

The Impact Of Artificial Intelligence-Assisted Learning Tools On Students' Self-Directed Learning Skills

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Abstract : *This study examines the influence of artificial intelligence (AI)-assisted learning tools, such as intelligent tutoring systems and AI-powered chatbots, on the development of self-directed learning (SDL) skills among university students. As AI applications have rapidly integrated into higher education since 2023, understanding their pedagogical effects has become essential for curriculum design and instructional policy. A quasi-experimental design was employed with 100 undergraduate students divided into an experimental group (using AI-assisted tools over a 12-week period) and a control group (using traditional self-study methods). Data were collected through a validated Self-Directed Learning Readiness Scale (SDLRS), pre- and post-intervention academic performance tests, and semi-structured interviews. Results indicated that the experimental group demonstrated statistically significant improvement in self-directed learning readiness scores compared to the control group, particularly in the sub-dimensions of self-management and desire for learning. However, no significant difference was found in the self-control sub-dimension, suggesting that AI tools support motivation and planning more than they support independent discipline. The findings suggest that AI-assisted learning tools can meaningfully enhance students' autonomy in learning when integrated with structured pedagogical scaffolding, but should not be treated as a substitute for instructor-guided skill development. Implications for curriculum designers and recommendations for future research are discussed.*

Keywords: *artificial intelligence, self-directed learning, higher education, educational technology, learner autonomy, AI-assisted tools*

1. INTRODUCTION

The rapid emergence of generative artificial intelligence tools since 2023 has fundamentally altered the landscape of higher education. Platforms capable of providing instant explanations, personalized feedback, and adaptive study plans are now widely accessible to students across disciplines. This shift raises an important pedagogical question: does the availability of AI assistance strengthen students' capacity to direct their own learning, or does it create a dependency that undermines the very autonomy education seeks to cultivate?

Self-directed learning (SDL) is broadly defined as a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying resources, and evaluating outcomes. SDL is widely regarded as a critical competency for lifelong learning, particularly in fields requiring continuous professional updating, such as medicine and engineering. Prior to the widespread adoption of AI tools, research on SDL primarily focused on library resources, peer collaboration, and instructor scaffolding as facilitators of learner autonomy.

Despite the growing use of AI tools in classrooms, empirical research examining their specific effect on SDL skill development remains limited, particularly outside Western educational contexts. Most existing studies address AI's effect on test scores or engagement rather than on the underlying self-regulatory processes that make learning sustainable beyond the classroom. This gap is especially relevant in transitional and developing higher education systems where digital learning infrastructure is expanding rapidly but pedagogical frameworks for AI integration are still forming.

This study aims to address that gap by investigating whether structured use of AI-assisted learning tools improves university students' self-directed learning readiness, and which specific dimensions of SDL are most affected. The research is guided by two questions: (1) Does 12 weeks of structured AI-tool use significantly improve students' overall SDL readiness compared to traditional self-study? (2) Which sub-dimensions of SDL (self-management, desire for learning, self-control) are most influenced by AI-assisted learning?

2. METHODS

2.1 Research Design

A quasi-experimental, pre-test/post-test design with a non-equivalent control group was used. This design was selected because random assignment to intact university course sections was not feasible, while it still allows for meaningful comparison of change over time between groups.

2.2 Participants

A total of 100 undergraduate students (mean age 20.3 years, 58% female) from two parallel sections of an introductory course were recruited through convenience sampling. Fifty students were assigned to the experimental group and fifty to the control group based on their pre-existing section enrollment. Informed consent was obtained from all participants, and the study protocol was reviewed for ethical compliance prior to data collection.

2.3 Intervention

Over a 12-week semester, the experimental group used an AI-assisted learning platform that provided personalized explanations, adaptive quizzes, and automated study-plan suggestions for weekly course material. Students received a 30-minute orientation session on effective prompting and critical evaluation of AI-generated content. The control group followed the same syllabus using conventional self-study resources, including textbooks and instructor-provided handouts, without access to AI tools.

