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Community Service Assessment of Demographic Predictors of Undergraduates' Readiness to Use Artificial Intelligence (AI) Tools for Learning

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ABSTRACT

Artificial Intelligence (AI) is central to Education 4.0, yet undergraduates' readiness to adopt AI tools varies across demographic groups. This study was conducted as a community service initiative to assess demographic factors as predictors of readiness to use AI tools for learning. Using a mixed-method explanatory sequential design, data were collected from 1,065 undergraduates in a quantitative survey and 15 students in qualitative interviews across public universities in North-Central Nigeria. The activity functioned as a service to the academic community by providing evidence-based insights into how gender and area of specialization influence students' preparedness for AI adoption. Results indicated a significant prediction based on gender, while area of specialization was not a significant predictor. The project demonstrates how community service can extend beyond training to include diagnostic research that informs policy, promotes inclusive readiness, and contributes to sustainable educational development.

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1. INTRODUCTION

The role of artificial intelligence (AI) tools in undergraduate educational success and development has resulted in new methods of learning, assessment, skill-building, communication, sharing, creation, analysis, and interaction with learning materials. When appropriately used to their full capability, AI tools enhance the development of digital literacy and informed citizenship. AI gadgets, applications, and software can prove to be a very effective learning tool for undergraduate students (Al-Khassawneh, 2023; Al Husaeni *et al*., 2024; Rochman *et al*., 2024; Solihat *et al*., 2024; Rahayu *et al*., 2023). The impact and use of AI tools are increasing rapidly; thus, the projection of the AI market is around $450 billion shortly (Ali *et al*., 2024). Currently, this is especially evident in the education sector, as several higher learning institutions worldwide strive to find a way of continuing to provide education despite the challenges presented by the COVID-19 pandemic. The pandemic drew attention to the necessity of technological developments, among which AI bears importance for the attainment of SDG4 (Kurtdede & Yıldırım, 2022). The product of rapid developments in science and technology is involved in several applications, including picture recognition, speech recognition, and natural language processing (NLP) (Gültekin, 2022).

Applications of AI in education will range from highly transformative to less invasive, with institutions rapidly integrating machine learning systems and algorithms. Integrations have given rise to AI-based e-learning, which has transformed education by offering personalized learning experiences for students (Anisur & Pravakar, 2023). AI applications can also support teachers and students by teaching in mixed aptitude classrooms, providing immediate feedback on written assignments, and freeing instructors from administrative tasks (Akgun & Greenhow, 2021). Social networking and chatbots increase the connectivity of students and instructors, promoting active learning and teamwork skills (Kurtdede & Yıldırım, 2022). Some of the most important AI artefacts in support of students and teachers with personalized learning material for increased learning efficiency are personalized learning systems, adaptive learning platforms, and intelligent tutoring systems (Nataliia *et al*., 2021).

Furthermore, the adaptive learning technology enables the extension and support of even more personalized teaching opportunities because of one-to-one lessons afforded between machines and students (García-Penvalo, 2023). Smart campuses are characterised by face recognition, text recognition, and voice interaction technologies geared towards improving campus management, safety, attendance checking, and the overall processes of teaching and learning while saving administrative costs (Kwet & Prinsloo, 2020). AI could be described as a healing antidote for educational inequity as it could overcome regional differences by facilitating learners from the most remote areas with personalised instruction, adaptive learning, and skill development, thus bridging the gap in educational resources. The roles of AI in the education ambit and integrate a lot of transformative impacts on education.

With continuous development in AI technologies, global collaboration in education will become more possible and remove the barrier of distance; hence, it will foster cultural diversity within educational institutions. Application of AI can also be used for informed decision-making of any institution by analysing large volumes of data regarding students for offering personalized teaching methods. AI also influences the professional development of educators in terms of personalized training and resources to keep them updated with changing methodologies in education. AI adaptive tools with their services enable access and inclusivity in education, mainly benefiting diverse learning styles and abilities. However, to achieve this, the ethical issues that need attention are data privacy, algorithmic bias, and the use of AI responsibly so that deployment is equitably achieved in educational settings.

