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REVISIÓN

Recent Advances in Generative AI and Their Impact on Education: Exploring Self-Efficacy in Learning Environments

Avances recientes en la IA Generativa y su impacto en la educación: explorando la autoeficacia en los entornos de aprendizaje

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ABSTRACT

Introduction: the study analyzes recent advances in generative AI and examines how these technologies interact with student self-efficacy within educational settings. It discusses how innovative AI tools can enrich learning experiences and aims to outline potential roles for these tools in boosting learners' confidence and motivation.This study emphasis on the comprehensive understanding of how GenAI technology will increase confidence levels of a student into academic work.
Method: a quantitative approach was employed with a sample of 161 students from diverse disciplines. Participants completed a self-efficacy scale and answered items related to their experience with generative AI tools. Statistical analysis were conducted to explore relationships between AI engagement and self-efficacy levels.
Results: the analysis's findings show a positive relationship between the application of generative AI and improved self-efficacy in pupils. The outcomes include increased confidence in learning activities and a stronger willingness to take on difficult tasks. The mean score on the Self-Efficacy (SE) scale was 3,12, SD = 0,58, indicating that on average, the participants reported a relatively high level of self-efficacy. This suggests a sample of students who, in general, feel confident in their ability to overcome challenges and succeed academically. Regarding generative AI usage, the data showed a wide range of engagement. The mean frequency of use was 3,45, SD = 1,15, with a significant portion of students reporting that they "often" or "very often" use GenAI tools for academic purposes. The most commonly reported uses were for brainstorming ideas (78 % of users), followed by drafting outlines (65 %) and revising text (55 %). A smaller percentage reported using AI for complex tasks such as generating code (28 %) or scientific summaries (22 %).
Conclusions: the findings suggest that introducing generative artificial intelligence into educational programs might be beneficial to the growth of students; nevertheless, additional research is necessary. The findings of this study highlight the importance of self-efficacy as a potential mediator in learning advances offered by artificial intelligence. Future research should investigate specific uses of artificial intelligence and the ways in which these applications affect the teaching and learning processes.

Keywords: Learning Outcomes; Generative AI; Education; Survey Analysis; Student Engagement; Self-Efficacy; Technological Integration.

RESUMEN

Introducción: el estudio analiza los avances recientes en IA generativa y examina cómo estas tecnologías interactúan con la autoeficacia de los estudiantes en entornos educativos. Discute de qué manera las herramientas innovadoras de IA pueden enriquecer las experiencias de aprendizaje y tiene como objetivo

esbozar roles potenciales para estas herramientas en el incremento de la confianza y la motivación de los aprendices. Este estudio enfatiza la comprensión integral de cómo la tecnología GenAI aumentará la confianza de un estudiante en su rendimiento académico.
Método: un enfoque cuantitativo fue utilizado con una muestra de 161 estudiantes de diversas disciplinas. Los participantes completaron una escala de autoeficacia y respondieron preguntas relacionadas con su experiencia con herramientas de IA generativa. Se realizaron análisis estadísticos para explorar las relaciones entre la interacción con IA y los niveles de autoeficacia.
Resultados: los hallazgos del análisis muestran una relación positiva entre la aplicación de IA generativa y una mejora de la autoeficacia en los alumnos. Los resultados incluyen un mayor desarrollo de la confianza en las actividades de aprendizaje y una mayor disposición para asumir tareas difíciles. La puntuación media en la escala de Autoeficacia (SE) fue de 3,12, SD = 0,58, lo que indica que, en promedio, los participantes reportaron un nivel relativamente alto de autoeficacia. Esto sugiere una muestra de estudiantes que, en términos generales, se sienten seguros de su capacidad para superar desafíos y rendir académicamente. En cuanto al uso de IA generativa, los datos mostraron una amplia gama de compromiso. La frecuencia media de uso fue de 3,45, SD = 1,15, con una parte significativa de los estudiantes reportando que la usan “a menudo” o “muy a menudo” para fines académicos con GenAI. Los usos reportados con mayor frecuencia fueron para generar ideas (78 % de los usuarios), seguido de redactar esbozos (65 %) y revisar textos (55 %). Un porcentaje menor reportó utilizar IA para tareas complejas como generar código (28 %) o resúmenes científicos (22 %)
Conclusiones: los hallazgos sugieren que la incorporación de la inteligencia artificial generativa en los programas educativos podría ser beneficiosa para el desarrollo de los estudiantes; no obstante, se requiere investigación adicional. Los resultados de este estudio destacan la importancia de la autoeficacia como posible mediador en los avances de aprendizaje ofrecidos por la inteligencia artificial. Las futuras investigaciones deberían investigar usos específicos de la IA y las maneras en que estas aplicaciones afectan los procesos de enseñanza y aprendizaje.

