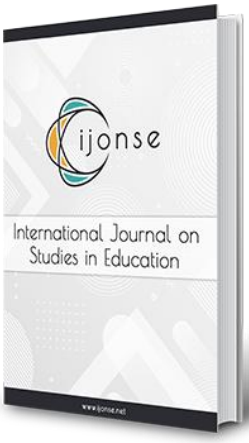

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Artificial Intelligence-Based Educational Interventions: Assessment of Student's Awareness, Perception, Usage and Challenges in Learning and Research

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Abstract

The integration of Artificial Intelligence (AI) in education holds great promise for advancing learning, research, and overall academic experiences, fostering accessibility and equity. This aligns with the pursuit of Sustainable Development Goal 4 - Quality Education, emphasizing inclusive and lifelong learning. To ensure successful AI integration, this study explores key student variables, such as awareness, perception, usage, challenges, and the impact of age and gender. With Five hypothesis guiding the study, the study employed a descriptive survey design with 529 higher education students that was randomly drawn using a stratified sampling technique. A scale Student's Awareness, Perception, Usage and Challenges of Artificial Intelligence-Based Education Interventions for Learning and Research Scale was used to obtain data. Validities were ensured using expert judgement and empirical evidence of factor analysis. Cronbach alpha was used to obtain a reliability coefficient of .95. 83, 90 and .88. for the four sections of the scale respectively, while a coefficient of .93 was obtained for the scale as a whole. Data were analyzed using mean, standard deviation, t-test, one-way ANOVA and two-way MANOVA. The research reveals a diverse spectrum of awareness, perception, usage, and challenges related to AI in education. Despite variations, a majority of students demonstrate above-average awareness and utilization of AI. Intriguingly, gender and age do not significantly impact students' awareness, perception, utilization, and challenges in AI-based education interventions, highlighting the potential universality of AI's positive influence in educational settings.

Introduction

Educational interventions incorporating artificial intelligence (AI) holds great promise in revolutionizing how teaching, learning and research is been done as it pertains to the educational landscape. It also has the potential to achieve Sustainable Development Goal 4 (SDG 4): Quality Education by providing inclusive and equitable education for all, fostering lifelong learning opportunities. Subsequently, incorporating AI into education has become a promising approach to enhance learning, outcomes, and research experiences. The ability of a digital machine to carry out tasks often performed by intelligent beings is known as artificial intelligence (Chiu et al.

2023). The idea of AI-based educational interventions, as seen by Eteng-Uket & Effiom (2024), is embodied in the application of AI interventions to the field of education. According to their assertion, a variety of technologies and applications that utilize AI processes and approaches to improve the educational process are referred to as AI-based educational interventions. Similarly, some academics have used phrases like AI in education to refer to the same idea (Chiu et al 2023).

Scholars have reported that intelligent tutoring systems (ITS) use artificial intelligence (AI) algorithms to give students tailored instruction and adaptive feedback based on their unique learning needs; virtual assistants provide students with real-time support by responding to inquiries, giving advice, and providing resources; Language learning applications use natural language processing procedures to assess and provide feedback on students' language skills; adaptive learning platforms use AI algorithms to customize learning paths and instructional content for individual students; automated grading systems use AI techniques to evaluate and provide feedback on student assignments; immersive technology (virtual and augmented reality) uses AI algorithms to create immersive and interactive learning experiences by simulating environments and superimposing digital information onto the real world; AI writing/research assistance helps to gather and analyse relevant information for academic research and intelligent content generation/chatbots uses AI algorithms to generate customized learning materials/information based on specific topics or prompts (Aimiuwu, 2022; Eteng-Uket & Effiom 2024; Jiang et al 2022; Kaban, 2023; Yang et al., 2023). AI tools that are specifically created for use in teaching, learning, and research activities include the GPT-3 model from OpenAI, Bard AI, Bing, Grammarly, Turnitin, Consensus, and similar programs.

AI-based interventions can improve educational systems, give students more capacity, and help achieve SDG 4's objectives for high-quality education. (Yuskovych-Zhukovska et al., 2022). The necessity of offering high-quality education that is inclusive, accessible, and tailored to students' needs is emphasized by SDG 4. These objectives may be met by AI-based educational interventions, which provide individualized and customized learning opportunities. These interventions can make use of AI algorithms to evaluate student data, offer tailored feedback, deliver timely and precise early intervention solutions, and design flexible learning paths. Additionally, they can give teachers access to real-time data and analytics, which will enable them to better understand the requirements of their students and modify their instructions accordingly (Eteng-Uket & Effiom 2024). Additionally, by allowing school dropouts to resume their education whenever it is convenient for them and by promoting lifelong learning through e-portfolios and AI technology, AI-based education interventions can aid in the achievement of SDG 4 (Mani, 2022). Teachers may meet the varied needs and skill levels of their students by using AI technologies, which encourages inclusivity and guarantees that no kid is left behind.

