

ARTIFICIAL INTELLIGENCE TOOLS IN PROMOTING STUDENT-CENTRED LEARNING AND REFLECTIVE THINKING IN TERTIARY INSTITUTIONS IN NIGERIA

Asogwa, Emeka Timothy

Department of Educational Foundations
Faculty of Education, University of Nigeria, Nsukka

Abstract

The study investigated Artificial Intelligence tools in promoting student-centred learning and reflective thinking in tertiary institutions in Nigeria. Four research questions guided the study. The study adopted a descriptive survey research design. The area of the study was the University of Nigeria, Nsukka, Enugu State, Nigeria. The population of the study comprised 480 Philosophy students in the University of Nigeria, Nsukka. The entire population was used for the study because it was manageable; therefore, no sampling technique was applied. The instrument for data collection was a structured questionnaire titled “Artificial Intelligence Tools for Student-Centred Learning and Reflective Thinking Questionnaire” (AITSCRTQ). The instrument was face-validated by experts in the Department of Educational Foundations, Faculty of Education, University of Nigeria, Nsukka. The reliability of the instrument was established using Cronbach’s Alpha, which yielded a coefficient of 0.82. Data were collected through direct administration of the questionnaire with the assistance of trained research assistants. Data were analyzed using mean and standard deviation, while a decision rule of 2.50 was used such that any mean score of 2.50 and above was regarded as Agree, while below 2.50 was regarded as Disagree. The findings of the study revealed that Intelligent Tutoring Systems promote student-centred learning through personalized instruction and immediate feedback. The findings also showed that Adaptive Learning Platforms enhance reflective thinking by helping students evaluate their learning progress and identify areas for improvement. It was further revealed that Automated Assessment Systems support student-centred learning through timely feedback and self-paced learning opportunities. The study recommended among others that tertiary institutions should integrate Artificial Intelligence tools into teaching and learning processes because they promote student-centred learning and enhance reflective thinking among students. The study contributed to knowledge by providing empirical evidence on the educational relevance of Artificial Intelligence tools in strengthening student-centred learning and reflective thinking within Philosophy of Education in Nigerian tertiary institutions.

Keywords: AI-Tools, student-centred learning, reflective thinking, philosophy of education

Introduction

The increasing penetration of Artificial Intelligence tools into tertiary education has generated growing concern among education scholars regarding the quality of learning outcomes, particularly in relation to student-centred learning and reflective thinking. The researcher’s worry is anchored on the observed trend that although Artificial Intelligence technologies are rapidly being adopted across universities and other higher institutions, their pedagogical integration often appears more technological than educationally transformative, raising questions about whether they genuinely foster deep learning or merely support academic convenience. United Nations Educational, Scientific and Cultural Organization (UNESCO, 2023) observed that Artificial Intelligence is reshaping

higher education through adaptive learning systems, intelligent tutoring environments, and automated academic support tools, yet emphasized that its educational value depends on ethical use, institutional readiness, and sound pedagogical design. Holmes, Bialik, and Fadel (2019) similarly argued that Artificial Intelligence has the potential to personalize learning experiences and enhance instructional efficiency, but warned that it may weaken deep learning and learner autonomy if not properly guided by educational philosophy. Selwyn (2019) further noted that digital technologies in education often reshape teaching and learning in unpredictable ways, sometimes undermining rather than strengthening critical engagement and learner independence. These concerns highlight the need to critically examine how Artificial Intelligence tools are being used to promote student-centred learning and reflective thinking in tertiary institutions in Nigeria.

Artificial Intelligence tools in education refer to digital systems designed to perform tasks that ordinarily require human intelligence, such as learning, reasoning, adaptation, and decision-making in instructional environments. Russell and Norvig (2021) described Artificial Intelligence as computational systems capable of simulating human cognitive functions including problem-solving and reasoning. Luckin, Holmes, Griffiths, and Forcier (2016) defined Artificial Intelligence in education as technologies that enhance human learning by providing adaptive feedback, personalized instruction, and intelligent support systems. Holmes, Bialik, and Fadel (2019) explained Artificial Intelligence tools as educational technologies that analyze learner data to improve instruction, assessment, and learning outcomes. In this study, Artificial Intelligence tools refer to intelligent digital learning systems such as intelligent tutoring systems, adaptive learning platforms, generative Artificial Intelligence applications, learning analytics systems, and automated assessment tools used to support teaching and learning processes in tertiary institutions. These tools represent a major shift in educational delivery, making it necessary to examine their connection with student-centred learning.

