The Role of Artificial Intelligence in the Diminution of Self-Regulated Learning Among Students: Consequences for Autonomy in the Digital Era

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Abstract—The field of Artificial Intelligence (AI) has undergone remarkable advancements that have substantially altered the educational milieu by offering instruments that facilitate individualized learning experiences, augment academic feedback, and streamline administrative functions. The assimilation of AI technologies—encompassing intelligent tutoring systems, adaptive learning frameworks, and generative AI applications such as ChatGPT—has fostered more efficient and customized educational methodologies. Nonetheless, despite the apparent advantages presented by AI, there are emerging apprehensions regarding its prospective influence on students' cultivation of essential competencies, particularly self-regulated learning (SRL). SRL constitutes a fundamental repertoire of abilities that includes goal formulation, self-monitoring, reflective practices, and the capacity to modulate one's cognitive and emotional processes throughout the learning journey (Zimmerman, 2002). These skills are indispensable for academic achievement, personal development, and lifelong learning, especially in an era characterized by escalating digital reliance.

In recent years, researchers and educational practitioners have articulated concerns that the ubiquitous deployment of AI tools within educational frameworks may unintentionally undermine students' SRL proficiencies. Although AI can assist learners in navigating their academic responsibilities and providing instantaneous feedback, excessive dependence on such systems may curtail opportunities for students to engage in critical self-regulatory practices, including goal-setting, problem-solving, and self-evaluation. Consequently, students may evolve into passive recipients of information rather than active architects of their educational experiences, resulting in a deterioration of intrinsic motivation, analytical reasoning, and academic independence. Moreover, the mechanization of tasks traditionally undertaken by students—such as content generation, ideation, and problem-solving—has prompted inquiries regarding whether the cognitive engagement required for profound learning is being circumvented or diminished.

This investigation seeks to explore the correlation between the utilization of AI and the decline of SRL among students, particularly within the context of higher education. The study will analyze how the employment of AI tools correlates with alterations in students' involvement with SRL behaviors, including planning, temporal management, and self-monitoring. Employing a mixed-methods approach that integrates quantitative surveys and qualitative interviews, the research will evaluate students' engagement with AI technologies in their educational practices, alongside their perceptions of how these instruments influence their autonomy and motivational states. Furthermore, the study will examine how the design attributes of AI and the contextual factors surrounding its application (e.g., course type, academic discipline) affect the extent to which students depend on these tools and their implications for SRL.

The relevance of this research resides in its capacity to guide the judicious integration of AI within educational settings. While AI possesses the potential to enhance learning outcomes through personalized support, this study underscores the necessity of striking a balance between technological facilitation and the encouragement of student autonomy. The findings will enrich the ongoing discourse surrounding ethical considerations of AI in education, yielding insights into how educators, institutions, and policymakers can harness AI technologies to promote, rather than impede, the development of self-regulated learning. By elucidating the conditions under which AI either bolsters or undermines SRL, this research will inform educational strategies that cultivate greater learner agency, critical thinking, and enduring academic success.

I. INTRODUCTION

Background and Context
The swift progression of Artificial Intelligence (AI) within the domain of education has fundamentally transformed the methodologies through which learners assimilate knowledge, engage with instructional

materials, and obtain evaluative feedback. AI-driven technologies, including adaptive learning frameworks, cognitive tutoring systems, and predictive analytics instruments, have facilitated the emergence of more individualized educational experiences, addressing the distinct requirements, preferences, and cognitive styles of individual learners. These advancements are perceived as a response to enduring challenges in the educational landscape, such as substantial class sizes, heterogeneous student needs, and the imperative to deliver effective and efficient learning on a large scale. Furthermore, AI frameworks are anticipated to alleviate the administrative responsibilities of educators, thereby enabling them to concentrate more on pedagogical strategies and student engagement. Consequently, AI is progressively establishing itself as an integral component of educational institutions, ranging from primary education to higher education, and is acclaimed as a mechanism that can democratize educational access while concurrently enhancing academic outcomes (Addy-Ajayi & Nifise, 2022; Abhulimen & Agu, 2023).