Palabras clave: Resultados de Aprendizaje; IA Generativa; Educación; Encuesta/Análisis; Participación del Estudiante; Autoeficacia; Integración Tecnológica.

INTRODUCTION

Generative AI, Self-Efficacy, and the Future of Learning

The fast deployment of artificial intelligence (AI), particularly Generative AI[1], is leading to a transformation in education and has a very significant impact on the development that is taking place in contemporary education. Applications that can create text, graphics, and other content that resembles human-authored work have transitioned from being a specialized technology to a reasonably mainstream use. Examples of such applications are ChatGPT and others. There has been a surge of enthusiasm and disagreement around the function that these instruments are expected to play in the classroom as a result of this. The occurrence of this phenomena presents a one-of-a-kind chance to tailor learning, provide quick feedback, and create educational experiences that are more dynamic and fascinating. On the other hand, the rapidity with which it is being incorporated has given rise to a number of significant worries. These issues include, but are not limited to, the development of an unhealthy dependence on it, the decline of critical thinking skills, and wider psychological repercussions on individuals.

In terms of self-efficacy beliefs, this research investigates a significant facet of this technological shift that has not been extensively investigated in previous research: the psychological impact that GenAI has on students[2] as described in Albert Bandura’s Social Cognitive Theory[3] defines self-efficacy as an individual’s conviction in his or her own talents as well as the possibility that a certain job will be completed or a goal will be accomplished. Self-efficacy reveals a core belief in the ability to apply that expertise in overcoming obstacles and completing desired goals; it is not a measure of competence but rather a reflection of that confidence. Self-efficacy is a reflection of the belief that something is possible. Whenever it comes to the realm of education, self-efficacy is an essential indicator of a student’s level of enthusiasm, effort, and tenacity when they are challenged with challenges pertaining to their studies. A high self-efficacy student would most likely confront difficult texts, persist through adversities, and attain better learning outcomes.[2] On the other hand, a student with low self-efficacy may consider the same assignments difficult and give up easily if they come to an ailment, thus failing to live up to their potential, even when they are knowledgeable on the same topic. Therefore, understanding the intricate relationship between the use of GenAI tools and the development of self-efficacy is paramount for educators and institutions seeking to create effective, confidence-building curricula in the digital age.

Problem Statement

While the transformative potential of generative AI in education[4] is widely discussed, there remains a significant gap in the empirical evidence that directly links the frequency and nature of GenAI usage to changes in student self-efficacy. As much anecdotal and initial research indicates Artificial Intelligence enhancing the attitude of students towards learning, quantitative data on the relationship between them is still rare.[5] Beyond conjecture lies the main argument toward a rather data-driven explanation of how effective these powerful tools will actually be in transforming students' levels of self-confidence.

The purpose of this study is to comprehensive understanding how GenAI technology will increase confidence levels of a student into academic work or undermine it. Such as, will using AI to generate ideas for an essay make a student feel better about writing, or does it create dependency with a strong sense that the student has done nothing?[6]

This research is grounded in several significant theoretical frameworks. These frameworks provide a prism through which to examine the connection between learning, cognition, and technology. The main theoretical underpinning is Bandura's Social Cognitive Theory[3], particularly his idea of self-efficacy. This theory states that there are four main sources of self-efficacy: mastery experiences, which involve completing a task successfully; vicarious experiences, which involve witnessing others complete tasks successfully; social persuasion, which involves soliciting encouragement from others; and physiological states, which involve interpreting one's own emotions and bodily responses.[2] All of these sources could be impacted by the application of GenAI techniques. An example of this would be how an artificial intelligence tool might help a learner attain a "mastery experience" that they otherwise could not have, so raising their confidence. This is accomplished by simplifying a difficult task.[5] In a similar vein, the instantaneous and individualized feedback that is offered by an artificial intelligence tutor has the potential to serve as a sort of social persuasion, stimulating the learner and supporting their confidence in their own capabilities.