Besides, AI adoption comes with drawbacks, such as the digital divide and resistance to change, concerns over job displacement, which will require an integrated implementation process. The future of education is characterised through the exploration of emerging applications of AI, including virtual reality and natural language processing. AI influence extends to family and community engagement as it allows teachers to give real-time updates on student progress and creates better avenues of communication between the schools and families. The emphasis of lifelong learning is a major role of AI applications in education, as the need is ever-evolving to acquire new skills throughout life and to adapt to changing job market demands. The use of AI tools in education emphasises collaboration, decision-making based on data, professional development, accessibility, ethical concerns, challenges, emerging applications, community involvement, cultural concerns, and the encouragement of lifelong learning. AI can learn, adapt, synthesise, self-correct, and use data to carry out tasks in ways that are similar to those of a human. Education becomes more proficient as AI solutions continue to advance to new heights and aid in identifying areas where teaching and learning are lacking (Popenici & Kerr, 2017).

Nigeria, especially Northern Nigeria, is characterised by gender stereotypes that could mitigate the integration of AI in education. Thus, for students to benefit from the potential of AI, there is a need for educational institutions to focus on digital literacy and specifically train male and female students in the use of AI tools to bridge this gap in Nigeria. Stereotypical gender roles implicitly affect male and female students' views (Ravi & Raman, 2022). AI as a field of study or interest through different lenses. Stereotypes make biases in the ways students view their abilities and interests in AI; thus, this might affect readiness to engage with AI tools. Gender refers to the sociocultural constructed characteristics and roles that are ascribed to males and females in any society. The concept of gender is used to refer to the spectrum of anatomical, biological, mental, and behavioural traits that relate to and distinguish between masculinity and femininity (Ajai, 2018).

This study researches gender to develop an understanding of undergraduates' readiness to use AI tools for learning. Understanding gender-specific perceptions towards technology can enhance undergraduates' experience and equitable access to AI tools. Gender stereotyping might have a rather influential role to play in students' conceptions about AI in academic learning. Research on how gender difference influences student readiness across several contexts, such as online learning or higher education sustainability, shows mixed results. For instance, Male students felt easier and ready to use computers than female students did (Hoang, 2023). The female students were much better positioned for the transition to new technologies than the male students were (Zeng, 2023).

Male students have a high self-efficacy and confidence level in handling any technology tool, even AI (Abdulhadi *et al*., 2023). However, on the opposite side, female students have a high self-confidence level. This would, in turn, result in influencing their awareness and intention to learn about AI for academic purposes. Peer influence and gender norms could reinforce such gender-based differences in awareness and perception of AI. Peer interactions and social dynamics strengthen gender preferences and attitudes toward technology, including AI (Keleş & Aydın, 2021). If AI is perceived among friends as a domain for males, then it could affect female students' awareness, interest, and readiness to use AI. The promotion of gender-responsive education serves to reduce such gender-based differences in awareness and preparedness to adopt AI. Research on AI should consider gender perspectives to overcome biases due to gender and motivate all students towards AI readiness.

Such considerations will help ensure that all students, irrespective of gender or disparities in technology-related fields, become aware of AI and are better prepared to work with it. Addressing gender-related factors will assist educators and policymakers in creating a more inclusive learning environment where no student is restricted from utilizing the full potential of AI based on gender. Beyond gender, another possible predictor of undergraduates' readiness to use AI tools is the area of specialisation, since different fields may require varying levels of interaction with advanced technologies. Area of specialisation refers to the faculty in which undergraduates pursue a degree. Previous studies have shown that the area of specialisation influences competency levels (Ezeudu & Ojih, 2014), students' attitudes toward the use of English (Eze, 2015; Eze *et al*., 2020), and readiness in adopting technology (Malahay, 2021). Students in science- and engineering-related faculties may demonstrate greater readiness due to their exposure to innovations, while those in arts and humanities may require more orientation on the benefits of AI before adoption. However, findings have been contradictory. For example, some studies revealed that the area of specialisation influences proficiency and readiness (Ezeudu & Ojih, 2014; Ajai, 2018), while others found no significant effect (Eze, 2015).

Therefore, the purpose of this study is to examine gender and area of specialisation as demographic predictors of undergraduates' readiness to use AI tools for learning in North-Central Nigeria. The novelty of this research lies in its focus on combining demographic factors with readiness for AI adoption, providing evidence from a region where such studies remain limited, and offering insights that can inform both policy and community service initiatives in higher education. The following research questions were raised and answered in the study:

(i) What is the extent to which gender predicts the undergraduate's readiness to use AI tools for learning in North-Central Nigeria?

