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Perceived Gains, Statistical Silence: The Paradox of AI Tools and Academic Performance Among Nursing Students in Nigeria

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ABSTRACT

Background: Artificial Intelligence (AI) tools are increasingly embedded in nursing education globally, yet evidence on their actual effect on measurable academic outcomes in Nigerian nursing institutions remains scarce. Students frequently report that AI tools improve their learning, but whether these perceptions translate into statistically demonstrable performance gains is unclear.

Objective: To examine nursing students' utilization of AI tools and to determine whether AI tool use has a statistically significant influence on academic performance, class participation, and collaborative learning at Horizon College of Nursing Sciences, Abuja, Nigeria.

Methods: A descriptive cross-sectional survey was conducted among 155 nursing students drawn from four programmes (Basic Nursing, Basic Midwifery, ND Nursing, and HND Nursing) using a multi-stage sampling technique. Data were collected with a structured, validated 24-item questionnaire (Spearman's rho = 0.89). Descriptive statistics summarized utilization and perception patterns, while Pearson Chi-square tested three null hypotheses at the 0.05 significance level.

Results: The level of AI tool utilization was moderate, with 54.8% reporting regular use for academic studies and 52.9% using AI applications to search for learning materials. Over half of respondents perceived that AI tools improved their understanding of nursing concepts (54.2%), helped them complete academic tasks more efficiently (54.2%), and provided quicker access to relevant learning resources (54.2%). However, Pearson Chi-square analysis revealed no statistically significant influence of AI tools on class participation ($\chi^2 = 174.62$, df = 153, p = 0.106), collaborative learning and academic interactions ($\chi^2 = 178.24$, df = 153, p = 0.082), or academic performance ($\chi^2 = 179.63$, df = 153, p = 0.074). All three null hypotheses were therefore accepted.

Conclusion: A paradox emerged: nursing students perceive clear benefits from AI tools, yet these perceptions are not matched by statistically significant engagement or performance outcomes. The educational value of AI appears contingent not on availability but on structured integration, guidance, and complementary pedagogy.

Keywords: Artificial Intelligence, Academic Performance, Nursing Students, Academic Engagement, Nigeria

INTRODUCTION

Artificial Intelligence (AI) has moved rapidly from experimental novelty to routine academic infrastructure in higher education worldwide. In nursing education specifically, AI-powered tools intelligent tutoring systems, writing assistants, conversational agents, and information retrieval platforms are promoted for their capacity to personalize learning, accelerate content production, and support clinical reasoning (Bozkurt et al., 2025; El-Ashry et al., 2025; Orok et al., 2024). The dominant narrative in the literature is optimistic: AI is presented as a catalyst for engagement, efficiency, and improved academic outcomes (Abbas et al., 2023; Dahri et al., 2024; Nguyen et al., 2024).

However, this optimism rests largely on studies of *perception* and *self-reported benefit*, often drawn from general student populations in well-resourced institutions. Far fewer studies test whether AI use is associated with *measurable* academic outcomes, and fewer still examine this question in nursing institutions in Nigeria a context characterized by infrastructural constraints, uneven digital access, and limited formal AI training (Rajah et al., 2025; Okeke et al., 2026). This gap matters because nursing education demands clinical reasoning, evidence-based decision-making, and interpersonal competence domains in which uncritical or superficial AI use could plausibly substitute for, rather than stimulate, genuine cognitive engagement.

This study addresses that gap by examining AI tool utilization and its influence on three engagement outcomes class participation, collaborative learning and academic interactions, and academic performance among nursing students at Horizon College of Nursing Sciences, Abuja, Nigeria. Its central concern is not whether students believe AI helps them, but whether the statistical evidence supports that belief. To this end, four specific objectives guide the study: to assess the level of utilization of AI tools among nursing students, to examine the influence of AI-powered learning tools on class participation, to assess the effect of AI tools on collaborative learning and academic interactions, and to determine the influence of AI tools on academic performance. Corresponding to these objectives, three null hypotheses were formulated and tested at the 0.05 level of significance: that AI-powered learning tools have no significant influence on class participation, that AI tools have no significant effect on collaborative learning and academic interactions, and that AI tools have no significant influence on academic performance.

