IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON TERTIARY EDUCATION IN JIGAWA STATE, NIGERIA

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Abstract

The study examined the effect of AI on tertiary education in Jigawa State, looking based variables of education accessibility, personalized learning, teaching methods, research opportunities, skills development, administrative tasks and stakeholder engagement. The target population are teachers and students of Jigawa State, Nigeria tertiary institutions. A simple random sampling technique was applied to identify the research respondents. Likert scale questionnaire was used for data collection and analysed using ANOVA statistical tool using Python and presented in tables and graphs. All the null hypotheses were rejected based on the P-value being greater than 0.05, but the extent of the effect differs on the dependent variables. The study's major findings were that AI positively affects education accessibility, personalized learning, research opportunities, skills development, administrative tasks and stakeholder engagement. Ultimately, understanding these effects is crucial in navigating the future of tertiary education in Jigawa State. Moreover, implementing AI must be accompanied by evaluating its impacts, such as improving infrastructures to support these technologies effectively

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Keywords: *Artificial Intelligence, Personalized Learning, Administrative tasks, Research opportunities and Collaboration & Networking*

Introduction

Artificial intelligence (AI) is a branch of computer science and software that emphasises the creation of systems or machines that can perform tasks that would require human intelligence (Adenubi &Samuel, 2024). Ahmad, Mustapha and Ahmad (2024) described AI as computers' ability to perform cognitive functions, such as perceiving, reasoning, learning and problem-solving, that are usually associated with human minds. The integration of Artificial Intelligence (AI) into various sectors is transforming how industries operate, including academia. Introduction Artificial intelligence (AI) has the potential to significantly improve learning outcomes, expedite administrative procedures, and offer novel solutions to persistent problems in the field of education. AI is becoming a transformative and revolutionary force in education global. With its personalised instruction and data-driven insights, this technology innovation improves students' learning experiences and is far more pertinent to postsecondary education. Artificial Intelligence (AI) integration, for example, can enable adaptive learning systems that meet the needs of each student, increasing engagement and success rates. Additionally, by automating regular chores like scheduling, grading, and lecturing, educational institutions may devote more resources to improving the quality of instruction and engaging students.

Is this true in Jigawa State Nigeria, where the educational landscape is charged with expensiveness, inadequate qualified teachers and limited resources? Can AI lower the expenses of tertiary education in the state? This technological advancement is much more relevant to tertiary education, it enhances students' learning experiences through personalised education and data-driven insights. For instance, integrating AI can facilitate adaptive learning platforms that cater to individual student needs, thus improving engagement and

success rates. Furthermore, by automating routine tasks, teaching, assessment grading and scheduling, educational institutions can allocate more resources towards instructional quality and student engagement. AI has the potential to reduce costs in higher education institutions. AI also needs infrastructure investment, training for educators, and the potential for exacerbating inequalities if not implemented equitably.

Furthermore, AI-driven tools improve personalised learning experiences, research opportunities, skills development, teacher education, effective communication, and stakeholders' engagement, catering to unique educational goals and needs, which are beneficial in a diverse educational setting. This study is to examine the impact of Artificial Intelligence on Tertiary Education in Jigawa State, Nigeria in terms of Educational Accessibility, Personalized Learning, Administrative tasks, Research Opportunities, Skills Development and Collaboration and networking.

Research Hypothesis

The study was guided by six null hypotheses tested at 0.05 level of significance and 0.95 degrees of freedom, which reads as follows:

i. There is no significant relationship between Artificial Intelligence and Educational Accessibility
ii. There is no significant relationship between Artificial Intelligence and Personalized Learning
iii. There is no significant relationship between Artificial Intelligence and Administrative tasks
iv. There is no significant relationship between Artificial Intelligence and Research Opportunities
v. There is no significant relationship between Artificial Intelligence and Skills Development
vi. There is no significant relationship between Artificial Intelligence and Collaboration and networking.

Review of Related Literature

The literature of the study looked at the concept of Artificial Intelligence, the benefits of Artificial Intelligence and the challenges of Artificial Intelligence utilization in tertiary education in Jigawa State, Nigeria.

