ARTIFICIAL INTELLIGENCE LITERACY, ACADEMIC INTEGRITY AND DATA SECURITY AMONG STUDENTS AND STAFF OF NIGERIAN HIGHER EDUCATION INSTITUTIONS IN THE 21ST CENTURY NIGERIA

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Abstract
In the 21st century, artificial intelligence (AI) has rapidly integrated into educational settings, reshaping traditional learning environments with innovative, data-driven tools. Senior secondary schools stand at the forefront of this transformation, harnessing AI to personalize learning, streamline administrative functions, and offer predictive insights into student performance. However, this shift brings urgent challenges related to security, privacy, and ethics, which, if unaddressed, could compromise student welfare and educational integrity. This paper explores the dual role of AI as both an asset and a potential liability within Nigerian higher education institutions, emphasizing the need for a comprehensive re-evaluation of security measures and ethical standards in educational applications. It examines the privacy risks posed by extensive data collection and potential biases embedded in AI algorithms that influence learning outcomes and student assessment. The analysis includes existing literature and case studies on educational data security breaches, ethical frameworks, and policy gaps. Based on these findings, the study propose actionable recommendations for higher education institutions to enhance cybersecurity, promote ethical AI use, and engage stakeholders in policy development. This rethinking of AI integration will help ensure that it serves as a tool for enhancing educational opportunities while upholding students' rights to privacy and unbiased learning experiences.

Keywords: Rethinking, cyber security, data-driven tools, educational integrity

Introduction
The adoption of artificial intelligence (AI) in education has accelerated in recent years, driven by advancements in data analytics, machine learning, and personalized learning technologies. Higher education institutions are increasingly leveraging AI to improve learning outcomes, streamline administrative processes, and personalize instruction. AI technologies, such as adaptive learning systems, intelligent tutoring systems, and automated grading tools, have proven capable of tailoring educational experiences to individual students' needs, enhancing engagement, and optimizing educational outcomes. This shift towards AI-enhanced education is reshaping the traditional educational landscape and holds promise for bridging learning gaps, improving access to quality education, and preparing students for

a technology-driven future.

One of the key factors driving the adoption of AI in higher education institutions is the capacity of AI to provide real-time feedback and support personalized learning pathways. Adaptive learning systems, for example, dynamically adjust content difficulty based on student performance, allowing each student to progress at their own pace and focusing on their unique needs. It has been demonstrated that these systems have the potential to significantly improve student achievement by providing tailored instruction and immediate feedback, thereby increasing motivation and retention (Luckin, 2016). AI-based learning analytics also enable teachers to monitor students' progress and identify those who may need additional support, offering timely interventions that can prevent students from falling behind (Baker & Inventado, 2014).

AI's potential to reduce administrative burdens is another major factor behind its widespread adoption. Automation tools in education streamline tasks such as attendance tracking, grading, and scheduling, thus freeing up educators' time to focus on direct student interaction and engagement. For instance, intelligent grading systems that assess essays and other written assignments have shown promising results in providing consistent and objective grading, potentially reducing bias and allowing teachers more time for in-depth feedback on student performance (Woolf et al., 2013). These systems have found particular application in large-scale educational settings, where high student-to-teacher ratios pose challenges for timely and personalized feedback (Holmes et al., 2019).

However, despite these benefits, AI adoption in higher education institutions also brings unique challenges, particularly around issues of data privacy, ethical considerations, and equity. The widespread collection and analysis of student data necessary for personalized learning and adaptive algorithms raise significant concerns about data security and privacy. Students' personal information, learning behaviours, and even biometric data may be stored and analyzed by AI systems, making educational institutions potential targets for cyber threats (Selwyn, 2019). Additionally, AI-driven learning tools must navigate ethical concerns around fairness, transparency, and accountability, as algorithmic biases can impact the equity of educational experiences for different groups of students (Binns, 2018).