Additionally, AI-powered interventions not only present fresh possibilities to improve learning environments, but they also significantly contribute to the revolution of research methods, the opening of fresh research directions, and the acceleration of scientific discoveries (Eteng-Uket & Effiom 2024). AI-powered interventions are not without some challenges. Some of these challenges are that it is restricted by limited language options, academic dishonesty, biases and lack of accountability, potential of reduction in human-to-human interaction since education is not solely about knowledge transfer but also social and emotional development, issues of ethical

concerns like issues related to the ownership of data, algorithmic transparency, and accountability, educational inequality, the tendency for intense use of AI to impair student's ability to learn independently and develop 21th century skills such as problem solving and critical thinking, lack of facility and expertise on part of educators. (Chiu & Chai, 2020; Eteng-Uket & Effiom 2024)

In spite of these risks and drawbacks, integrating AI-based educational interventions has the potential to reinvent research and learning methodologies, spur innovation, and promote both national and international change. It also has the potential to improve accessibility, equity, and engagement for all learners. In order for higher educational institutions to effectively leverage these benefits and by extension, achieve the SDG goal of quality education, certain dynamics that relates to the learners and students who are principal benefactor of these AI interventions has to be investigated. These dynamics and variables include factors like awareness, attitude, perception, interest, personality, usage, digital literacy level and the likes. That is successful integration and adoption of AI technologies in education depend on students' attitudes which encompasses students' willingness to engage with them. Some studies have been carried out on AI -based educational interventions and AI in education as it relates to the attitude toward (Almed et al., 2022; Buabbas et al 2023; Amaraz-Lopez et al 2023; Al Saad et al., 2023; Eteng-Uket & Effiom 2024), Others has been on perception, knowledge, usage, and readiness. The influence of factors such as students' awareness, perception, usage, and challenges of Artificial Intelligence (AI) in education can significantly impact university students' learning experiences.

Awareness of AI-Based Educational Interventions

One important factor that greatly influences the incorporation of AI into educational processes is awareness of AI-Based educational interventions. Knowing and comprehending the existence and intent of AI-based educational interventions is referred to as awareness of these interventions. It involves knowledge of AI's educational benefits and potentials as well as its limitations and ethical considerations. The awareness of various intelligent tutoring programs, such as Carnegie, Khan Academy, AI content generators, and writing aids, such as ProWritingAid, Grammarly, Bard, Chat GPT, as well as automated grading and feedback programs, such as Turnitin, gradescope, Augmented Reality, Virtual Reality, and Virtual Lab Simulation, and similar programs, is also included.

Evaluating students' level of awareness aids in identifying gaps and formulating plans to encourage a more comprehensive grasp of AI in the classroom. With this knowledge, students can actively participate in AI-based interventions and make well-informed judgments. Students who are aware of the use of AI in education might be more willing to integrate it into their research projects and learning procedures. They might actively look for AI tools and resources, which would result in a proactive and rich learning environment, yet ignorance might cause students to lose out on these benefits. Their inability to adequately utilize AI-driven educational resources and comprehend their potential advantages could restrict their usefulness of their research endeavours and educational experiences. Some studies suggest that a great number of students have awareness of AI educational tools in their educational pursuit and learning (Adelana & Akinyemi, 2021; Dergunova et al 2022; Khadse 2020; Juma 2021; Khater et al., 2023; Simhadri, & Swamy 2023), other studies reported a moderate level of knowledge and

awareness regarding AI (Al-Qerem et al., 2023; Khadse 2020; Mansor et al 2022;) while other studies shows that student are not aware of AI educational tools in their educational pursuit and while learning (Chan & Hu 2023). Study also shows that across gender, class, and subject specializations there was no significant influence of these variables on the awareness of AI tools (Adelana & Akinyemi, 2021).

Perception of AI-Based Educational Interventions

The way in which students perceive AI-based educational interventions influences how well they accept and use these tools. The term "perception" describes how students feel about artificial intelligence towards their learning activities. Perception refers to students' attitudes, beliefs, and opinions towards AI in education. Increased usage and engagement may result from favourable and positive perception, such as the idea that AI might be a useful tool for skill improvement and individualized learning. On the other hand, unfavourable and negative perceptions, such worries about morality, privacy, or losing one's job, could prevent AI-based solutions from being used effectively. Gaining insight into how students see AI in the classroom can help clear up misunderstandings, establish credibility, and promote a positive outlook.

Higher motivation and engagement levels can result from a favourable perception of AI in the classroom. Thus, positive views of AI as a useful addition to traditional learning methods may encourage students to embrace technology, leading to more effective and personalized learning experiences. Negative perceptions on the other hand, like fear of losing their job or privacy concerns, may prevent students from adopting AI technologies, thus, their ability to use cutting-edge teaching and research resources may be hampered by this opposition.

A range of studies have explored students' perceptions of AI in education, with varying results. Some studies suggest that a great number of students have a positive perception and invariably, positive attitude towards AI in education (Al Saad et al., 2023; Keles & Aydin 2021; Khater et al., 2023; Utami et al., 2023) while other studies show that negative perceptions are more significant among students (Keles & Aydin 2021). Also, the studies showed that students had mixed reactions and perceptions concerning AI in education (Al-Qerem et al., 2013; Castillo-Acobo et al 2023; Smolansky et al., 2023;). These studies suggest that students' perceptions of AI in education are complex and may be influenced by variables such as field of study and the specific application of AI, prior experience with AI, gender, just to mention but a few. Research on the perception of male and female students toward AI in education reveals some interesting findings. Lodhi (2019) found that male students had a more positive attitude and disposition towards computer-assisted language learning. However, Gherheș and Obrad (2018), noted that a significant number of both male and female students have a positive orientation towards the advent of AI, with some differences based on their type of specialization and gender. These studies collectively suggest that while there may be some gender differences in the perception of AI in education, there is also a general positive attitude and perception towards AI among students. Several factors may influence students' attitudes towards AI-based educational interventions like perceived usefulness, ease of use, prior experience, trust, psychological variables, socio-demographic factors like age and gender just to mention but a few. Thus, understanding students' perspectives, beliefs, and concerns regarding AI-based interventions is essential for designing inclusive and effective learning environments (Liao et al., 2019).

