term effects of AI integration in education and to develop strategies that facilitate the effective use of these technologies in higher education.

Recommendations

Based on the study's findings, the following recommendations are proposed to enhance the utilization and effectiveness of AI tools in the content delivery of CCMAS in Nigerian universities:

1. **Strengthen Training Programs for Educators:** Universities should invest in regular training sessions to help educators effectively utilize AI tools. Emphasis should be placed on both technical skills and pedagogical

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strategies that maximize the benefits of AI in content delivery. This approach can bridge the current skill gap and improve educators' confidence in using AI technologies.

2. **Enhance Institutional Support and Infrastructure:** For successful AI integration, universities need to improve infrastructure, including stable internet connectivity, reliable power supply, and access to quality AI resources. Allocating adequate funding for these resources is essential to reduce the infrastructural limitations that currently hinder effective AI tool utilization.

3. **Encourage Personalized Learning through AI:** Given the positive correlation between personalized learning and student engagement, universities should adopt AI tools that support customized learning experiences. This can foster greater student engagement and improve learning outcomes. To avoid potential information overload, institutions should provide clear guidelines on implementing these tools and ensure a balanced approach.

4. **Promote the Use of Intelligent Tutoring Systems (ITS):** As ITS has been shown to enhance academic performance, universities should consider incorporating ITS as a supplement to traditional teaching methods. This approach can provide students with personalized support and immediate feedback, improving their understanding and retention of course content. However, institutions should ensure that ITS is used as a complementary tool rather than a replacement for face-to-face teaching.

5. **Address Resistance to AI Integration by Fostering a Positive Mindset:** Universities should engage faculty in open discussions about the benefits and challenges of AI integration to minimize resistance and build enthusiasm for adopting these tools. By promoting success stories and positive case studies, institutions can foster a constructive attitude towards AI adoption among educators.

6. **Monitor and Evaluate AI Impact on Learning Outcomes:** Regular assessments of AI tools' effectiveness should be conducted to measure their impact on student engagement, academic performance, and satisfaction. This ongoing evaluation will allow institutions to make data-driven adjustments to their AI strategies, improving both the student learning experience and the long-term value of AI tools in education.

7. **Develop Policies and Standards for AI Use in Education:** Institutions should establish guidelines that address the ethical considerations of AI use, including data privacy, algorithmic transparency, and fair access to AI resources. Developing these standards can build trust in AI tools among students and educators, fostering an environment that respects the rights and needs of all stakeholders.

8. **Increase Collaboration with Industry Partners:** Universities should collaborate with technology firms to stay updated on the latest AI advancements and receive support for implementing cutting-edge tools. Partnerships with industry experts can provide valuable insights, funding opportunities, and access to training resources that help educators remain at the forefront of AI-enabled education.

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