

## Ethical Implications of Artificial Intelligence in Education: The Perspective of Final-Year Science Education Students

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### Abstract

In today's educational landscape, students increasingly rely on AI applications for completing assignments, term papers, articles, and theses, which raises concerns about the originality and creativity, as well as the ethical implications of using these technologies in education. Guided by two research questions and one hypothesis, the study examined the ethical implications of artificial intelligence in education through the lens of final-year postgraduate and undergraduate students. A descriptive survey research design was employed, involving a sample of 212 students. Data were collected using a questionnaire. The reliability of the instrument was assessed using the Cronbach Alpha method, yielding an overall reliability index of 0.795. Research questions were analyzed descriptively, while a t-test was conducted to evaluate the sole hypothesis. The findings indicated that AI poses significant ethical challenges, including racial, cultural, and gender biases; furthermore, the use of AI in educational settings complicates teachers' ability to accurately evaluate students' knowledge and comprehension. Consequently, it is suggested that educators undergo capacity training on how to identify work produced by AI applications, among other measures.

**Key words:** Ethical implication, artificial intelligence, education, and gender

### Introduction

In the 21st century, advancements in science and technology have led to the development of computers that emulate human thought and behavior. This capability stems from the integration of artificial intelligence (AI), which enables machines to replicate human actions. To this end, AI has been defined by several authors. For instance, Baker and Smith (2019) defined it as computers that carry out cognitive tasks like humans, especially in areas of learning and problem solving. Artificial intelligence systems use algorithmic structure to carry out cognitive or perceptual activities that were hitherto reserved for human reasoning, judgment, and thought (Leslie et al., 2021). Additionally, Russell and Norvig (2010) describe AI as a system that is aware of its surroundings using sensors and interacts with actuators. Thus, these definitions imply that AI is a machine with some degree of intelligence that can perform tasks ascribed to humans, both in cognitive, learning, decision-making, and environmental adaptability. Artificial intelligence in this context is a machine or software that uses a large language model (LLM) to mine data related to a learner in addressing learning challenges in education.

Artificial intelligence promotes education, resulting in enhanced teaching, learning, and assessment strategies for teachers and students, and overall learning outcomes. The integration of robotics supported by AI in education has risen remarkably. This technology is now utilized by both educators and learners to facilitate the educational process, resulting in heightened student's engagement and enhanced safety. Given the current advancements in AI, the incorporation of robotics in education is becoming increasingly essential. Robots serve as valuable learning tools for both students and teachers, allowing for in-depth exploration of subjects without the risk of monotony (Atlantic Re: think, 2018). Artificial intelligence fosters the development of robots that enrich the educational experience across all levels, from early childhood to higher education. Timms (2016) noted that collaborative robots, or cobots, are being employed to assist in teaching children's fundamental tasks such as spelling and pronunciation, while adapting to individual student's capabilities. The role of AI in education is not to replace human instructors with humanoid robots, but rather to leverage computer intelligence to support both teachers and students, thereby enhancing the overall

educational framework. In education, Artificial intelligence is used in intelligent tutoring systems, smart classroom technologies, adaptive learning methodologies, and pedagogical agents. Furthermore, artificial intelligence can facilitate adaptive learning experiences, tailoring the pace of instruction to align with each student's performance (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2022). One of the reasons why the definition of AI remains open and contested is that it implicitly or explicitly refers to humans (or other animals) as a point of reference, and the fact that AI is meant to replicate some aspect of human or animal ("natural") intelligence. Bringing to the fore what is natural as against artificial. This also results in the philosophical and ethical concerns regarding what differentiates machines from human beings (Brooks, 2014). Artificial Intelligence technologies have standard rules that guide their operations. These rules are seen as the ethical codes of AI implementation. Therefore, ethics in AI, according to Faggella (2017), is an array of moral codes guiding the development and use of AI technological infrastructures. Considering that AI acts intelligibly like humans, there is a need for moral guidelines/codes in its decision-making, just like humans. Suffices to say that without regulation of AI ethics, the propensity to use it for misconduct could be high. Artificial intelligence ethics implies adopting AI in a manner that is transparent, responsible, and accountable (Griggs, 2019). It implies making sure that AI use is following the laws, regulations, norms, and mores of the society.

