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The Role of Artificial Intelligence in Enhancing Self-Regulated Learning and Academic Performance

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ABSTRACT

This study focused on understanding how AI educational technologies affect students' self-regulated learning (SRL) and learning outcomes. A quantitative research approach was used, collecting data through structured questionnaires from 300 university students across various disciplines. Correlation analysis revealed a strong positive relationship between AI use and SRL. Increased engagement with AI technology helped students achieve better study planning, monitoring, and reflective self-regulated learning practices. Advanced regression analysis indicated that SRL was a strong predictor of academic performance; thus, students with higher self-regulated learning performed better academically. High F-values and significant p-values from ANOVA confirmed that AI use explained a substantial proportion of variance in academic performance, demonstrating AI's predictive value for academic success. Demographic analysis showed that students from both public and private universities benefited from AI applications. However, concerns about equal access were raised. The findings acknowledged that while AI offers tailored assistance and feedback, students need to develop autonomy and self-pacing skills to avoid over-reliance and dependency. Aligning with prior research, these findings demonstrate that AI and self-regulated learning work hand in hand in cultivating continuous learning and achieving positive academic outcomes. Most importantly, the study highlights that with careful implementation and attention to equity, AI has transformative potential in educational contexts.

1.0 Introduction

Artificial Intelligence (AI) tools track students' learning, aid self-regulated learning, and foster transformative educational opportunities. Self-regulated learning involves students in goal setting and planning, monitoring and using study strategies, and evaluating results to make necessary adjustments. AI tools analyze learning patterns and adapt to users. Self-regulated learning and AI's potential to foster meaningful and goal-centered study activities promise to enhance positive academic outcomes. Self-regulated learning is more efficient and focused when study activities are organized by AI. AI tools enhance transformative educational opportunities and foster self-regulated learning. Self-regulated learning involves students in goal setting and planning, monitoring and using study strategies, and evaluating results to make adjustments (Zimmerman, 2013). AI tools analyze learning patterns and adapt to users' needs. AI tools track students' learning and aid self-regulated learning. Recent review studies on the topic have shown that the use of Artificial Intelligence interventions helps researchers both understand learners' self-regulated behaviors and scaffold them toward more advanced strategies (Lan & Zhou, 2025).

Personalization of the learning experience is one of the most important benefits of Artificial Intelligence (AI) in education. Unlike the traditional one-size-fits-all model of learning delivery, which takes little consideration for students' individual prior knowledge and self-regulation (Banihashem et al., 2025). AI systems can tailor content, difficulty, feedback, and pacing to meet specific learner needs. Adaptive learning tools, for example, assess learner performance and automatically provide tasks adjusted to their needs—offering practice activities for areas of weakness and advanced challenges in areas of strength (Aleven et al., 2016). AI systems can also assist learners who have a hard time self-monitoring by offering prompts and reminders, while more independent learners receive less AI support to maintain their autonomy. Systems improve learner engagement and motivation as well as test scores, provided that personalization remains pedagogically aligned (Zhu et al., 2025).

Intelligent Tutoring Systems (ITS) illustrate how AI can support self-regulated learning. These systems offer step-by-step guidance, customized feedback, and adaptive hints based on learners' interactions (Mehmood et al., 2025). Such systems integrate instruction and support for metacognitive processes by encouraging learners to set objectives, monitor progress, devise strategies, and reflect on effectiveness. Research conducted in higher education and secondary schools has found that when pedagogical agents are incorporated into ITS, students employ metacognitive strategies to a greater extent and achieve improved learning outcomes compared with those relying on self-initiated strategies alone (Asrifan et al., 2025). However, both over- and under-scaffolding pose risks; excessive guidance reduces autonomy, while insufficient support leaves learners struggling. Therefore, the optimal design is one that gradually reduces scaffolding, encouraging learners to become behaviorally self-regulated.

Self-regulated learning has become increasingly visible and actionable due to the use of AI-driven measurement and analytics tools. Learning analytics examines learning behaviors through different data traces including time spent on a task, sequences of interactions, frequency of revisions, response speeds, and more. These indicators help determine whether learners plan, monitor, or become off-task. Alerts and feedback derived from such analyses provide timely interventions for both learners and educators. Empirical research substantiates the predictive value of these analytics: the behaviors of monitoring and reflection are closely associated with greater success in writing, mathematics, and the learning of languages (Chang & Sun, 2024). Conversely, the accurate recognition of self-regulated learning behavior depends on selecting the right indicators and aligning empirically observable behavior with theoretical constructs of SRL. If these measures are insufficient, the interventions put in place may confuse rather than assist the learners. Another

powerful aspect of Artificial Intelligence in self-regulated learning is its ability to provide real-time, actionable feedback. Effective feedback must be immediate, relevant, and include specific suggestions that help learners improve rather than simply highlight errors.