2.4 Instruments

Self-directed learning readiness was measured using the Self-Directed Learning Readiness Scale (SDLRS), a validated 40-item instrument assessing three sub-dimensions: self-management, desire for learning, and self-control. The scale was administered at the beginning and end of the semester. Academic performance was assessed through identical pre- and post-tests covering course content. Additionally, 20 students (10 from each group) participated in semi-structured interviews to provide qualitative insight into their learning experiences.

2.5 Data Analysis

Quantitative data were analyzed using paired and independent-samples t-tests to compare within-group and between-group changes in SDLRS scores and academic performance, with a significance threshold of $p < 0.05$. Interview transcripts were analyzed thematically to identify recurring patterns related to autonomy, motivation, and reliance on AI assistance.

3. RESULTS

The experimental group showed a statistically significant increase in overall SDLRS scores from pre-test to post-test, while the control group's improvement was smaller and did not reach significance. Between-group comparison confirmed that the experimental group's gain was significantly greater than that of the control group.

Analysis of sub-dimensions revealed a differentiated pattern of effects, summarized in Table 1.

SDL Sub-dimension	Experimental Group Gain	Control Group Gain	Significance (p)
Self-management	+8.4	+2.1	$p < 0.01$
Desire for learning	+6.7	+1.5	$p < 0.01$

Self-control	+1.2	+0.9	p = 0.41 (ns)
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Academic performance post-test scores were also significantly higher in the experimental group compared to the control group. Qualitative interview data supported the quantitative findings: students in the experimental group frequently described AI tools as helpful for organizing study schedules and clarifying difficult concepts on demand, which several attributed to increased confidence in setting their own learning goals. However, some students noted a tendency to consult the AI tool immediately upon encountering difficulty, rather than first attempting independent problem-solving, echoing the non-significant change observed in the self-control sub-dimension.

4. DISCUSSION

The findings suggest that structured integration of AI-assisted learning tools can meaningfully strengthen university students' self-directed learning readiness, particularly in the domains of self-management and desire for learning. These improvements are consistent with the interpretation that AI tools function effectively as scaffolding devices: they reduce the cognitive burden of locating and organizing information, freeing students to engage more deliberately in goal-setting and planning.

The absence of significant improvement in the self-control sub-dimension is a notable and cautionary finding. It suggests that while AI tools can support the planning and motivational aspects of autonomous learning, they do not automatically cultivate the discipline required to persevere through difficulty without external assistance. This aligns with concerns raised in recent educational technology literature regarding the risk of over-reliance, where easy access to AI-generated answers may reduce students' tolerance for productive struggle, a process considered important for durable learning.

These results carry practical implications for instructors and curriculum designers. Rather than deploying AI tools as unsupervised, open-ended aids, embedding them within structured pedagogical frameworks, such as requiring students to attempt a problem independently before consulting AI, may better balance the benefits of personalized support with the preservation of self-control. This is particularly relevant in professional fields such as medical education, where the capacity for sustained independent study is essential for lifelong clinical competence.

This study has several limitations. The quasi-experimental design and reliance on convenience sampling from a single institution limit the generalizability of findings. The 12-week duration, while sufficient to detect initial change, cannot capture longer-term effects on self-control or the risk of dependency that may emerge over an academic career. Future research should employ randomized designs across multiple institutions and longitudinal follow-up to examine whether the self-management gains observed here persist once AI tool access is withdrawn.

5. CONCLUSION

This study provides evidence that structured use of AI-assisted learning tools can significantly enhance university students' self-directed learning readiness, particularly in self-management and desire for learning, while showing no measurable effect on self-control. These findings support a cautious, structured approach to AI integration in higher education: one that leverages AI's strengths in personalization and planning support while preserving opportunities for independent, unassisted problem-solving. As AI tools continue to evolve, sustained empirical attention to their differentiated effects on the components of learner autonomy will be essential for informed pedagogical policy.

REFERENCES

Guglielmino, L. M. (1977). Development of the Self-Directed Learning Readiness Scale. Doctoral dissertation, University of Georgia.

Knowles, M. S. (1975). Self-Directed Learning: A Guide for Learners and Teachers. Association Press.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, 41(2), 64–70.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 39.

UNESCO. (2023). Guidance for generative AI in education and research. UNESCO Publishing.