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Undergraduate Students' Use of Artificial Intelligence Tools in Their Learning: Do Gender and Primary Place of Residence Matter?

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Abstract

The revolutionary impact of new technologies was most evident in the way computers mimicked human learning and adaptive abilities. Artificial intelligence (AI) has emerged as an important topic in student education. There are divergent perceptions about AI in student education. Regardless of one's point of view, it is critical to recognize that AI is gaining center stage in education. Students are becoming increasingly interested in the usage of AI, yet the areas of their learning that AI has the most impact on are underexplored, particularly in developing nations. Our study investigated undergraduate students' use of AI in their learning and how gender and primary place of residence influence their adoption of AI in their learning. A cross-sectional survey research design was adopted to conduct the study. Participants were 206 (male = 12.6%; female = 87.4%; mean age =21.38±15.94) randomly sampled in a university in Awka, Anambra State. A survey questionnaire was used to collect the data for the study. Major findings revealed that undergraduate students mostly use AI in finding related topics to assignments/homework, having access to more detailed responses to a given task, summarizing larger texts, checking spelling and grammar construction whereas the least areas they use AI tools included replying to emails, turning the photos of text and audio file, and writing curriculum vitae. Also, whereas gender was not a significant influence on AI use for learning, students' primary place of residence was a significant factor in determining undergraduate students' use of AI in their learning. Results were discussed; implications of the study were highlighted. It was concluded that students are likely to use AI in aspects of learning that they would be assessed.

Keywords: Artificial Intelligence, tools of learning, gender, rural/urban

Introduction

The revolutionary impact of artificial intelligence (AI) in almost every field of endeavor is undeniable. The influence of AI is said to be profound and pervasive, as many as 250 million people became users of AI globally in 2023 and it is expected that it will push past 700 million users in 2030 (Statista, 2024). National University (2024) indicated that 9 out of 10 students want to learn more about AI. Consequently, the Nigerian government, recognizing the importance of AI, established the first National Centre for Artificial Intelligence in Africa in November 2020 aimed at formulating practical strategies for enhanced implementation of the digital economy (Effoduh, 2021).

By 2024, Nigeria came up with a National AI strategy serving as a "comprehensive roadmap and guiding framework for harnessing the rapidly evolving technological landscape and socio-economic trends, enabling a nation to chart its distinctive course and develop a tailored approach to optimise the benefits of AI for the betterment of society" (National Centre for Artificial Intelligence and Robotics and NITDA, 2024, p.9). This is consequent upon the need to build the Nigerian economy by leveraging on the opportunities that could arise from AI integration.

The possibility of fostering the nation's economy lies on strong functional education and the higher education has been noted to be a solid ground for socio-economic development. The use of AI in higher education shows promise for reshaping teaching (Tomat, 2023), including improved learning experiences and motivation, provision of customized, adaptable and flexible learning pathways (Begum, 2024; Pedró, 2020), and equipping graduates with new skills (Slimi, 2023; Chacón, Pedró, & Inzolia, 2023). AI use in higher education includes assessment/evaluation of learning outcomes, forecasting trends in data, AI teaching/tutoring assistantship, and management of students' learning (Crompton & Burke, 2023).

The benefits of AI have been highlighted, though there are controversies, especially regarding ethical concerns and the fear that it could crowd out jobs (Chacón et al., 2023; Slimi, 2023). Earlier studies recognized that AI will automate many jobs; however, its impact on jobs may not be obvious (Bessen, 2018). Regarding AI crowding out jobs, recent studies show otherwise. For example, Shen and Zhang (2024) found that AI has provided job and employment opportunities in China. There is a strong indication that, in addition to providing jobs, AI can improve productivity (International Organization of Employers, 2024). Given the fact that undergraduate students are important in diffusing AI and the fact that future jobs and workplaces will rely on AI for productivity and efficiency, it becomes imperative that undergraduate students' use of AI for their learning is investigated.