LITERATURE REVIEW

AI in education refers to computer-based systems that simulate human cognitive processes reasoning, language understanding, and problem-solving to support teaching and learning (Abbas et al., 2023). In nursing education, these systems include intelligent tutoring systems that adapt content to learner responses (Wang & Wang, 2024), AI-powered writing and content generation tools such as ChatGPT, Grammarly, and QuillBot (Eleje et al., 2025; González-García et al., 2024), and virtual assistants that provide real-time academic dialogue (Phua et al., 2025; Alotaibi, 2025). Proponents argue these tools enhance academic productivity, personalize learning pathways, and improve access to educational resources (Dahri et al., 2024; Nguyen et al., 2024).

Academic engagement encompasses behavioral participation (attendance, contribution, assignment completion), emotional involvement (interest, enthusiasm, belonging), and cognitive effort (critical thinking, deep processing) (Crawford et al., 2024; Haozhuo & Chen, 2024; Abdullahi, 2025). Engagement is consistently linked to improved learning outcomes, persistence, and academic achievement (Yakubu et al., 2025; Nwile et al., 2025). If AI tools genuinely enhance engagement, they should produce detectable effects on at least one of these dimensions.

A recurring pattern in the empirical literature is the coexistence of strong positive perceptions with weak or inconsistent evidence of measurable benefit. Ruiz-Rojas et al. (2024) found high familiarity and favorable perceptions of generative AI among university students, yet noted the need for continuous training and warned of limited longitudinal evidence. Phua et al. (2025) reported high engagement driven by perceived benefits but also flagged over-reliance and critical-thinking concerns. Rajah et al. (2025), studying nursing students in Kano, Nigeria, found positive attitudes alongside significant infrastructural barriers. Okeke et al. (2026) found a significant association between AI knowledge and perceived impact but identified substantial adoption barriers. What remains underexplored is whether perceived benefit translates into statistically demonstrable engagement or performance gains the precise question this study addresses.

The Technology Acceptance Model (TAM) holds that perceived usefulness and perceived ease of use shape attitudes, behavioural intention, and actual technology use (Davis, 1989). TAM explains *why* students adopt AI tools but does not guarantee that adoption produces learning gains. Indeed, TAM's emphasis on perception is precisely why a perception–outcome gap is theoretically plausible: students may perceive AI as useful (high perceived usefulness) and therefore use it frequently, without that use being structured in ways that improve measurable academic outcomes. This study therefore uses TAM to interpret utilization patterns while testing empirically whether perceived usefulness corresponds to demonstrable influence.

METHODS

A descriptive cross-sectional survey design was employed at Horizon College of Nursing Sciences, Abuja, Nigeria. The design was appropriate for collecting standardized information from a representative sample without manipulating study variables (Saunders et al., 2019). The population comprised 355 students across four programmes: Basic Nursing, Basic Midwifery, National Diploma (ND) Nursing, and Higher National Diploma (HND) Nursing. Using the Taro Yamane (1967) formula, a sample size of 188 was determined. A multi-stage sampling technique was applied: stratified sampling by programme level, followed by convenience sampling of available and willing students. Of 188 questionnaires distributed, 175 were returned (95.6% return rate) and 155 were valid for analysis (88.6%).

A structured questionnaire titled "Utilization of Artificial Intelligence Tools on Academic Engagement among Nursing Students" was used. It contained five sections: demographics (Section A) and four 6-item Likert sections (Sections B–E) covering AI utilization, class participation, collaborative learning and academic interactions, and academic performance. Responses used a five-point scale (Strongly Agree to Strongly Disagree). Content validity was established through review by the project supervisor and three experts in the field. Reliability was assessed through a test–retest procedure with 10 respondents of comparable characteristics over a one-week interval. Spearman's rho for the four sections ranged from 0.87 to 0.91, with an overall reliability coefficient of $\rho = 0.89$ all above the acceptable 0.70 threshold.