In response to these challenges, governments, organizations and higher education institutions have begun to develop guidelines and frameworks for ethical AI use in education. UNESCO, for instance, has released a series of policy recommendations aimed at promoting responsible AI integration in educational systems worldwide, emphasizing transparency, privacy, and fairness in AI technologies (UNESCO, 2021a). As AI adoption in education continues to expand, these frameworks will play a critical role in ensuring that AI-enhanced educational tools support inclusive, safe, and equitable learning environments.

The Importance of Higher Education Institutions in Shaping Critical Thinking and Ethical Reasoning

Higher education institutions serve as a foundational period for developing critical thinking, ethical reasoning, and moral judgment among students. At this stage, students are positioned to form complex cognitive skills and ethical perspectives that guide their future academic, personal, and professional lives. These skills are essential, especially in today's digital age where rapid technological advancements, including the proliferation of artificial intelligence (AI), require students to navigate an increasingly complex world with informed and responsible decision-making abilities (Noddings, 2013).

Critical Thinking Development

Critical thinking refers to the ability to analyze information, identify assumptions, evaluate evidence, and reason logically. At the higher education institutions, students begin to engage in more advanced coursework that challenges them to interpret information, assess conflicting viewpoints, and make reasoned decisions. This period is crucial for developing students' analytical abilities, as they encounter subjects that demand structured thought, complex problem-solving, and creativity (Ennis, 2011). Higher education institutions encourages students to evaluate the reliability of information, which is increasingly relevant in a digital world where they are constantly exposed to vast amounts of data, often from unverified or biased sources (Paul & Elder, 2006).

Higher education institutions often incorporate frameworks for critical thinking into subjects such as mathematics, science, social studies, and literature, where students learn to question underlying assumptions, analyze cause-and-effect relationships, and appreciate multiple perspectives. Research suggests that critical thinking skills developed in senior secondary education have a lasting impact, enabling students to approach future challenges with discernment and adaptability (Halpern, 2014). For example, a student trained in critical thinking is better equipped to understand the limitations and ethical considerations associated with AI applications, as well as the implications of their use in society.

Ethical Reasoning and Moral Development

Ethical reasoning is the process by which individuals assess actions and decisions through the lens of morality, fairness, and justice. At the higher education institutions, students are exposed to diverse viewpoints and ethical dilemmas through subjects such as history, philosophy, and social sciences, which help them, understand the consequences of actions on individuals and society (Rest et al., 1999). Exposure to ethical reasoning during this period is vital, as students grapple with questions of right and wrong, fairness, and social responsibility, helping them establish a personal moral compass that can guide their future behavior (Noddings, 2013).

The importance of ethical reasoning is heightened in the current digital and AI-driven world, where ethical dilemmas are increasingly complex and require individuals to weigh benefits against potential harms. For instance, students are now faced with issues such as privacy, data security, and algorithmic bias challenges that demand both critical thinking and a sound ethical foundation (Binns, 2018). Higher education institutions provides a structured environment for students to debate, reflect on, and understand these issues, promoting moral maturity and a sense of accountability. Research indicates that students who undergo formal education in ethics during at the higher institution of learning tend to exhibit higher levels of moral reasoning and ethical awareness as they transition into adulthood (Narvaez, 2001).

Role of Higher Education Institutions in Facilitating Critical and Ethical Skills

Higher education institutions play a critical role in nurturing critical thinking and ethical reasoning by creating an environment that fosters open dialogue, inquiry, and reflection. Through a combination of classroom discussions, debate clubs, and ethics courses, schools can guide students in understanding complex moral issues and the ethical implications of technology. Additionally, many higher education institutions incorporate service-learning projects, which combine classroom instruction with community service, allowing students to see the practical applications of ethical decision-making (Hart et al., 2008).

The importance of this training is underscored by the challenges of the AI era, where students must navigate moral and ethical considerations related to technology use. AI tools

in education, for instance, introduce ethical questions around privacy, equity, and autonomy. Students who are educated in critical thinking and ethical reasoning are better equipped to understand and challenge the moral implications of AI applications, fostering a generation of responsible, informed citizens capable of contributing positively to society.