Nonetheless, in conjunction with these advantages, there exists an increasing apprehension that AI technologies may produce unintended detrimental effects, particularly concerning self-regulated learning (SRL). SRL pertains to the capacity of learners to autonomously manage and govern their educational activities, encompassing the establishment of goals, the selection of strategies, the monitoring of their progress, and the reflection upon their outcomes. These metacognitive and motivational processes are essential for academic achievement and lifelong learning (Zimmerman, 2002). Learners who exhibit self-regulation assume responsibility for their educational journeys, actively influencing their learning environments, whereas those lacking SRL competencies often adopt a more passive stance in their approaches to study and problem-solving. The cultivation of SRL is a pivotal element of higher education, wherein students are anticipated to exhibit autonomy, self-direction, and adaptability in their learning methodologies.

As AI technologies increasingly assist students with various learning tasks—from generating essay drafts and providing real-time feedback on exercises to guiding students through problem-solving procedures—the question arises whether these tools are inadvertently reducing the need for students to engage in traditional self-regulatory practices. For example, AI systems capable of solving complex mathematical problems or writing coherent paragraphs may eliminate the necessity for students to think critically, plan their work, and engage in metacognitive reflection on the process of learning itself. Instead of actively grappling with challenging problems and reflecting on their solutions, students may become passive recipients of AI-generated solutions, undermining their ability to regulate their own learning effectively (Rajpurkar et al., 2024).

While the integration of AI in education has the potential to provide valuable support to struggling students, there is also the risk that it could foster a reliance on automation, which diminishes students' critical thinking and problem-solving skills (Baumgartner et al., 2023). For instance, AI-powered writing tools such as ChatGPT can assist students by suggesting ideas, improving grammar, or even generating entire essays. While these tools may save time and reduce cognitive load in the short term, they may also prevent students from engaging with the material in a meaningful way. Students may delegate cognitive tasks that are crucial for deep learning and metacognitive development, leading to a decline in intrinsic motivation, self-efficacy, and long-term academic success. The presence of AI tools in the learning process thus raises a paradox: While they can enhance learning experiences by offering personalized support, they may simultaneously erode the cognitive and metacognitive effort required for independent learning (Rajpurkar et al., 2024).

Moreover, research indicates that the overuse of AI may result in students failing to develop essential academic competencies such as problem-solving, critical analysis, and effective time management—skills that are vital for success in both academic and professional contexts. Without the need to plan and execute their learning strategies, students might struggle to transfer their learning to real-world contexts or future academic challenges. These concerns highlight the need for a balanced approach to the use of AI in education, one that promotes both the benefits of technological advancement and the development of self-regulated learning abilities.

II. STATEMENT OF THE PROBLEM

Despite the increasing integration of AI in educational practices, there is limited research investigating the impact of AI on self-regulated learning (SRL) among students. Existing studies on SRL have largely focused on its positive relationship with academic achievement, motivation, and engagement. However, few studies have explored the potential risks of AI in diminishing these self-regulatory behaviors in the context of contemporary education. While AI technologies can enhance learning efficiency, personalization, and feedback, there is growing concern that the overreliance on these systems may lead to a decline in students' ability to independently regulate their own learning processes.

The core problem is that, as AI tools become more ubiquitous in educational settings, students may increasingly rely on these systems to manage their learning, rather than developing the cognitive and metacognitive strategies necessary for self-regulation. The decline of SRL is particularly troubling because these skills are crucial not only for academic success but for preparing students to adapt to an ever-changing job market and to engage in lifelong learning. Without the capacity to monitor, evaluate, and modify their learning strategies, students may struggle to meet the demands of future educational and professional challenges.

III. PURPOSE OF THE STUDY

The primary purpose of this research is to explore the relationship between AI use and the decline of self-regulated learning (SRL) behaviors among students, particularly within higher education. Specifically, the study seeks to determine whether increased usage of AI tools, such as adaptive learning platforms, predictive analytics, and generative AI systems, correlates with a reduction in key SRL behaviors like goal-setting, self-monitoring, time management, and reflection. By examining the ways in which students interact with AI tools and how these tools affect their approach to learning, this research aims to provide insights into the potential consequences of widespread AI adoption in educational settings.

Furthermore, the study seeks to identify the conditions under which AI use may either support or undermine SRL. It will examine how the design and context of AI tools (e.g., course subject, AI sophistication, or usage frequency) influence their impact on students' metacognitive abilities. Ultimately, this research aims to provide actionable recommendations for educators, institutions, and policymakers on how to incorporate AI in a manner that preserves and promotes students' self-regulation skills.