Usage of AI-Based Educational Interventions

The integration and setting up of artificial intelligence technologies to improve several facets of the learning and research process is what usage of AI in education refers to. This entails using or utilising AI tools and algorithms to produce more effective, personalized, and adaptive learning environments. The goal is to optimize the learning journey for individuals by tailoring content, assessments, and feedback to their specific needs and abilities. The extent to which students are using AI-based education interventions in classrooms for their research and learning activities can be inferred from usage trends of these technologies. To ensure AI-based interventions are successfully incorporated into the learning process and help achieve SDG 4, it would be advantageous to investigate and comprehend the patterns of AI use of students in higher education. Students' comprehension of difficult subjects and the process of producing research papers can be improved by actively utilizing AI technologies for learning and research, such as virtual assistants, adaptive learning platforms, intelligent tutoring systems, and writing assistance. In addition, it can offer tailored feedback, attending to specific learning requirements and encouraging self-directed learning; yet, improper or unguided application of AI technologies may cause confusion or dissatisfaction. Students may find it difficult to incorporate AI technology into their regular research and learning activities if they do not receive adequate instruction on how to use them. Some studies suggest that a great number of students have used and applied AI educational tools in their educational pursuit while learning (Alharbi 2023; Utami eta al., 2023) while other studies shows that students do not use and apply AI educational tools in their educational pursuit of learning, research and general academic activities. (Chan & Hu 2023; Juma 2021). Studies also shows that gender does not have any influence on the application of AI tools and interventions into learning while age did (Castillo-Acobo et al 2023). That is there was no significant difference between male and female respondents who reported using AI in the classroom. Studies also suggest that students' usage of AI in education are complex and may be influenced by factors such as field of study and the specific application of AI, age, gender, prior experience with AI, (Castillo-Acobo et al 2023). Precisely, the findings of Castillo-Acobo et al (2023) showed that age and field of study had influential effects on the application of AI in education. While the Study of Khadse (2020) shows that gender does not have any influence on the application of AI tools and interventions into learning.

Challenges of AI-Based Educational Interventions

The difficulties and problems that can occur when incorporating artificial intelligence technologies into educational institutions are referred to as the "challenges of AI in education." The challenges of AI in education are the difficulties and problems that may arise when implementing artificial intelligence technologies in educational settings. The most frequently mentioned challenges to the use of AI, according to a number of studies by various researchers, are: a lack of knowledge and expertise; a lack of time due to the burden of schooling; a lack of access to technical equipment; ethical and privacy concerns; accuracy; poor internet facilities; disruption of the roles of teachers and students; an intensifying of existing inequities; inadequate funding; and poor power supply. (Afonughe, 2021; Al-Qerem et al., 2023; Utami 2023; Castillo-Acobo et al 2023; Chan & Hu 2023). These could hinder the adoption of AI tools and limit student’s benefiting from its numerous advantages as it applies to their education. It is thus imperative that educators and policymakers addresses these challenges to ensure that AI

interventions in education are fair and beneficial to all students, in line with SDG 4 principles.

Several factors may influence students' awareness, perception and usage of AI in educational pursuit of research and learning. Some of the factors that may affect students' awareness, use, and perception of artificial intelligence (AI) for learning and research include perceived usefulness, ease of use, prior experience, trust, psychological factors like personality, interest, and the like, and other factors like digital literacy and sociodemographic factors like age and gender, to name a few. Age as a factor may influence students' awareness, perception and usage of AI in learning and research. Age is a measure of the time that an individual has been alive, typically measured and expressed in years Eteng-Uket & Iruloh (2023). Younger students, who have grown up in a digital age and are more tech-savvy, may have more awareness, and usage of AI tools than their older counterparts. They might be more comfortable using technology as a learning tool. On the other hand, older students may have a more cautious approach to AI in education, as they may be less familiar with technology or have concerns about adapting to new teaching methods. Gender could be another influencing factor. Gender is the set of social, cultural, and psychological characteristics associated with being male or female. Eteng-Uket & Iruloh (2023). The perception and application of AI in education by students may be influenced by gender preconceptions and biases. For instance, female students' use of and interest in AI-based treatments may be impacted if they believe AI is primarily connected to sectors with a male preponderance. Gender-specific learning preferences might also have an impact. Learning preferences can also be influenced by gender, and male and female students might perceive AI systems that conform to their unique learning patterns differently. Therefore, creating inclusive and productive learning environments requires an understanding of the perception, awareness, usage, and barriers faced by male and female students of all ages as it relates to AI in education. This is evident from the previously mentioned research studies conducted by researchers on challenges, awareness, usage, perception, and attitude.

The Present Study

Although research has been done in a number of non-African climes, there is still a significant knowledge vacuum on students' awareness, usage, perspectives, and difficulties with AI in Nigerian educational settings. A more thorough investigation of Nigerian students' understanding, perception, usage, and obstacles with regard to AI-based interventions is necessary if we are to successfully integrate and support AI technology into higher educational settings. Undertaking a research initiative to investigate students' knowledge, views, use, and obstacles regarding AI in higher education could help bridge this gap. This study would not only provide valuable insights into students' experiences with AI in higher education but also support the achievement of Sustainable Development Goal 4 - Quality Education. By illuminating the dynamics of AI integration in the educational landscape of Rivers State, Nigeria, the study aligns with the broader goal of enhancing the quality of education. Recognizing and addressing the reservations and hurdles faced by students in adopting AI can facilitate the development of policies and strategies that foster a more inclusive and technologically advanced educational environment, aligning with the principles of SDG 4. It is against this premises that this research was carried out which was to assess higher education student’s awareness, perception, usage and challenges towards AI-based educational interventions for learning and research.