(ii) What is the extent to which the area of specialization predicts the undergraduate's readiness to use AI tools for learning in North-Central Nigeria?

The following hypotheses were formulated and tested at a 0.05 level of significance:

(i) H_{01}: There will be no significant association between male and female undergraduates on readiness to use AI tools for learning in North-Central Nigeria.

(ii) H_{02}: There will be no significant association between area of specialisation and undergraduates' readiness to use AI tools for learning in North-Central Nigeria.

2. METHODS

This study adopted a mixed-method research approach comprising quantitative and qualitative research designs using an explanatory sequential research design because the researcher collected data in two stages; quantitative data was acquired in the first step. The gathering of the qualitative data was the focus of the second stage. The quantitative data were collected by administering a questionnaire. The qualitative data collection involves the use of interviews. The Explanatory Sequential Process of the Research Design is presented in **Figure 1**.

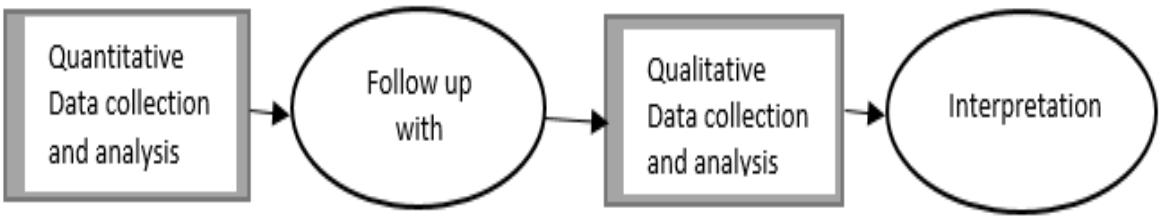

Figure 1. An explanatory sequential design.

All undergraduate students in North Central Nigeria, consisting of six states and the FCT, Abuja: Benue, Kogi, Kwara, Nasarawa, Niger, Plateau, and the Federal Capital Territory, Abuja, make up the study's population. The target population consisted of all undergraduates in North-Central universities in Nigeria, with a population of 500,000 undergraduate students. Three states, Kwara, Nasarawa, and the Federal Capital Territory, were purposively sampled to select participants from diverse ethnic and socioeconomic backgrounds, ensuring a comprehensive understanding of the research phenomenon. This study focused only on public universities within the region for consistency and better control of possible variables. The decision to use only government universities was guided by several considerations: government universities are assumed to have more standardized policies, curricular structures, and academic environments compared to their private counterparts.

This was done to increasingly homogenize the research setting to minimize the potential confounding variables. This is also supplemented by public funding and support, making the resource allocations across the institutions fairly comparable. It therefore makes this aspect an equalizer in many factors that influence the adoption of the AI technology. Third, state universities tend to attract a more heterogeneous demographic, for instance, students from different socio-economic backgrounds. This approach tries to provide comprehensive knowledge of the factors influencing AI technology readiness within a wider range of students.

Findings from public universities are also likely to have more direct implications for national education policies because governmental institutions largely adhere to national policies. The study used a multistage sampling technique to ensure a diverse and representative sample. To choose the schools, purposeful sampling was applied. To choose respondents from the designated schools, simple random sampling was employed. The number of respondents in each school was selected using a proportionate sampling technique. The sample size was 1,065 undergraduate students from the population for this study, and 15 participants for the qualitative study.

Instruments for data collection were a questionnaire and an interview protocol. In the questionnaire, respondents were asked to provide demographic information in Section A, including their gender and area of specialisation. Section B has eleven items designed to collect data on undergraduate students' readiness to use AI for learning, rated on a four-point scale with Strongly Agree, Agree, Disagree, and Strongly Disagree are the four possible responses. Semi-structured interviews were conducted to collect qualitative data; the interview guide contains seven interview items on the predictors and moderating variables. Interviews were audio-recorded and transcribed for analysis. The questionnaire and interview items were first checked for face validity and content validity by five senior lecturers from the Department of Educational Technology and two lecturers from the Department of Computer Science. In line with their recommendations and suggestions, the questionnaire items were revised, and the final draft was prepared. The reliability of the questionnaire was pilot tested using an independent sampling technique on 40 students randomly selected from a different university outside the study population. The results from the pilot test were examined to verify the internal consistency of the reliability. Cronbach's alpha was used to analyse the data, and a reliability index of 0.89 was obtained for readiness, which showed that the questionnaire is reliable.

