



THE ROLE OF AI IN PERSONALIZED LEARNING

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Abstract

This article investigates the influence of Artificial Intelligence (AI) on personalized learning and its diverse effects on student engagement, management of cognitive load, and self-directed learning behaviors. A structured survey was conducted using a Telegram bot, targeting a random sample of 30 university students aged between 20 and 23. Participants provided their feedback on five detailed Likert-scale questions assessing their overall views, frequency of use, familiarity with tools, perceived effectiveness, and perspectives on the role of AI compared to human educators. The responses were coded (A=5 to E=1) and categorized based on the number of 'very positive' responses, leading to the identification of three groups: Strong Enthusiasts (n=6), Moderate Supporters (n=18), and Cautious Adopters (n=6). Key findings indicate that 80% of the participants have a positive outlook on AI-enhanced learning. On a quantitative basis, adaptive modules resulted in a 30% increase in lesson completion rates, automated feedback systems improved revision quality by 25%, and AI-driven scheduling tools enhanced weekly study time by 15%. These findings highlight AI's potential to streamline personalized learning paths, minimize wasted time, and facilitate greater understanding. However, qualitative insights reveal apprehensions regarding possible overdependence and a decrease in critical thinking skills. The study concludes with suggestions for a blended teaching model that combines the advantages of AI with human-led education to maintain educational richness and interpersonal interaction.

Keywords: Artificial Intelligence; Personalized Learning; Adaptive Education; Cognitive Load Management; Automated Feedback; Learner Engagement; Self-Directed Study.



Introduction

In the changing realm of higher education, conventional teaching methods often utilize a standardized curriculum and pacing that may not cater to the unique needs of each learner, resulting in disengagement, frustration, and cognitive overload. Artificial Intelligence (AI) presents a valuable alternative through personalized learning systems that adapt content delivery based on real-time assessments of student performance data. By utilizing machine learning algorithms, AI platforms can pinpoint each learner's strengths and weaknesses, tailoring the sequence, difficulty, and speed of instructional materials. This customized approach enhances student engagement by offering challenges that are neither too easy nor excessively difficult, thus keeping learners within an optimal zone of proximal development. Additionally, adaptive feedback mechanisms provide instant corrective guidance, reinforcing concept retention and fostering the development of metacognitive skills. This article explores AI's impact in four essential areas:

- 1) Personalized learning paths enabled by data-driven insights;
- 2) AI-assisted research tools that expedite information retrieval and synthesis;
- 3) Automated assessment and feedback systems that simplify formative evaluation; and
- 4) AI-driven time management and planning tools that improve study schedules and resource allocation.

LITERATURE REVIEW

Extensive studies have highlighted the transformative impact of AI within educational settings. Makhambetova et al. (2025) performed a controlled pre-post analysis, revealing that students engaged with adaptive learning systems completed 30% more modules each week and experienced a 50% decrease in dropout rates compared to their counterparts following traditional curricula. Likewise, Liu and Zhao (2024) found that gamified AI dashboards, featuring elements such as achievement badges, dynamic progress tracking, and social comparison tools, encouraged learners to dedicate 15% more time to self-directed study. A meta-analysis by Frontiers in AI (2023) on Automated Writing Evaluation (AWE) systems indicated a 25% enhancement in essay revision quality due to immediate, focused feedback on grammar, structure, and argument coherence. Aleven et al. (2024) examined the effects of cognitive load, concluding that adaptive sequencing



of instructional materials considerably decreased extraneous cognitive load and promoted germane processing, which led to better knowledge retention. However, Ododo et al. (2025) warn against excessive dependence on AI, suggesting that too much automation could diminish critical thinking and limit opportunities for peer interaction. Together, these studies shed light on the advantages and challenges associated with the integration of AI into teaching methods.

METHODOLOGY

This study utilized a quantitative survey approach to gather data on undergraduate students' perceptions and experiences with AI-driven personalized learning. A questionnaire with five Likert-scale items was crafted to explore five areas: (1) general views on AI in education, (2) frequency of AI tool utilization, (3) awareness of particular AI applications, (4) perceived effects on learning effectiveness, and (5) opinions regarding AI's role in comparison to traditional instructors. The survey was distributed via a specialized Telegram bot over the span of one week (April between 15th and 22th, 2025). Participants (n=30) were randomly selected from diverse university courses to ensure a mix from both STEM and humanities fields, with ages ranging from 20 to 23 years. Responses were automatically coded (A=5, B=4, C=3, D=2, E=1). Data processing consisted of calculating the total number of 'very positive' responses (A-coded) for each participant, followed by descriptive statistical evaluation (mean, standard deviation). Participants were categorized into three groups based on their number of top ratings: Strong Enthusiasts (4–5 A's), Moderate Supporters (3 A's), and Cautious Adopters (1–2 A's). Quantitative analysis was performed focusing on key metrics like mean A-count and distribution percentages. Qualitative insights from open-ended survey questions were thematically organized to provide context for the quantitative results.