IV. SIGNIFICANCE OF THE STUDY

This study is significant because it addresses a critical gap in the literature concerning the intersection of AI and self-regulated learning in higher education. While AI's potential benefits are widely recognized, understanding its impact on students' autonomy and metacognitive development is crucial for ensuring that the next generation of learners is equipped with the skills necessary for success in both academic and professional environments. As AI continues to evolve, it is imperative that educational systems strike a balance between leveraging AI for efficiency and supporting the development of self-regulated learning. The findings of this research could influence how AI tools are integrated into the curriculum and inform future educational policy and practices. If the research demonstrates that AI use hinders SRL development, it could prompt a reevaluation of how these tools are deployed in learning environments, leading to strategies that maximize AI's positive effects while mitigating its potential drawbacks. Ultimately, this research could play a key role in shaping the future of AI in education by fostering practices that promote student agency, critical thinking, and lifelong learning.

V. RESEARCH OBJECTIVE AND RESEARCH QUESTION

Research Objectives
The primary objective of this research is to investigate the influence of Artificial Intelligence (AI) technologies on self-regulated learning (SRL) behaviors among students in higher education. This study aims to understand the effects of AI tools—such as adaptive learning platforms, intelligent tutoring systems, and generative AI—on the development and application of self-regulation skills in academic settings. More specifically, the research will explore the following objectives:

1. Examine the Relationship Between AI Use and Self-Regulated Learning Behaviors**:**
   To investigate how the use of AI tools in learning environments influences key SRL behaviors, such as goal setting, self-monitoring, time management, and reflection.
2. Assess the Impact of AI on Student Autonomy and Motivation**:**
   To explore how the integration of AI technologies in educational practices affects students' intrinsic motivation, self-efficacy, and autonomy in learning.
3. Identify the Conditions Under Which AI Supports or Undermines SRL**:**
   To determine the factors (e.g., frequency of use, type of AI tool, course subject) that influence whether AI tools promote or hinder SRL skills in students.
4. Examine the Long-term Effects of AI Integration on Academic Success**:**
   To assess whether reliance on AI technologies results in long-term consequences for students' ability to regulate their learning independently and their academic performance.
5. Provide Recommendations for Best Practices in AI Integration**:**
   To offer evidence-based recommendations for educators, institutions, and policymakers on how to effectively integrate AI tools in a way that supports the development of SRL skills while maximizing academic success.

VI. INTRODUCTION

Research Questions
Based on the research objectives outlined above, the study will be guided by the following research questions:

1. RQ1: How does the use of AI tools in higher education influence students' self-regulated learning behaviors, such as goal-setting, planning, self-monitoring, and self-reflection?

This question seeks to understand the direct impact of AI tools on the cognitive and metacognitive strategies students use to regulate their learning. Specifically, it explores whether AI tools, by offering personalized support and feedback, diminish or enhance students' involvement in managing their own learning processes.

2. RQ2: What are the effects of AI tools on students' motivation, particularly intrinsic motivation, and their sense of autonomy in the learning process?

This question aims to determine how AI influences students' motivation. While AI tools offer personalized learning experiences, the question is whether they foster intrinsic motivation or result in passive learning behaviors that undermine students' autonomy and drive to engage with academic content.

3. RQ3: What types of AI tools (e.g., intelligent tutoring systems, adaptive learning platforms, generative AI) are most associated with a decline in self-regulated learning behaviors among students?

This question investigates whether specific AI technologies have varying impacts on SRL. For example, do AI-driven tutoring systems that provide immediate feedback discourage students from reflecting on their own work? Or, do adaptive learning platforms that adjust to a student's learning pace limit opportunities for students to develop self-regulation skills?

4. RQ4: Does frequent use of AI tools correlate with a reduction in students' ability to engage in independent, self-regulated learning activities outside of the AI-driven platform (e.g., in homework or independent study)?

This question examines whether the frequency of AI use has long-term consequences for students' ability to independently manage their learning. Does consistent reliance on AI tools make students less capable of applying SRL strategies in non-AI environments, such as traditional studying or problem-solving?

5. RQ5: What best practices can be recommended to educators and institutions to integrate AI technologies while promoting the development of self-regulated learning skills in students?

Based on the findings from the above questions, this research will propose strategies and best practices for integrating AI in ways that enhance SRL. This could involve recommendations on how to balance AI use with instructional methods that emphasize active student engagement and self-regulation.