A letter of introduction was obtained from the Head of Department of Educational Technology in the University of Ilorin, Ilorin, Nigeria, by the researchers. The selected universities received the letter. After receiving approval from the relevant authorities, the

researcher visited the chosen institutions with the assistance of three research assistants to administer the questionnaire to the students. Semi-structured interviews were carried out in tandem with 15 students selected at random.

We ensured that the study substantially complies with the generally stated rules and procedures of research in education as required by the University of Ilorin, Kwara State, Nigeria. Strict confidentiality and anonymity were guaranteed by the researcher with the data collected from the respondents; also, the respondents were informed about the purpose of the study and were not coerced into answering the questionnaire or taking part in the interview. The information obtained was solely utilised in this research.

The researcher solicited the permission of authorities and participants, the researcher ensured the participants' free will to participate in the study or be excused, to avoid being coerced into participating in the study. At every stage of the study, the researcher ensured strict compliance and adherence to all search ethical guidelines, and jealously guarded and handled with care the information provided by the participants. All authors whose work contributed to this study were adequately cited and duly referenced.

The analysis of the collected data was done in two phases: the quantitative (questionnaire) data analysis followed by the qualitative data analysis. In answering questions, mean, standard deviation, and scatter plot were employed. The hypotheses were analysed using point biserial at a 0.05 level of significance. The second phase of the analysis is the analysis of qualitative data gathered through interviews. The qualitative data were organised and transcribed, and coded, and findings were triangulated with the quantitative results. A total of one thousand and sixty-five (1,065) questionnaires were administered to undergraduates in North-Central, Nigeria, and nine hundred and seventy-four were retrieved.

3. RESULTS AND DISCUSSION

3.1. Demographic Data

The demographic data were presented with regard to respondents' gender and area of specialization. Distribution of samples by gender is presented in **Table 1**. **Table 1** shows the male and female respondent distribution. Five hundred and thirty-six respondents representing 55.00% of the total respondents were male. Similarly, four hundred and thirty-eight respondents representing 45% of the total population were female. This implies that most of the respondents in this study are male.

Table 1. Male and female respondent distribution.

Gender	Frequency	Percent
Male	536	55.0
Female	438	45.0
Total	974	100.0

3.2. Sample Distribution based on Areas of Specialisation

The distribution of the sample according to areas of specialization is presented in **Table 2**. **Table 2** reveals the distribution of respondents according to area of specialization. Two hundred and sixty-six of the respondents, which represents 27.3% of the respondents, are from the Faculty of Science. Similarly, respondents from the Faculty of Agriculture were two hundred and fifteen, representing 22.1% of the respondents.

One hundred and sixty of the respondents, representing 16.4% of the respondents, were from the faculty of Education. These consisted of one hundred and sixty-three, representing 16.7% of the Faculty of Arts. In addition, one hundred and seventy respondents, who

represented 17.5% were from the Faculty of Social Sciences. This means the highest number was within science.

Table 2. Distribution of the sample according to areas of specialization.

Areas of specialization	Frequency	Percent
Faculty of Science	266	27.3
Faculty of Agriculture	215	22.1
Faculty of Education	160	16.4
Faculty of Arts	163	16.7
Faculty of Social Science	170	17.5
Total	974	100.0

3.3. Research Question One: To What Extent to Which Gender Predict the Undergraduate's Readiness to use AI tools for Learning in North-Central Nigeria?

A scattered plot was used to answer research question one, as shown in **Figure 2**. **Figure 2** shows a scatter plot of the extent gender predicts the overall readiness of undergraduates to use AI tools for learning in North-Central, Nigeria. The scattered plot indicates that there is a weak positive relationship between gender and undergraduate readiness to use AI tools for learning in North-Central, Nigeria, as indicated by the regression line. This implies that gender weakly predicts undergraduates' readiness to use AI tools for learning in North-Central, Nigeria.