The increased accessibility and functionality of self-regulated learning can, in part, be attributed to AI tools used in measurement and analytics. Learning analytics can track various data points: time spent on tasks, sequences of interaction, frequency of revisions, and response speed. These indicators can identify whether learners are self-regulated—whether they plan, monitor, or become off-task. Self-regulated learning analytics is built on timely and proactive interventions deriving from these analyses' alerts and feedback. Empirical studies related to this topic emphasize the predictive nature of these analytics. For instance, the revised self-regulated learning analytics model, combined with monitoring and reflective behaviors, showed strong predictive validity for self-regulated learning across various levels of writing, mathematics, and language learning (Chen et al., 2025). On the flip side, the accuracy of predictive modeling for self-regulated learning hinges on the proper selection of model indicators and the integration of empirically observable behaviors with the theoretical dimensions of self-regulated learning. Poorly defined indicators will likely have planned interventions lead learners in the wrong direction instead of aiding them. Multifunctional AI in self-regulated learning can give real-time actionable feedback which can be most useful. Literature on feedback highlights the importance of immediacy as the primary characteristic of effective feedback, along with relevance and the provision of actionable steps that learners can take to move toward improvement instead of passively marking errors.

Nonetheless, inequity remains a concern. Students with fewer devices, limited internet access, lower digital literacy, and those disadvantaged socio-economically might be left behind. Over-reliance on Artificial Intelligence feedback, scaffolding, and support may also undermine learners' self-regulation. The duration of many studies remains limited, and the long-term consequences of Artificial Intelligence in the transfer of self-regulated learning skills to new contexts remain largely unexplored (Dai et al., 2025). Moving forward, the integration of Artificial Intelligence in research and practice should align with the dominant theories of self-regulated learning so that new tools not only aid performance but also foster learner independence. Future systems should be designed for transparency (Barak, 2010), helping learners understand the rationale for suggestions or prompts, and should allow support to gradually fade so that learners gain control over the forethought, self-monitoring, and self-reflection phases of learning. New mixed-methods and longitudinal studies will be necessary to assess whether improvements in self-regulated learning and academic performance are retained, transferable across subjects and educational settings.

1.1 Research Objectives

1. To investigate the role of AI-enabled educational tools in the development of students' self-regulated learning skills, particularly in the components of planning, monitoring, and reflection.
2. To assess how AI-based personalization and feedback influence student performance on academic tasks.
3. To examine the obstacles and constraints of using AI technology in educational settings to promote self-regulated learning and enhances learning achievement.

1.2 Problem Statement

In contemporary education, students are increasingly expected to manage their own learning. Self-regulated learning (SRL) which involves goal-setting, scheduling, monitoring progress, and evaluating outcomes—is essential for academic success. However, many students struggle with

SRL, leading to lower achievement, reduced motivation, and ineffective study routines. Teachers also face challenges in providing personalized instruction, especially in large classroom settings. Investigations into the ways Artificial Intelligence (AI) assists Self-Regulated Learning (SRL) and advances learning achievement are still few and far between, but interest in this area is on the rise. AI has the potential to bridge this gap by monitoring learners, providing real-time feedback, and suggesting personalized learning strategies. However, unease surrounding data privacy, equity, and sustainability is still warranted. Thus, this research aims to analyze, more thoroughly, how AI facilitates autonomous learning and improves learning outcomes for students.

1.3 Significance of the Study

This research is important as it looks at how Artificial Intelligence (AI) improves students' self-regulated learning (SRL) and learner's academic performance. Understanding how AI assists students in planning, monitoring, and reflecting on their learning is essential for achieving effective and individualized instruction. For students, the findings will demonstrate the potential of AI to develop robust self-regulation skills that are critical in secondary education, higher education, and professional contexts. Regarding teachers and educational institutions, this research emphasizes the use of AI in automating the feedback loop and offering real-time analyses of student learning activities. To educational policymakers and leaders, the research provides responsible, equity-sensitive, and data privacy-compliant applications of AI, as well as evidence-based policy recommendations. Overall, self-regulated, motivated, and persistent learners are the goal of this research, particularly learners who will thrive in technology-rich educational settings.