The rise of AI ethics cuts across different disciplinary divides like medicine, education, and engineering. Understandably, ethical intentions alone are not enough, but their enforcement in AI development and adoption is key. Given this, issues like fairness, accountability, transparency, bias, autonomy, agency, and inclusion must be tackled. Furthermore, a thorough understanding of the ethics across the pedagogical decisions and potential unintended consequences must be acknowledged (Dastin, 2018; Reich & Ito, 2017; Whittaker et al., 2018). The ethics of AI is increasingly becoming of interest in user modeling, e-learning environments, adaptive learning, and intelligent agents. For example, the user modeling sector has for quite some time concentrated on security, privacy, inspectability (Zapata-Rivera & Greer, 2014), and privacy (Kobsa, 2007).

Artificial Intelligence tools play a significant role in education, enhancing both teaching and learning experiences. As AI technologies evolve, they increasingly support students' learning and success,

leading to their widespread adoption (Congressional Research Service, 2018). While AI can execute a variety of tasks to simplify our lives, it lacks the understanding of the reasons behind our requests. Therefore, it is crucial to use these technologies ethically and to comprehend their operational mechanisms. Given that educational assistive technologies are often employed with minors, issues surrounding privacy, data security, and informed consent must be addressed, although opinions vary on the accountability of educational technology companies (Regan & Jesse, 2019). A concerning aspect of AI in education is the emergence of applications that generate potential answers to inquiries. For instance, Chat Generative Pre-Trained Transformer (ChatGPT) can respond to a wide range of subjects and even assist in project writing. This raises important questions: Does this application respect copyright laws? Is it free from plagiarism, and how can we ensure and monitor this? Is its use ethically justified? These inquiries are pressing for researchers, particularly regarding whether AI technology is gender-neutral or biased.

Gender is characterized as the condition of being male or female, shaped by social and cultural distinctions rather than biological factors. According to Goswami (2023), women exhibit greater anxiety than men regarding the use of information technology. The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2022) indicates a significant trend towards feminizing AI tools, which is based on established gender roles. Roles traditionally associated with women, such as secretaries, customer service representatives, and cleaners, are more frequently assigned to AI. Consequently, programmers are more likely to imbue service-oriented AI tools, like chatbots or voice assistants, with feminine attributes, often unconsciously excluding male representations from these roles. In contrast, male robots are generally perceived as more suitable for security-related positions. Additionally, programming often translates the English word 'nurse' into a female-gendered term, while 'doctor' is rendered as a male noun. Numerous researchers, including Crawford and Calo (2016), Holmes et al. (2019), Celikk et al. (2022), Kim and Kim (2022), have explored various aspects of Artificial Intelligence technology in education; however, there is a notable lack of research addressing the ethical implications of AI technology in educational settings, particularly among lecturers and students in African countries like Nigeria, which this study aims to address. Thus, the purpose of the study is to establish the ethical implications of

Artificial Intelligence technology in education. Specifically, the study tends to determine the;

1. Ethical implications of using Artificial Intelligence-driven mobile apps for educational purposes.
2. Influence of gender on students' views on the ethical implications of Artificial Intelligence apps in education.

In line with the specific purpose, the following research questions guided the study:

1. What are the ethical implications of using Artificial Intelligence-driven mobile apps for educational purposes?
2. What is the influence of gender on the ethical implications of Artificial intelligence apps in education?

To guide the study, one null hypothesis was formulated and tested at a 0.05 level of significance.

$H_{01}$ : Gender has no significant influence on the views/opinions of the respondents on the ethical implications of AI apps in education.