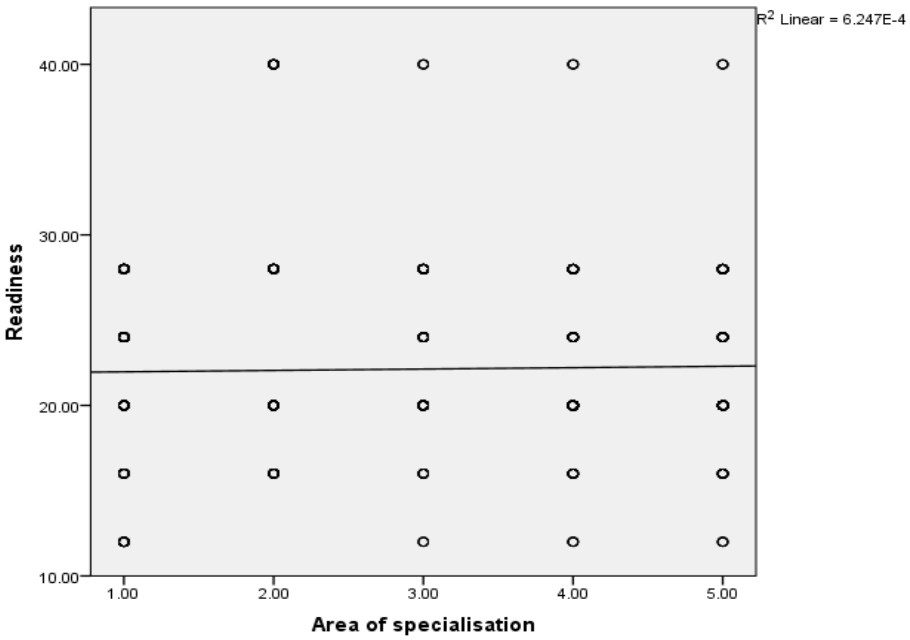

Figure 3. Scattered Plot on the extent area of specialisation predicts the overall readiness of undergraduates to use AI tools for learning in North-Central, Nigeria.

3.4. Research Question Two: What is the extent to which the area of specialization predicts the undergraduate's readiness to use AI tools for learning in North-Central Nigeria?

A scattered plot was used to answer research question two, as shown in **Figure 3**. **Figure 3** shows a scatter plot of the extent of specialisation to predict the overall readiness of undergraduates to use AI tools for learning in North-Central, Nigeria. The scattered plot

indicates that there is a weak positive relationship between the area of specialisation and undergraduate readiness to use AI tools for learning in North-Central, Nigeria, as indicated by the regression line. This implies that the area of specialisation weakly predicts undergraduates' readiness to use AI tools for learning in North-Central, Nigeria.