The following null hypothesis guided the study and were tested at 0.5 sig level:

1. There is no significant difference in the awareness level of students towards AI-Based educational intervention for learning and research
2. There is no significant difference in the perception of students towards AI-Based educational intervention for learning and research
3. There is no significant difference in the usage level of AI-Based educational intervention tools for learning and research by students
4. There is no significant difference in the level of challenges faced by students towards the adoption of AI-Based educational intervention for learning and research
5. There is no significant influence of gender and age on students' awareness, perception, usage and challenges faced towards AI-Based educational intervention for learning and research

Methods

Research Design, Population and Sampling

A survey was used as the study design. This design utilized the analytic descriptive design. This approach was used in the study to analyse how higher education students perceive, use, and encounter the challenges of AI interventions in learning and general academic activities. For the variables under study, this approach is also appropriate when comparing different strata of the sample. (2013) Nwankwo posited. The study's population was made up of 15,875 undergraduate students at the University of Port During the academic year of 2022/2023. Using disproportionate stratified random sampling, a sample of 539 participants was selected based on gender.

Instruments for Data Collection

The Student's Awareness, Perception, Usage, and Challenges of Artificial Intelligence-Based Education Interventions for Learning and Research Scale (SAUPCAIELSS) was the instrument used to collect data. Part A and Part B comprised the two sections of the instrument. Socio-demographic data including sex, age, department, faculty, and course of study were included in Part A. There were four sections in Part B: A, B, C, and D. Sections A contains items on Student's Awareness of Artificial Intelligence-Based Education Interventions for Learning research and general academic activities, sections B, contained items on Student's usage of Artificial Intelligence-Based Education Interventions for Learning research and general academic activities, sections C, contained items on Student's perception of Artificial Intelligence-Based Education Interventions for Learning research and general academic activities and sections D contained Items on Barriers/challenges confronting student's utilization of Artificial Intelligence-Based Education Interventions for Learning research and general academic activities. The part B contained 14 items that was designed to obtain awareness towards AI-based educational interventions for learning. Respondents are asked to rate items using a response scale that ranged from very highly aware to not aware at all. With the Scores on this scale indicating the level of awareness of students. The part C contained 17 items that was designed to obtained perception towards AI-based educational interventions for learning and research. Respondents are asked to rate items using a response scale that ranged from positive perception to negative perception. With the Scores on this scale indicating the kind of perception of students towards AI for

learning research and general academic activities. The part C contained 17 items that was designed to obtained usage of AI-based educational interventions and tools for learning and research. Respondents are asked to rate items using a response scale that ranged from very highly utilization to not utilized at all. With the Scores on this scale indicating the level of usage/utilization of students. The part D contained 11 items that was designed to obtain level of barriers/challenges faced by students towards AI-based educational interventions for learning and research. Scores on this scale indicating the level of barriers/challenges faced by students towards AI for learning, research and general academic activities.

Validity and Reliability of Instruments

Expert judgment and empirical factor analysis evidence were used to assure validity. By consulting with experts (counselling psychologists, test and measurement specialists), face and content validity were guaranteed. These specialists thoroughly examined each item for content, language, and ambiguities, as well as making sure that the scale items aligned with aim of the study. The items that were deemed to have obtained substantial approval from specialists were the only ones retained for item analysis, based on their critiques and remarks as it relates to content, usefulness, completeness, clarity, and literacy requirements of the instrument. That is, the instrument's final version included their suggestions and corrections. Furthermore, multivariate factor analysis was applied to established the construct validity of the scale, it was shown that all of the items' initial factor loading was considerably more than 1. The internal consistency of the instruments was assessed using the Cronbach alpha method in order to determine their construct validity and reliability. A sample different from the study's actual sample was used for the pilot testing of these equipment. The Cronbach alpha technique was used to assess each test item's quality and selection and a reliability coefficient of 0.95 was obtained for the section on Student's Awareness of Artificial Intelligence-Based Education Interventions for Learning research and general academic activities, sections B, on Student's usage had a coefficient of 0.90, sections C on Student's perception of Artificial Intelligence-Based Education Interventions for Learning research and general academic activities had a coefficient of 0.830, sections D on Barriers/challenges confronting student's utilization of Artificial Intelligence-Based Education Interventions for Learning research and general academic activities had a coefficient of 0.883 while the scale as a whole had a coefficient of 0.938.

Data Analysis

Data were analysed using mean, standard deviation, t-test and one-way ANOVA and two-way MANOVA.

Results

Hypothesis 1; There is no significant difference in the awareness level of students towards AI-Based educational intervention for learning and research.

Table 1 reveals the level of awareness of higher education students towards AI-based educational interventions for learning and research.

Table 1. Mean, SD and One-Way ANOVA Analysis of Significant Difference in the Level of Students towards AI-Based Educational Intervention for Learning and Research

Awareness Levels	N	$\bar{X}$	SD	Df	Mean Square	F	Sig.	p	Decision
Not aware	44	11.54	1.469						
Slightly	125	20.55	3.746						
Moderately	320	32.92	5.073	3.528	9888.5	504.35	.000	0.05	Reject Ho_1 p>0.05
Very Aware	40	47.47	2.447						
Total	529	29.25	9.714						

The table shows that students have different levels of awareness that ranges from those that are not aware, to those that are slightly aware, to those moderately aware and then those very aware as seen by the varying awareness level means of 11.54, 20.25, 32.92, 47.47 and the total average awareness mean for the whole group which is 29.25. The varying awareness means shows there is a difference in the level of awareness of higher education students towards AI-based educational interventions for learning and research. Specifically, it shows that 44 students with a mean of 47.47 are very aware, 320 students with a mean of 32.92 are moderately aware, 125 students with a mean of 20.55 are slightly aware, while 44 students with a mean of 11.54 are not aware at all of AI educational intervention and tools that can be used for learning and research.