### **Artificial Intelligence in Education (EAIED) Ethics Framework**

Several ethical frameworks have been advanced to act as guiding principles or perhaps policy on the development, deployment, and use of AI in education (AIED). However, in this study, special consideration is given to ethical principles of artificial intelligence in education by Nguyen et al. (2023), given that the principle is a synthesis of other extant principles of AIED. According to the principle, AIED is a spectrum of governance and stewardship, transparency and accountability, sustainability and proportionality, privacy, security and safety, inclusiveness, and human-centeredness. For governance and stewardship, AIED should take multistakeholder, interdisciplinary, and international approaches. It should also be monitored and evaluated from time to time. The transparency and accountability arc connotes that AIED should be transparent, explicable, or explainable, responsible, accountable, and should be auditable over time. Similarly, AIED should possess sustainability and proportionality features, meaning that AIED should be environmentally friendly, support the local and international space, and promote lifelong learning. Also, AIED in education should not breach the privacy rights of the users, both for adults and children. Moreover, AIED should be secure and safe, indicating that it should be robust, secure, and free from harm. In a similar vein, AIED should be inclusive for all, accommodating diverse groups, and possess data integrity. It should be non-discriminatory, with no algorithm biases, fairness,

and gender equality. Lastly, AIED should be human-centered, respecting human dignity and rights. It should also respect the autonomy of human agents like teachers and students. Thus, this principle forms the framework underpinning this study, underscoring the need for students and teachers to use AI in a more responsible, accountable, transparent, secure, and inclusive manner without infringing on the copyright and property rights of others.

### **Method**

A descriptive survey research design was utilized. As described by Nworgu (2015), a design of this type deals with the systematic collection and description of data, highlighting the features and facts of a specific population. The research was conducted at the University of Nigeria, Nsukka, located in Enugu State, Nigeria. This location was chosen given the university's long-standing reputation as one of Nigeria's leading institutions, where students and staff have a history of engaging in cutting-edge research and are believed to incorporate AI applications in their research and academic activities.

The study's population comprises 73 postgraduate students (32 males and 41 females) and 159 final-year undergraduates (38 males and 121 females), totaling 212 students from the Department of Science Education at the University of Nigeria, Nsukka, during the 2021-2022 academic session. The selection of postgraduate and final-year undergraduate students was made because they are likely to utilize Artificial Intelligence technologies for their assignments and research projects. Given the manageable size of the population, no sampling was necessary, and the entire population was included as the sample.

The data collection tool utilized is a structured questionnaire created by the researchers, named 'Questionnaire on Ethical Implications of Artificial Intelligence (AI) in Education Rating Scale (QEIAIERS)'. This questionnaire is divided into two sections: Section A gathers the demographic information of the respondents, while Section B includes items aimed at collecting data relevant to the research objectives concerning the ethical implications of Artificial Intelligence in education. The instrument employs a four-point Likert scale ranging from strongly agree (SA) to strongly disagree (SD).

The instrument underwent validation by three specialists, including two from the Measurement and Evaluation unit and one from the Physics Education unit. They provided essential revisions to the items, which were integrated into the final version of the instrument before its administration to the

participants. To assess the instrument's reliability, a trial test was conducted. The questionnaire was distributed to 20 postgraduate students and 45 final-year undergraduate Science Education students from a federal university in a nearby state. The reliability of the instrument was calculated using the Cronbach's Alpha formula, yielding a reliability coefficient of 0.795. The Cronbach Alpha method was chosen due to the polytomous scoring of the instrument.

The data collection method employed in this study was direct contact. Before gathering data, the researchers obtained a permission letter from their department head to ensure ethical standards were met.

The student respondents were guaranteed confidentiality regarding their answers. The researchers personally met with the students to clarify the instructions for completing the questionnaire before they began answering the questions. To prevent any loss of completed questionnaires, the researchers distributed the instrument directly to the respondents. Data analysis was conducted using mean and standard deviation, with a mean threshold of 2.50 indicating agreement and any score below that indicating disagreement. The hypothesis was evaluated using t-test statistics, as it involved gender, which has two categories: males and females.