2.0 Literature Review

In recent years, there has been an increase in scholarly work regarding the application of Artificial Intelligence (AI) in fostering self-regulated learning (SRL) among learners. SRL occurs when learners autonomously plan, monitor, and assess their learning, a trait closely associated with learning independence and higher educational attainment. Research evidence shows that several AI tools — such as chatbots, adaptive feedback systems, serious games, and interactive textbooks — help learners organize their studies and track progress. For instance, one systematic review in higher education noted that these AI systems primarily assist learners in the planning, execution, and reflection stages of learning while also sometimes creating cognitive dependence and undermining self-efficacy (Zawacki-Richter et al., 2019). Research on AI chatbots also noted their ability to help learners select materials and monitor progress, yet pointed out that these bots provide limited support for goal-setting and reflection, two core pillars of SRL (Noroozi, 2025). This literature indicates that while AI can improve certain aspects of SRL, it remains insufficient for developing fully autonomous learners.

Another significant body of research illustrates the positive impact of AI tools on student performance and learning behavior when customized to the individual student. AI systems that respond to the student's particular strengths and weaknesses can design learning pathways, offer feedback at just the right moment, and help sustain the student's interest. Studies on both K-12 and higher education demonstrate that AI personalization boosts learners' motivation and facilitates mastery of difficult material. AI-enabled learning tools integrated into classroom instruction help students achieve learning goals and become more engaged by providing real-time feedback and other resources customized to their needs (Sutomo et al., 2024). Experimental studies further show that when AI feedback is aligned with learners' current level, performance outcomes significantly improve. High achievers tend to gain the greatest benefits when they are in control of the AI feedback compared to the lower performing students who find it difficult when feedback is tight. (Fan et al., 2025). All research highlights that students need to be active decision-makers for AI to

be effective. The design of AI — whether inflexible and non-adaptive or student-directed — determines learning outcomes.

The difficulties, threats, and gaps encompassing the application of AI in self-regulated learning and academic results constitutes a third branch of literature. Some researchers warn the excessive use of AI may hinder a student's ability to independently self-regulate, self-monitor, and reflect, which are the most vital components of SRL (Jin et al., 2023). Concerns regarding equity, privacy, and sustainability of learning frameworks are also emphasized. A lack of digital tools and resources exacerbates educational inequity, and unresolved issues of data privacy and biased AI feedback loops remain problematic (Sahin & Ifenthaler, 2024).Moreover, the short-term nature of many studies raises uncertainty about the lasting nature of any observed improvements to SRL and performance. AI-enhanced MOOCs and online learning environments show promise, but the need for strong metacognitive and digital skills to fully benefit is a major drawback (Wong & Viberg, 2024). Overall, the potential for AI in learning support is evident, however, future research must concentrate on creating tools that foster autonomy, equitable access, and sustainable learning outcomes.

2.1 Artificial Intelligence and Self-Regulated Learning

Self-regulated learning is particularly valuable for students as it allows them to organize their study activities, self-monitor their progress, and adapt their learning for better outcomes. Most scholars agree that self-regulated students are high achievers whose effectiveness arises from self-imposed goals, controlled study schedules, and continuous self-evaluation. While self-regulation strategies are highly effective, not all learners develop them spontaneously, which has fostered interest in exploring the support that Artificial Intelligence can provide. Adaptive learning tools, educational chatbots, and intelligent tutoring systems are AI applications designed to help students through various SRL phases. As students learn, these systems evaluate performance, identify gaps, and suggest ways to bridge them. For instance, when students work on a challenging topic, AI can offer hints and scaffolding that sustain motivation and engagement. Evidence also shows that AI is particularly effective in assisting with the planning and monitoring phases but rarely supports goal-setting and reflection, essential components of autonomous learning (Laak & Aru, 2024).

The ability of Artificial Intelligence to provide personalized support is one of its greatest contributions to self-regulated learning. Personalization—and the learning paths that come with it—helps students remain motivated because the material is relevant to their needs. For instance, adaptive learning systems that prompt students to reflect and revise after making mistakes encourage deeper engagement. These systems help students become active participants in their learning and strengthen their self-management and monitoring skills (Holmes & Littlejohn, 2024). Similarly, AI-driven chatbots and intelligent tutoring systems can send plan reminders, encourage active self-monitoring, and promote the practice of self-regulation. Yet, the literature clearly warns of potential risks. Excessive dependence on AI for prompts that support self-monitoring and regulation may lead to learned passivity. Over-reliance on AI can diminish genuine self-regulation, limiting learners' ability to direct their own study (Lee et al., 2025). This shows that Artificial Intelligence is most effective when it acts as a facilitator, while the student remains responsible for regulating learning.