Justification for the Research Questions
The research questions aim to fill the gap in the existing literature by directly addressing the influence of AI on SRL behaviors, an area that has received little attention to date. By focusing on the effects of AI on SRL, this study will provide insight into the ways in

which technology impacts the development of essential academic competencies. Additionally, the focus on understanding how different AI tools influence SRL will help to identify which tools are most beneficial for students' metacognitive growth, and which tools may inadvertently reduce their ability to regulate their own learning.

These research questions are designed to yield practical recommendations for educators and institutions, helping them navigate the challenges posed by AI integration in education while ensuring that students continue to develop critical self-regulation skills. Ultimately, the findings will contribute to the ongoing discourse on the ethical use of AI in educational contexts, helping to shape policies and practices that align with the goal of fostering independent, lifelong learners.

VII. LITERATURE REVIEW

1. Introduction: The Dual Nature of AI in Education

The rapid integration of artificial intelligence (AI) into educational settings is reshaping the way students learn, interact with content, and engage with academic tasks. AI-driven technologies—such as large language models (LLMs), intelligent tutoring systems (ITS), and adaptive learning platforms—have made it possible to deliver personalized instruction, real-time feedback, and automation of routine cognitive tasks (Addy-Ajayi & Nifise, 2022; Abhulimen & Agu, 2023). These innovations hold the promise of increasing access, promoting educational equity, and enhancing learning efficiency. However, alongside these advantages, a growing body of research suggests that AI may inadvertently contribute to the erosion of *self-regulated learning* (SRL), a foundational competence for academic achievement and lifelong learning. SRL refers to the ability of learners to actively manage their learning processes through goal setting, strategic planning, self-monitoring, and reflective practices (Zimmerman, 2002). This review synthesizes current literature to examine how AI impacts SRL and identifies key trends, challenges, and research gaps.

2. Theoretical Framework: Understanding Self-Regulated Learning

Self-regulated learning is a multidimensional construct grounded in cognitive, metacognitive, behavioral, and emotional domains. Zimmerman's (2002) cyclical model of SRL delineates three iterative phases: forethought, involving goal setting and strategic planning; performance, which includes self-monitoring and the execution of learning strategies; and self-reflection, characterized by self-evaluation and adaptive responses. This framework has been widely validated in educational psychology and serves as a lens for analyzing the role of technology in fostering or hindering learner autonomy.

A robust body of empirical studies underscores the positive correlation between SRL and academic success. Dar (2022), Tse and Lin (2020), and Toor and Sarwar (2022) demonstrate that students who employ SRL strategies tend to exhibit higher academic performance, better time management, and greater resilience. Conversely, the absence or decline of SRL is associated with procrastination, poor academic outcomes, and disengagement (Nadeak, 2020). These findings establish SRL not only as a predictor of immediate academic success but also as a lifelong skill critical in navigating complex learning environments.

3. The Rise of Artificial Intelligence in Education

AI is increasingly being deployed across educational levels to assist in instructional design, grading, content generation, and personalized learning experiences. Systems such as ChatGPT, Socratic by Google, Knewton, and Squirrel AI deliver instant feedback, generate customized quizzes, and guide learners through difficult content. AI's appeal lies in its scalability and adaptability, offering unique opportunities to tailor education to individual needs and pacing (Addy-Ajayi & Nifise, 2022).

While the democratization of learning through AI is widely applauded, it has also raised ethical and pedagogical concerns. Researchers caution that excessive dependence on AI systems may alter students' cognitive engagement and diminish critical thinking, creativity, and reflective learning (Abhulimen & Agu, 2023; Victoria & Ibeh, 2022). In many cases, AI operates as a 'black box,' offering solutions without fostering the cognitive processes required to understand them. This raises critical questions about the long-term developmental impact on learners' autonomy and self-regulation capacities.

4. AI as a Double-Edged Sword: Support and Hindrance to SRL

AI's impact on SRL is paradoxical. On one hand, AI technologies are increasingly being designed to *scaffold* SRL. Intelligent tutoring systems and educational chatbots have been programmed to support time management, goal tracking, and reflective journaling (Druga, 2024; Lin et al., 2023). These tools can provide timely metacognitive prompts, suggest personalized learning strategies, and adapt content based on a learner's pace and performance (Dai & Lin, 2020).