Our research review shows that AI affects student attitudes and self-efficacy in a mixed but beneficial way. Some recent research have found a statistically significant positive association between university students' AI tool use and self-efficacy. GenAI may provide cognitive scaffolding for less confident students, helping them psychologically. Other studies have also found that self-efficacy can mediate the relationship between GenAI use and creative cognition, indicating that a student's confidence is a key factor in how they leverage these tools for creative tasks. However, the broader, quantitative link across a diverse range of disciplines remains an area ripe for further investigation. This study specifically identifies and addresses this niche by providing a broad, quantitative look at the correlations between AI usage and self-efficacy across different academic fields, offering a more generalized perspective than some of the existing, more focused studies.

METHOD

This section entails the research design, participants, instruments, and methodology adopted to investigate the correlation between student self-efficacy and the use of generative artificial intelligence.[7] It explains all the painstaking procedures followed to ensure validity and reliability in data collection and analyses and gives an elaborate account of the ethical issues considered during the course of the study.

Type of study, period and location

This study employed a quantitative, cross-sectional technique to examine the link between two principal variables: student self-efficacy and their utilization of generative AI tools.[8] The survey approach enabled the collection of self-reported data regarding participants' individual perceptions, attitudes,[9] and behaviors, which are the primary psychological constructs under investigation.

Participants

Among the 161 students who participated in the research, there were students from a variety of academic fields, including engineering, the humanities, business, and natural sciences. The purpose of the planned incorporation of a wide range of disciplines was to provide a holistic viewpoint on the connection between GenAI and self-efficacy, as opposed to concentrating just on a single domain. The participants' demographic characteristics are as follows:

The participants' ages ranged from 18 to 25 years, with a mean age of 20,3 years. This signifies that the majority of the sample comprised undergraduate students. The study sample comprised 89 females, 72 males, and three persons who did not identify with either gender.

Student Years: the distribution of students was equitable across various academic years, encompassing individuals from their first year to those in their final year of study. This facilitated the effective portrayal of diverse experience levels and degrees of maturity.

The diversified sample utilized enhances the generalizability of the results to a broader student population in higher education, hence augmenting the external validity of the findings.[10]

Instrument and Data Collection Process

The data collection process employed two core instruments: a self-efficacy measure and a custom-designed questionnaire on generative AI experiences, both deemed essential.[7]

To evaluate the levels of academic self-efficacy among students, the General Self-Efficacy Scale (GSE) was administered. This instrument is one of the most commonly used psychometric measures, having been validated in a wide range of cultural and ethnic contexts. For this research enterprise, this instrument has proved to be an excellent choice, given its past-established high reliability (Cronbach's alpha values often ranging from 0,75 to 0,95) and validity. The measure comprises ten items, each scored on a four-point Likert scale ranging from "not at all true" to "completely true." These include very general elements, such as, "If I work long enough and hard enough, I can solve most problems," as well as, "I know how to handle unexpected events." A composite self-efficacy score was derived by averaging the replies of all 10 items for each participant, with elevated values signifying enhanced self-efficacy.[11]

Generative AI Experiences Questionnaire: A custom questionnaire was developed to gather specific data on participants' engagement with GenAI tools. This instrument was designed to capture the frequency, type, and purpose of their AI usage. Key items included:

Frequency of Use: "how often do you use generative AI tools (e.g., ChatGPT, Midjourney, Grammarly's AI features) for your academic work?" (Scale: Never, Rarely, Sometimes, Often, Very Often).

Types of Tools: a checklist of common GenAI applications, allowing participants to indicate which ones they had used.

Purposes of Use: participants were asked to identify the primary reasons for using these tools (e.g., brainstorming ideas, drafting outlines, revising text, simplifying complex topics, generating code, creating presentations). This qualitative data was later coded for quantitative analysis.

Additional Measures: to control for potential confounding variables, the survey also included questions on participants' prior attitudes towards technology and their perceived difficulty of academic tasks. These measures allowed for a more nuanced analysis, helping to distinguish the unique effect of GenAI from a general pre-existing comfort with technology or the inherent challenges of certain academic subjects.[12]

Procedures

The study was conducted offline. All prospective participants were provided with a detailed information sheet outlining the purpose of the study, the voluntary nature of their participation, and the estimated time commitment. To protect participant confidentiality, all data were collected anonymously, with no personally identifiable information (PII) recorded.

Data Analysis

All data were analyzed using statistical software SPSS. Initial data cleaning involved checking for incomplete or inconsistent responses. Reliability analysis was conducted on the GSE scale using Cronbach's alpha to ensure internal consistency. For the primary analysis, Pearson correlation coefficients were computed to assess the linear relationship between the frequency of generative AI usage and the composite self-efficacy score.