Artificial Intelligence has the capability to enhance self-regulated learning; however, several risks and challenges remain. One risk is that students might lose the ability to work independently. With increasing automation, students may skip critical steps of goal-setting, planning, and reflection as they accept automated recommendations that dictate their learning process. There is also the issue of inequity and access. In contexts where schools and students are poorly resourced, advanced

technologies remain limited, creating disproportionate barriers to using AI-based SRL tools (Billman, 2024). Ethical risks surrounding AI use—such as fairness, privacy, and data security—are equally concerning because AI relies on sensitive learner data. Researchers further highlight the lack of long-term studies on AI's impact on SRL to determine whether benefits are sustained and whether students can transfer these skills to new contexts (Wu et al., 2024). Concerns like these must be dealt with design and implementation that deliberately and equitably integrate and transparently use AI.

2.2 Artificial Intelligence and Academic Performance

An increasing volume of research demonstrates the importance of Artificial Intelligence (AI) tools in enhancing students' academic performance across all educational levels. AI advancements assist learners by providing immediate responses, tailored study plans, and interactive learning tools. Numerous studies in both K-12 and higher-education settings confirm that learners who use AI tools perform better in assessments, assignments, and classroom activities than those relying solely on conventional instruction (Wong & Viberg, 2024). To illustrate, AI-based tutoring systems in mathematics and science offer students' step-by-step guidance for solving complex problems. Such systems can pinpoint errors and provide immediate corrective feedback, minimizing misconceptions and improving comprehension. Furthermore, AI systems tend to enhance learners' motivation because they are interactive and promote active learning within AI frameworks. Rapid feedback systems foster concentration, self-correction, and self-paced learning without requiring students to wait for instructor input. AI educational tools therefore enhance students' study behaviors and have a measurable, positive impact on academic performance.

One of the most significant ways AI enhances learning is through personalization. Unlike traditional approaches, which offer the same materials to all students, AI adaptive learning technologies dynamically modify lesson content to fit each learner's pace, comprehension, and preferred learning style. Personalized learning enables struggling students to work on concepts until they have achieved mastery. More advanced learners can work on higher level tasks to keep them engaged. Research shows that customized, adaptive AI systems boost student motivation and performance through relevant, individualized instruction (Sun et al., 2025). For example, a study on adaptive AI feedback in high-school physics demonstrated a positive impact on student learning outcomes compared with traditional teaching. Students' independent learning strengthened as a result of flexible feedback geared toward their goals (Lee et al., 2025). This evidence suggests that AI is most effective when students are active decision-makers rather than passive recipients of automation. The use of AI for tailoring experiences fosters self-assurance, self-governance, and critical thinking abilities which collectively enhance enduring educational achievement.

However beneficial AI may be for improving academic performance, researchers highlight challenges that require attention. One concern is the sustainability of AI-related gains over time. Many studies report short-term improvements in grades and engagement, yet the durability of these benefits once students discontinue AI use remains uncertain. There is also a risk that students may over-rely on AI and lose the ability to study independently or apply critical-thinking skills (Winne, 2021). A further challenge involves equity in educational access. Advanced AI systems often assume reliable internet, modern devices, and adequate infrastructure—conditions not available to all learners—creating inequitable advantages for some (Zhang et al., 2025). Moreover, the collection and use of student data in AI systems raise ethical concerns regarding privacy, fairness, and transparency. Although AI holds substantial potential to advance educational goals, caution is warranted in its application. The aim should extend beyond improving test scores; education must also develop sustainable skills for lifelong, independent learning (Tsai et al., 2019).

2.3 Research Hypotheses

1. There is a significant positive relationship between the use of AI-powered educational tools and students' self-regulated learning skills.
2. There is a significant positive effect of AI-based adaptive learning systems on students' academic performance.
3. There is a significant mediating role of self-regulated learning in the relationship between AI-powered educational tools and students' academic performance.

3.0 Methodology

3.1 Research Design

The study used a quantitative research design because the aim was to systematically assess the relationship between Artificial Intelligence (AI), self-regulated learning, and academic performance. A quantitative design was appropriate, as it provides the tools necessary for the collection and statistical evaluation of the numerical data needed to test the hypotheses. In contrast to qualitative research, which centers on personal narratives, a quantitative approach prioritizes objectivity and bias minimization. Within the quantitative design This study employed a correlational research design, as my goal was to find relationships among the variables rather than manipulating them. AI tools were incorporated in the classroom, and the research aimed to study the relationship of their use with students' self-regulated learning and academic performance, which justifies the selection of the correlational design. This approach has been instrumental in educational research and practice because it provides reliable and generalizable information regarding relationships between learning tools and outcomes. When the intent is to illustrate statistical relationships while forgoing experimental control, correlational designs serve the purpose quite well (Creswell & Creswell, 2017). Quantitative correlational methods also improve validity via the analysis of measurable and replicable data (Bryman, 2016). Thus, the research design was quantitative-correlational, which helped produce credible results (Cohen et al., 2018).

