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Qualitative Study on Integration of Artificial Intelligence for Self-Regulated Learning among Higher Institutions of Learning in Nigeria: Rethinking Learner Autonomy

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Abstract

The integration of Artificial Intelligence (AI) in education is transforming global teaching and learning practices; however, its application in enhancing self-regulated learning (SRL) and learner autonomy within Nigerian higher education remains under-theorized. This study adopts a theoretical approach to examine how AI technologies, such as intelligent tutors, Chatbots, and learning analytics dashboards can support the core dimensions of SRL: planning, monitoring, and reflection. Drawing on Zimmerman's Self-Regulated Learning Theory and Bandura's Social Cognitive Theory, the paper explores how AI tools promote metacognitive awareness, goal setting, and feedback-driven reflection, thus enabling learners to become more autonomous and strategic in managing their learning. The study also critically examines the contextual challenges hindering effective AI adoption, including infrastructural deficits, limited educator readiness, and ethical concerns around transparency and data privacy. A conceptual framework is proposed to illustrate the pathways through which AI tools can enhance learner agency, moderated by socio-technical and institutional factors. The paper concludes with recommendations for curriculum innovation, policy reform, and professional development to support ethical, inclusive, and learner-centred AI integration in Nigerian higher education.

Keyword: Learner autonomy, Artificial Intelligence, Self-regulated learning, Higher education, Nigeria

Introduction

Global education is rapidly evolving, and new technology and student autonomy are becoming increasingly significant. AI is one of the most potent forces in this evolving society. It changes how knowledge is shared, accessed, and personalised. Intelligent tutoring systems, learning analytics, generative AI models (such as ChatGPT), and adaptive learning platforms are changing the teacher-centred paradigm to be more learner-centred. AI offers a powerful opportunity to rethink educational practices, particularly in the cultivation of learner autonomy, in Nigerian higher education, where overcrowded classrooms, inadequate instructional materials, and limited access to personalised support persist. An emerging field, artificial intelligence in education (AIED) affects curriculum design, evaluation, and learner assistance (Chiu et al., 2021). AI's ability to handle vast amounts of data, detect learner behaviour patterns, and deliver fast feedback makes it a tempting tool for educational fairness and personalisation. Hwang et al. (2020) state that AI's educational functions include intelligent content development, adaptive instruction, automated assessment, and dynamic learner modelling. Recently, apps like ChatGPT have showed promise as learning companions, explaining, summarising, and encouraging deeper thought (Sullivan et al., 2023). AI has great promise, but it must be implemented carefully, especially in locations with different infrastructure and pedagogical preparedness.

Educational research has also focused on self-regulated learning (SRL) as a key capacity for academic performance and lifetime learning. SRL requires learners to plan, monitor, and evaluate their learning (Lee et al., 2018). Setting objectives, managing time, using tactics, requesting support, and reflecting on results are examples. When knowledge is abundant and instructors are shifting from information providers to facilitators, learners must be able to govern their own learning. Self-regulation abilities are crucial to academic success and retention in higher education, especially online and hybrid learning (Zhang et al., 2022; Karlen, 2023). Fostering SRL is difficult, especially in schools with rote learning, teacher-dependence, and inadequate metacognitive instruction. Higher education in Nigeria is no exception. Traditional lectures impede student freedom,

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metacognition, and strategic learning. Given these limits, AI can improve SRL by providing timely feedback, fostering reflective thinking, scaffolding goal-setting, and replicating tutor-learner interaction (Chiu, 2023). AI tools may assess students' study patterns and recommend personalised improvement techniques, helping them manage their academic development. According to Gui (2021), 5G and AI can digitise and democratise education, empowering students from all socioeconomic levels. AI can help students in Nigeria access personalised learning resources regardless of location or institution, reducing digital inequalities. Despite its promise, AI in education raises ethical, data privacy, algorithmic bias, and academic integrity concerns (Sullivan et al., 2023). Higher education relies on authentic learning and assessment for academic legitimacy, making these concerns crucial. Thus, stakeholders must balance AI's capabilities with education's essential principles.