The table also shows that majority of students are generally more aware of AI educational intervention and tools that can be used for learning and research as seen by the means for the various levels that are more than the total mean representing the general average awareness level. It invariably implies that students generally have a more than average awareness of AI-based educational interventions potentials and benefits in education, ethical consideration and its limitations. It also means they have an above average awareness of some Intelligent tutoring systems like Carnegie, Khan Academy, AI content generator and writing assistance like ProWritingAid, Grammarly, Bard, Chat GPT, some plagiarism detection tools and automated grading/feedback systems like Turnitin, gradescope, Augmented Reality, Virtual Reality and Virtual Lab Simulation and the likes.

The table reveals as well that the computed $F(3, 598) = 504.357$, $p < .05$, i.e. $p = .000$, i.e, $p = .000$ is less than 0.05 and this is statistically significant at the chosen alpha level of 0.05. Therefore, the null hypothesis of no significant difference in the awareness level of students towards AI-Based educational intervention for learning and research is rejected and the alternate accepted. This implies that there is a difference in the level of awareness of students who are not aware at all, with those who are slightly aware, with those with moderate level of awareness and then with those with high level of awareness for AI-Based educational intervention for learning and research and this difference is statistically significant.

Hypothesis 2: There is no significant difference in the perception of students towards AI-Based educational intervention for learning and research.

Table 2 presents the analysis of students' perception towards AI-based educational interventions for learning and

research.

Table 2. Mean, SD and Independent Samples t-Test Analysis of Perception of Students towards AI-Based Educational Intervention for Learning and Research

Perception	N	$\bar{X}$	SD	Df	t	Sig.	p	Decision
Positive	497	41.89	4.07	527	12.34	.000	0.05	Reject Ho_1
Negative	32	32.68	4.35					p<0.05

Table 2 shows that 497 students with a mean of 41.89 and a SD of 4.07 have a positive perception of AI-based educational interventions and tools for learning and research, while the mean for the students with a negative perception is 32.68, with a standard deviation of 4.35. The analysis shows that the perception of students towards AI-based educational interventions for learning and research is predominantly positive. The majority of students have a favourable perception towards these interventions, indicating their acceptance and willingness to engage with AI technologies for educational purposes.

The independent samples t-test analysis is conducted to determine if there is a significant difference between the positive and negative perception groups. The t-value is calculated as 12.34, with a df of 527. The significance value (Sig.) is reported as .000, which is less than the significance level of 0.05. Thus, the null hypothesis is rejected. This indicates that there is a significant difference between students with positive perception and those with negative perception towards AI-based educational interventions for learning, research and general academic activities.

Hypothesis 3: There is no significant difference in the usage level of AI-Based educational intervention for learning and research by students.

Table 3 shows the level of usage and utilization of tools for AI-based educational interventions for learning and research by students in higher education.

Table 3. Mean, SD and One-way ANOVA Analysis of Significant Difference in the Usage Levels of AI-Based Educational Intervention for Learning and Research by Students

Usage	N	$\bar{X}$	SD	Df	Mean Square	F	Sig.	p	Decision
Never Used	21	17.19	.872	4.527	30769.35	869.25	.000	0.05	Reject Ho_1
Rarely Used	116	27.38	5.19						P>0.05
Occasion	183	43.25	5.48						
Regularly	155	57.07	7.27						
Frequently	54	74.88	5.83						
Total	529	46.02	16.37						

Table 3 shows that students have varying levels of utilization that ranges from those that never used or utilize AI educational tools, to those that rarely utilize it, to those who occasionally use it, to those who regularly use it and

then to those who frequently utilize it as seen by the varying usage level means of 17.19 27.38, 43.25, 57.07, 74.88 and the total average usage mean for the whole group which is 46.02. The different utilization means shows there is a difference in the level of utilization and usage of AI based educational interventions previously mentioned by students in higher education. The table also shows that majority of students generally more than occasionally use AI educational intervention and tools for learning and research as seen by the means for the various levels. The table reveals shows that the computed F (3, 598) = 869.25, p <.05, i.e. p = .000, i.e, p = .000 is less than 0.05 and this is statistically significant at the chosen alpha level of 0.05. Therefore, the null hypothesis is rejected. This implies that there is a difference in the level of utilization of AI educational interventions for learning and research by those who never used or utilize AI educational tools, to those that rarely utilize it, to those who occasionally use it, to those who regularly use it and then to those who frequently utilize it and this difference is statistically significant.

Hypothesis 4: There is no significant difference in levels of challenges faced by students towards the adoption of AI-Based educational intervention for learning and research.

Table 4 unveils the level of challenges faced by higher education students in the adoption of AI-based educational interventions for learning and research.

Table 4. Mean, SD and One-Way ANOVA Analysis of Significant Difference in the Level of Challenges faced by Students towards the Adoption of AI-Based Educational Intervention for Learning and Research

Challenges	N	$\bar{X}$	SD	Df	Mean Square	F	Sig.	p	Decision
Not at all	20	11.00	.000						
Not so much	96	18.75	3.74						
Challenging	235	29.03	3.65	4.528	10236.12	812.65	.000	0.05	Reject Ho1
Much of Challenging	139	37.94	3.29						p>0.05
Very Much	39	47.97	4.12						
Total	529	30.22	9.48						

Table 4 shows that the challenge ranges from those that see these barriers as not a challenge at all with a mean of 11.00, to those that see it as not so much a challenge with a mean of 18.75, to those that sees it as challenging with a mean of 29.03, to those that see it as much a challenge with a mean of 37.94 to those that sees it as very much a challenge with a mean of 47.97. and a general average mean of 30.22. The varying utilization means shows there is a difference in the level of challenges like technical issues, privacy concerns, lack of training or support, and potential biases in AI systems, lack of awareness and familiarity, limited access to infrastructure, digital illiteracy. skepticism and resistance to change and lack of infrastructure faced by higher education students in the adoption of AI-based educational interventions for learning and research. The table also shows that majority of students generally faces more barriers that are challenging than those not so challenging in being able to utilize AI educational intervention and tools for learning and research as seen by the means for the various levels. The table as well shows that the computed F (3, 598) = 812.65, p <.05, i.e. p = .000, i.e, p = .000 is less than 0.05 and

this is statistically significant at the chosen alpha level of 0.05. Therefore, the null hypothesis is rejected and the alternate accepted. This implies that there is a significant difference in levels of challenges faced by students towards the adoption of AI-Based educational intervention for learning and research tools.