Questionnaires were administered directly by the researcher with two trained assistants. Data were analysed using SPSS. Descriptive statistics (frequencies and percentages) summarized demographic characteristics and item responses. Pearson Chi-square tested the three hypotheses at the 0.05 significance level.

RESULTS

4.1 Demographic Profile

Table 1: Demographic Profile of Respondents (N = 155)

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	72	46.5
	Female	83	53.5
Age Group	16–20 years	52	33.5
	21–25 years	71	45.8
	26 years and above	32	20.6
Marital Status	Single	139	89.7
	Married	13	8.4
	Divorced/Widowed	3	1.9
Programme	Basic Nursing	50	32.3
	ND Nursing	40	25.8
	Basic Midwifery	36	23.2
	HND Nursing	29	18.7
Access to Digital Devices	Smartphone Only	31	20.0
	Smartphone and Laptop	98	63.2
	Other Devices	26	16.8
Frequency of AI Use	Daily	45	29.0
	Weekly	54	34.8

Demographic Variable	Category	Frequency (n)	Percentage (%)
	Occasionally	38	24.5
	Rarely	18	11.6

The demographic profile of the 155 respondents, as presented in Table 1, reveals a predominantly young, single, and digitally equipped student population. The sample was fairly balanced in gender, comprising 83 females (53.5%) and 72 males (46.5%). In terms of age, the largest proportion of respondents (45.8%) fell within the 21–25 years age bracket, followed by those aged 16–20 years (33.5%), while those aged 26 years and above constituted 20.6%. The vast majority of the respondents were single (89.7%), with only a small fraction being married (8.4%) or divorced/widowed (1.9%). Regarding their academic programmes, the sample was well-distributed across four disciplines, with the highest representation from Basic Nursing (32.3%), followed by ND Nursing (25.8%), Basic Midwifery (23.2%), and HND Nursing (18.7%). Notably, the respondents demonstrated a high level of digital readiness, as 63.2% had access to both a smartphone and a laptop, while 20.0% relied solely on smartphones and 16.8% used other devices. Finally, the frequency of AI tool usage indicated moderate to active engagement with the technology, with 34.8% using AI tools weekly, 29.0% daily, 24.5% occasionally, and only 11.6% rarely using them.

4.2 Level of AI Tool Utilization

Table 2: ***Level of Utilization of Artificial Intelligence (AI) Tools among Nursing Students (N = 155)***

S/N	Statement	SA n (%)	A n (%)	U n (%)	D n (%)	SD n (%)
1	I regularly use AI tools to assist with my academic studies and assignments.	36 (23.2)	49 (31.6)	24 (15.5)	29 (18.7)	17 (11.0)
2	I do not find AI tools useful for my nursing education activities.	15 (9.7)	23 (14.8)	26 (16.8)	52 (33.5)	39 (25.2)
3	I use AI-powered applications to search for academic information and learning materials.	34 (21.9)	48 (31.0)	28 (18.1)	28 (18.1)	17 (11.0)
4	I rarely utilize AI tools when preparing for tests and examinations.	18 (11.6)	27 (17.4)	25 (16.1)	50 (32.3)	35 (22.6)
5	AI tools are part of my regular learning activities as a nursing student.	32 (20.6)	47 (30.3)	29 (18.7)	30 (19.4)	17 (11.0)
6	I avoid using AI tools because they are difficult to operate.	13 (8.4)	22 (14.2)	27 (17.4)	54 (34.8)	39 (25.2)

Note. SA = Strongly Agree; A = Agree; U = Undecided; D = Disagree; SD = Strongly Disagree.