Higher education institutions are crucial in developing students' critical thinking and ethical reasoning, skills that are essential for navigating today's complex, technology-driven world. Providing students with opportunities to engage with complex ideas and moral questions, higher education institutions help students become analytical, ethical individuals prepared to meet the challenges of the AI era with insight and integrity.

AI's Impact on Security, Privacy, and Ethics in Education

The integration of artificial intelligence (AI) into higher education institution settings offers new opportunities for personalized learning, efficient administration, and academic advancement. However, it also brings significant challenges in terms of security, privacy, and ethics, raising crucial questions about data protection, responsible use of technology, and equitable access to educational resources. As AI systems become more prevalent in schools, it is essential to address these impacts to ensure a safe, ethical, and inclusive learning environment.

Security in AI-Enabled Education

AI technologies in education often rely on large datasets, which include personal information about students, teachers, and administrative staff. These datasets, which may contain sensitive information such as academic records, behavioral insights, and even biometric data, are essential for personalizing learning experiences and optimizing educational outcomes. However, this data dependency makes educational institutions susceptible to cyber security threats and data breaches. In 2020 alone, multiple educational institutions experienced significant data breaches due to inadequate security measures in their digital infrastructures, exposing personal data of millions of students worldwide (Henry et al., 2020).

As AI systems become integrated into school infrastructures, robust cyber security measures are essential to safeguard sensitive information. Best practices include encryption, multi-factor authentication, and regular security audits, but schools often lack the resources or expertise needed to implement these measures effectively. This lack of preparedness makes AI in education particularly vulnerable to cyber-attacks. Researchers and policymakers are urging institutions to adopt stronger cyber security policies and invest in technology that can protect student data (Kim et al, 2019). They suggest that machine learning-based security systems can be employed to identify threats in real-time, enhancing response times and potentially minimizing the damage caused by breaches (Makridakis, 2017).

Privacy Concerns in AI-Powered Education

Privacy is another significant issue associated with the use of AI in educational contexts. The data collection processes required for AI applications to function—tracking academic performance, behavioral patterns, and engagement levels—often involve collecting extensive amounts of personal information. This data collection can feel intrusive, especially if students and their parents are not fully informed about the nature of the data being collected, its purpose, or how it will be stored and used (Chaudhuri & Monteleoni, 2009). In the absence of clear regulations, there is a risk of data misuse, including the possibility of sharing or selling student data without consent, leading to potential exploitation.

The European Union's General Data Protection Regulation (GDPR) provides a framework for managing privacy in data-driven fields and is increasingly viewed as a model for protecting student data in AI applications worldwide (Voigt & von dem Bussche, 2017). Key principles in GDPR, such as data minimization and the right to erasure could guide educational institutions in developing privacy protocols that respect student rights. Furthermore, privacy-preserving AI technologies, such as data anonymization and federated learning, are being explored to reduce the risk of data misuse by allowing AI systems to analyze data without directly accessing sensitive information (Chaudhuri & Monteleoni, 2009).

Ethical Implications of AI in Education

AI-driven education also presents significant ethical challenges, particularly regarding fairness, accountability, and transparency. One major ethical issue is the potential for algorithmic bias, which can lead to unfair treatment of certain groups of students based on gender, socioeconomic background, or ethnicity. For example, biased algorithms could lead to underrepresentation of minority students in advanced classes or unintended disparities in learning outcomes (Binns, 2018). These biases can emerge from the data used to train AI models or from the design of the algorithms themselves, and they risk reinforcing existing inequalities rather than promoting inclusive education.

Transparency and accountability in AI decisions are essential to addressing these ethical challenges, as they allow educators and administrators to understand how AI systems operate and to intervene if biases are detected. Ethical AI guidelines, such as those proposed by UNESCO, advocate for "explainable" AI systems that can be audited and interpreted by human stakeholders to ensure responsible usage (UNESCO, 2021b). Additionally, fostering a culture of ethical awareness among AI developers, educators, and policymakers can help identify and mitigate potential biases early in the deployment process.