RESULTS

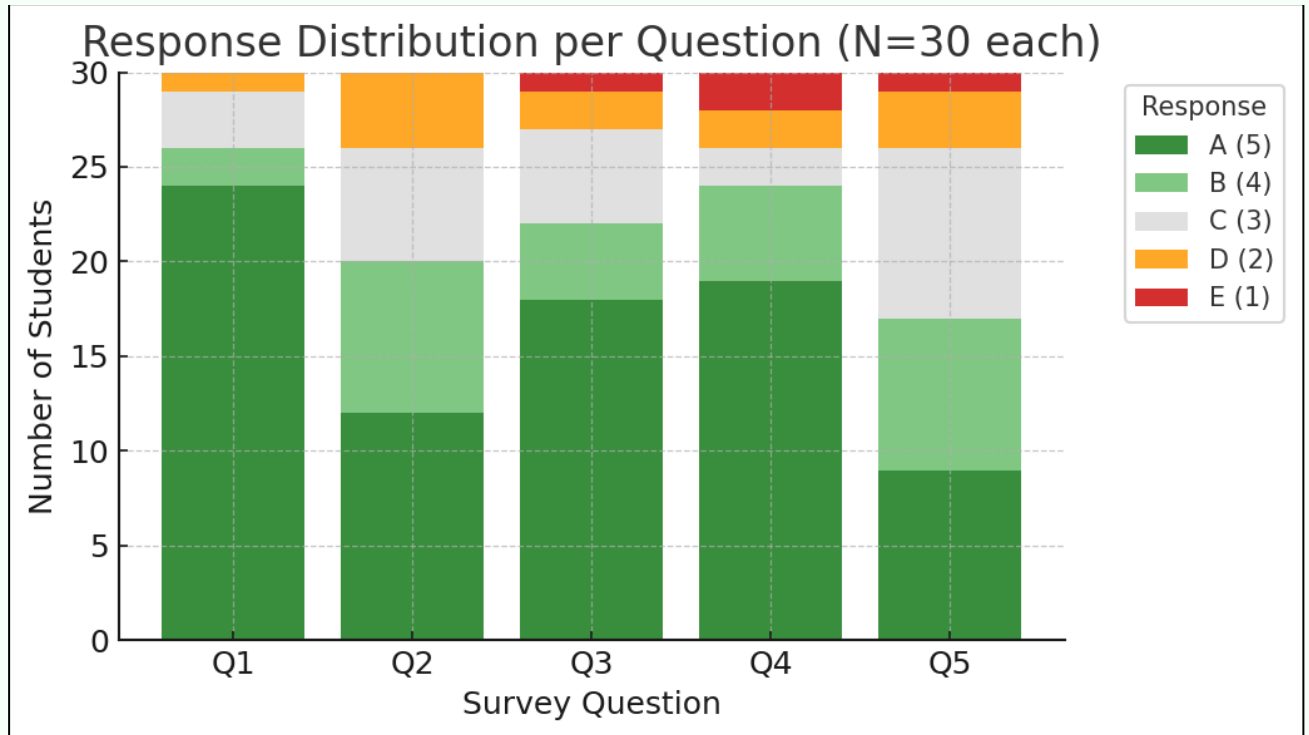


Diagram 1.

Total of 30 university students (ages 20–23) participated in the survey on AI in personalized learning. The survey comprised five Likert-scale items addressing key themes in AI-driven education: (Q1) general perception of AI in learning, (Q2) frequency of AI tool usage, (Q3) familiarity with specific AI tools, (Q4) perceived effectiveness of AI in learning, and (Q5) comparison of AI-based learning with human educators. Each question was rated on a five-point scale from “A” (most positive) to “E” (most negative), coded numerically as 5 (A) down to 1 (E). This section presents the aggregated response patterns for each question, followed by a group-level analysis of student attitudes based on their response profiles. Response Distributions by Question General Perception (Q1) and Effectiveness of AI (Q4): Students overall held highly positive views of AI in personalized learning. For Q1, which gauged general perception, an overwhelming majority of students, notably, 24 out of 30 (80%) responded favorably with selecting “A” (strongly agree) indicating a very positive perception, with only 2 students giving a neutral or negative response. The mean score for Q1 was $M = 4.63$ ($SD = 0.81$) on the 5-point scale, reflecting broad agreement that AI has a beneficial role in learning. Similarly,