This study investigates how AI can increase learner agency and autonomy in a situation with potential and challenges. The paper examines how AI apps are being used (or could be used) to facilitate SRL among Nigerian university students, identifies enablers and hurdles, and provides evidence-based suggestions for educators and institutions. This study adds to the growing body of research on the pedagogical, technological, and environmental factors that affect AI use in education. The findings should inform worldwide movements towards digital and learner-centred education policy and instruction. The project also aims to help Nigerian higher education improve academic performance and prepare students for the knowledge economy, which requires self-directed, digitally literate graduates. Furthermore, this study comes at a crucial time in global and local education systems. It recognises that while AI has great potential to improve education, its greatest influence may come from empowering learners to take ownership of their learning journeys. This study examines AI and self-regulated learning in Nigerian higher education to assist students become more independent, engaged, and successful in the digital age.

Literature Review

The concepts of learner autonomy and self-regulated learning (SRL) have become increasingly central to contemporary educational discourse, especially in light of recent technological advances and the shift toward more learner-centred pedagogies. These constructs, while related, emphasize distinct but complementary facets of the learning process. Learner autonomy emphasizes the learner's capacity to take control of their learning, while SRL focuses on the strategies and cognitive processes learners use to manage, monitor, and reflect on their learning. Together, they offer a powerful framework for fostering lifelong learning, academic success, and adaptability in diverse educational contexts.

Learner Autonomy: Conceptual Foundations

Learner autonomy is the skill and willingness to take charge of learning. It requires independence from direct instructor control and educated choices about learning goals, resources, tactics, and assessments. Loeng (2020) states that adult education and lifelong learning allow learners to diagnose their learning requirements, set goals, find resources, and evaluate outcomes. Adult learners need self-direction, and younger generations in complex, information-rich situations need it more. With Generation Z at the forefront of education, autonomy is both a pedagogical ideal and a practical requirement. Chardonnens (2025) notes that Generation Z learners want personalised, interactive, and tech-mediated learning. They thrive in autonomous contexts with structured metacognitive growth and technology scaffolding. This makes learner autonomy a dynamic interaction between freedom and guided help, especially as education moves towards hybrid and digital models.

Self-Regulated Learning (SRL): Strategies and Significance

Self-regulated learning refers to the degree to which learners are actively involved in their own learning process through goal setting, strategy selection, self-monitoring, and reflection. SRL is a cyclical process that encompasses cognitive, metacognitive, motivational, and behavioural components. Teich et al. (2024) further demonstrate the importance of adaptive support mechanisms in promoting SRL strategies, particularly in continuing education and online courses. Their findings reveal that learners often require explicit prompts and personalized feedback to effectively regulate their learning, even when they have access to quality digital content. Chardonnens (2025) also emphasizes the integration of metacognitive strategies into technology-enhanced learning environments. He posits that AI-powered tools can facilitate SRL by offering real-time feedback, suggesting learning strategies, and helping students visualize their learning progress. For example, intelligent tutoring systems can prompt students to reflect on their understanding or adjust their approach to a problem. Such tools act as "scaffolds" that gradually build learners' capacity for autonomous learning.

Applications of Artificial Intelligence in Education

AI is being used in education to improve teaching, streamline administration, and personalise learning. AI offers revolutionary prospects across multiple academic levels as educational institutions worldwide aim to increase efficiency and learner outcomes. Ge and Hu (2020) note that AI has revolutionised higher education management with intelligent scheduling, automated evaluation, and predictive analytics. These apps optimize resource allocation, decrease administrative burdens, and

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enable data-driven decision-making. AI has helped administrative management organisations estimate enrolment trends, identify at-risk students, and automate repetitive jobs, increasing responsiveness and planning. AI-powered learning tools enable personalised and adaptable instruction. Intelligent teaching systems, speech recognition tools, and automated essay scoring engines are listed by Xu et al. (2021). The tools adjust content to individual learners, track learning behaviours in real time, and provide quick feedback, improving student engagement and learning efficiency. In Nigeria, Ezekiel and Akinyemi (2022) study University of Ibadan teachers' views on AI in education. Their findings show that AI's potential to improve assessment accuracy and student tracking is becoming more widely known. The study also raises technical infrastructure, training, and ethical issues like data privacy and academic integrity. These studies demonstrate AI's many educational uses. From administration to personalised learning, AI could transform institutions and education. However, careful investment in infrastructure, capacity building, and ethical frameworks is necessary to fully realise these benefits, especially in developing countries like Nigeria.