Another ethical concern is the risk of reducing students' autonomy and critical thinking skills. Over-reliance on AI-driven systems, such as automated grading or predictive analytics, may discourage students from developing essential analytical and problem-solving skills (Holmes et al., 2019). If not carefully managed, AI could lead to a passive learning experience, where students interact primarily with algorithms rather than engaging with educators or peers. As educational institutions adopt AI, it is important to maintain a balance that respects students' autonomy and fosters their development as independent thinkers.

Addressing AI's Security, Privacy, and Ethical Challenges

Mitigate the risks requires higher education institutions to adopt a multi-faceted approach that prioritizes security, privacy, and ethical considerations. First, there is the need for schools to bolster cyber security measures to prevent unauthorized access to sensitive student data. This includes not only technological safeguards but also regular training for staff and students on data protection best practices. For privacy protection, schools must adopt policies that minimize data collection to only what is essential, and ensure transparent communication with students and parents about how data will be used. Regulatory frameworks like GDPR offer useful guidelines for developing policies that uphold students' privacy rights, and privacy-preserving technologies should be further explored for education-specific applications.

Ethically, fostering transparency and accountability in AI applications in schools with a commitment to monitoring and addressing biases within AI systems must be the aim. Implementing AI guidelines, promoting ethical AI research, and ensuring diverse

representation in the development and application of AI technologies can contribute to a more equitable educational environment. While AI brings promising innovations to education, addressing its impacts on security, privacy, and ethics is essential to creating a responsible and supportive educational ecosystem. Balancing technological advancement with robust security, privacy protections, and ethical considerations, higher education institutions can ensure that AI contributes positively to student learning and development.

Artificial intelligence (AI) has rapidly evolved in recent years, revolutionizing the educational landscape by introducing technologies that enhance personalized learning, track academic progress, and streamline administrative tasks. These advancements are driven by machine learning, natural language processing, and predictive analytics, enabling more customized and data-driven approaches to teaching and learning. A wealth of research highlights AI's transformative role in education, exploring its potential to not only improve learning outcomes but also to support teachers and administrators in optimizing classroom management and institutional efficiency.

AI for Personalized Learning

Personalized learning is one of the most widely researched and implemented applications of AI in education. AI algorithms analyze individual learning patterns, adapt to students' strengths and weaknesses, and offer customized content based on student performance. Studies indicate that AI-powered adaptive learning platforms, such as intelligent tutoring systems, have demonstrated effectiveness in improving student engagement and performance, especially in large and diverse classrooms (Chen et al., 2020). Adaptive learning systems can continuously adjust difficulty levels and content based on real-time feedback, making learning both more challenging and accessible to students at all levels. A prominent example of personalized learning through AI is Carnegie Learning's MATHia, an AI -driven math tutoring system designed to support individual learning needs. Research has shown that students using MATHia exhibited higher proficiency in mathematics than those in traditional settings (Pane et al., 2017). AI-based platforms like these are particularly useful for bridging learning gaps, as they enable students to work at their own pace, helping to reduce disparities in academic achievement (Holstein et al., 2020).

Tracking Academic Progress and Learning Analytics

AI also enhances tracking of academic progress through the use of learning analytics and predictive models. By analyzing vast datasets collected through student interactions on digital platforms, AI systems can identify students at risk of falling behind and provide early interventions. Learning management systems (LMS) equipped with AI can assess engagement levels, predict student outcomes, and alert teachers to potential issues (Natriello, 2021). Recent studies emphasize that AI-driven learning analytics can serve as a valuable tool for educators by providing insights into individual learning trajectories and enabling tailored support for students who might otherwise be overlooked (Johnson et al., 2020). For example, Georgia State University implemented an AI-based advising system that utilizes predictive analytics to identify students who might benefit from additional academic support. This system analyzes data such as grades, attendance, and engagement metrics to provide timely interventions, which has resulted in improved student retention and graduation rates (Baer & Norris, 2021). Similar systems are being adopted across various institutions, proving the value of AI in proactive academic support and retention strategies.