Hypothesis 5: There is no significant influence of gender and age on students' awareness, perception, usage and challenges faced towards AI-Based educational intervention for learning and research.

Table 5. Mean, SD and Two-Way MANOVA Analysis of the Significant Influence of Gender and Age on Students' Awareness, Perception, Usage and Challenges faced towards AI-Based Educational Intervention for Learning and Research

Variables	Gender	Age	Mean	Std. Deviation	N	Univariate test (F)	Sig	Multivariate Test (F)	Sig
Awareness	Male	16Yrs -20Yrs	27.9750	9.71750	80	1.036	.376		
		21-25yrs	30.5965	8.66203	57				
		26-30yrs	32.6563	9.09310	32				
		31 Years Above	29.5455	11.92781	11				
		Total	29.7333	9.51658	180				
	Female	16Yrs -20Yrs	26.4718	9.94360	142				
		21-25yrs	30.2577	9.16891	163				
		26-30yrs	31.3667	10.62036	30				
		31 Years Above	35.0714	8.19441	14				
		Total	29.0057	9.81934	349				
	Total	16Yrs -20Yrs	27.0135	9.86721	222				
		21-25yrs	30.3455	9.02198	220				
		26-30yrs	32.0323	9.80125	62				
		31 Years Above	32.6400	10.17300	25				
		Total	29.2533	9.71449	529				
Usage	Male	16Yrs -20Yrs	45.3125	18.14819	80	.921	.430		
		21-25yrs	45.1053	14.46632	57				
		26-30yrs	49.4063	15.23337	32				
		31 Years Above	48.5455	21.75024	11				
		Total	46.1722	16.74382	180				
	Female	16Yrs -20Yrs	43.3451	16.86115	142				
		21-25yrs	46.2209	14.88309	163				
		26-30yrs	51.7333	16.83579	30				
		31 Years Above	56.6429	16.79106	14				
		Total	45.9427	16.20937	349				
	Total	16Yrs -20Yrs	44.0541	17.32095	222				
		21-25yrs	45.9318	14.75152	220				
		26-30yrs	50.5323	15.93914	62				

Variables	Gender	Age	Mean	Std. Deviation	N	Univariate test (F)	Sig	Multivariate Test (F)	Sig
		31 Years Above	53.0800	19.14837	25				
		Total	46.0208	16.37769	529				
Perception	Male	16Yrs -20Yrs	41.3250	4.37419	80	.589	.622	.973	.472
		21-25yrs	40.7368	5.26961	57				
		26-30yrs	40.0625	6.78679	32				
		31 Years Above	42.1818	4.66515	11				
		Total	40.9667	5.16098	180				
	Female	16Yrs -20Yrs	41.2324	4.42697	142				
		21-25yrs	41.9018	4.12492	163				
		26-30yrs	40.6667	4.52071	30				
		31 Years Above	42.2143	5.46568	14				
		Total	41.5358	4.34331	349				
	Total	16Yrs -20Yrs	41.2658	4.39833	222				
		21-25yrs	41.6000	4.46641	220				
		26-30yrs	40.3548	5.76336	62				
		31 Years Above	42.2000	5.02494	25				
		Total	41.3422	4.64070	529				
Challenges	Male	16Yrs -20Yrs	29.9875	8.97182	80	2.004	.112		
		21-25yrs	31.9123	9.85480	57				
		26-30yrs	29.2188	11.07084	32				
		31 Years Above	31.2727	13.24455	11				
		Total	30.5389	9.90026	180				
	Female	16Yrs -20Yrs	28.3662	9.65246	142				
		21-25yrs	30.5276	8.56660	163				
		26-30yrs	33.3333	8.93012	30				
		31 Years Above	34.9286	10.88022	14				
		Total	30.0659	9.28066	349				
	Total	16Yrs -20Yrs	28.9505	9.42473	222				
		21-25yrs	30.8864	8.91568	220				
		26-30yrs	31.2097	10.22234	62				
		31 Years Above	33.3200	11.85931	25				
		Total	30.2268	9.48931	529				

For the awareness level of AI interventions/tools for learning and research by students in higher education, the means representing the awareness levels for male and female participants were 29.733 and 29.00, respectively. This shows that males are more aware of AI educational interventions/tools than their female counterparts although this was not significant statistically ($p=.629 >.05$). The means for participants aged 16-20yr, 21-25yrs, 26-30yrs and 30years above were 27.01, 30.34, 32.03 and 32.64, respectively. This was significant statistically ($p=.000<.05$). The table 1.5 shows that female aged 31 years above had the highest level of awareness followed

by male between 26-30yrs while female aged 16-20yrs had the least level scores representing that they have the lowest level of awareness of AI educational interventions. The univariate test showed that there was no significant interaction influence between gender and age on awareness level of AI interventions/tools for learning and research by students in higher education ($p = .376$, $p > .05$).