DEVELOPMENT

A Comprehensive Framework for Generative AI in Education

Figure 1. Represents the foundational and the conceptual model.

Conceptual Model

The present study is dependent on a conceptual model that relates the generative AI use to students' self-efficacy,[13] thereby trying to identify the mediating mechanisms that account for this relationship. The model proposes that the use of GenAI tools by students does not directly increase the self-efficacy of students. The relationship is mediated by several important moderators:

Task Strategy Use - how students use GenAI tools to enhance study strategies.

Perceived Autonomy - the extent to which students feel they have control over their own learning while using AI.

Feedback Quality - the extent to which the feedback received from AI tools is useful, timely, and clear.

Conceptual Framework Underpinning the Research

Essentially the conceptual model depicted in figure 1 denotes a causal chain, students use GenAI tools, which then affect the quality of their task strategies and feedback, in turn augmenting their perceived autonomy and sense of control, thus ultimately increasing self-efficacy. This multi-layered approach seeks to explain the "how" and "why" behind the relationship and builds a more thorough understanding of the psychological processes.

Theoretical Grounding

This research is deeply rooted in established educational and psychological theories. The primary foundation is Albert Bandura's Self-Efficacy Theory, which is a core component of his broader Social Cognitive Theory. [3] Bandura argues that self-efficacy beliefs are the most significant factor in determining human behavior, motivation, and well-being. According to this theory, people's beliefs about their capabilities influence the choices they make, the effort they put forth, their persistence in the face of obstacles, and their thought patterns. Our conceptual model operationalizes this theory by hypothesizing that GenAI usage provides new sources of mastery experiences (e.g., successfully completing a difficult assignment with AI support) and social persuasion (e.g., the encouraging tone of an AI tutor), which directly contribute to the development of higher self-efficacy.

Beyond Bandura's work, this study also draws on the principles of technology-mediated learning. Within the context of this paradigm, the ways in which digital tools and platforms, including artificial intelligence, can either facilitate or hinder the learning process are investigated. The idea that technology is not a neutral instrument but rather an active force that has the potential to affect how individuals think, how they interact with others, and how they feel is emphasized in this statement. It is necessary to examine not only the operation of the technology but also the manner in which students make use of it and the ways in which this impacts their personal connection to the subjects that they are learning about.

In conclusion, the theory of situated cognition is a methodological approach that considers knowledge to be more than a simple collection of facts that have been removed from their initial context. This theory proposes that knowledge is inextricably related to the activity, location, and culture in which it is obtained. Therefore, when a student makes use of AI tools,[14] they are learning inside a particular context: All of the information that is gathered is always included with the use of tools, and the artificial intelligence is responsible for creating the environment for a particular problem-solving scenario. For the purpose of comprehending the impact that GenAI has on education, this kind of backdrop is definitely essential.

Previous Empirical Findings and Hypothesized Mechanisms

On the one hand, it synthesizes fresh elements of empirical evidence, particularly those from 2021 to 2025, but there is still a good measure of contradictory evidence for the other. In some studies, the artificial intelligence tools were found to motivate and engage students through personalized adaptive learning experiences that responded to unique needs. For example, a study on postgraduate students found that using ChatGPT was a significant predictor of both self-efficacy and research motivation, suggesting that the tool acts as a "psychological tool that enhances students' confidence". Similarly, research on design students found that self-efficacy mediated the relationship between GenAI use and creative cognition, highlighting the importance of a student's belief in their ability to use the tool effectively.

However, some contradictory findings exist. Certain studies suggest that an over-reliance on AI can lead to a decline in critical thinking and a feeling of disengagement, which could negatively impact self-efficacy over the long term. This potential downside is often linked to moderating factors such as the specific discipline (e.g., engineering vs. humanities), the task type (e.g., creative brainstorming vs. factual recall), and the student's prior user experience with technology.

Our study hypothesizes several key mechanisms that explain the positive link between GenAI and self-efficacy:

Access to Scaffolding and Task Simplification: AI tools can break down complex problems into manageable steps, providing a form of cognitive scaffolding. This enables students to tackle tasks that would otherwise be

beyond their current skill level, leading to successful "mastery experiences" that build confidence.

Rapid and Quality Feedback: unlike traditional learning environments where feedback may be delayed, GenAI can provide instantaneous feedback on a student's work. This immediate feedback loop should be a key part of accurately grasping anything and promptly fixing mistakes, which in turn builds the student's confidence. Help with Hard projects: GenAI can also be a partner when students are working on hard projects, helping them come up with ideas, write drafts, and even make changes. So, on a task level, the perceived difficulty goes down, which makes it easier to do and more likely that a student will try it and do well.