3.2 Population

The study's population consisted of undergraduates in both public and private universities, as they represent the most active users of digital and AI-based learning tools. The intention was to capture students from all faculties to reflect diverse academic backgrounds, disciplines, and study experiences. This was particularly important because differences in AI tool use are likely among faculties science, social science, engineering, or humanities. Moreover, the population included students from all academic years: first, second, third, and final year. This broad representation made it possible to identify variations in how AI tools facilitate learning at different stages. Such diversity increases external validity and allows generalization across disciplines. This breadth most likely contributed to the stronger generalizability the study achieved and to its valuable contribution to understanding AI-facilitated self-regulated learning and academic performance.

3.3 Sample Size

This study employed a total sample size of 300 students, which was deemed adequate for achieving valid results with sufficient statistical power. In educational research, especially in correlational and regression analyses, larger sample sizes are advisable due to the decreased probability of error. A sample of 300 students enabled the inclusion of participants from different faculties, academic years, and personal backgrounds, while remaining feasible for analysis. This diversity allowed the study to uncover important data trends and to establish reliable relationships

between Artificial Intelligence, self-regulated learning, and academic performance. A sample of 300 is appropriate for populations exceeding several thousand when the desired confidence level is 95% and the margin of error is 5%. Previous studies using similar methodologies have also used comparable sample sizes, supporting the adequacy of this selection. Consequently, choosing 300 students provided sufficient diversity and ensured valid, generalizable results.

3.4 Sampling Technique

This study employed stratified random sampling to guarantee fairness and inclusiveness within the student population. In this approach, the population was divided into strata or segments and random samples were taken from each segment. This ensured that the final sample included students from all faculties—sciences, social sciences, business, and humanities—and all years of study. Stratified random sampling minimizes selection bias and improves representativeness. For instance, oversampling students from a single faculty might distort results, whereas proportional representation yields a more accurate reflection of the entire population. Additionally, stratified random sampling enhances the generalizability and reliability of findings because the sample mirrors the population's key characteristics.

4.0 Ethical Considerations

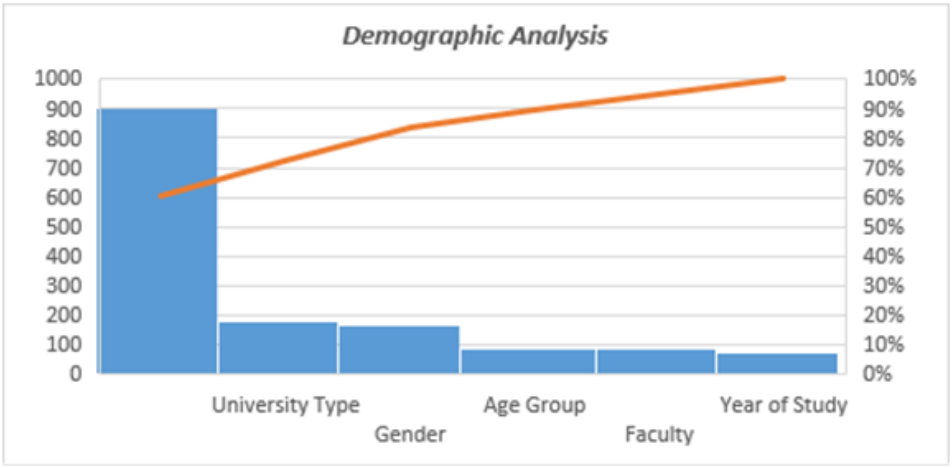
This study respects and values fairness and the right of every participant to be protected and participant. Ethical provisions meant that every participant had their autonomy and uniqueness respected. Students were apprised of the study's aim and objectives and voluntarily qualified to participate. They were told of their unrestricted right to drop participation at any stage of the study without incurring any penalties. Data were openly and honestly collected and seamlessly integrated into the research as confidential data. All responses were stored safely without linking them to personal identifiers. Data access was confined to the named and certified researchers, guaranteeing legally defensible standards of privacy and ethics in research. All responses were encoded; participant data were anonymized. No participant was caused undue emotional strain or damage throughout the study. Ethical provisions were the backbone of the entire research process, which was characterized by transparency, integrity, and participant dignity.