For the usage level of AI interventions/tools for learning and research by students in higher education, the means representing the usage levels for male and female participants were 46.17 and 45.94, respectively and this was not significant statistically ($p=.257 >.05$). The means for participants aged 16-20yr, 21-25yrs, 26-30yrs and 30years above were 44.05, 45.93, 50.53 and 53.08, respectively. This was significant statistically ($p=.011<.05$). Female aged 31 years above had the highest level of usage and utilization followed by male between 26-30yrs while female aged 16-20yrs had the least level scores representing that they have the lowest level of awareness of AI educational interventions. The univariate test showed that there was no significant interaction influence between gender and age on usage level of AI interventions/tools for learning and research by students in higher education ($p = .430$, $p > .05$).

Table 5 also show the perception of students towards AI interventions/tools for learning and research, the means representing the perception for male and female participants were 40.96 and 41.53, respectively and this was not significant statistically ($p=.109 >.05$). The means for participants aged 16-20yr, 21-25yrs, 26-30yrs and 30years above were 41.26, 41.60, 40.35 and 42.20, respectively. This was not significant statistically ($p=.299>.05$). Female aged 31 years above had more positive perception of AI interventions for learning and research followed by male between 26-30yrs while male aged 16-20yrs had the least level scores. The univariate test showed that there was no significant interaction influence between gender and age on usage level of AI interventions/tools for learning and research by students in higher education ($p = .622$, $p > .05$).

For the challenge/barrier level faced by students in higher institution in the utilization of AI interventions/tools for learning and research, the means representing the challenge levels for male and female participants were 30.53 and 30.06, respectively and this was not significant statistically ($p=.331 >.05$). The means for participants aged 16-20yr, 21-25yrs, 26-30yrs and 30years above were 28.95, 30.88, 31.20 and 33.32 respectively. This was significant statistically ($p=.064<.05$). Female aged 31 years above had more of challenges following utilization of these AI tools, followed by male between 26-30yrs while female aged 16-20yrs had the least level scores representing that they have the lowest level of challenge of AI educational interventions. The univariate test showed that there was no significant interaction influence between gender and age on levels of challenge of AI interventions/tools for learning and research by students in higher education ($p = .112$, $p > .05$).

The combined effects of age and gender awareness, perception, usage, and challenges in AI educational interventions and technologies are examined overall using the two-way MANOVA multivariate test. The findings indicate that age and gender have no discernible influence on the four dimensions taken together ($F=.973$, $p=.472$). According to Wilk's $\wedge=.973$, $p =.472$, $>.05$., there is no significant difference observed between male and female students aged 16–20, 21–25, 26–30, and 31 years and above in terms of awareness, usage, perception, and problems. This purely indicates that awareness, perception, usage, and challenges in AI educational

interventions/tools are not significantly influenced by age (whether one is 16–20 years old, 21–25 years old, 26–30 years old, or 31 years old and above) or gender (whether one is male or female).

Discussion

The study's findings indicate that most students are generally highly knowledgeable and aware of AI educational interventions and resources for research and learning. The statistical examination offers a strong validation of the noted variations in awareness levels as the null hypothesis was rejected, highlighting the statistical importance of the results. That is, students are generally more aware than average of the possibilities and advantages of AI-based educational interventions in education, as well as the ethical issues and constraints associated with them. This finding aligns with previous researches that shows that a great number of students are aware of AI educational tools for their educational pursuit and learning (Adelana & Akinyemi 2021; Dergunova et al 2022; Khadse 2020; Juma 2021; Khater et al., 2023; Simhadri, & Swamy 2023). It is also in harmony with other studies that reported a moderate level of knowledge and awareness regarding AI in education (Al-Qerem et al., 2023; Khadse 2020; Mansor et al 2022) but not in alignment with study of Chan & Hu 2023 which revealed that that students are not aware of AI educational tools in their educational pursuit and while learning. The reason for this divergence could be due to difference in the scale used in obtaining the data and also difference in the sample demographic.

The majority of students can be classified as very aware or somewhat aware. This high degree of awareness that is currently prevalent indicates that AI tools and their educational applications are well known. The students' above-average knowledge suggests that they have a sophisticated comprehension of the potentials, advantages, ethical issues, and limitations of AI-based educational interventions in addition to their recognition of these tools. Students are more equipped to interact with AI tools and interventions in the educational space as a result of this increased awareness. These findings suggest that including AI-related information into the curriculum can help educators make the most of students' already-existing knowledge.

According to the analysis's findings, students have a very favourable perception of AI-based educational interventions for both learning and research. This outcome is consistent with other studies. (Al Saad et al., 2023; Chan et al., 2023; Keles & Aydin 2021; Khater et al., 2023; Utami et al., 2023) which showed that students had a positive perception towards AI in education. This result disagrees with some studies result which shows that negative perceptions are more significant among students, (Keles & Aydin 2022) Other studies showed that students had mixed reactions and perceptions concerning AI in education (Al-Qerem et al., 2013; Castillo-Acobo et al 2023; Smolansky et al., 2023). Difference in area of study and other demographic details could account for this divergent result.

It is encouraging that students overwhelmingly view AI-based educational interventions favourably and positively and show a desire to embrace and use AI technologies for both learning and research. It's possible that students have encountered artificial intelligence (AI) in a variety of contexts and have favourable encounters with it, which may have shaped their perceptions. Positive experiences with these interventions can result in increased enthusiasm, better research activities, better comprehension, or higher academic performance. Positive

perceptions can be influenced by what is perceived as the benefits of AI technologies. Furthermore, because they were raised in a technologically advanced environment, today's students are sometimes referred to as digital natives. Their comfort level with technology might be higher, and they might be more inclined to welcome new developments in the field, such as AI-powered tools and interventions. This finding underscores the importance of understanding and addressing the concerns and barriers that may contribute to negative perceptions. According to these findings, customized educational initiatives are required to create educational interventions that offer engaging and positive experiences with AI tools, which can help to increase students' positive perceptions while decreasing their negative ones. In addition, it is necessary to incorporate AI-related content into the curriculum to introduce students to the advantages and real-world uses of these technologies. This practical experience may help foster a more favourable perception and attitude.