## Results

**Table 1**

***Mean and Standard Deviation Ratings of the Ethical Implications of Artificial Intelligence-Driven Mobile Apps in Education***

| S/N | ITEM STATEMENT   | MEAN | SD  | REMARK    |
|-----|--|------|-----|-----------|
| 1   | Artificial intelligence may exhibit bias towards a specific gender.  | 3.42 | .78 | Agreed    |
| 2   | The use of AI-driven mobile applications poses a risk of impersonation.  | 3.52 | .80 | Agreed    |
| 3   | AI-powered mobile applications enable students to replicate the work of other educators without obtaining consent from the original creator.             | 3.49 | .76 | Agreed    |
| 4   | AI-driven mobile applications pose privacy risks as they collect and potentially misuse personal data.   | 3.43 | .72 | Agreed    |
| 5   | The absence of clear guidelines for utilizing these applications in educational settings fails to establish a boundary for academic dishonesty           | 3.73 | .58 | Agreed    |
| 6   | Employing AI tools like ChatGPT for writing projects can lead to instances of plagiarism.  | 3.36 | .63 | Agreed    |
| 7   | An overreliance on AI language models diminishes intellectual curiosity and hampers critical thinking skills among students.                             | 3.46 | .69 | Agreed    |
| 8   | Additionally, there are concerns regarding copyright infringement, as AI can generate responses based on its textual sources without proper attribution. | 3.33 | .73 | Agreed    |
| 9   | The data-centric nature of AI technologies often highlights individuals' names, particularly those of African descent.                                   | 3.60 | .66 | Agreed    |
| 10  | AI has contributed to job losses due to automation.  | 3.83 | .60 | Agreed    |
| 11  | When students use AI to complete assignments, it complicates teachers' ability to accurately evaluate their knowledge and comprehension.                 | 3.61 | .68 | Agreed    |
| 12  | On a positive note, AI has the potential to enhance students' cognitive abilities  | 1.19 | .58 | Disagreed |
| 13  | and it fosters independence in students' creative endeavors  | 1.19 | .63 | Disagreed |
|     | Overall  | 3.17 | .19 | Agreed    |

Results in Table 1 revealed the ethical implications of Artificial Intelligence mobile-driven apps in education. From Table 1, items 1–11 had mean values ranging from 3.17–3.83. These values were above the 2.50 mean value set for the decision rule. The result, therefore, implies that items 1–11 are the ethical implications of Artificial Intelligence mobile-driven apps in education. While items 12 and 13 had mean values of 1.19 and 1.19. These values were below the 2.50 mean values set for the decision

rule. This showed that these two items are not the ethical implications of Artificial Intelligence mobile-driven apps in education. The standard deviation of the 13 items ranged from 0.58 – 0.76 with overall of 0.68, indicating that the respondents were homogeneous in their responses. Hence, the responses on the ethical implications of Artificial Intelligence mobile-driven apps in education are positive.

**Table 2**

***Mean and Standard Deviation Ratings of Male and Female Students' Responses on the Ethical Implications of Artificial Intelligence Mobile-Driven Apps in Education***