The findings presented in the table above indicate a generally moderate to high level of AI tool utilization among the nursing students. A clear majority of respondents affirmed that they regularly use AI tools for their academic studies and assignments (54.8% agreed) and use AI-powered applications to search for academic information and learning materials (52.9% agreed), with roughly half (50.9%) confirming that AI tools are part of their regular learning activities. Furthermore, the data reveals that a significant proportion of students actively utilize AI in preparing for tests and examinations, as evidenced by the 54.9% who disagreed with the statement that they *rarely* use AI for this purpose. Conversely, the barriers to utilization appear to be attitudinal or infrastructural rather than technological, as only a minority (23.9%) agreed that AI tools are not useful for nursing education, and an even

smaller proportion (22.6%) avoid them due to difficulty of operation. Overall, the responses demonstrate that AI has been meaningfully integrated into the students' academic routines, though the proportions suggest the usage is widespread rather than universally intensive

Perceived Influence on Engagement Outcomes

Table 3: Perceived Influence of AI Tools on Academic Engagement Outcomes (N = 155)

Domain	Key Perceived Benefit	Agreement
Class participation	AI tools encourage more active participation in classroom discussions	54.9%
Class participation	AI tools help prepare better for classroom interactions and presentations	53.5%
Collaborative learning	AI tools facilitate effective collaboration during group assignments	53.5%
Collaborative learning	AI-powered platforms help share academic ideas and resources	53.6%
Academic performance	AI tools improve understanding of nursing concepts and course content	54.2%
Academic performance	AI tools assist in completing academic tasks more efficiently	54.2%
Academic performance	AI tools contribute to better achievement through quick access to resources	54.2%

The data in table 3 reveals a consistently positive pattern of perceived influence across all three academic engagement domains, with more than half of the respondents endorsing the benefits of AI tools in each area. In terms of class participation, 54.9% of students agreed that AI tools encourage them to participate more actively in classroom discussions, and 53.5% agreed that these tools help them prepare better for interactions and presentations. Similarly, regarding collaborative learning, 53.5% affirmed that AI facilitates effective collaboration during group assignments, and 53.6% agreed that AI-powered platforms help them share academic ideas and resources with peers. Finally, perceptions of academic performance benefits were uniformly strong, with 54.2% of respondents agreeing on all three indicators: that AI tools improve their understanding of nursing concepts, assist them in completing academic tasks more efficiently, and contribute to better achievement by providing quick access to relevant learning resources. Overall, these findings indicate that a clear majority of nursing students perceive AI tools as beneficial catalysts for their engagement and performance, setting the stage for the statistical analysis of whether these perceived gains translate into measurable outcomes.

Hypothesis Testing

Table 4: Pearson Chi-Square Results for the Influence of AI Tools on Academic Engagement Outcomes

Hypothesis	χ^2 calculated	df	Critical value ($\alpha = 0.05$)	p-value	Decision
H_o1: AI tools → class participation	174.62	153	182.86	0.106	Accepted
H_o2: AI tools → collaborative learning	178.24	153	182.86	0.082	Accepted
H_o3: AI tools → academic performance	179.63	153	182.86	0.074	Accepted

As shown in table 4, the Pearson Chi-square analysis revealed no statistically significant influence of AI tools on any of the three measured engagement outcomes, thereby creating a sharp contrast with the positive perceptions reported earlier. For the first hypothesis, the calculated chi-square value for class participation ($\chi^2 = 174.62$) fell below the critical value of 182.86, yielding a p-value of 0.106. Similarly, the influence on collaborative learning and

academic interactions produced a calculated value of 178.24 against the same critical value, with a p-value of 0.082, while the influence on academic performance yielded a calculated value of 179.63 and a p-value of 0.074. Because all calculated values fell below the critical threshold and all p-values exceeded the 0.05 level of significance, the null hypotheses (H_o1, H_o2, and H_o3) were accepted. This indicates that, despite students' strong perceptions of benefit, the utilization of AI tools does not hold a statistically significant influence over their class participation, collaborative learning, or academic performance at the conventional threshold.

DISCUSSION

The central finding of this study is a paradox: nursing students overwhelmingly perceive AI tools as beneficial, yet statistical analysis detects no significant influence on class participation, collaborative learning, or academic performance. This is not a contradiction of the descriptive data but a critical qualification of it. Perception of benefit and demonstrable benefit are distinct constructs, and this study shows they can diverge.