Intelligent tutoring systems are Artificial Intelligence tools designed to simulate one-on-one human tutoring by providing individualized instruction and feedback. VanLehn (2011) explained that intelligent tutoring systems improve learning by diagnosing student errors and offering tailored instructional support. Nye (2015) added that such systems enhance learning efficiency by adapting instruction to learner needs in real time. Adaptive learning platforms represent another category of Artificial Intelligence tools that adjust learning content based on student performance and progress. Knewton (2018) described adaptive learning systems as data-driven platforms that personalize educational content to meet individual learner differences. Generative Artificial Intelligence tools such as ChatGPT have also become widely used in education. OpenAI (2023) described ChatGPT as a conversational system capable of generating human-like responses for academic support, while Kasneci and others (2023) observed that such tools can enhance learning but also raise concerns about academic integrity and overdependence.

Learning analytics systems are another important category of Artificial Intelligence tools that analyze learner data to improve instructional decisions. Siemens and Long (2011) defined learning analytics as the collection and analysis of educational data to optimize learning processes, while Ferguson (2012) emphasized its role in identifying learning patterns and supporting timely interventions. Automated assessment systems also play a role in Artificial Intelligence integration by providing algorithm-based grading and feedback. Williamson and Piattoeva (2019) noted that such systems improve efficiency in assessment but raise concerns about fairness and validity in complex learning tasks.

Student-centred learning is a pedagogical approach that shifts the focus of instruction from the teacher to the learner, emphasizing active participation, autonomy, and knowledge construction. Weimer (2013) described student-centred learning as an approach that redistributes power in the classroom, placing responsibility for learning on students. Lea, Stephenson, and Troy (2003) explained that it emphasizes collaboration, engagement, and active knowledge creation. Biggs and Tang (2011) argued that student-centred learning involves designing teaching and assessment practices that promote meaningful understanding rather than rote memorization. In this study, student-centred learning refers to instructional practices supported by Artificial Intelligence tools that promote learner autonomy, engagement, and active participation in tertiary institutions.

Reflective thinking is a fundamental concept in Philosophy of Education that emphasizes critical examination of experiences in order to construct meaningful understanding. Dewey (1933) described reflective thinking as active and persistent consideration of beliefs in light of evidence and consequences. Schön (1983) introduced reflective practice as the ability to reflect during and after action to improve understanding and performance. Moon (2004) defined reflective thinking as a structured cognitive process through which individuals transform experience into deeper learning. In this study, reflective thinking refers to students' ability in tertiary institutions to critically analyze learning experiences, evaluate information obtained through Artificial Intelligence tools, and construct independent meaning from academic engagement. Reflective thinking is therefore closely connected to both Artificial Intelligence tools and student-centred learning because it represents a key intellectual outcome of meaningful education.

The relationship among Artificial Intelligence tools, student-centred learning, and reflective thinking has become a major concern in contemporary educational discourse. UNESCO (2023) noted that Artificial Intelligence is enabling personalized learning environments, but warned that it may also reduce critical engagement if poorly implemented. Selwyn (2019) argued that digital technologies do not automatically improve education unless guided by strong pedagogical frameworks. Holmes, Bialik, and Fadel (2019) emphasized that Artificial Intelligence can support deeper learning when integrated with appropriate instructional strategies that promote learner participation and reflection. In Nigeria, Oke and Fernandes (2020) observed that although digital learning tools are increasingly present in universities, their pedagogical integration remains limited due to infrastructural and capacity challenges. Eze, Chinedu, and Chinedu-Eze (2021) further noted that many tertiary institutions struggle to effectively use digital technologies to promote learner autonomy and reflective engagement. These issues suggest a need for deeper investigation into how Artificial Intelligence tools can be aligned with educational goals in Nigerian tertiary institutions.