| S/N | ITEM STATEMENTS  | GENDER<br>N= 70<br>N= 142 | MEAN | SD  | REM.   | t     | p     | DECISION |
|-----|--|---------------------------|------|-----|--------|-------|-------|----------|
| 1   | Artificial intelligence may exhibit bias towards a specific gender.  | Male                      | 3.60 | .69 | Agreed | 2.461 | 0.133 | NS       |
|     |  | Female                    | 3.32 | .80 | Agreed |       |       |          |
| 2   | The use of AI-driven mobile applications poses a risk of impersonation   | Male                      | 3.64 | .70 | Agreed | 1.530 | 0.024 | S        |
|     |  | Female                    | 3.46 | .84 | Agreed |       |       |          |
| 3   | AI-powered mobile applications enable students to replicate the work of other educators without obtaining consent from the original creator.   | Male                      | 3.43 | .81 | Agreed | -.773 | .235  |          |
|     |  | Female                    | 3.51 | .73 | Agreed |       |       | NS       |
| 4   | AI-driven mobile applications pose privacy risks as they collect and potentially misuse personal data.   | Male                      | 3.46 | .72 | Agreed | .327  | .966  | NS       |
|     |  | Female                    | 3.42 | .73 | Agreed |       |       |          |
| 5   | The absence of clear guidelines for utilizing these applications in educational settings fails to establish a boundary for academic dishonesty | Male                      | 3.71 | .59 | Agreed | -.295 | .596  | NS       |
|     |  | Female                    | 3.74 | .58 | Agreed |       |       |          |
| 6   | Employing AI tools like ChatGPT for writing projects can lead to instances of plagiarism.  | Male                      | 3.33 | .63 | Agreed | -.482 | .839  | NS       |
|     |  | Female                    | 3.37 | .64 | Agreed |       |       |          |
| 7   | An overreliance on AI language models diminishes intellectual curiosity and hampers  | Male                      | 3.46 | .72 | Agreed | -.076 | .852  | NS       |
|     |  | Female                    | 3.46 | .68 | Agreed |       |       |          |



|    |  |        |      |     |        |        |      |    |
|----|--|--------|------|-----|--------|--------|------|----|
|    | critical thinking skills among students  |        |      |     |        |        |      |    |
| 8  | Additionally, there are concerns regarding copyright infringement, as AI can generate responses based on its textual sources without proper attribution. | Male   | 3.43 | .67 | Agreed | 1.321  | .555 | NS |
|    |  | Female | 3.29 | .75 | Agreed |        |      |    |
| 9  | The data-centric nature of AI technologies often highlights individuals' names, particularly those of African descent.                                   | Male   | 3.56 | .69 | Agreed | -.652  | .212 | NS |
|    |  | Female | 3.62 | .64 | Agreed |        |      |    |
| 10 | AI has contributed to job losses due to automation.  | Male   | 3.76 | .69 | Agreed | -1.247 | .019 | S  |
|    |  | Female | 3.87 | .55 | Agreed |        |      |    |
| 11 | When students use AI to complete assignments, it complicates teachers' ability to accurately evaluate their knowledge and comprehension                  | Male   | 3.50 | .81 | Agreed | -1.630 | .002 | S  |
|    |  | Female | 3.66 | .61 | Agreed |        |      |    |
| 12 | On a positive note, AI has the potential to enhance students' cognitive abilities  | Male   | 1.24 | .69 | Agreed | .958   | .051 | S  |
|    |  | Female | 1.16 | .51 | Agreed |        |      |    |
| 13 | AI fosters independence in students' creative endeavors  | Male   | 1.26 | .74 | Agreed | 1.039  | .046 | S  |
|    |  | Female | 1.16 | .57 | Agreed |        |      |    |
|    | Overall  | Male   | 3.18 | .19 | Agreed | .834   | .643 | NS |
|    |  | Female | 3.16 | .12 | Agreed |        |      |    |

NB: NS= Not Significant; N= Significant

Results in Table 2 showed the male and female responses of students on the ethical implications of Artificial Intelligence in education. From the table, items 1-11 had mean values ranging from 3.29-3.76, with an overall of 3.18 and 3.16. These values were above the 2.50 mean value set for the decision rule. This implies that items 1–11 are the responses of male and female students on the ethical implications of Artificial Intelligence mobile-driven apps in education. It also implies that gender does not influence the ethical implications of Artificial Intelligence mobile-driven apps in education. While items 12 and 13 had mean values of 1.24 and 1.16, which were below the 2.50 mean value set for the decision rule. Therefore, items 12 and 13 are not the

ethical implications of Artificial Intelligence mobile-driven apps in education. The standard deviation of the 13 items ranged from .51–.84, with an overall of .19 and .20, indicating that the respondents were homogeneous in their responses.