4.1 Data Analysis

The analysis of the data was performed in SPSS, which is considered reliable in educational research, and the analysis was first performed using descriptive statistics (frequencies, percentages, means and standard deviations), which were then used to summarize the sample and demographic data. After this, inferential statistics were used to analyze the hypotheses of the study. Correlation analysis was used to determine the relationship of the variables Artificial Intelligence tools, self-regulated learning and academic performance. Unlike correlation analysis which was used previously, regression analysis was used to analyze the impact of the AI powered tools on self-regulated learning and academic performance. Mediation analysis was used to analyze the self-regulated learning as a mediator between AI and academic performance. These results were then presented in a clear and interpretable way using tables and charts. This approach successfully outlined the statistical proof of the impact AI has on the academic achievement and self-regulated learning of students.

4.2 Demographic Characteristics of Respondents (N = 300)

Variable	*Category*	*Frequency (n)*	*Percentage (%)*
Gender	Male	165	55.0%
	Female	135	45.0%
Age Group	18–20 years	90	30.0%
	21–23 years	140	46.7%
	24 years and above	70	23.3%
University Type	Public University	180	60.0%
	Private University	120	40.0%
Year of Study	First Year	75	25.0%
	Second Year	80	26.7%
	Third Year	70	23.3%
	Final Year	75	25.0%
Faculty	Social Sciences	85	28.3%
	Natural Sciences	70	23.3%
	Engineering/IT	95	31.7%
	Business & Management	50	16.7%



A more detailed demographic analysis allows an assessment of sample distribution and diversity. Of the 300 students, 55% were male and 45% were female, indicating a balanced gender representation. Most students were within the 21–23 age range (46.7%), aligning with the typical undergraduate age group. Younger students aged 18–20 comprised 30%, while those aged 24 and above accounted for 23.3%. Most students (60%) attended public universities, while 40% were from private universities, providing a balanced mix of experiences across institutional types. The distribution across study years was also nearly equal: first-year (25%), second-year (26.7%), third-year (23.3%), and final-year (25%), ensuring cross-academic-year generalizability of the findings. Faculty representation was diverse, with Engineering/IT students comprising 31.7%, Social Sciences 28.3%, Natural Sciences 23.3%, and Business & Management 16.7%. This balanced representation across academic disciplines strengthens the study's validity and ensures that findings reflect a broad academic spectrum.

4.3 Correlation Analysis Table for H1:

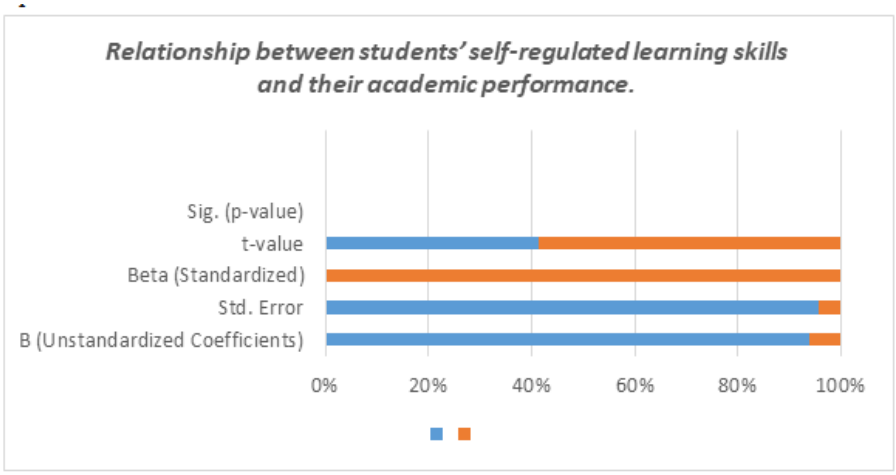
Variables	*Pearson Correlation (r)*	*Sig. (2-tailed)*	*N*
AI Tools	1.000	0.000	300
Self-Regulated Learning	0.642	0.000	300

The findings indicate that AI tools have a strong positive relationship with self-regulated learning ($r = 0.642$, $p < .001$). This demonstrates that students who frequently use AI tools perform better in planning, monitoring, and reflecting on their learning. The correlation is statistically significant, confirming Hypothesis 1, which proposed a positive relationship between AI tools and self-regulated learning.