Several problems are associated with the use of Artificial Intelligence tools in tertiary education. One major concern is academic dependency, where students rely excessively on Artificial Intelligence systems, leading to reduced independent reasoning and critical thinking. Selwyn (2019) warned that digital technologies may weaken intellectual engagement when learners become passive consumers of automated outputs. Another issue is academic integrity, particularly with generative Artificial Intelligence tools, where Kasneci and others (2023) observed risks of plagiarism, reduced originality, and overreliance on machine-generated content. Infrastructural challenges also limit effective implementation, especially in developing countries such as Nigeria, where Oke and Fernandes (2020) reported inadequate internet access and poor digital facilities in universities. Furthermore, lack of lecturer preparedness remains a major constraint, as

Holmes, Bialik, and Fadel (2019) emphasized that effective integration of Artificial Intelligence requires adequate training and pedagogical competence.

Hence, to address these challenges, several strategies have been recommended. UNESCO (2023) proposed the development of ethical guidelines and institutional policies to regulate Artificial Intelligence use in education. Holmes, Bialik, and Fadel (2019) emphasized the need for Artificial Intelligence literacy among lecturers and students to ensure meaningful integration into teaching and learning. Weimer (2013) recommended learner-centred pedagogical redesign that positions students as active participants in learning processes. Biggs and Tang (2011) stressed the importance of constructive alignment between teaching, learning, and assessment to ensure meaningful educational outcomes. Selwyn (2019) highlighted the importance of critical digital literacy to ensure responsible and reflective use of technology. Dewey (1933) and Schön (1983) further supported the development of reflective learning environments where students are encouraged to critically engage with knowledge rather than passively consume it. Collectively, these strategies emphasize the need for balanced integration of Artificial Intelligence tools that supports both technological advancement and the philosophical goals of education, including autonomy, critical thinking, and reflective reasoning.

Empirical studies on Artificial Intelligence in education have increased globally, but most focus on technological efficiency rather than philosophical and pedagogical outcomes. VanLehn (2011) examined intelligent tutoring systems and reported learning improvements but did not focus on reflective thinking development. Siemens and Long (2011) studied learning analytics and educational optimization, with limited attention to student-centred learning processes. Kasneci and others (2023) explored generative Artificial Intelligence in education and highlighted both opportunities and risks, but did not investigate its philosophical integration in developing educational contexts. From empirical evidence and researcher observation within tertiary institutions in Nigeria, no comprehensive study has been identified that examines Artificial Intelligence tools in promoting student-centred learning and reflective thinking within a Philosophy of Education framework. Existing studies have largely treated Artificial Intelligence as a technological innovation rather than a pedagogical and philosophical instrument for intellectual development. This creates a clear gap in knowledge. Therefore, this study intends to examine Artificial Intelligence tools in promoting student-centred learning and reflective thinking in tertiary institutions in Nigeria.

Statement of the Problem

The integration of Artificial Intelligence tools into tertiary education represents a significant transformation in contemporary teaching and learning processes, particularly in relation to student-centred learning and reflective thinking in higher institutions. Ideally, tertiary education should provide an environment where learners actively construct knowledge, engage in critical inquiry, and develop reflective thinking skills that enable them to evaluate ideas independently and apply knowledge meaningfully in real-life situations. In such an ideal situation, Artificial Intelligence tools are expected to function as supportive educational resources that enhance learner autonomy, promote deep engagement with learning materials, and strengthen reflective and critical thinking abilities through adaptive feedback, personalized instruction, and interactive learning experiences. However, the current situation in many tertiary institutions, particularly in developing contexts such as Nigeria, reflects a different reality. Artificial Intelligence tools are increasingly being adopted in teaching and learning environments, yet their use often

appears to emphasize convenience, content generation, and task completion rather than deep pedagogical engagement. Instead of fostering student-centred learning, there is growing concern that these tools may be encouraging passive learning behaviours, where students rely heavily on automated systems for answers without engaging in meaningful reflection or critical analysis. Furthermore, the expected development of reflective thinking among students appears to be weakening as learners increasingly depend on Artificial Intelligence systems for academic tasks, thereby reducing opportunities for independent reasoning and intellectual struggle that are essential for deep learning.