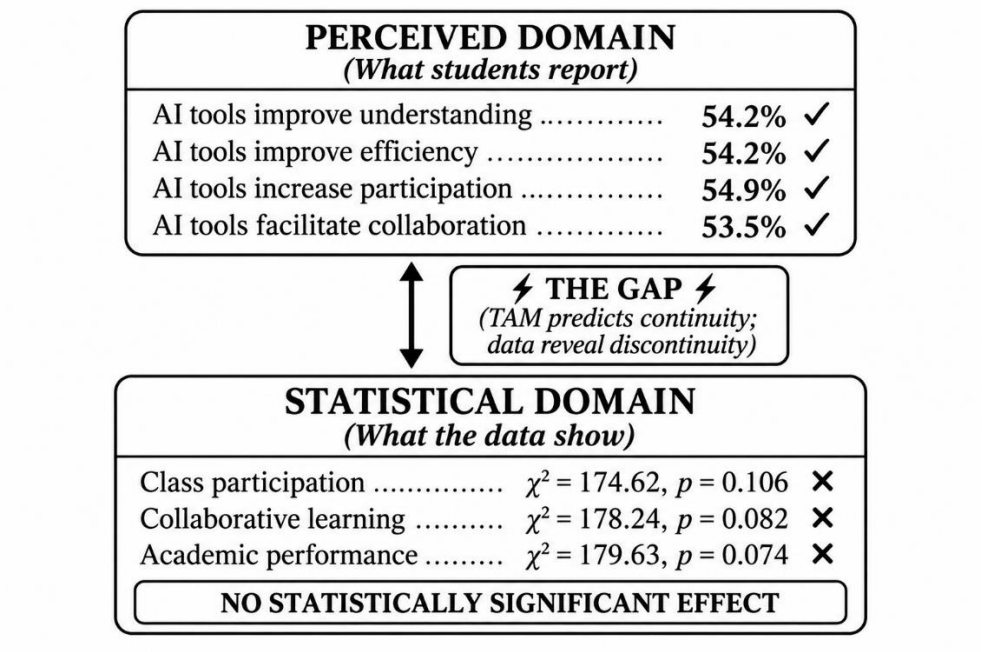


Figure 1: The Perception–Outcome Gap in AI Tool Utilization

Note. *The upper panel summarizes students' perceived benefits. The lower panel presents the Pearson Chi-square results, revealing no statistically significant influence of AI tools on the three engagement outcomes.*

Several explanations are plausible. First, students may use AI tools in *superficial* ways generating text, retrieving information, or summarizing content without engaging in the deeper cognitive processing that improves academic performance (Crawford et al., 2024; Haozhuo & Chen, 2024). Second, current assessment designs may not reward AI-assisted learning: if examinations test recall rather than AI-augmented reasoning, frequent AI use would not translate into measurable gains. Third, TAM's perceived usefulness (Davis, 1989) may operate as a *belief* that motivates use without being an accurate predictor of outcome a gap between attitude and effect that the technology acceptance literature has long acknowledged but rarely tested against performance data.

These findings are consistent with Rajah et al. (2025), who found positive perceptions but infrastructural barriers among Nigerian nursing students, and with Ruiz-Rojas et al. (2024), who reported high familiarity but occasional use and called for continuous training. They diverge from studies reporting positive AI–performance associations (Crawford et al., 2024; Oubibi et al., 2025; Abbas et al., 2023), and this divergence is instructive: those studies were conducted in better-resourced contexts with more structured AI integration. The present study suggests that in a Nigerian nursing college with moderate utilization and no formal AI training, availability alone does not produce measurable engagement or performance gains.

Three implications follow. First, AI literacy training must precede AI integration. Students who use AI without guidance may be using it inefficiently a plausible explanation for the null findings. Second, assessment must be redesigned so that AI-assisted learning is rewarded; otherwise, AI use will remain disconnected from measurable achievement. Third, institutional policy should treat AI as a supplement, not a substitute for guided discussion, clinical reasoning exercises, and collaborative learning. The null results are not an argument against AI, but an argument against *unstructured* AI.