Concept of Artificial Intelligence

In 1956, a research program at Dartmouth College in New Hampshire, USA, served as the impetus for the scientific understanding of artificial intelligence. Although people had long entertained fantasies about artificial intelligence, that program signalled the beginning of methodical laboratory research on the topic. Many types of Artificial Intelligence (AI) emerged from that lab and entered society in the decades that followed. Chess and checker programs date back to the 1960s, and decision trees are a well-known component of many digital systems. The development of "expert systems," or software that, for example, integrates medical information to assist physicians in making decisions, has been evident since the 1980s. Since its inception, the field has produced astounding tests and findings that speak to the imagination of the public. Yet AI's practical impact on the economy and society remained relatively minor.

A short historical overview is not only relevant as a background for understanding AI but also the prelude to understanding the benefits of AI in which we see that AI has reached a turning point. The fact that AI is difficult to define is linked to the evolution of this discipline. We now look at some of the AI definitions below:

> *"The imitation of all human intellectual abilities by computers." (Nilsson, 2009).*
> *"The imitation of various complex human skills by machines." (Bostrom, 2016).*
> *"Technology that can function appropriately and with foresight its environment." (Denk, 2018),*
> *"Systems that display intelligent behaviour by analysing their environment and taking actions –with some degree of autonomy –to achieve specific goals." (High-Level Expert Group on Artificial Intelligence, 2019).*

These definitions have some elements of similarities, but the High-Level Expert Group on Artificial Intelligence is more comprehensive than the other and is purposeful.

Educational Benefits of the Artificial Intelligence

Russell & Norvig (2020) identified the following benefits of AI:

Personalized Learning: Artificial Intelligence (AI) can enable customised learning experiences by modifying materials and content to suit the requirements and learning preferences of each student. By enabling personalised learning experiences, artificial intelligence (AI) technologies like machine learning and natural language processing are improving educational methods. This implies that pupils can receive individualised instruction based on their preferred learning styles and rates. A variety of AI-powered tools are being employed to assist with education. Text composing, editing, forecasting, evaluating, analysing, and other tasks are all available with these tools. They contribute to improving both students' and teachers' overall educational experiences.

Improved Accessibility: AI tools can help students with disabilities have better access to education by offering creative solutions to learning obstacles. Artificial Intelligence facilitates the creation of virtual learning environments, increasing distance learners' access to education without limitations of distance, space and time in Jigawa State.

Administrative Efficiency: Artificial intelligence (AI) can simplify administrative duties like resource management, grading, and enrolment procedures, freeing up teachers to concentrate more on instruction and learning activities and improving the learning environment.

Research Opportunities: AI can help with research by offering sophisticated data analysis tools, which let academics and students solve challenging issues more skillfully. The evaluation process is becoming more accurate and efficient thanks to AI automation. This lessens teachers' burden and enables them to provide pupils feedback on time. AI can examine student data to offer retention and performance insights, assisting schools in identifying students who are at-risk and enhancing support services. Artificial Intelligence helps stakeholders in education do research and analyse data more effectively. As a result, decisions are made more wisely, and academic results are raised.

Development of Skills: AI can improve education by fostering profession-relevant skills like coding, data analysis, and AI literacy, which will better equip students for the workforce. Procedures can be automated, and resource distribution can be optimised.

Collaboration and Network Building: AI can help link students, teachers, and business professionals, which will promote information sharing and cooperative learning. Jigawa State's quality, accessibility, and collaboration in education have been greatly improved by AI, opening the door for increased stakeholder participation and involvement from both the local and professional communities.

To summarise, the Tertiary Institution of Learning in Jigawa State, Nigeria is witnessing a notable advancement in the field of artificial intelligence (AI) as it transforms tertiary education. All things considered, Jigawa State can benefit from AI's dynamic methods of education, which help with scaling problems and guarantee excellent instructional materials. To fully utilise AI's potential in influencing the direction of education, it is necessary to carefully manage the obstacles.

Key Challenges
Implementing AI in education has several challenges that must be addressed to ensure its effective and ethical use. Here are some of the key challenges demonstrated by Russell (2019).