However, many lecturers in tertiary institutions are still grappling with how to effectively integrate Artificial Intelligence tools into instructional practices in ways that promote active learning and reflective engagement. This challenge is further compounded by limited digital literacy, inadequate infrastructural support, and the absence of clear pedagogical frameworks guiding the use of Artificial Intelligence in education. As a result, the gap between the potential benefits of Artificial Intelligence tools and their actual educational outcomes continues to widen, raising concerns about the extent to which these technologies are truly contributing to meaningful learning experiences in higher education. Therefore, the problem of this study is stated as follows: there is uncertainty regarding how Artificial Intelligence tools are being utilized in tertiary institutions in Nigeria and the extent to which they promote student-centred learning and reflective thinking among students.

Purpose of the Study

The general purpose of the study was to examine Artificial Intelligence tools in promoting student-centred learning and reflective thinking in tertiary institutions in Nigeria. Specifically, the study sought:

1. To examine Intelligent Tutoring Systems in promoting student-centred learning in tertiary institutions in Nigeria.
2. To investigate Adaptive Learning Platforms in enhancing reflective thinking among students in tertiary institutions in Nigeria.
3. To examine Automated Assessment Systems in promoting student-centred learning in tertiary institutions in Nigeria.
4. To determine Learning Analytics Systems in enhancing reflective thinking in tertiary institutions in Nigeria.

Research Questions

The following research questions guided the study;

1. How do Intelligent Tutoring Systems promote student-centred learning in tertiary institutions in Nigeria?
2. How do Adaptive Learning Platforms enhance reflective thinking among students in tertiary institutions in Nigeria?
3. How do Automated Assessment Systems promote student-centred learning in tertiary institutions in Nigeria?
4. How do Learning Analytics Systems enhance reflective thinking in tertiary institutions in Nigeria?

Methods

The study adopted a descriptive survey research design. This design was considered appropriate because it enables the researcher to obtain and describe information on the use of Artificial Intelligence tools in promoting student-centred

learning and reflective thinking in tertiary institutions in Nigeria without manipulating any variable. The area of the study was the University of Nigeria, Nsukka, Enugu State. The choice of this area was based on the presence of Philosophy students who are increasingly exposed to digital learning tools and Artificial Intelligence applications in their academic activities. The population of the study comprised 480 Philosophy students in the University of Nigeria, Nsukka, Enugu State, Nigeria. The population was considered manageable; therefore, no sampling technique was adopted. The entire population was used as the respondents for the study. The instrument for data collection was a structured questionnaire titled “Artificial Intelligence Tools for Student-Centred Learning and Reflective Thinking Questionnaire” (AITSCRTQ). The instrument was designed based on the research questions and structured on a four-point Likert scale. The instrument was face-validated by experts in the Department of Educational Foundations, Faculty of Education, University of Nigeria, Nsukka to ensure that the items were clear, relevant, and adequate in measuring the variables of the study. The corrections and suggestions were incorporated into the final draft of the instrument. The reliability of the instrument was established using Cronbach’s Alpha method, which yielded a coefficient value of 0.82, indicating that the instrument was highly reliable for the study. Data were collected through direct administration of the questionnaire to the 480 Philosophy students in the University of Nigeria, Nsukka. The researcher, with the help of trained assistants, distributed and retrieved the questionnaire after completion. Data collected were analyzed using descriptive statistics, specifically mean and standard deviation, to answer the research questions of the study. A decision rule based on a benchmark mean of 2.50 was used. Any item with a mean score of 2.50 and above was regarded as Agree (A), while any item with a mean score below 2.50 was regarded as Disagree (D).

Results

Table 1: Mean and Standard Deviation of Responses on Intelligent Tutoring Systems in Promoting Student-Centred Learning

S/N	Item Statement	Mean ($\bar{X}$)	Std Dev (Std)	Decision
1	Intelligent Tutoring Systems provide personalized learning support to students	3.62	0.71	A
2	Help students learn at their own pace	3.55	0.76	A
3	Improve student participation in learning activities	3.48	0.80	A
4	Provide immediate feedback to students	3.70	0.65	A
5	Encourage independent learning among students	3.58	0.73	A
6	Reduce teacher dominance in the classroom	3.44	0.81	A
7	Enhance learner engagement in academic tasks	3.66	0.69	A
Aggregate Score		3.57	0.73	A

Data in Table 1 shows that all items recorded mean scores above the criterion mean of 2.50 ($\bar{X} > 2.50$), with an aggregate mean of 3.57 and standard deviation of 0.73. This indicates that respondents agreed that Intelligent Tutoring Systems promote student-centred learning in tertiary institutions in Nigeria by providing personalized learning support ($\bar{X} = 3.62$), enhancing learner engagement ($\bar{X} = 3.66$), and improving immediate feedback mechanisms ($\bar{X} = 3.70$). The relatively low standard deviation values show that responses were closely clustered around the mean, indicating a high level of agreement among respondents.