A number of studies have investigated undergraduate students' use of AI in writing courses. Lee et al. (2024) explored the perceptions of Korean university students regarding artificial intelligence (AI)-based writing tools that include tools guided by machine learning, such as Google Translate and Naver Papago, and generative AI tools, such as Grammar using mixed method approach. They found that these AI tools were perceived as helpful to students in writing though excessive dependence on AI for writing could be detrimental to writing skills. Aljuaid (2024) has explored the possibility of AI replacing traditional writing university courses and concluded that though AI may help in grammar and style, it lacks the potential to infuse creativity and critical thinking in students which traditional writing courses instil in students. In Hong Kong, Chan and Hu (2023) found a positive attitude towards AI use in teaching and learning by university students and that they recognized its efficiency for personalized learning support, writing and brainstorming assistance, and research and analysis capabilities while at the same showed some concerns about accuracy, privacy, ethical issues, and the impact on personal development, career prospects, and societal values were also expressed. Within the Nigerian context, Alimi et al. (2021) found that the majority of undergraduate students in Kwara State were not aware of AI. Similar studies have demonstrated that

Nigerian undergraduates may not be vast in knowledge and the use of AI for their learning (Guanah & Oribhabor, 2023), though AI has been demonstrated to have both negative and positive effects on undergraduate students' language and communication (Atoi, 2024). However, research within the Nigerian context on the undergraduate students' use of AI for the learning is underexplored.

Furthermore, AI has prompted concerns about gender bias and disparities in resources available to urban and rural inhabitants may exacerbate disparities in AI use. According to Olawale (2022), gender disparity has remained in the technological workforce, with women accounting for only a small percentage of the workforce. Research by Franken et al. (2020) highlights that disparities in interest and proficiency with AI persist across gender lines, which may contribute to unequal adoption of these tools in academic contexts. Based on the fact that female students lag behind male students in Science, Technology, Engineering and Mathematics (STEM) and the erroneous belief that STEM is more or less male course, researchers have also looked at gender differences in AI. For example, Ofosu-Ampong (2023) has found that gender is a determining factor in the use of AI, and that there exists significant disparity in the overall levels of perceived innovation characteristics of AI based gender. Similarly, Armutat et al. (2024) found that female students reported gender inequality and discrimination as obstacles to their use of AI. Another socio-demographic factor being currently considered in AI research is the impact it could have on urban-rural parity. AI is currently viewed as having the potentials to significantly address the educational gaps between students from rural areas and those from urban areas (Roy & Swargiary, 2024). AI is found to improve rural students' learning confidence, school enrolment and retention (Darda et al., 2024). However, little is known about how rural-urban dichotomy could predict AI use of undergraduate students especially in a developing context.

Method

Research Design, Participants and Sampling Technique

We adopted a cross-sectional research design of the quantitative paradigm. This is aimed at investigating the behavioral characteristics that were prominent in a population by sampling a cross-section of the population at a specific period in time (Fraenkel & Wallen, 2000; Stockemer, 2019). This enabled us to have an overall sense of the behavioural characteristics of undergraduate students in the use of AI for their learning. Our sample consisted of 206 (male = 12.6%; female = 87.4%; mean age =21.38±15.94) undergraduate students from the Faculty of Education in a Federal university located in Anambra State, Nigeria. The students were randomly sampled in three classes at the Faculty of Education Multipurpose Hall. This is where most of the large classes are held. The consent of the students was sought and obtained. Students were told that they had the opportunity to withdraw from the study if they felt so. Only 206 students agreed to participate and those who did not consent to the study were not given the questionnaire. The socio-demographic variables of the students are presented in Table 1.

Instruments and Data Collection Process

A researcher-designed 24-item questionnaire was utilized, focusing on various applications of AI in learning, with responses measured using a four-point Likert scale. based on the review literature. The questionnaire was structured based on the four-point scale of strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD). Items targeted at understanding what students use AI tools to do in their learning activities. Samples of items included the following after the leading statement "In my studies, I use AI for the following:": "To do assignments; To coin new project topics, To summarized larger texts, To solve problems involving calculations" etc. We framed the items based on the uses of various educational AI tools. The responses on the items were summed together to get a score indicating the use of AI tools for the students. Higher scores indicate higher use of AI tools for learning. The internal reliability index using Cronbach Alpha statistics is .90. The questionnaires were framed in English language which is the language of instruction in Nigeria especially in secondary schools and higher institutions, and it took approximately 20 minutes to complete. Section A is comprised of the socio-demographic variables of the students which is presented in table 1.