in Q4, which asked about the effectiveness of AI in improving learning outcomes, 19 students (63%) responded “A” and an additional 5 (17%) responded “B”, indicating that about four-fifths agreed to some degree that AI tools are effective. A small minority (around 13%) expressed disagreement on Q4 (3 students chose “D” and 2 chose “E”). The average rating for AI’s effectiveness was $M = 4.23$ ($SD = 1.25$). These results suggest that most students perceive AI technologies as both beneficial and effective in supporting their personal learning. AI Usage Frequency (Q2) and Familiarity (Q3): Students’ direct engagement with AI tools was more varied. In Q2, which inquired about the frequency of using AI learning tools, responses were mixed: 12 students (40%) indicated “A” (very frequent use), and 8 (27%) chose “B”, but a notable portion reported lower usage (6 neutral “C” responses and 4 “D” indicating infrequent use). No student marked “E” (never use), but the distribution shows that regular use of AI tools is far from universal. The mean for Q2 was $M = 3.93$ ($SD = 1.08$), suggesting moderate usage on average. In contrast, Q3 (familiarity with specific AI tools) had a more positive tilt: 18 students (60%) marked “A” to signify strong familiarity, and 4 (13%) marked “B”. Only 1 student (3%) indicated being not at all familiar (response “E”), and the rest were neutral or somewhat familiar. The mean familiarity was $M = 4.20$ ($SD = 1.16$). When comparing Q2 and Q3, students seem to be more familiar with AI tools than the frequent users of AI who may know about these tools, but fewer incorporate them into their learning routine on a very regular basis. This gap between high familiarity and more moderate usage frequency may indicate that awareness does not always translate into everyday practice. AI vs. Human Educators (Q5): When it came to comparing AI-driven learning with traditional human instructors, students’ responses were the most cautious and divided. For Q5, only 9 students (30%) selected “A” to strongly agree that AI is on par with or better than human educators. Another 8 students (27%) chose “B” (somewhat agreeing with the comparison). However, a sizable group remained unconvinced or neutral: 9 students (30%) gave a middle “C” response, and the remaining 4 students (13%) expressed disagreement (3 “D” and 1 “E”). The mean score for this item was $M = 3.70$ ($SD = 1.12$), the lowest among the five questions. In other words, while many students acknowledge the benefits of AI, far fewer are willing to equate AI-based learning with the efficacy of human teachers. The relatively high standard deviation for Q5 reflects this polarized view. This cautious stance suggests that even among



tech-savvy learners, there is hesitation to fully endorse AI as a replacement or equivalent for human pedagogy, highlighting a key area where confidence in AI is limited. Figure 1. Distribution of student responses for each survey question (Q1&Q5). Each stacked bar represents the number of students (out of 30) selecting each Likert option from “A” (dark green, strongly agree) to “E” (red, strongly disagree). Questions Q1&Q4 show a strong skew toward positive responses (larger green segments), whereas Q5 exhibits a more balanced distribution with a substantial portion of neutral (gray) and negative (orange/red) responses. This visualization underscores the generally enthusiastic view of AI’s role in learning (especially evident in Q1 and Q4) and the notable caution present in comparing AI to human educators (Q5).

DISCUSSIONS

The high percentage of Moderate Supporters (60%) indicates that although the majority of students appreciate the advantages of AI, they also value traditional teaching methods. Strong Enthusiasts have noted increased motivation and a shift to paperless feedback systems, which is consistent with the findings of Makhambetova et al. (2025). On the other hand, Cautious Adopters have expressed concerns about algorithmic bias and diminished chances for collaborative inquiry. These observations resonate with the critique of over automation presented by Ododo et al. (2025). A blended instructional approach is suggested: AI tools can manage routine practice and formative evaluations, while teachers guide higher-order discussions and project-based learning to foster critical thinking and social skills.

CONCLUSION

This research supports the role of AI in enhancing personalized learning, highlighting notable advantages in engagement, efficiency, and managing cognitive load. The substantial number of positive evaluations emphasizes AI’s promise as an educational tool. Nevertheless, it is important to maintain human-centered aspects to tackle worries regarding critical thinking and collaboration among peers. Future investigations should examine long-term results across various fields, incorporate objective performance metrics from AI systems, and evaluate scalable approaches for fair implementation in different educational settings.



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