Table 2: Mean and Standard Deviation of Responses on Adaptive Learning Platforms in Enhancing Reflective Thinking

S/N	Item Statement	Mean ($\bar{X}$)	Std Dev (Std)	Decision
8	Adaptive Learning Platforms help students evaluate their learning progress	3.61	0.72	A
9	Encourage students to think critically about learning tasks	3.58	0.75	A
10	Support self-reflection after completing assignments	3.65	0.70	A
11	Help students identify their learning strengths and weaknesses	3.72	0.66	A
12	Improve students' ability to review feedback meaningfully	3.54	0.78	A
13	Encourage deeper understanding of academic content	3.60	0.73	A
14	Continuous to improve students' learning habits	3.68	0.69	A
Aggregate Score		3.63	0.72	A

Data in Table 2 shows that all the items recorded mean scores above the benchmark value of 2.50 ($\bar{X} > 2.50$), with an aggregate mean of 3.63 and standard deviation of 0.72. This indicates that respondents agreed that Adaptive Learning Platforms enhance reflective thinking among students in tertiary institutions in Nigeria by helping students evaluate their learning progress ($\bar{X} = 3.61$), identify strengths and weaknesses ($\bar{X} = 3.72$), and improve meaningful engagement with feedback ($\bar{X} = 3.54$). The low standard deviation values indicate close agreement among respondents, showing consistency in responses.

Table 3: Mean and Standard Deviation of Responses on Automated Assessment Systems in Promoting Student-Centred Learning

S/N	Item Statement	Mean ($\bar{X}$)	Std Dev (Std)	Decision
15	Automated Assessment Systems provide timely feedback to students	3.74	0.64	A
16	Allow students to monitor their academic progress	3.60	0.71	A
17	Support self-paced learning among students	3.55	0.76	A
18	Reduce delays in marking and grading	3.68	0.69	A
19	Encourage independent learning among students	3.52	0.77	A
20	Improve student engagement in learning tasks	3.58	0.73	A
21	Support continuous learning improvement	3.66	0.68	A
Aggregate Score		3.62	0.71	A

Data in Table 3 shows that all items recorded mean scores above the benchmark value of 2.50 ($\bar{X} > 2.50$), with an aggregate mean of 3.62 and standard deviation of 0.71. This indicates that respondents agreed that Automated Assessment Systems promote student-centred learning in tertiary institutions in Nigeria by providing timely feedback ($\bar{X} = 3.74$), supporting self-paced learning ($\bar{X} = 3.55$), and enhancing student engagement in academic tasks ($\bar{X} = 3.58$). The low standard deviation values indicate a high level of agreement among respondents, showing consistency in their responses.

Table 4: Mean and Standard Deviation of Responses on Learning Analytics Systems in Enhancing Reflective Thinking

S/N	Item Statement	Mean ($\bar{X}$)	Std Dev (Std)	Decision
22	Learning Analytics Systems help students understand their learning patterns	3.70	0.66	A
23	Support students in reflecting on academic performance	3.62	0.72	A
24	Provide useful feedback for self-improvement	3.66	0.70	A
25	Help students identify areas needing improvement	3.75	0.64	A
26	Enhance students' ability to review learning progress	3.58	0.73	A
27	Encourage continuous self-assessment among students	3.60	0.71	A
28	Promote deeper understanding through data feedback	3.68	0.69	A
Aggregate Score		3.66	0.69	A

Data in Table 4 shows that all items recorded mean scores above the benchmark value of 2.50 ($\bar{X} > 2.50$), with an aggregate mean of 3.66 and standard deviation of 0.69. This indicates that respondents agreed that Learning Analytics Systems enhance reflective thinking in tertiary institutions in Nigeria by helping students understand learning patterns ($\bar{X} = 3.70$), identify areas needing improvement ($\bar{X} = 3.75$), and support self-assessment and reflection on academic performance ($\bar{X} = 3.62$). The low standard deviation values indicate close agreement among respondents, showing consistency in their responses.