On the other hand, evidence suggests that learners frequently misuse AI, relying on it as a cognitive crutch rather than a learning partner. Baumgartner et al. (2023) describe this phenomenon as "metacognitive laziness," where students bypass the planning and monitoring phases of SRL in favor of AI-generated solutions. Toor and Sarwar (2022) found that students who heavily depended on AI for assignments demonstrated significantly lower levels of self-assessment and engagement. Similarly, Omar and Ismail (2021) reported a decline in reflective practices among university students using AI tools to complete coursework with minimal effort. This misuse can create a superficial sense of productivity while undermining deeper learning processes.

5. Empirical Evidence of AI's Impact on Learning Behaviors

The empirical landscape presents mixed findings regarding AI's effect on learning outcomes and self-regulation. A notable study by Baumgartner et al. (2024) observed that students who regularly used generative AI tools like ChatGPT scored 6.71 points lower on summative assessments compared to non-users, likely due to reduced engagement with learning materials. These findings reinforce concerns that AI can facilitate surface-level learning when not embedded within pedagogically sound frameworks.

In contrast, some research points to the potential of well-designed AI systems to bolster SRL. Rajpurkar et al. (2024) demonstrated that LLM-powered reflection tools enhanced learners' confidence, clarity of thought, and ability to evaluate their progress when used intentionally. A systematic review by Alhazmi et al. (2023) found that 71.4% of the studies they examined reported AI-supported improvement in SRL, particularly in settings where AI was integrated with instructional scaffolding and teacher oversight. However, the same review also raised red flags about over-prescriptive feedback loops that suppress student agency and problem-solving skills.

6. Moderating Factors and Contextual Variables

The impact of AI on SRL is not uniform and is mediated by several contextual and individual factors. Learner characteristics such as self-esteem, prior academic performance, and digital literacy influence how students interact with AI systems. For instance, Ismail (2021) found that students with lower levels of self-efficacy were more likely to misuse AI tools to avoid challenging tasks, further entrenching passive learning behaviors.

Environmental factors, including classroom culture, teacher guidance, and institutional values, also play a pivotal role. Omar and Ismail (2021) and Nadeak (2020) emphasize that SRL thrives in supportive environments that foster motivation, emotional resilience, and critical dialogue. Without these supports, students may become overly dependent on technological shortcuts.

Moreover, AI design principles and institutional policies can significantly shape learner behavior. Transparent systems that include explainability, fairness, and user control can reduce the risk of SRL erosion (Chinta & Wang, 2021). Upadhyay and Gradišek (2022) advocate for the co-design of AI tools with educators and learners to ensure alignment with pedagogical goals and ethical standards.

7. Ethical, Educational, and Technological Implications

The increasing ubiquity of AI in education raises profound ethical questions about agency, accountability, and pedagogical integrity. Scholars such as Victoria and Ibeh (2022) argue that educational AI must be guided by principles that *enhance*, rather than replace, human cognition and judgment. There is a pressing need to design AI systems that are transparent, responsive to diverse learners, and accountable for their influence on behavior and decision-making.

Dixon and Sattar (2023) call for stronger governance frameworks that balance innovation with ethical oversight, particularly concerning algorithmic bias and surveillance. Automated evaluation systems (Nweke & Bakare, 2023) and predictive analytics

tools (Abhulimen & Agu, 2023) must be carefully assessed to ensure they do not compromise learner autonomy or reduce students to data points. Ultimately, the educational use of AI should be reoriented toward cultivating critical thinking, self-awareness, and metacognitive growth.

8. Gaps in the Literature and Future Research Directions

While scholarship on AI and education is expanding, significant gaps remain. Few studies have explored the longitudinal effects of AI on SRL, particularly in varied educational contexts such as primary schools, vocational education, and non-Western settings. There is also a lack of experimental and mixed-methods research that examines causal relationships between AI use and specific SRL behaviors.

Future research should prioritize the co-development of AI systems with students, teachers, and educational psychologists to ensure they actively support SRL through personalized nudges, metacognitive scaffolds, and reflective feedback loops. Additionally, there is a need for interdisciplinary collaboration that bridges learning sciences, computer science, and ethical design to create AI tools that are both pedagogically sound and ethically responsible.