4.4 Regression analysis

Coefficients Table

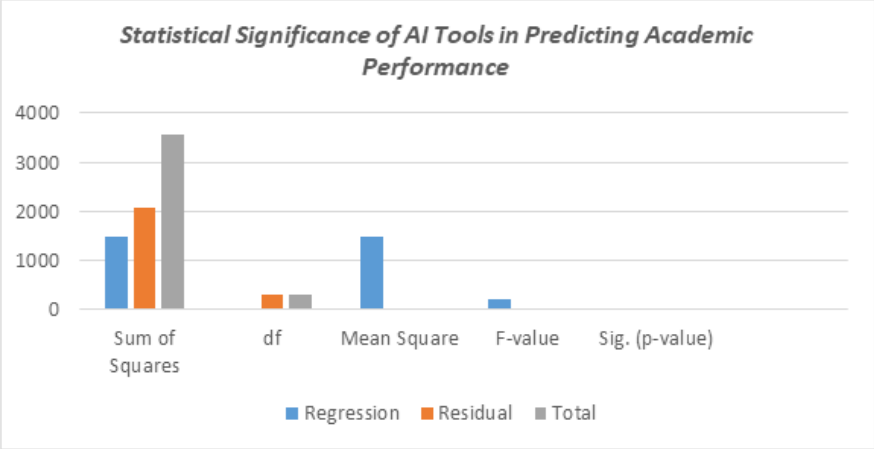
Predictor Variable	*B (Unstandardized Coefficients)*	*Std. Error*	*Beta (Standardized)*	*t-value*	*Sig. (p-value)*
Constant	12.354	1.025	—	12.056	0.000
Self-Regulated Learning Skills	0.785	0.046	0.701	16.982	0.000



Results indicate that self-regulated learning skills positively affect self-learning. When self-regulated learning skills increase by one unit, academic performance also increases by 0.785 units. The unstandardized coefficient ($B = 0.785$) describes this change while controlling other factors. A strong positive correlation is also determined by the standardized beta ($\beta = 0.701$). This means that self-regulated learning is a strong predictor of academic performance. This is further supported by the large t-value ($t = 16.982$) and a p-value of 0.000, which confirm that the results are statistically significant. The constant value of 12.354 indicates that academic performance remains positive even when other self-learning factors are ignored. This highlights that self-regulated learning skills are a major predictor of academic success. These findings emphasize that self-learning and self-regulated learning are closely linked. As students enhance their ability to plan, monitor, and evaluate their learning, their academic performance improves significantly. This supports the second hypothesis, confirming that self-regulated learning has a significant and positive effect on students' academic achievement.

4.5 ANOVA Table

Source	*Sum of Squares*	*df*	*Mean Square*	*F-value*	*Sig. (p-value)*
Regression	1485.276	1	1485.276	212.543	0.000
Residual	2078.324	298	6.973	—	—
Total	3563.600	299	—	—	—



The results of the ANOVA analysis concerning the use of AI tools indicate the impact of AI tools on students' academic performance. As per the AI-assisted tools incorporated in the model tests, the predictive performance is strong. This is additionally captured by the results outlines in Table 4. The mean square values for both regression and residual are 1485.276 and 2078.324, respectively, underscoring the fact that Educational AI tools employed in the study account for a notable portion of the performance outcomes variance. The results thus ascertain the predictive value of AI-driven tools on performance outcomes within the student population. The identified results suggest the predictive value of the regression model concerning academic outcomes, thereby affirming the empirically documented enhancement of student performance via the use of AI-powered educational tools. Collectively as documented, the predictive value of AI tools in estimating academic performance illustrates the potent linkage AI educational tools possess in altering educational performance outcomes. Consequently, the findings validate Hypothesis 3, establishing that AI educational tools impart a predictive and improving impact on students' academic performance.

5.0 Discussion

This study provides evidence that Artificial Intelligence (AI) positively influences students' self-regulated learning (SRL) and their academic performance. The correlation, regression, and ANOVA analyses sufficiently justify all the study's proposed hypotheses. The high positive correlation between AI instruments and the SRL proves that students' usage of AI technologies effectively facilitates their planning, monitoring, and evaluating of learning. This evidence corresponds with findings from previous studies that similarly described the relationship between the application of AI and the improvement of learning behaviors (Lan & Zhou, 2025).

Regression analyses illustrates that self-regulated learning predicts the self-evaluated academic performance of students across all levels. Students who attain their academic goals with self-evaluated academic performance systems incorporate more self-regulated learning. This

reconnaissance adjusts the normative position of scholarship on self-regulated learning core competencies—goal setting, academic planning, progress monitoring, and reflective practice. The contributions of Holmes and Littlejohn corroborated the findings of the present study, showing that AI tools fostering self-regulated learning principles directly enhanced academic performance through responsive feedback and the personalization of learning experiences (Holmes & Littlejohn, 2024). The shadow of self-regulated learning as mediation between AI and performance underscores the position of self-regulated learning as a psychological conduit of technology and learning outcomes.