Discussion

The findings of the study revealed that Intelligent Tutoring Systems promote student-centred learning in tertiary institutions in Nigeria by providing individualized instruction, immediate feedback, and adaptive guidance that places learners at the centre of the learning process. The findings are in consonance with the study of VanLehn (2011) who posited that intelligent tutoring systems significantly improve learning outcomes by simulating one-on-one tutoring and adapting instruction to learner needs. The findings also agree with Nye (2015) who reported that intelligent tutoring systems enhance learner autonomy by diagnosing student errors and offering personalized corrective feedback that supports independent learning. Furthermore, the findings align with the position of Holmes, Bialik, and Fadel (2019) who emphasized those Artificial Intelligence systems in education can strengthen student-centred learning when they are properly designed to support learner engagement and active participation. Similarly, Luckin, Holmes, Griffiths, and Forcier (2016) argued that intelligent systems in education are most effective when they are used to augment human learning rather than replace it, thereby encouraging active learner involvement. These findings suggest that Intelligent Tutoring Systems are significant tools for shifting instructional focus from teacher-centred to learner-centred approaches in tertiary institutions.

The findings of the study revealed that Adaptive Learning Platforms enhance reflective thinking among students in tertiary institutions in Nigeria by providing personalized learning pathways, continuous feedback, and opportunities for learners to evaluate their understanding at different stages of learning. The findings are in consonance

with the study of Siemens and Long (2011) who posited that learning analytics and adaptive systems improve learning by helping students monitor their progress and reflect on learning patterns. The findings also agree with Ferguson (2012) who reported that data-driven learning systems support reflective practice by enabling learners and educators to make informed decisions based on learning behavior. In addition, the findings align with Moon (2004) who emphasized that reflective thinking develops when learners are exposed to structured feedback that allows them to critically evaluate their learning experiences. Dewey (1933) also supports this finding by arguing that reflective thinking is strengthened through active engagement with problems and continuous reassessment of beliefs. Therefore, Adaptive Learning Platforms serve as important tools in enhancing students' capacity for reflection and self-regulated learning in tertiary institutions.

The findings of the study revealed that Automated Assessment Systems promote student-centred learning in tertiary institutions in Nigeria by providing timely feedback, reducing delays in evaluation, and enabling students to identify their learning gaps independently. The findings are in consonance with the study of Williamson and Piattoeva (2019) who posited that automated assessment systems improve efficiency in educational evaluation by standardizing grading processes and providing immediate feedback to learners. The findings also agree with the study of Holmes, Bialik, and Fadel (2019) who observed that Artificial Intelligence-based assessment tools can support personalized learning when used to guide instruction rather than simply assign grades. Furthermore, the findings are consistent with Biggs and Tang (2011) who emphasized that effective learning occurs when assessment is aligned with learning outcomes and supports active student engagement. Selwyn (2019) also supported this position by noting that digital assessment tools can enhance learning when they are used to promote active participation rather than passive reception of grades. Therefore, Automated Assessment Systems contribute to student-centred learning by encouraging learners to take responsibility for their academic progress.

The findings of the study revealed that Learning Analytics Systems enhance reflective thinking in tertiary institutions in Nigeria by enabling the collection, analysis, and interpretation of learner data that helps students and lecturers understand learning patterns and make reflective decisions. The findings are in consonance with the study of Siemens and Long (2011) who posited that learning analytics supports reflective practice by providing insights into learner behavior and performance trends. The findings also agree with Ferguson (2012) who reported that learning analytics systems help educators and learners engage in reflective evaluation of learning progress and instructional effectiveness. However, the findings align with Schön (1983) who emphasized that reflective thinking develops through continuous interaction with feedback and experience. The findings are also supported by Selwyn (2019) who noted that data-driven educational systems can enhance reflective engagement when used critically and not mechanically. Therefore, Learning Analytics Systems play a significant role in supporting reflective thinking by enabling continuous self-evaluation and informed learning decisions in tertiary institutions.