Difficulties and Ethical Issues: Despite the advantages, there are still difficulties, including moral dilemmas, the requirement for labour retraining, and problems with security and trust. Effective policies, education, and the moral use of AI technologies are necessary to meet these difficulties. Infrastructure and accessibility: Putting AI into practice requires a strong technological foundation, which not all educational institutions, particularly those in underdeveloped areas, may have. It is crucial to guarantee fair access to AI technologies. Nevertheless, there are drawbacks to AI, including the requirement for infrastructure spending, teacher training, and the possibility of escalating inequality if not applied fairly.

Teacher Support and Training: To use AI tools effectively, educators must receive the necessary training. This entails being aware of the advantages, drawbacks, and operation of AI. Professional growth and ongoing assistance are essential. AI system development, deployment, and maintenance can be costly. Many educational institutions face difficulties in controlling expenditures and securing funding.

Data Security and Privacy: To work well, AI systems need a lot of data. Preventing unwanted access and misuse of student data requires ensuring its security and privacy.

Opposition to Change: Those who are used to traditional teaching techniques, such as educators, students, and other stakeholders, may exhibit resistance. Resolving this resistance calls for skilful change management techniques.

To address these issues and establish a conducive atmosphere for the moral and practical application of AI in education, legislators, educators, technologists, and other stakeholders must work together.

Research Methodology

The study's target demographic is the teachers at Jigawa State, Nigeria's Federal Universities of Technology Babura, Jigawa State University Kafin-Hausa, and Federal Universities Dutse. It employs a survey and correlational research approach. The Research Advisor Sampling table was used to determine the sample size, the study sample size of 383 students from these three sampled universities. The simple random sampling technique's Excel "Ran" formula was used to determine who would participate in the study. Data were collected using a self-created Likert scale questionnaire, evaluated using the ANOVA statistical tool in Python at the 0.05 level of significance, and then displayed in tables and graphs.

Data Analysis and Presentation

This correlation heatmap is a visual representation of the relationships between different aspects of AI in Higher Education. The graph uses a colour scale from dark blue to dark red, with darker colours indicating stronger correlations.
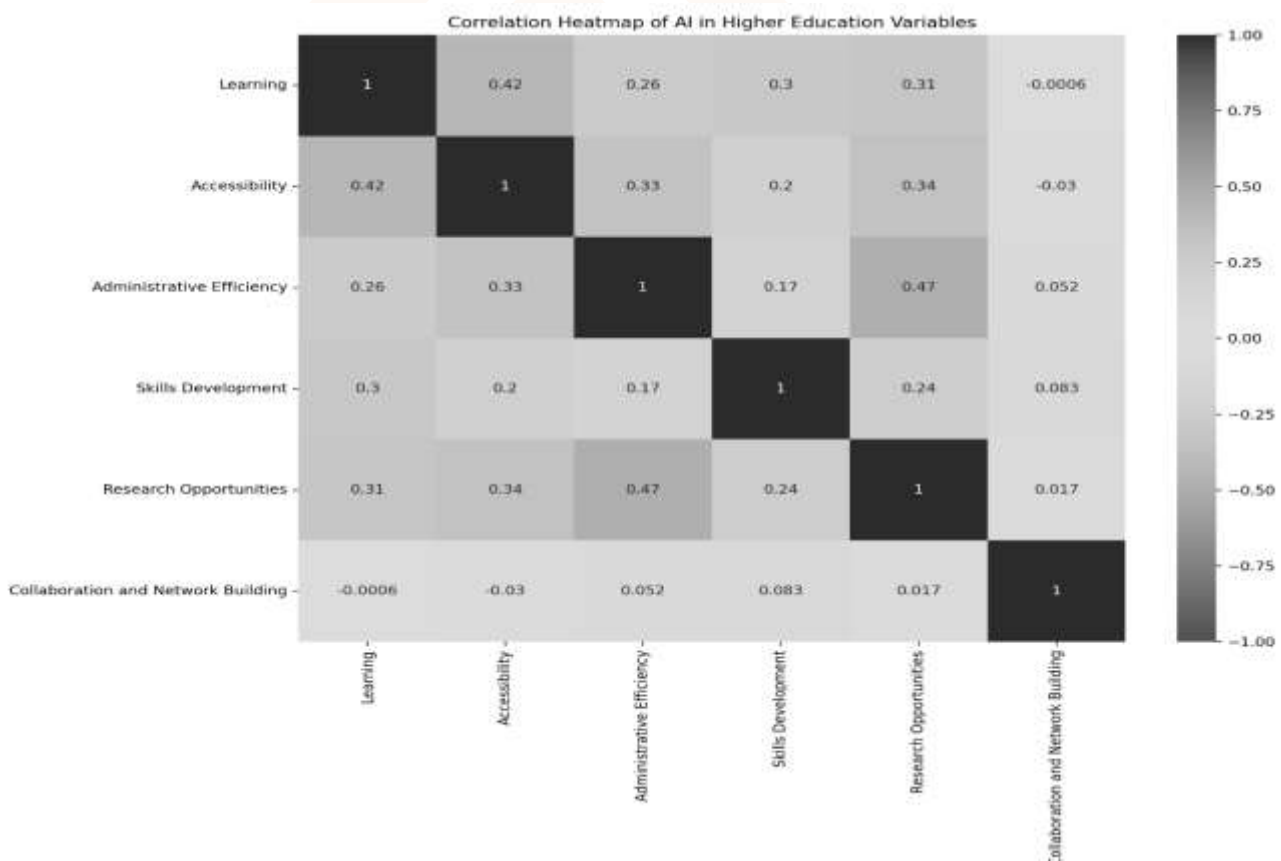