Several limitations should be noted. The study relied exclusively on self-report data, which may be subject to social desirability bias. The cross-sectional design permits association but not causal inference. The sample was drawn from a single institution, limiting generalizability beyond Horizon College. Some respondents required clarification before completing the questionnaire. The null findings should also be interpreted cautiously: p-values of 0.074–0.106 are close to the threshold, and a larger sample or more sensitive instrument might detect small effects. Finally, the questionnaire did not measure the *quality* or *depth* of AI use, which may be the decisive mediating variable.

CONCLUSION

This study set out to determine whether AI tools measurably influence academic engagement among nursing students in Abuja, Nigeria. The answer is nuanced: students use AI moderately, perceive substantial benefits, and yet show no statistically significant improvement in class participation, collaborative learning, or academic performance attributable to AI use. The paradox of "perceived gains, statistical silence" is itself the most important finding it cautions against equating enthusiasm with effectiveness and suggests that the educational value of AI depends less on access than on structured integration, guidance, and complementary pedagogy. Nursing institutions should invest in AI training, redesign assessments to reward AI-supported learning, and establish policies that position AI as an aid to not a replacement for active, collaborative, and clinically grounded learning.

RECOMMENDATIONS

1. Structured AI training programmes should be established to move students from superficial to purposeful AI use.
2. Assessment redesign should incorporate tasks that reward AI-supported critical thinking and reasoning.
3. Institutional guidelines should define ethical and responsible AI use in nursing education.
4. Digital infrastructure should be strengthened to remove connectivity and access barriers.
5. Longitudinal research with larger, multi-institution samples and measures of AI use quality should be conducted to test whether the perception–outcome gap persists over time.

REFERENCES

Abbas, N., Ali, I., Manzoor, R., Hussain, T., & Hussain, M. (2023). Role of Artificial Intelligence Tools in Enhancing Students' Educational Performance at Higher Levels. *Journal of Artificial Intelligence and Machine Learning in Neural Networks*, 3(5), 36–49. https://doi.org/10.55529/jaimlnn.35.36.49

Abdullahi, N. (2025). Managing Artificial Intelligence-Driven Platforms for Student Development. *International Journal of Engineering Technology and Natural Sciences*. https://doi.org/10.46923/ijets.v7i1.467

Alotaibi, S. (2025). Determinants of Generative Artificial Intelligence (GenAI) adoption among university students and its impact on academic performance: the mediating role of trust in technology. *Interactive Learning Environments*, 33, 4159–4188. https://doi.org/10.1080/10494820.2025.2492785

Bozkurt, R. A., Aydoğan, A. P. S., Dursun, F., & Ergezen. (2025). A systematic review and sequential explanatory synthesis: Artificial intelligence in healthcare education, a case of nursing. *International Nursing Review*, 72. https://doi.org/10.1111/inr.70018

Crawford, J., Allen, K.-A., Pani, B., & Cowling, M. (2024). When artificial intelligence substitutes humans in higher education: the cost of loneliness, student success, and retention. *Studies in Higher Education*, 49, 883–897. https://doi.org/10.1080/03075079.2024.2326956

Dahri, N. A., Yahaya, N., Al-Rahmi, W., Vighio, M., Alblehai, F., Soomro, R., & Shutaleva, A. (2024). Investigating AI-based academic support acceptance and its impact on students' performance in Malaysian and Pakistani higher education institutions. *Education and Information Technologies*, 29, 18695–18744. https://doi.org/10.1007/s10639-024-12599-x

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.

El-Ashry, A., Saleh, N. S. al, AlOtaibi, N., Almutairi, T., Sallam, L., Alnassar, M., Alshehri, K., Al-Ghareeb, S., Al-Otaibi, R. A., Almutairi, W., Alkubati, S., & El-Sayed, M. (2025). The Impact of Artificial Intelligence Attitudes and Acceptance on Critical Thinking Motivation among Nursing Students in Saudi Arabia. *SAGE Open Nursing*, 11. https://doi.org/10.1177/23779608251369564

Eleje, L., Ezeugo, N., Esomonu, N., Metu, I., Anierobi, E., Mbelede, N., Nwosu, K., Ezeonwumelu, V., Ufearo, F., & Eleje, G. (2025). Artificial intelligence adoption in higher education in Nigeria. *Discover Artificial Intelligence*, 5. https://doi.org/10.1007/s44163-025-00452-0