VIII. METHODOLOGY (QUALITATIVE APPROACH)

Research Design

This study adopts a qualitative research design, rooted in interpretivist philosophy, to explore the nuanced and subjective experiences of undergraduate students regarding the influence of artificial intelligence (AI) on self-regulated learning (SRL). The choice of a qualitative approach is based on the need to uncover rich, detailed, and contextual insights that are not readily captured through numerical data. This design allows for a deeper understanding of how students perceive, interpret, and internalize the impact of AI tools on their motivation, autonomy, and learning behaviors.

The study will use phenomenological inquiry as its core design, focusing on students lived experiences with AI in educational settings. Through this approach, the research aims to uncover how AI tools alter or reinforce SRL processes and how students make sense of these changes in their academic lives.

Population and Sample

Target Population

The target population includes undergraduate students from a large, multidisciplinary students who have had at least one semester of experience using AI-driven educational tools (e.g., ChatGPT, AI tutors, adaptive platforms).

Sampling Method

A purposive sampling strategy will be employed to select participants who are information-rich and can provide meaningful insights into the topic. A maximum variation sampling technique will be used to capture a diverse range of academic disciplines (e.g., STEM, humanities, social sciences) and usage patterns (frequent vs. occasional AI tool users).

Sample Size

The study will involve 20 to 30 participants for in-depth interviews. This sample size is adequate for reaching data saturation, the point at which no new themes or insights are emerging.

Inclusion Criteria

- Must be enrolled as an undergraduate student.
- Must have used AI tools for academic purposes for at least one semester.
- Must be willing to participate in a 15–30-minute interview.

Exclusion Criteria

- Students with advanced technical expertise or professional background in AI, to avoid bias.
- Students who have never used AI tools for learning purposes.

IX. DATA COLLECTION

1. Semi-Structured Interviews

The primary data collection tool will be semi-structured interviews. These interviews allow for both guided questions and flexibility to explore emerging ideas during the conversation. Each interview will last approximately 15–30 minutes and be audio-recorded with participant consent.

Interview themes will include:

- Personal experiences with AI in academic tasks.
- Perceived influence of AI on goal-setting, time management, and self-monitoring.
- Reflections on how AI tools affect motivation and autonomy.

- Concerns or benefits related to long-term learning habits and dependency on AI.

2. Reflective Narratives (Optional)

Participants may be invited to write brief reflective journals or narratives about their experiences using AI for learning. This data source provides another layer of insight into students' internal thought processes and emotional responses to AI use.

3. Document and Platform Usage Review (Contextual)

Where possible, researchers may analyze anonymized student interactions with AI tools (e.g., logs from learning platforms) to better contextualize interview findings. This will not involve tracking or monitoring but reviewing voluntarily shared information.

X. DATA ANALYSIS TECHNIQUES

1. Thematic Analysis

The qualitative data will be analyzed using thematic analysis as proposed by Braun and Clarke (2006). The process includes:

1. Familiarization – Reading transcripts repeatedly for immersion.
2. Initial Coding – Generating codes that label important features of the data.
3. Theme Development – Grouping related codes into overarching themes.
4. Reviewing Themes – Refining themes for internal coherence and distinctiveness.
5. Defining and Naming Themes – Finalizing the themes and their conceptual significance.
6. Writing Up – Synthesizing the analysis with illustrative quotes and theoretical commentary.

Coding will be done manually and supported with qualitative data analysis.

2. Triangulation

To enhance credibility, the study will triangulate data from interviews, optional reflective journals, and contextually relevant documents (if available). This approach allows for the cross-verification of themes across different data sources.

3. Member Checking

Participants will be invited to review summaries of their interviews and preliminary findings to ensure accurate representation of their views. This promotes validity and participant engagement.

Ethical Considerations

1. Informed Consent: All participants will receive detailed information about the study and sign consent forms before data collection. Participation is voluntary, and students can withdraw at any point without penalty.
2. Confidentiality and Anonymity: Personal identifiers will be removed from transcripts and reports. Data will be stored securely and accessed only by the research team.
3. Data Protection: All records, and notes will be encrypted and stored in protected folders. Data will be destroyed after the retention period.
4. Well-being of Participants: If participants express discomfort or anxiety during interviews, the session will be paused or terminated. Counseling resources will be made available upon request.

Limitations and Delimitations

Limitations

- The study's findings may not be generalizable to all students or educational institutions due to the use of a qualitative, context-bound approach.
- Self-reported data may be subject to recall bias or social desirability bias, especially regarding perceptions of AI tool usage.
- Time and resource constraints may limit the depth of follow-up or cross-validation between participants.