Theoretical Framework

Zimmerman's Self-Regulated Learning Theory

Zimmerman's Self-Regulated Learning (SRL) Theory, proposed by Barry J. Zimmerman in the 1980s, is a comprehensive framework that explains how learners take control of their own learning processes through a cycle of planning, performance, and self-reflection. According to Zimmerman (1986), self-regulated learners are those who actively set goals, select appropriate strategies, monitor their progress, and reflect on the outcomes of their learning. The theory emphasizes that effective learning is not just about acquiring knowledge but also about developing the ability to manage one's cognitive, motivational, and behavioural processes in pursuit of academic success. This theory is highly relevant to the present study, as it provides a foundation for understanding how students in Nigerian higher education can become autonomous learners. In particular, it supports the notion that self-regulated learning is not innate but can be developed and enhanced through targeted interventions. Artificial Intelligence (AI) tools, such as intelligent tutoring systems and learning analytics platforms, can play a crucial role in facilitating the SRL cycle by prompting learners to set goals, track their progress, and receive personalized feedback. As such, Zimmerman's theory serves as a conceptual lens for exploring how AI can enhance learner autonomy and improve educational outcomes in Nigerian universities.

Bandura's Social Cognitive Theory

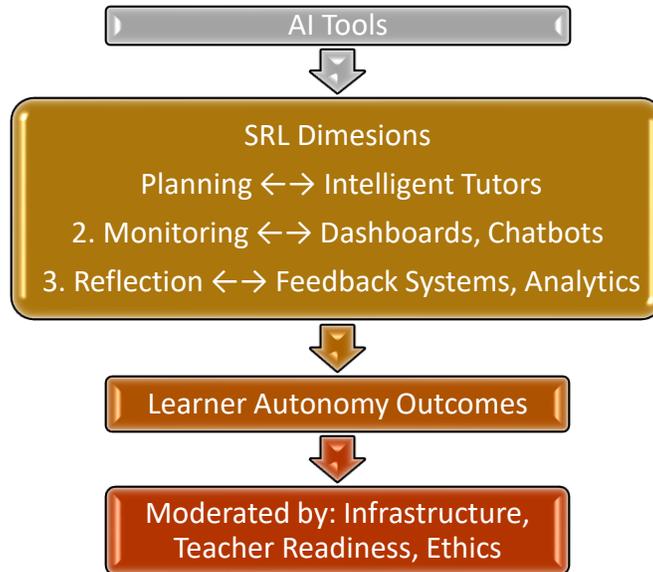
Albert Bandura's Social Cognitive Theory, originally developed in 1986, is a psychological framework that emphasizes the role of observational learning, social interaction, and self-efficacy in human behaviour. Central to the theory is the concept of reciprocal determinism, which suggests that personal factors (like beliefs and attitudes), behavioural patterns, and environmental influences interact to shape individual learning and development. Bandura (1986) argued that individuals learn not only through direct experience but also by observing others and modelling their behaviours. In the context of this study, Bandura's theory provides a social and cognitive foundation for understanding how learners develop the confidence and skills needed to regulate their own learning. AI tools, when designed effectively, can simulate social interactions (e.g., via chatbots or adaptive feedback systems) that reinforce learning through modelling and encouragement. For example, AI-powered virtual tutors can demonstrate problem-solving strategies, provide motivational scaffolding, and adapt content delivery based on learner behaviour, all of which align with Bandura's emphasis on observational learning and environmental support. Moreover, by enhancing students' self-efficacy through timely feedback and personalized learning paths, AI can strengthen their willingness to engage in autonomous and self-regulated learning, especially in resource-constrained environments like Nigerian higher education.