AI for Administrative Efficiency

AI's potential to streamline administrative tasks is another key area of advancement in

educational technology. Automation in areas such as grading, attendance tracking, and scheduling can alleviate teachers' workloads, allowing them to devote more time to direct student interaction and instructional planning. For example, automated grading systems can evaluate assignments and provide feedback, offering consistency and reducing human bias (Shermis & Hamner, 2013). Natural language processing (NLP) algorithms are also being employed to evaluate written assignments, detect plagiarism, and even assess student understanding based on the quality of their responses (Ullmann, 2020).

AI-driven chatbots have been deployed in various higher institution of learning to assist with administrative tasks such as answering frequently asked questions, guiding students through course selection, and reminding them of upcoming deadlines. A study conducted at Deakin University in Australia revealed that their AI-powered chatbot, Genie, significantly reduced the workload on administrative staff by automating responses to routine queries and offering 24/7 support to students (Davis et al., 2020). Such applications of AI in administration are instrumental in enhancing institutional efficiency and improving the overall student experience.

Challenges and Ethical Considerations

While AI advancements hold immense potential for transforming education, their adoption is not without challenges. Issues related to data privacy, algorithmic bias, and the potential for over-reliance on automated systems raise important ethical concerns. As AI technologies gather and analyze vast amounts of student data, there is a risk of violating privacy standards and exposing students to potential misuse of their personal information. Furthermore, biases in AI algorithms can lead to unequal treatment of students based on race, gender, or socioeconomic background, potentially exacerbating existing inequalities (Binns, 2018). Despite these challenges, AI remains a promising tool in education, with continued research aiming to enhance its capabilities, improve transparency, and address ethical issues. As educational institutions strive to balance technological advancements with ethical considerations, AI's role in education will likely continue to grow, shaping a more personalized, efficient, and data-informed educational landscape.

Ethical Concerns: AI and Data Privacy, Fairness, and Transparency in Algorithms

The rise of artificial intelligence (AI) in education brings several ethical concerns, particularly in terms of data privacy, fairness, and transparency in algorithms. While AI has transformative potential, these ethical considerations are essential to ensure it is implemented responsibly and equitably. This section explores the major ethical issues associated with AI in education, particularly around how data is handled, how fairness is maintained, and how transparent and accountable AI systems are.

Data Privacy in AI-Powered Education

AI in education often requires large amounts of data for effective functioning. This data can include personal information on students' academic performance, behavioral patterns, and even biometric data in some cases. While data collection allows for personalized learning experiences and predictive analytics, it also raises privacy concerns, as sensitive information is collected, stored, and potentially shared. Without strong data privacy safeguards, there is a risk that educational institutions could inadvertently expose students to data breaches, unauthorized access, or even profiling (Binns, 2018).

The General Data Protection Regulation (GDPR) in the European Union sets a standard for data privacy, emphasizing data minimization, purpose limitation, and the right to erasure. Compliance with GDPR and similar frameworks is essential, as they encourage institutions

to collect only necessary data, ensure transparent data usage policies, and offer students control over their personal data (Voigt & von dem Bussche, 2017). Furthermore, privacy-preserving technologies, such as data anonymization and federated learning, are being developed to enable AI systems to function effectively without exposing individual data to unnecessary risks (Chaudhuri & Monteleoni, 2009).

Fairness in AI Algorithms

AI algorithms can inadvertently reproduce or even amplify existing social biases, leading to concerns about fairness. This is particularly relevant in education, where biased algorithms could impact decisions about student placement, assessment, and resource allocation. For example, historical data used to train AI models may reflect existing inequities, which can lead to unfair outcomes for underrepresented groups in terms of race, gender, or socioeconomic status. Without careful monitoring and adjustment, AI systems can thus unintentionally reinforce inequalities rather than bridge those (Holstein et al., 2020).