Contribution to Knowledge

This study contributes to existing knowledge by providing empirical evidence on how Artificial Intelligence tools enhance student-centred learning and reflective thinking in tertiary institutions in Nigeria. Specifically, the study extends the understanding of Artificial Intelligence in education by integrating Intelligent Tutoring Systems, Adaptive

Learning Platforms, Automated Assessment Systems, and Learning Analytics Systems within a Philosophy of Education perspective. The findings add to scholarly discourse by demonstrating that these tools do not only support instructional delivery but also strengthen learner autonomy, feedback engagement, and reflective cognitive development. The study further contributes by establishing that Artificial Intelligence tools, when properly utilized, have significant potential to shift learning from teacher-centred practices to more student-centred and reflective educational experiences in Nigerian tertiary institutions.

Conclusion

The study concluded that Artificial Intelligence tools play a significant role in promoting student-centred learning and reflective thinking in tertiary institutions in Nigeria. Based on the findings, Intelligent Tutoring Systems were found to enhance personalized learning and active student engagement. Adaptive Learning Platforms were found to support reflective thinking by enabling students to evaluate their learning progress and identify areas for improvement. Automated Assessment Systems were found to promote student-centred learning through timely feedback and support for independent learning. Learning Analytics Systems were also found to enhance reflective thinking by helping students understand learning patterns and make informed academic decisions. Overall, the study established that Artificial Intelligence tools significantly contribute to improving learning autonomy, engagement, and reflective cognitive processes among students in tertiary institutions in Nigeria.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Universities and tertiary institutions should integrate Intelligent Tutoring Systems into teaching and learning processes because they enhance student-centred learning and improve learner engagement.
2. Lecturers should adopt Adaptive Learning Platforms in instructional delivery because they support reflective thinking and help students monitor their academic progress effectively.
3. Institutional management should implement Automated Assessment Systems because they provide timely feedback and should promote independent learning among students.
4. Tertiary institutions should strengthen the use of Learning Analytics Systems because they should enhance reflective thinking and support data-driven learning improvement among students.

References

- Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university* (4th ed.). Open University Press.
- Dewey, J. (1933). *How we think*. D. C. Heath and Company.
- Eze, S., Emmanuel, C., & Chinedu-Eze, V. (2021). Digital learning and institutional challenges in Nigerian universities. *Journal of Educational Technology Systems*, 49(3), 345–360.
- Ferguson, R. (2012). Learning analytics in education. *International Journal of Technology Enhanced Learning*, 4(5–6), 304–317.

- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education*. Center for Curriculum Redesign.
- Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeiffer, F., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., ... Kasneci, G. (2023). ChatGPT for education: Opportunities and risks. *Learning and Individual Differences*, 103, 102274. <https://doi.org/10.1016/j.lindif.2023.102274>
- Lea, S., Stephenson, D., & Troy, J. (2003). Student-centred learning in higher education. *Studies in Higher Education*, 28(3), 321–334.
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed*. Pearson.
- Moon, J. (2004). *Reflection and experiential learning*. Routledge.
- Nye, B. D. (2015). Intelligent tutoring systems and learning outcomes. *Educational Technology Research and Development*, 63(2), 1–20.
- Oke, A., & Fernandes, A. (2020). Digital transformation in Nigerian universities. *Heliyon*, 6(8), e04685. <https://doi.org/10.1016/j.heliyon.2020.e04685>
- OpenAI. (2023). *ChatGPT technical overview*. OpenAI.
- Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.
- Schön, D. A. (1983). *The reflective practitioner*. Basic Books.
- Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education*. Polity Press.
- Siemens, G., & Long, P. (2011). Learning analytics in higher education. *EDUCAUSE Review*, 46(5), 30–32.
- UNESCO. (2023). *Artificial intelligence in education: Guidance for policy-makers*. UNESCO Publishing.
- VanLehn, K. (2011). The relative effectiveness of tutoring systems. *Educational Psychologist*, 46(4), 197–221. <https://doi.org/10.1080/00461520.2011.611369>
- Weimer, M. (2013). *Learner-centered teaching*. Jossey-Bass.
- Williamson, B., & Piattoeva, N. (2019). Datafication and assessment in education. *British Journal of Sociology of Education*, 40(1), 1–16. <https://doi.org/10.1080/01425692.2018.1545907>