Conceptual Framework

The conceptual framework for this study is designed to illustrate the interplay between Artificial Intelligence (AI) tools and the core dimensions of Self-Regulated Learning (SRL), such as planning, monitoring, and reflection, within the context of Nigerian higher education. Grounded in Zimmerman's Self-Regulated Learning Theory and Bandura's Social Cognitive Theory, this framework explores how specific AI applications (such as intelligent tutors, learning analytics dashboards, and chatbots) can facilitate the development of autonomous learning behaviours by supporting students' metacognitive and motivational processes. In the Nigerian educational context, where challenges such as limited teacher-student interaction, infrastructural gaps, and uneven access to digital resources persist (Petrie et al., 2020; Nkwenti et al., 2023). AI tools offer a transformative means of enabling students to independently manage their learning. However, the use of AI must be guided by ethical standards (Nguyen et al., 2022; AI Ethics and Higher Education, 2022) and pedagogical purpose (Jin et al., 2023; Hooda et al., 2022). The framework is shown in figure 1 below:

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Figure 1: AI-SRL-LR Model



Source: Authors (2025)

Constructs and Relationships in the AI-SRL-LR Model

The conceptual framework is organized around two major constructs:

AI Tools in Education: AI applications provide intelligent and adaptive support to learners through:

- a) **Intelligent Tutoring Systems (ITS):** Deliver personalized instruction and instant feedback (Hooda et al., 2022).
- b) **Chatbots and Virtual Assistants:** Offer 24/7 learning support, answer queries, and provide reminders.
- c) **Learning Analytics Dashboards:** Help learners track their progress, time management, and resource use (Jin et al., 2023).

SRL Dimensions: Self-regulated learning consists of three cyclical and interdependent phases:

- a) **Planning:** Setting learning goals, selecting strategies, and allocating resources.
- b) **Monitoring:** Tracking progress, assessing performance, and adjusting strategies.
- c) **Reflection:** Evaluating learning outcomes, identifying mistakes, and planning for improvement.

The model proposes that Artificial Intelligence (AI) tools act as external mediators that scaffold learners' self-regulated learning (SRL) processes by supporting them through each phase of the SRL cycle: planning, monitoring, and reflection. These tools are not merely technological add-ons but serve as active facilitators of cognitive and metacognitive development. During the planning phase, intelligent tutoring systems guide students in setting realistic academic goals, identifying learning objectives, and selecting appropriate strategies. By offering personalized recommendations based on learners' performance history and cognitive profiles, these AI tools empower students to initiate learning with clarity and intention.

In the monitoring phase, tools such as chatbots and learning analytics dashboards provide real-time feedback on learners' activities, track progress toward goals, and highlight areas of difficulty or improvement. This immediate, data-driven insight encourages students to evaluate their ongoing performance and make strategic adjustments where necessary. During the reflection phase, AI technologies support post-task evaluation through automated feedback, personalized performance summaries, and visual representations of learning trends. These reflective prompts and analytics encourage deeper metacognitive processing, enabling students to assess the effectiveness of their learning strategies and make informed changes for future tasks. Importantly, social and environmental factors, as emphasized in Bandura's Social Cognitive Theory, moderate the relationship between AI tools and SRL outcomes. The success of AI-enhanced learning depends significantly on the availability of enabling infrastructure such as internet connectivity and digital devices, as well as educator readiness and institutional support systems (Ayanwale et al., 2022; Oyetola et al., 2024). Without these conditions, the potential of AI tools to facilitate autonomy and SRL remains limited. Finally, ethical considerations are foundational to ensuring that AI promotes

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learner agency rather than dependency or manipulation. As highlighted by Nguyen et al. (2022) and Onyejebu (2023), transparency in AI decision-making, data privacy protections, and fairness in algorithmic outputs are essential for building trust and encouraging meaningful engagement. Responsible AI use in education must therefore align with principles that uphold learner dignity, equity, and empowerment.

Methodology

This study adopted a theoretical research approach to critically explore the intersection between learner autonomy, self-regulated learning (SRL), and the role of Artificial Intelligence (AI) in Nigerian higher education. Unlike empirical research that relies on primary data collection, theoretical research focuses on synthesizing existing knowledge, frameworks, and conceptual models to generate new insights or reinterpret existing phenomena (Anfara & Mertz, 2014). In this context, the study aimed to conceptualize how AI technologies can be harnessed to promote SRL and learner autonomy within the unique social, cultural, and infrastructural realities of Nigeria's tertiary education system. The research employed a descriptive theoretical design, which is appropriate for articulating and analysing the components of complex educational issues without direct fieldwork or experimentation (Miksza & Elpus, 2018). Descriptive theoretical designs are commonly used in education and social sciences to analyse relationships among theoretical constructs, clarify definitions, and propose explanatory models. Through this design, the study systematically reviewed relevant literature, examined existing theories, and applied them to the Nigerian higher education context. The study relied primarily on secondary data, drawn from a range of peer-reviewed journal articles, policy documents, theoretical books, and empirical reports. The selected literature included foundational works on self-regulated learning and learner autonomy, as well as contemporary studies on AI integration in education. The research also incorporated policy documents and theoretical texts that addressed educational challenges in Nigeria, particularly those related to digital transformation, pedagogy, and access to learning technologies. A conceptual analysis method was employed to organize and interpret the selected literature. This involved identifying key concepts such as "learner autonomy," "metacognition," "AI-enhanced learning," and "self-regulation," and examining their interrelationships through theoretical mapping. Drawing on the works of Welch and Patton (1992), this analytical process was iterative, allowing for both deductive engagement with existing theoretical constructs and inductive interpretation of their relevance to the Nigerian higher education context.