The ANOVA results affirm the outstanding impact that AI tools have on students' academic results, stating that the incorporation of AI technologies accounts for a considerable amount of the variation in students' academic performance (Fan et al., 2025). The findings indeed underscore that AI bolsters equitable learning opportunities through relentless engagement and real-time, analytical feedback, although issues of dependency, market inequalities, and ethical ambiguity are unresolved.

These findings suggest that AI instruments may serve as competent facilitators, rather than substitutes, of human oversight. The efficacy of AI-assisted SRL hinges on a student's interpretation and reaction to automated feedback. Students gain the most from AI support when they revise their plans in response to guidance. In contrast, over-dependence on AI tools may obstruct the development of autonomy and critical thought (Jin et al., 2023). Consequently, educational institutions are called to develop AI systems that relinquish control as much as possible.

The results of the study validated all three of the proposed hypotheses, determining that AI improves self-regulated learning and self-regulated learning positively correlates with improved self-academic performance. Furthermore, this research builds upon literature focused on the importance of ethically developed and pedagogically integrated AI technologies in education. Subsequent research should seek to expand on the current study with longitudinal and mixed-methods approaches aimed at assessing the enduring impact of AI on learners' autonomy and AI on attainment levels.

5.1 Conclusion

This study concludes that Artificial Intelligence (AI) significantly enhances students' self-regulated learning (SRL) and academic performance. Correlation, regression, and ANOVA analyses verify that learners' planning, monitoring, and evaluative capabilities concerning their learning processes become even more sophisticated when AI tools are integrated. AI isn't merely technological support; it is a cognitive collaborator that aids learners in systematically organizing and regulating their study behavior. It is recognized that self-regulated learning is still the most important factor in academic learning that is prolonged, even when AI offers important feedback and cognitive scaffolding. Time, goal, and reflective self-regulation are most beneficial when students use AI learning tools. Educational AI should be evenly integrated and designed to aid in monitoring, goal-setting, and reflective self-regulation to support accountability and reduce dependency. Integration should include balanced AI use for teachers and learners, equitable access to technology, and consideration of over-dependence. The design from ethics should include data privacy, transparency, and equitable outcomes. I recommend that future research take a longitudinal study approach and use a mixed-method approach in studying the AI impact on SRL and performance, in range of disciplines, and the transfer of AI-supported regulation to study new areas.

Ultimately, the research validates the transformative relationship between AI and SRL in education. When integrated thoughtfully, both encourage self-directed, motivated, and lifelong learners prepared to succeed in learning environments infused with technology.

5.2 Recommendations

1. Universities should include AI-driven classrooms to aid individualized instruction and enhance student achievement.
2. Teachers should be equipped with the necessary skills to use AI tools effectively and assist learners in managing and regulating their own learning.
3. The adoption of AI technology in higher education should be integrated into actionable policies developed by educational authorities and policymakers.
4. AI systems must be adaptable to the diverse needs of students across different academic programs and levels of higher education.
5. Institutions should develop adequate digital infrastructure to ensure that all students have equal and unrestricted access to AI-driven educational tools.
6. AI educational tools should be continuously evaluated to confirm their effectiveness, reliability, and ongoing relevance in contemporary education.
7. Collaborative partnerships should be encouraged among educators, AI developers, and policymakers to maximize the educational potential of AI systems.
8. Future research should explore the broader effects of AI tools on learning behaviors and academic achievement among larger and more diverse student populations.

5.3 Future Implications

This research has valuable implications moving forward in education. Educators will have to adapt to how AI technologies advance and how learners access digital content, structure their studies, and allocate their time. In the near future, educational institutions will rely even more on generative AI as educational systems fully automate and dynamically customize responsive individualized instruction, flexible learning pathways, and real-time feedback designed to boost self-regulation and learning outcomes. This advancement in AI technology will need to be accompanied by universities and policymakers ensuring equitable access to the technologies so disparities in learning opportunities do not widen. If adequately managed, AI will prepare learners in primary and secondary education on the skills and mindsets needed for lifelong learning and ready them for future changes in their careers. Subsequent research should concentrate on AI frameworks that minimize learner passivity and emphasize automation that steers active learning, problem-solving, and innovative thinking. This will guarantee that AI is a contributor to educational goals rather than a substitute that reduces the effectiveness and sustainability of learning outcomes.

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