González-García, A., Bermejo-Martínez, D., Lopez-Alonso, A., Trevissón-Redondo, B., Martín-Vázquez, C., & Pérez-González, S. (2024). Impact of ChatGPT usage on nursing students education: A cross-sectional study. *Heliyon*, 11. https://doi.org/10.1016/j.heliyon.2024.e41559

Haozhuo, L., & Chen, Q. (2024). Artificial intelligence (AI)-integrated educational applications and college students' creativity and academic emotions: students and teachers' perceptions and attitudes. *BMC Psychology*, 12. https://doi.org/10.1186/s40359-024-01979-0

Nguyen, A., Hong, Y., Dang, B., & Huang, X. (2024). Human-AI collaboration patterns in AI-assisted academic writing. *Studies in Higher Education*, 49, 847–864. https://doi.org/10.1080/03075079.2024.2323593

Nwile, C., Amaewhule, E., & Ezeugo, C. R. (2025). Utilization of Artificial Intelligence Tools for Improving Educational Outcomes of Students in Public Universities in Rivers State, Nigeria. *African Journal of Humanities and Contemporary Education Research*. https://doi.org/10.62154/ajhcer.2025.019.0121

Okeke, N., Ogbor, G. I., Ikukaiwe, J. N., Jacob, J., Ozioko, D. C., Okeke, I. K., Akpobasa, O. B., & Okeke, G. C. (2026). Artificial Intelligence In Nursing Education: Knowledge And Perceived Impact Among Undergraduate Nursing Students In Nigeria. *Cognizance Journal of Multidisciplinary Studies*. https://doi.org/10.47760/cognizance.2026.v06i02.027

Orok, E., Okaramee, C., Egboro, B., Egbochukwu, E., Bello, K., Etukudo, S., Ogologo, M.-S., Onyeka, P., Etukokwu, O., Kolawole, M., Orire, A., Ekada, I., & Akawa, O. A. (2024). Pharmacy students' perception and knowledge of chat-based artificial intelligence tools at a Nigerian University. *BMC Medical Education*, 24. https://doi.org/10.1186/s12909-024-06255-8

Oubibi, M., Hryshayeva, K., & Huang, R. (2025). Enhancing postgraduate digital academic writing proficiency: the interplay of artificial intelligence tools and ChatGPT. *Interactive Learning Environments*, 33, 3940–3958. https://doi.org/10.1080/10494820.2025.2454445

Phua, J. T. K., Neo, H., & Teo, C. (2025). Evaluating the Impact of Artificial Intelligence Tools on Enhancing Student Academic Performance: Efficacy Amidst Security and Privacy Concerns. *Big Data and Cognitive Computing*, 9, 131. https://doi.org/10.3390/bdcc9050131

Rajah, A. S., Sarduana, M. Z., & Ladan, M. (2025). Exploring the experiences and perceptions of artificial intelligence utilization among students of the department of nursing, Bayero University, Kano. *Journal of Practical Nurse Education and Practice*. https://doi.org/10.29173/jpnep43

Ruiz-Rojas, L. I., Salvador-Ullauri, L., & Acosta-Vargas, P. (2024). Collaborative Working and Critical Thinking: Adoption of Generative Artificial Intelligence Tools in Higher Education. *Sustainability*, 16, 5367. https://doi.org/10.3390/su16135367

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students* (8th ed.). Pearson.

Taro Yamane. (1967). *Statistics: An Introductory Analysis* (2nd ed.). Harper and Row.

Wang, Y., & Wang, H. (2024). Mediating effects of artificial intelligence on the relationship between academic engagement and mental health among Chinese college students. *Frontiers in Psychology*, 15. https://doi.org/10.3389/fpsyg.2024.1477470

Yakubu, M., David, N., & Abubakar, N. (2025). Students' behavioural intention to use content generative AI for learning and research: A UTAUT theoretical perspective. *Education and Information Technologies*, 30, 17969–17994. https://doi.org/10.1007/s10639-025-13441-8