Algorithmic fairness is an evolving area of research. Techniques like bias audits, where data scientists and engineers analyze AI outcomes for disparities, are essential in reducing biased outputs. Some educational institutions are also experimenting with fair ML techniques that emphasize inclusive and balanced training data, as well as adjusting algorithmic outputs to reduce differential impacts across demographic groups (Binns, 2018). Moreover, the involvement of diverse stakeholders in AI development and the establishment of fairness benchmarks are increasingly recommended practices to ensure AI applications align with ethical and inclusive principles.

Transparency and Accountability in AI Systems

Transparency and accountability are critical for the responsible use of AI in education. As AI systems increasingly inform or automate decisions about student learning paths, performance assessments, and behavior monitoring, understanding how these decisions are made is essential for accountability. Yet, many AI algorithms operate as "black boxes," making it difficult for educators, students, and parents to understand the basis for the AI's recommendations or decisions (Lipton, 2018).

Transparent AI, sometimes called "explainable AI," is designed to make AI processes more interpretable by human users. Explainable AI helps users understand the logic behind an algorithm's decision-making process, ensuring that AI-driven outcomes are clear, interpretable, and open to scrutiny. This transparency is vital in education, where decisions can significantly impact student futures. For example, by offering explainability features, AI systems allow educators to identify and address potential issues in algorithmic predictions and ensure that decisions align with students' best interests (UNESCO, 2021b).

Accountability is closely linked to transparency, as it ensures there are clear guidelines on who is responsible for AI-driven decisions. Ethical guidelines, such as those proposed by UNESCO, suggest that high education institutions and developers be accountable for AI applications, maintaining a high standard of transparency and oversight (UNESCO, 2021a). Higher education institutions can address any unintended harms or errors and correct them efficiently by establishing mechanisms for accountability.

Ethical AI Implementation in Higher Education Institutions

The following are germane for AI implementation in higher education institutions in Nigeria.

i. Enhanced Data Privacy Measures: Higher education institutions could adopt data privacy policies that align with legal standards such as GDPR, implementing data minimization and transparency in data usage. Privacy-preserving techniques, like anonymization and federated learning, should be further explored to protect students' personal information.

ii. Fairness Audits and Bias Mitigation: Regular audits of AI systems are essential to identify and rectify any biases. Higher education institutions could also prioritize inclusive data sets and establish fairness benchmarks to ensure AI applications support equitable educational experiences.

iii. Explainability and Accountability Protocols: AI systems in higher education should be designed with explainable features that allow teachers, students, and administrators to understand and trust the system's recommendations. Clear accountability structures should be established, with policies in place to address and rectify any unintended negative consequences.

Conclusion

AI in higher education presents an opportunity to enhance learning and streamline processes, but ethical considerations around data privacy, fairness, and transparency are crucial to its responsible implementation. Prioritizing ethical standards, higher education institutions can create an AI-augmented learning environment that respects student privacy, promotes fairness, and ensures transparent, accountable AI processes. The rapid adoption of AI in education offers vast potential benefits but also brings significant security risks, including data security challenges, AI-enabled surveillance concerns, and student data vulnerabilities. Proactively addressing these issues with robust data protection measures, transparent surveillance practices, and comprehensive cyber security protocols, higher education institutions can better safeguard student data and ensure that the integration of AI in education aligns with ethical and security standards.

Suggestions

The following have been suggested:

i. Strong encryption protocols and strict access control mechanisms are essential to prevent unauthorized access. Higher education institutions should enforce role-based access and limit the amount of data accessible to each user based on their responsibilities.
ii. AI-enabled surveillance should be implemented with full transparency. Higher education institutions should communicate with students, parents, and staff about data collection practices, privacy rights, and consent options to build trust and ensure ethical practices.

iii. Cyber security education for both staff and students is crucial for preventing data breaches. Training on phishing, social engineering, and proper data handling practices can significantly reduce the likelihood of successful cyber attacks.

iv. Continuous assessment of AI systems and data protection infrastructure helps to identify and address emerging vulnerabilities. Routine security audits should be an institutional priority, with dedicated resources allocated to keep up with the latest cybersecurity best practices.

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