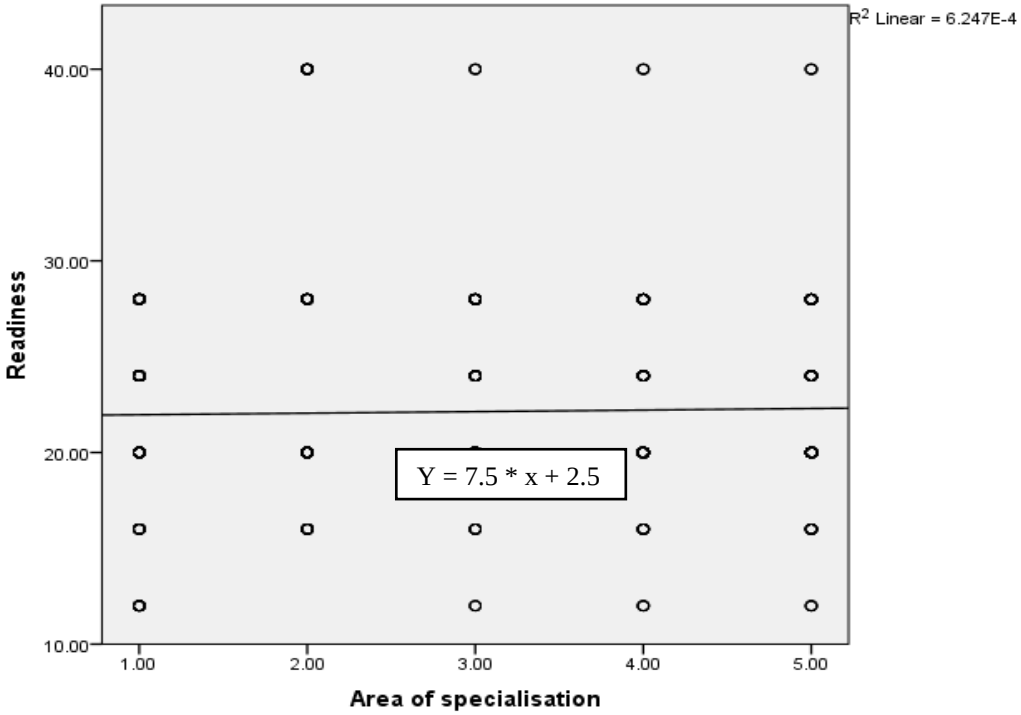

Figure 4. Scattered Plot on the extent area of specialisation predicts the overall readiness of undergraduates to use AI tools for learning in North-Central, Nigeria.

3.5. Hypothesis One: There will be so Significant Association Between Male and Female Undergraduates on Readiness to use AI Tools for Learning in North-Central Nigeria

In testing hypothesis one, point biserial was used as presented in **Table 3**. **Table 3** presents the point biserial correlation on the prediction of the overall readiness of male and female undergraduates to use AI tools for learning in North-Central Nigeria. The result shows γ_{pb}. (1,974) = 0.110, p (0.001), > 0.05, hence hypothesis one was rejected. This implies a significant prediction in the overall readiness of male and female undergraduates to use AI tools for learning in North-Central Nigeria. The correlation coefficient (γ_{pb} = 0.110) further shows that there is a positive relationship in the readiness of male and female undergraduates to use AI tools for learning.

Table 3. Point biserial on the prediction of gender on the overall readiness of undergraduates to use AI tools for learning in North-Central Nigeria.

		Gender	Readiness
Gender	Pearson Correlation	1	.110**
	Sig. (2-tailed)		.001
	N	974	974
Readiness	Pearson Correlation	.110**	1
	Sig. (2-tailed)	.001	
	N	974	974

3.6. Hypothesis Two: There will be no Significant Association Between Area of Specialisation and Undergraduates' Readiness to use AI Tools for Learning in North-Central Nigeria.

In testing hypothesis two, point biserial was used as presented in **Table 4**. **Table 4** shows the point biserial on the prediction of the area of specialisation on the overall readiness of undergraduates to use AI tools for learning in North-Central Nigeria. The result shows γ_{pb}. (1,974) = 0.025, p (0.436), > 0.05, hence hypothesis two was not rejected. This implies that the area of specialisation is not significantly predictive of undergraduate readiness to use AI tools for learning in North-Central Nigeria.

Table 4. Point biserial on the prediction of the area of specialisation on the overall readiness of undergraduates to use AI tools for learning in North-Central Nigeria.

		Area of Specialisation	Readiness
Area of Specialisation	Pearson Correlation	1	.025
	Sig. (2-tailed)		.436
	N	974	974
Readiness	Pearson Correlation	.025	1
	Sig. (2-tailed)	.436	
	N	974	974

The quantitative finding revealed a significant prediction in the overall readiness of male and female undergraduates to use AI tools for learning. However, the qualitative analysis revealed that 40 interviewed undergraduates said no gender influence in undergraduate readiness to adopt AI, implying that undergraduates are ready to adopt AI irrespective of their gender. From the analysed quantitative and qualitative data, the following is a summary of findings:

(i) a significant prediction in the overall readiness of male and female undergraduates to use AI tools for learning in North-Central Nigeria;
(ii) The area of specialisation is not significantly predictive of undergraduate readiness to use AI tools for learning in North-Central Nigeria.

It was shown from the quantitative data analysis that there is a statistically significant difference in the overall readiness of male and female undergraduates to use AI tools for learning. In other words, looking at the number and the statistical measure, gender plays an important role in predicting how ready the students are for adopting AI tools. This probably reflects those differences exist in the levels of readiness of both male and female students, perhaps mediated by several factors like social norms, exposure to technology, prior experiences with AI, and general self-assurance when working with technologies.

On the other hand, the qualitative analysis was contradictory. This qualitative study undertook semi-structured interviews with 15 undergraduates to discuss the relevance of gender in the intention to use AI tools. The responses from these interviews have always shown that students do not believe that gender plays a role in their decision or interest in being ready to use AI tools. The interviewed undergraduates uniformly expressed that readiness to adopt AI is not determined by gender, implying a more egalitarian view among the students regarding AI adoption.