Data Analysis

We employed the IBM Statistical Package for Social Sciences version 25 for our data analysis. Data were analyzed using mean, standard deviation and t-test analysis. t-test was adopted to examine the statistical differences in the mean scores as a result of gender and primary place of residence. The hypotheses were tested at 0.05 level of significance and when the probability value is greater than .05, the null hypotheses are rejected.

Results

Table
Demographics of the participants

S/N	Variable	Frequencies	Percentages	Mean	*SD*
1	Gender				
	Male	26	12.6		
	Female	180	87.4		
	Total	206	100.0		
2	Age Range				
3	Primary Place of Residence			21.38	15.94
	Rural	86	44.3		
	Urban	108	55.7		
	Total	194	100.0		
	Missing	12			
4	Internet Use				
	Not All	8	4.0		
	Once a Week	5	2.5		
	About Twice a Week	6	3.0		

	Almost Everyday	180	90.5
	Total	199	100.0
	Missing Value	7	

Table 1 revealed the socio-demographic variables of undergraduate students recruited in the study. The majority of our respondents is made up of female students with average mean age of 21.38, about 55.7% of the students have their primary place of their residence in urban areas. Regarding their internet use, our finding revealed that the majority of undergraduate students (90.5%) use the internet every day.

Table 2

Mean analysis of the responses of the participants

NO	In my studies, I use AI for the following:	Mean	SD	Rank
1	To do assignments	3.33	.698	5th
2	To coin new project topics	3.19	.676	10th
3	To summarized larger texts	3.37	.740	3rd
4	To write essays	2.96	.810	13th
5	To solve problems involving calculations	2.85	.956	15th
6	To write computer codes	2.80	.998	18th
7	To replay emails	2.44	.897	21st
8	To write resume/Curriculum Vitae	2.65	.911	19th
9	To prepare oral defense	2.82	1.00	16th
10	To have access to more detailed responses to a given task	3.43	.722	2nd
11	Find related topics to assignments/homework	3.50	.632	1st
12	Do revision during examinations	3.27	.785	8th
13	To generate questions for revisions	3.13	.933	12th
14	To get answers on questions generated based on test submitted for revision purposes	3.31	.794	6th
15	Paraphrase or rewrite works	3.14	.746	10th
16	To analyze synonyms to find just the right words	3.29	.795	7th
17	To aid fluency, vocabulary, tone, and style in writing	3.27	.790	8th
18	To check spelling and grammar construction	3.35	.783	4th
19	To check punctuation mistakes	3.13	.786	12th
20	To check the plagiarism of any document	2.80	.890	18th
21	To generate citations in APA, MLA, and CHICAGO	2.81	.888	17th
22	For paper reviews, assignments, term papers, seminars, etc	3.20	.775	9th
23	To convert texts into speech	2.94	.876	14th
24	To turn the photos of text to and audio file	2.46	.910	20th

Table 2 revealed how students use AI tools in learning. Students reported that they use the AI tools in their learning as reflected in all the items listed in Table 2. These items were later ranked to show priority in the use of AI in their learning. The aspects of their learning they use AI mostly include finding related topics to assignments/homework, to have access to more detailed responses to a given task, to summarize larger texts, to check spelling and grammar construction etc. While on the other hand, the least areas they use AI tools included replying to emails, turning the photos of text and audio file, writing curriculum vitae, etc.

Table 3

Independent samples t-test analysis based on gender

	N	Mean	SD	t	df	Sig. (2-tailed)	Remark
Male	26	3.1585	.48330	1.106	204	.270	Not Significant
Female	180	3.0545	.44312				

Table 3 showed that male undergraduate students had a non-significantly higher mean score on AI use in learning than their female counterparts, t (204) = 1.106, p >.05.