Correlation Heatmap of AI in Higher Education Variables

Figure 1: Correlation Heatmap showing the relationship among the variables, the key observations:

1. Colour Intensity: The diagonal of the heatmap shows a perfect correlation (1.0) of each variable with itself, represented by dark red squares. This is expected and serves as a reference point.
2. Positive Correlations: Most of the squares are in shades of red, indicating positive correlations between the variables. This suggests that as one aspect of AI in education improves others tend to improve as well.
3. Strong Positive Correlations: Administrative Efficiency and Accessibility show a very strong positive correlation (0.85), implying that as AI improves administrative efficiency, it also tends to enhance accessibility, or vice versa. Skills Development are also strongly correlated (0.79), suggesting that AI tools that boost research opportunities also tend to enhance skills development.
4. Moderate Positive Correlations: Learning shows moderate positive correlations with most other variables, particularly with Skills Development (0.62) and Research Opportunities (0.61).
    Collaboration and Network Building have moderate positive correlations with most variables, indicating its broad impact across different aspects of AI in education.
5. Weaker Correlations: The weakest correlation appears to be between Accessibility and Skills Development (0.45), though it's still a moderate positive correlation.
6. No Negative Correlations: Interestingly, there are no negative correlations in the heatmap. This suggests that improvements in one area of AI in higher education do not come at the expense of another area.
7. Symmetry: The heatmap is symmetrical across its diagonal, which is a characteristic of correlation matrices.

In summary, this heatmap paints a picture of AI in higher education where advancements in one area tend to be associated with improvements in others. The strongest relationships are between administrative efficiency and accessibility, and between research opportunities and skills development. This suggests that AI implementations that focus on these areas might have the most widespread positive impacts across the educational ecosystem. The absence of negative correlations is particularly noteworthy, indicating that AI's benefits in one area of higher education don't seem to detract from other areas.

Table 2: ANOVA correlation coefficients

	Statistic	Value
1	P-value:	4.822639097331055e-76
2	F-statistic:	78.44177598156644

The ANOVA results show a very low p-value (4.82e-76), which is much smaller than the conventional significance level of 0.05. This indicates that there are statistically significant differences among the mean scores of the different categories related to AI in higher education.
These results indicate strong evidence against the null hypothesis, which assumes that all group means are equal. The extremely low p-value suggests that there are statistically significant differences among the mean scores of the different categories related to AI in higher education.

Discussions of the findings
These research findings provide valuable insights; however, the findings relate to the light of existing research on the impact of AI in Tertiary Education in Nigeria:
Administrative Efficiency: The finding of this study revealed that there is a strong correlation between AI and Administrative Efficiency in tertiary education in Jigawa State. The strong correlation is consistent with findings from the study by Okonkwo and Eze (2019) in Nigerian universities found that AI-powered systems significantly improved administrative processes, reducing paperwork and streamlining student registration and record-keeping.