He quantitative finding concurs with previous research showing that gender-related factors significantly shape how students perceive the utility, effectiveness, and potential drawbacks of AI tools in education (Zeng, 2023). Gender has also been found to be significantly associated with students' e-learning readiness (Kabir *et al*., 2021). Similarly, gender contributes significantly to learning readiness (Dangol & Shrestha, 2021). A strong positive relationship between gender and e-learning readiness was also reported (Bubou & Job, 2022). Evidence further indicated that gender differences impact students' readiness to accept AI tools (Dodge *et al*., 2022). In addition, female learners may experience difficulties in accessing information on AI and its uses (Adebayo *et al*., 2021), while significant gender differences in readiness were also observed among faculty members adopting AI for teaching (Alnasib, 2023). The qualitative results corroborated findings that gender predicts respondents' perceptions and level of preparation (Lua & Ibrahim, 2015). Other studies revealed that gender significantly affects acceptance, with male students showing greater willingness compared to female counterparts (Ramírez-Correa *et al*., 2015). Gender disparities across science, technology, engineering, and mathematics (STEM) disciplines were also reported among undergraduates (Eddy & Brownell, 2016). Moreover, factors influencing undergraduate females' motivation in STEM include encouragement, gender bias, and sexual harassment (Leaper & Starr, 2018). However, some evidence showed no significant relationship between gender and readiness in medical AI contexts (Xuan *et al*., 2023):

(i) No, both male and female are using, and we are all in the same environment (Student J).
(ii) Student K added: No
(iii) Student M said : No, equal awareness.

This study also discovered that the area of specialisation is not a significant predictor of undergraduate readiness to use AI tools for learning in North-Central Nigeria. Unlike gender, area of specialisation—whether science, arts, social sciences, agriculture, or education—does not significantly influence students' readiness (Ajai, 2018). This indicates that undergraduates are equally prepared to use AI tools for learning regardless of their field of study (Ezeudu & Ojih, 2014).

Related findings have shown mixed outcomes. For instance, subject combination was found to have no statistically significant correlation with academic success in mathematics (Ajai, 2018), while the area of specialisation of geography instructors influenced their competency in teaching map work in secondary schools (Ezeudu & Ojih, 2014). In addition, students' attitudes toward AI tools in English were influenced by their area of specialisation, with perceived relevance and practical benefits serving as major determinants (Hartono *et al*., 2023). Similarly, when teachers' areas of specialisation aligned with AI technologies, their teaching performance improved (Malahay, 2021). By contrast, the present study revealed that undergraduate readiness to adopt AI tools for learning was not predicted by area of specialisation. The disparity in findings may be attributed to differences between assessing faculty readiness and undergraduate readiness.

4. CONCLUSION

This study concluded that demographic factors play varying roles in predicting undergraduates' readiness to use AI tools for learning in North-Central Nigeria. Gender was found to be a significant predictor, indicating measurable differences in readiness levels between male and female students. However, the area of specialisation was not a significant predictor, suggesting that students across different faculties demonstrate relatively similar levels of readiness. The findings imply that initiatives aimed at enhancing readiness for AI

adoption in higher education should focus on addressing gender-related gaps while ensuring inclusivity across all fields of study. Furthermore, the results highlight the importance of integrating AI education into curricula to prepare undergraduates for future academic and professional demands. These insights contribute to both research and practice, demonstrating how demographic factors can guide educational policies and community service initiatives designed to promote equitable AI adoption in higher education. The study's findings lead to the following recommendations:

(i) Gender should be taken into consideration while boosting undergraduates' readiness to use AI tools for learning, since there was a considerable gap in the overall readiness of male and female undergraduates in North-Central Nigeria.

(ii) Area of specialisation is not significantly predictive of undergraduate readiness to use AI tools for learning in North-Central Nigeria; hence, adequate training programmes should be organised for undergraduates irrespective of their area of specialisation.

(iii) To prepare students for a future integrated with AI technology, educational systems must incorporate AI into the academic curriculum, providing essential knowledge and skills. This approach will help maintain student interest and create a talent pipeline, benefiting both individuals and society.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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