Discussion of Findings

AI and the Promotion of Metacognition

Learners can monitor, assess, and alter their learning techniques through metacognition. Students rarely obtain metacognitive help in typical Nigerian classrooms, which are lecture-based and provide little formative feedback. However, AI provides revolutionary tools that help this learning element. According to Jin et al. (2023), AI applications like learning analytics dashboards, intelligent tutoring systems, and virtual learning companions are helping students understand their cognitive processes. These technologies show learning progress in real time, suggest strategic changes, and stimulate reflection. AI-powered systems can help Nigerians overcome overworked professors and limited resources by providing continual, individualised feedback that helps students assess their learning. AI can identify trends in student blunders and promote metacognition like "Do you need to revisit this concept?" or "What strategy worked best for you in solving this type of problem?" (2022, Hooda et al.) These reflecting cues let students take ownership of their learning, a prerequisite for educational autonomy. AI also promotes metacognition by making learning apparent. AI design should be transparent, according to Nguyen et al. (2022), so learners may understand how their data is used and how recommendations are made. Transparency promotes trust and improves metacognitive awareness by helping students interpret feedback and adjust their strategies. AI-driven learning platforms can help passive Nigerian university students become active and self-reflective learners.

AI and Goal Setting

SRL also requires setting SMART goals to guide learning. AI provides structured help through personalised goal recommendations, progress tracking, and adaptive feedback loops. AI systems can help students define feasible academic goals based on their learning history and recommend step-by-step methods to achieve them, according to Jin et al. (2023). This scaffolding is especially useful for Nigerian higher education students who lack academic planning and strategic learning expertise. AI links goal achievement with real-time feedback and progress visualisations, motivating users. Hooda et al. (2022) discovered that students are more inclined to persevere and adapt their techniques when they can observe their progress towards specified goals, such as understanding a concept or improving evaluation scores. Due to overcrowded classrooms, inadequate instructor attention, and unclear academic objectives, Nigerian students typically lack motivation. Such systems can be very effective. AI systems' goal-setting functionality lets students define their own learning goals and receive AI-generated suggestions based on their performance and preferences. This balance between autonomy and supervision follows Nguyen et

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al. (2022)'s ethical AI implementation principles of learner empowerment, agency, and fairness. AI systems that enable individualised goal setting can democratise excellent learning in Nigeria, a country with educational disparity and uneven academic support.

Limitations of Rethinking Learner Autonomy in Nigeria through Artificial Intelligence

The infrastructural and digital divide in many Nigerian institutions makes using AI to promote learner autonomy difficult. AI's promise is recognised, yet many Nigerian universities struggle with internet connectivity, digital device access, power supply, and learning management systems (Petrie et al., 2020). Due to institutional issues, AI-enhanced platforms are not widely available to students, especially those in rural or impoverished universities. The preparedness and capacity of educators to meaningfully interact with AI technologies is another issue. According to Ayanwale et al. (2022), some Nigerian educators want to teach or utilise AI in classrooms, but many lack the skills, confidence, and pedagogical understanding to do so. Without well-prepared educators, AI-enhanced learner autonomy may be shallow or inconsistent, expanding the theory-practice divide. Ethics are another important obstacle. Onyejebu (2023) warns that West African university curricula, notably Nigeria, lack consistent AI ethical integration, raising data privacy, algorithmic bias, transparency, and digital surveillance concerns. If students think AI technologies are obtrusive or untrustworthy, they may stop using them for self-directed learning. In weak or non-existent regulatory environments, ethical breaches could damage AI-driven education systems' credibility. The transition to autonomous, AI-enhanced learning is complicated by teacher-centred culture and pedagogy. In their study on library and information science educators, Oyetola et al. (2024) showed that many faculty are still adjusting to student autonomy and struggle to give up control. Innovative AI technologies for learner-driven education are delayed by institutional inertia and opposition to change.