### Testing of Research Hypothesis.

#### Research Hypothesis One

Gender has no significant influence on the mean responses of students on the ethical implications of Artificial Intelligence mobile-driven apps in education.

### **Analysis of the null hypothesis is presented in Table 2.**

The results of the data analysis in Table 2 show,  $t(210) = 0.834$ ;  $P = 0.643$ , greater than the 0.05 level of significance. This indicates that the null hypothesis is upheld. This means that gender has no significant influence on the mean responses of students on the ethical implications of Artificial Intelligence mobile-driven apps in education.

### **Summary of Findings**

The following findings emerged based on the analysis of data in the study of ethical implications of Artificial Intelligence mobile-driven apps in education. They include;

1. AI can favor one gender. there is a risk of using AI-driven mobile apps for impersonation. Using AI to write assignments makes it difficult for teachers to accurately assess students' knowledge and understanding. Artificial intelligence could pose a risk to people's privacy and information since it trains on people's data and stores it for future use. Artificial intelligence also tends to be biased, considering that African names are usually underlined, and AI could also lead to the loss of work in the future due to automation, among others.
2. Lastly, it was revealed that no gender difference exists in the students' views of the ethical implications of Artificial Intelligence apps in education.

### **Discussion**

The research indicated that the application of Artificial Intelligence in education (AIED) presents several ethical challenges, including biases related to race, culture, and gender. Additionally, the study highlighted concerns regarding AI's role in writing, which may infringe upon copyright, originality, and creativity. These issues arise from AI's tendency to overlook foreign names and unfamiliar information, leading to their marginalization. Furthermore, reliance on AI for writing can foster laziness among students, depriving them of the chance to think critically and express their creativity. This reliance also stifles originality, as it restricts the diversity of writing styles and vocabulary choices. The findings suggest that AI-powered mobile applications pose privacy risks due to the collection and potential misuse of personal data. This study aligns with the conclusions of Wallach and Allen (2010), which identified privacy, accountability, transparency, and bias as key ethical concerns in educational AI. There

are apprehensions that the absence of clear guidelines for using AI-driven mobile applications in educational settings may blur the lines of academic integrity, as students might exploit AI for impersonation or plagiarize the work of educators without consent. The results of this study resonate with previous research, indicating that participants recognize the ethical implications of AI in education, particularly regarding privacy and bias. According to UNESCO (2018), ethical principles of AI encompass transparency, meaning AI systems should be designed to ensure their operations and decision-making processes are clear and comprehensible to users.

Additionally, fairness and justice are crucial ethical considerations, emphasizing that AI systems must be developed and implemented to prevent any form of bias, discrimination, or unfair treatment of individuals and groups. These ethical principles set the foundation for responsible AI deployment in educational contexts. Again, the findings also agree with Nguyen et al. (2023)'s comprehensive ethical principles of AIED, which include governance and stewardship, transparency and accountability, sustainability and proportionality, privacy, security and safety, inclusiveness, and human-centeredness, presupposing therefore that the findings are grounded in AIED use principles.

### **Conclusion**

The study's findings and subsequent discussion highlighted the ethical concerns surrounding Artificial Intelligence. For instance, the use of AI-powered mobile applications poses a risk of impersonation, while employing AI for assignment writing complicates teachers' ability to evaluate students' knowledge and comprehension accurately. Additionally, AI raises privacy issues as individuals' data can be collected and misused; this is particularly concerning for individuals with African names, who may be disproportionately affected. Furthermore, automation driven by AI has resulted in job losses.

### **Recommendations**

Educators ought to possess a fundamental understanding of artificial intelligence systems and should instruct students on the ethical implications of AI to help them recognize the limits of academic integrity. Also, educators should receive training on how to identify works produced by AI applications.

### **Acknowledgement**

The researchers appreciate the efforts of the students in taking their time to respond to the instrument. This singular gesture is highly

appreciated, especially given that they have the choice of declining to respond to the questionnaire, but they chose the opposite.

### Declaration of Conflict of Interest

There is no conflict of interest to declare

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