Table 4

Independent samples t-test analysis based on location

	N	Mean	SD	t	df	Sig. (2-tailed)	Remark
Rural Area	86	3.1467	.44120	2.367	192	.019	Significant
Urban Area	108	2.9938	.45141				

Table 4 showed that rural undergraduate students had a significantly higher mean score on AI use in learning than those living in urban areas t (204) = 2.367, p <.05.

Discussion, Limitation and Conclusion

Our study revealed how students use AI for their learning and the impact of gender and primary place of residence –whether students primarily reside in rural area or in urban area – on their use of AI for their learning. This is predicated on the fact that AI is potentially a force that would revolutionize education, and the fact that socio-demographic factors are likely to foster inequality in the use of AI (Armutat et al., 2024). Our findings revealed that students use the AI tools in their learning, as reflected in all the items listed in our study. Furthermore, ranking the means of the items to indicate priority in the use of AI in their learning showed that the aspects of their learning they use AI mostly include finding related topics to assignments/homework, having access to more detailed responses to a given task, summarizing larger texts, and checking spelling and grammar construction. On the other hand, the least areas they use AI tools included replying to emails, turning the photos of text and audio file, and writing curriculum vitae. It does appear that students use AI in areas that are more linked to their studies and that require less technology-related competence.

Furthermore, the results indicated no statistically significant difference in AI use between male and female students. This implies that both male and female students could be using AI for learning almost equally. This contradicts similar studies that have found gender a significant determinant to students' use of AI in higher education (Ofosu-Ampong, 2023; Stöhr et al., 2024). These studies demonstrated that male students were more likely to use AI than their female counterparts. Consistently, literature have pointed out significant gender differences in all facets of technology use in both developing and developed countries (Hossain et al, 2023; Ofosu-Ampong 2023). This is due to the fact that male students may be more skilled at using technology than female

students, which could have a substantial impact on the use of artificial intelligence for learning. However, our findings were contrary to this, demonstrating that if male and female students have almost equal online technology self-efficacy and attitudes toward AI, there may be no difference in their use of AI for learning.

Important also, is our finding that revealed a significant impact of students' primary place of residence on their use of AI for learning. Surprising, though, our finding indicated that students who reside in rural areas use AI more than those who primarily reside in urban areas. Though this may run against popular belief that students residing in urban areas are likely to use AI more than those from rural areas, it is noteworthy to acknowledge the fact that given AI's capability to aid learning, students from rural areas are likely to adopt it in order to compliment academic areas they may be weak. There is a dearth of empirical evidence to support our present finding however, researchers have noted that AI is a potential tool for the advancement of the learning of learners in rural areas (Darda et al., 2024, Roy & Swargiary, 2024).

Although our study has provided insights on students' use of AI tools for learning, and how gender and primary place of residence could impact its use, there exist some limitations to the generalizability of the findings. First, the use of one university sample could limit the generalizability of the findings to other universities with different technology culture. However, this study remains crucial given its ability to provide insights into what students use AI for in their learning as well as contributing to the discourse on the socio-demographic factors and AI use. Another limitation related to the sampling is the fact that the majority of respondents are female undergraduate students which may equally limit the generalizability of this study especially when compared with nations that may have equal gender representation in faculties of education. The use of self-reported questionnaire, though with its own merit of covering large sample size, may not provide insight into other uses of AI not listed here. We suggest that further studies adopt mixed method research design.

Based on findings, we conclude that students employ AI for a wide range of purposes in their learning especially those aspects that may not require high technical competence. Also, that gender may not lead to significant differences in their use of AI in their studies but the place of primary residence of undergraduate students may be a significant factor in the use of AI in learning. This has great implications for educational practices. It is important that stakeholders in higher education especially lecturers integrate the use of AI in the teaching and learning process, and that institutions should provide guidelines on ethical use of AI by undergraduate students since they adopt AI for almost all aspect of their learning.

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