Possibilities of Rethinking Learner Autonomy in Nigeria through AI

Though limited, AI's potential to reimagine learner autonomy in Nigerian higher education is enticing. AI can personalise learning at scale, adapt to learning styles, provide real-time feedback, and assist differentiated training. Bali et al. (2024) note that Nigerian institutions are testing AI trends like adaptive learning systems, intelligent tutors, and natural language processing applications, which could improve learner engagement and outcomes. AI can also fill gaps in learner assistance, especially in large, underfunded classrooms where kids get little attention. AI-driven analytics and automated tests give students rapid feedback and customised learning pathways, encouraging ownership. Nkwenti et al. (2023) support Africa's push towards open, flexible, and inclusive education by advocating for the strategic use of digital technologies to increase learner access and autonomy across varied contexts. When done publicly and with learner initiative, ethical AI development and deployment may build trust and engagement. AI Ethics and Higher Education (2022) recommends fairness, inclusion, and informed consent in AI application. If Nigerian schools include these concepts into their AI policies and practices, students may see AI as a tool that empowers rather than regulates their learning. Building local AI capacity is another option. Nigerian institutions can invest in AI technologies suited to local languages, curriculum, and pedagogy due to the present AI trend. Localised innovation boosts relevance, sustainability, and educational transformation ownership.

Conclusion

This study has illuminated the transformative potential of AI technologies in fostering learner autonomy through enhanced metacognition, goal setting, and self-regulated learning (SRL). Grounded in Zimmerman's Self-Regulated Learning Theory and Bandura's Social Cognitive Theory, the study has shown that AI can act as a personalized tutor, reflective partner, and motivational guide especially in educational contexts where traditional instruction fails to promote independent learning. However, the study also recognizes structural, pedagogical, and ethical limitations that must be addressed to fully harness the benefits of AI for Nigerian students. Despite infrastructural constraints, low digital literacy among educators, and ethical concerns around data privacy and equity, the findings indicate a significant opportunity to integrate AI tools to bridge learning gaps, increase learner agency, and modernize teaching and learning practices. If well implemented, AI can empower students to become autonomous, reflective, and goal-oriented learners, thus positioning Nigeria's higher education sector for global competitiveness.

Recommendations

Based on the findings and discussions, the following recommendations are offered:

1. Government and institutional stakeholders should prioritize investments in reliable internet access, modern computing facilities, and power supply to ensure that AI technologies can be effectively deployed across all higher institutions.
2. Universities should organize continuous professional development programs to equip lecturers and academic staff with practical skills for integrating AI tools into teaching, assessment, and student support in ways that promote learner autonomy and SRL.

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3. Higher education curricula should include modules on AI literacy, ethical AI use, metacognitive strategies, and self-regulated learning to prepare students for independent, AI-enhanced learning.
4. Clear policies and ethical frameworks should be established to guide the responsible use of AI in education focusing on data privacy, transparency, bias mitigation, and student consent.
5. Nigerian institutions and EdTech developers should collaborate to design AI tools that align with local languages, cultural realities, and educational objectives to enhance relevance and student engagement.
6. Faculty should shift from traditional teacher-centred instruction to student-centred pedagogies that integrate AI tools, encourage goal-setting, and promote reflective practices.
7. Universities should create dedicated units or help desks that support students in navigating and using AI tools effectively for academic planning, self-monitoring, and feedback interpretation.
8. AI-powered distance learning solutions should be deployed to extend quality learning opportunities to underserved areas, ensuring equity in access to AI-supported education.
9. Academic institutions should promote interdisciplinary research on AI applications in education and support pilot projects that evaluate their impact on student autonomy and learning outcomes.
10. Collaborations between universities, industry, government, and international organizations should be strengthened to provide technical expertise, funding, and policy support for sustainable AI integration in higher education.

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