The study's findings indicate that most students belong to groups that use AI educational tools more frequently than occasionally, indicating a widespread and substantial use of these tools for research and learning. This is in tandem with the result of some studies that suggest that a great number of students have uses and apply AI educational tools in their educational pursuit while learning (Alharbi 2023; Utami eta al., 2023) while it is not in tandem with other studies which shows that students do not use and apply AI educational tools in their educational pursuit. (Chan & Hu 2023; Juma 2021). Divergent demographic could account for this observed disagreement in findings. These AI technologies probably improve students' comprehension of difficult subjects as well as the process of writing research papers in general. Additionally, it can offer tailored feedback, meeting each student's unique learning requirements and encouraging independent study. Students' use of AI tools for research and learning in the classroom is probably influenced by their awareness of, favourable perception, and experiences with AI in their daily life. From preceding discuss, it has been identified that there is a prevailing high level of awareness suggesting a widespread familiarity with AI tools and their applications in the educational context as well as predominantly positive perception of AI-based educational interventions among students indicating a willingness to embrace and engage with AI technologies for learning and research purposes. This heightened awareness and positive perception positions students to utilize AI tools and interventions for learning and research. Utilization can also be increased by encouraging a collaborative environment where students can exchange insights and experiences about using AI tools. Peer cooperation can help create a learning environment that is more welcoming and encouraging.

The data further reveals a spectrum of challenges, from those perceived as not challenging at all to those considered very much a challenge. This is in agreement with the findings of researches on challenges and barriers on the utilization and adoption of AI in education (Afonughe, 2021; Al-Qerem et al., 2023; Utami et al 2023; Castillo-Acobo et al 2023; Chan & Hu 2023). A notable variation in the perceived levels of challenges across students is indicated by the means that differ. Some students, for example, perceive these difficulties to be very minor, but others find them to be far more intimidating. The majority of students appear to face challenges that are rated as challenging rather than not so challenging, as evidenced by the means across the various levels which was statistically significant. This implies a significant difference in the levels of challenges faced by students in the adoption of AI-based educational interventions for learning and research highlighting the diverse and impactful nature of these challenges.

The importance of these obstacles highlights the necessity of specialized approaches and support systems to deal with these particular challenges and enable a more seamless integration of AI technologies into the higher education classroom. Effectively addressing these issues is essential to maximizing the advantages of AI-based educational interventions and guaranteeing equitable access for every student. The result shows also that males are slightly more aware of AI educational interventions/tools than their female counterparts, although this difference is not statistically significant this is in consonant with the findings of Adelana & Akinyemi (2021). However, a statistically significant difference is observed based on age groups, with older students demonstrating higher awareness levels.

The result also indicates that males utilize AI educational interventions/tools more than their female counterparts, although this difference is not statistically significant. This finding aligns with that of Castillo-Acobo et al (2023) and Khadse (2020) where gender had no significant influence on application of AI in education. However, a statistically significant difference is observed based on age groups, with older students demonstrating higher utilization levels. This finding aligns with that of Castillo-Acobo et al (2023) where age was observed to be a significant influence on the application of AI in education. No significant difference was found in the perception levels between male and female participants or across different age groups. However, Gherhes & Obrad (2018) found a difference in the study conducted. In addition, there is no significant difference in the challenge levels faced by male and female participants. However, a marginally significant difference is observed across age groups, with older students facing higher challenge levels. The two-way MANOVA multivariate test examines the overall influence of age and gender on awareness, perception, usage, and challenges combined. The results reveal no significant influence of age and gender across these dimensions. This suggests that, collectively, age and gender do not significantly impact students' awareness, perception, usage, and challenges related to AI educational interventions/tools.

Although age and gender have a slight impact on awareness, utilization, and problems, their combined influence has no discernible influence on students' overall experiences with AI-based educational interventions in higher education. Based on the accepted hypothesis, gender may not have as much of an impact as age when it comes to AI strategies and interventions in education. However, these strategies and interventions may still need to be customized for particular age groups. These findings provide valuable insights for students, educators, test developers, and institutions aiming to implement and optimize AI tools in higher education settings.

Conclusion

In conclusion, there is a wide range in the level of awareness among higher education students about AI-based educational interventions and tools, with most having a noteworthy above average understanding. Furthermore, they overwhelmingly see AI favourably and have a positive perception. Additionally, students' usage of AI-based educational interventions and tools in higher education exhibit a range of degrees of usage and utilization; most users are above average in this regard. Additionally, students' face a variety of challenges in their adoption of these AI tools; most students in higher education encounter these challenges above average. In addition, gender and age did not have any significant influence independently or jointly on student's awareness, perception, usage,

and challenges in the use of AI in education for learning and research

Recommendations

Based on the study's findings, it is recommended that students actively engage in hands-on AI experiences, collaborate with diverse peers, and participate in awareness campaigns on ethical AI use. Also, educators should design inclusive interventions, pursue ongoing professional development, and incorporate ethical AI discussions into the curriculum, guiding students on responsible usage. Furthermore, test developers can enhance assessments using AI tools, creating fair and engaging experiences. In addition, administrators and policymakers should invest in AI infrastructure, promote digital literacy, and establish ethical guidelines to ensure accessible, inclusive, and user-friendly AI solutions, ultimately preparing students for the future workforce.

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