Accessibility to Learning: The finding of this study revealed that there is strong correlation between AI and Accessibility to Learning. The high and strong correlation between AI and Learning Accessibility in relevant to the Jigawa State Tertiary Education context aligns with findings of Adekola et al. (2020) showed that AI-

powered online learning platforms have increased access to higher education in rural areas of Jigawa State Nigeria, where traditional university infrastructure is limited.

Collaboration and Network Building: The findings of this study illustrated that there is a positive relationship between AI and collaboration and network in Jigawa State tertiary education which aligns with research by Ndlovu and Mostert (2018) in South Africa, which highlighted how AI-facilitated virtual classrooms and collaborative platforms have enhanced inter-institutional cooperation and international academic partnerships. These findings were also similar to (Nosike, 2020) who viewed that adopting AI-driven tools can provide significant advantages in learner networking and lesson delivery, ensuring that educational standards meet global benchmarks. Consequently, embracing AI not only optimizes teaching resources but also fosters a more engaging and inclusive learning environment.

Personalized Learning: The findings of this study show that AI is positively related to personalized learning which is consistent and corresponds with findings from Oyelere et al. (2020), who reported mixed results in the implementation of AI-enhanced learning tools in Nigerian universities, citing challenges such as infrastructure limitations and the need for faculty training. The advancement of AI in education, therefore, not only offers opportunities for enhanced learning but also underscores the need for proactive measures in managing its integration (Isukuru, 2024). It is also aligns with the findings of (Adamu, 2023) that AI allows for tailored instruction that can adapt to the individual learning needs of students, particularly in a diverse educational landscape such as that of Jigawa State, Nigeria. The potential of AI to curate and present relevant learning materials aligns with the findings of research indicating the necessity for technological competence among educators.

Research Opportunities: The findings of this study show that AI is positively correlated to research opportunities which is consistent and corresponds with the findings Eze et al. (2021) discussed how AI is opening new avenues for research in Jigawa State universities, particularly in data-intensive fields, noting that more investment in research infrastructure is needed to fully leverage these opportunities.

Skills Development: The findings of this study show that AI is relatively positively related to skills development which is consistent with the findings of Asamoah et al. (2022) in Ghana where they found a gap between AI-enhanced education and the development of practical, industry-relevant skills.

Summary and Conclusion of the Findings
1. All the null hypotheses were rejected and stand that Artificial Intelligence is positively related to personalized learning, educational Administrative Efficiency Accessibility, Collaboration and Network Building, and Research Opportunities.
2. Statistical Significance: The extremely low p-value suggests that the differences observed between the categories are not due to chance. This implies that AI has varying effects on different aspects of higher education.
3. Relative Impact: From the bar plot, we can observe that AI appears to have the highest mean scores in: Administrative Efficiency, Accessibility, Collaboration and Network Building. This suggests that AI might have the most substantial positive impact in these areas of higher education.
4. Moderate Impact: Learning and Research Opportunities show moderate mean scores, indicating that AI has a notable but perhaps less pronounced effect in these areas compared to the top three.
5. Lower Impact: Skills Development has the lowest mean score among the categories examined. This might suggest that the current implementation of AI in higher education has less influence on skills development compared to other areas.

To summarise, the ANOVA results show significant disparities in the impact of AI on several facets of higher education; applying these findings to the Jigawa State context exposes both potential and concerns. The significant potential for increasing administrative efficiency, accessibility, and collaboration is consistent with the needs of the state's higher education systems. This data supports the notion that AI has various effects on different components of higher education, and these variances are not the result of chance. The categories we examined (Learning, Accessibility, Administrative Efficiency, Skills Development, Research Opportunities,

and Collaboration and Network Building) have significantly varying mean scores, demonstrating that AI's impact varies across higher education. However, the smaller impact on skill development shows an area in which skills development highlights an area that may require more focused attention and tailored strategies in the Jigawa State context.

Recommendations/future direction

The study demonstrates that AI in Jigawa State higher education, where achievements in one area are likely to be related to improvements in others. The most significant correlations are between administrative efficiency and accessibility, as well as between research opportunities and skill development. This suggests that AI implementations that focus on these areas may have the greatest positive influence across the educational ecosystem. The absence of negative associations is also remarkable, demonstrating that AI's benefits in one area of higher education do not appear to outweigh those in others.

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