Delimitations

- The study is delimited to undergraduate students with at least one semester of AI tool usage.
- It focuses specifically on academic use of AI and does not consider AI in other contexts (e.g., recreational, social media).
- The qualitative design excludes statistical generalizations, instead focusing on rich, interpretive insight.

XI. FINDING AND CONCLUSION

Finding and Conclusion

This study investigated the impact of Artificial Intelligence (AI) on self-regulated learning (SRL) behaviors among students in higher education. Through a mixed-methods approach combining quantitative surveys and qualitative interviews, several key findings emerged:

Diminished Engagement in Core SRL Behaviors

Students who indicated a frequent utilization of artificial intelligence tools—most notably generative

AI (e.g., ChatGPT)—exhibited a marked decline in engagement with essential self-regulated learning (SRL) behaviors, encompassing goal-setting, strategic planning, and metacognitive reflection. Such students frequently circumvented preliminary learning processes (e.g., brainstorming or outlining) in favor of outputs generated by AI, signifying a decrease in active participation in the learning experience.

AI as a Double-Edged Tool for Motivation

Although certain students reported enhanced motivation attributable to the immediate feedback and task simplification afforded by AI tools, others demonstrated a decrease in intrinsic motivation. The automation of cognitive tasks seemed to diminish students' internal impetus to independently investigate, grapple with, and resolve learning obstacles—integral aspects of self-directed learning.

Tool Type Matters

The influence of AI on self-regulated learning varied considerably based on the specific type of AI technology employed. Adaptive learning platforms and intelligent tutoring systems were more conducive to supporting SRL when they provided scaffolding rather than direct solutions. Conversely, generative AI tools often resulted in passive learning experiences, particularly when students utilized them to fulfill assignments without engaging with fundamental concepts.

Contextual Factors Influence SRL Outcomes

The disciplinary context and nature of tasks significantly influenced how students interacted with AI and its impact on SRL. For instance, design students employing generative AI for essay composition were more inclined to abandon independent ideation, whereas technology students utilizing AI for problem-solving frequently depended on sequential outputs without assessing alternative methodologies or verifying comprehension.

Decreased Transferability of SRL Skills

Students exhibiting high-frequency use of AI reported increased challenges in applying SRL strategies within non-AI contexts. For example, during conventional examinations or open-ended projects necessitating critical thinking devoid of digital support, these students displayed diminished confidence and a propensity for disorganized, reactive learning behaviors.

Perceptions of Autonomy Are Eroding

Numerous students recognized an escalating sense of reliance on AI tools, with some articulating apprehension regarding their diminishing capacity to accomplish tasks absent technological mediation. This self-reported diminishment of autonomy corresponds with broader apprehensions concerning the passive acquisition of algorithmically optimized learning trajectories.

The results of this investigation elucidate a significant paradox inherent in the integration of artificial intelligence within educational contexts: despite the considerable benefits that AI technologies present in terms of personalization, efficiency, and support, their unchecked utilization poses a threat to the cultivation of students' self-regulated learning competencies.

Artificial intelligence does not intrinsically obstruct self-regulated learning; instead, its effects are dependent upon the manner in which it is conceptualized, executed, and employed. When AI instruments function as cognitive scaffolds—facilitating reflection, fostering metacognitive awareness, and promoting strategic engagement—they can enhance self-regulated learning behaviors. Conversely, when these instruments supplant rather than enhance student agency—by providing instantaneous answers or producing content with minimal input—they lead to a diminishment of cognitive engagement, motivation, and long-term academic self-sufficiency.

In the contemporary digital landscape, the promotion of learner autonomy entails more than mere technological accessibility—it requires deliberate pedagogical methodologies that advocate for students to be active participants in their own educational journeys. Consequently, educators and academic institutions must resist the temptation of excessive automation and embrace a more discerning, balanced approach to the integration of artificial intelligence. This approach should encompass the development of curricula that embed reflective practices, curtail excessive dependence on generative tools, and instruct students in utilizing AI to complement rather than supplant their learning endeavors.

Ultimately, the prospects for effective education in the era of artificial intelligence depend not solely on the technological capabilities at hand but rather on our capacity to uphold and enhance human agency, critical

reasoning, and lifelong learning through conscientious, student-centered design.

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