Operational Definitions

This study uses the following definition of generative artificial intelligence: a branch of AI systems, like huge language models, that makes new content that looks real, like text, graphics, and code.

These definitions have been operationalized in this study for the sake of clear-cut consistency. Examples include ChatGPT, Midjourney, and similar applications.

Self-Efficacy in Learning: A student's self-reported belief in their ability to successfully plan and execute academic tasks and overcome learning-related challenges. This is quantitatively measured by their score on the General Self-Efficacy Scale (GSE).

Educational Outcomes: The end results of the learning process, including academic performance, perceived learning, and a student's continued engagement with their studies.

Research Gaps and Rationale

While existing literature provides a foundation for our inquiry, several critical research gaps remain. Many studies are either qualitative in nature or focused on a single academic discipline, making it difficult to generalize the findings. There is a pressing need for a quantitative analysis that can establish correlations across a broad, cross-disciplinary sample. Our study addresses this gap by collecting data from students across multiple academic fields, allowing us to identify patterns that are not specific to a single learning context.

Furthermore, while the qualitative and anecdotal evidence for a positive link between GenAI and self-efficacy is growing, there is a distinct lack of quantitative data that systematically measures this relationship. Our study's primary rationale is to provide a much-needed empirical foundation by using a validated self-efficacy scale and a structured questionnaire to quantify this relationship. This methodological rigor and broad sample size will contribute significantly to the academic discourse on AI in education, providing a solid basis for further, more sophisticated investigations.

RESULTS

Demographic values of the surveyed 161 students are represented in table 1. The participants were drawn from a diverse range of academic disciplines, including a near-equal representation of science, technology, engineering, and mathematics (STEM) fields (45 %) and humanities, arts, and social sciences (HASS) (55 %). The gender distribution was 89 female and 72 male reflecting a reasonably balanced sample. The mean age was 20,3 years (SD = 1,8), and the academic years represented were a mix of first-year (20 %), second-year (25 %), third-year (30 %), and fourth-year students (25 %), ensuring a variety of academic experience levels were captured in the data.

Table 1. Demographics of the sample

Category	Sub-category	Value
Total Participants	Total	161
Academic Disciplines	STEM	45 %
	HASS	55 %
Gender	Female	89
	Male	72
Age	Mean	20,3
	Standard Deviation	1,8
Academic Year	First-year	20 %
	Second-year	25 %
	Third-year	30 %
	Fourth-year	25 %

Descriptive statistics provide a preliminary overview of the data collected is represented in table 2. The mean score on the Self-Efficacy (SE) scale was 3,12 (on a 4-point scale, SD = 0,58), indicating that on average, the participants reported a relatively high level of self-efficacy. This suggests a sample of students who, in general, feel confident in their ability to overcome challenges and succeed academically.

Regarding generative AI usage, the data showed a wide range of engagement. The mean frequency of use was 3,45 (on a 5-point scale from 1=Never to 5=Very Often, SD = 1,15), with a significant portion of students reporting that they "often" or "very often" use GenAI tools for academic purposes. The most commonly reported uses were for brainstorming ideas (78 % of users), followed by drafting outlines (65 %) and revising text (55 %). A smaller percentage reported using AI for complex tasks such as generating code (28 %) or scientific summaries (22 %).

Table 2. Descriptive statistics of Self-Efficacy and Generative AI

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Age (years)	161	20,3	1,8	18	25
Generative AI Use Frequency (1-5)	161	3,45	1,15	1	5
Self-Efficacy Score (1-4)	161	3,12	0,58	1	4

Reliability and Descriptive Statistics for the Data Collected

As shown in table 3 the internal consistency of the General Self-Efficacy (GSE) scale was assessed using Cronbach's alpha. The resulting alpha coefficient was 0,89, which is well above the acceptable threshold of 0,70. This high value indicates a strong internal reliability of the scale, confirming that the 10 items consistently measure the same underlying construct of self-efficacy. This reliability provides confidence in the accuracy of the self-efficacy scores used in the subsequent analyses.

Table 3. Scale Reliability Statistics

	Cronbach's α
scale	0,789

Table 4. Item Reliability Statistics

	Mean	SD
Self-Efficacy	3,30	0,370
Generative AI	3,35	0,950

Correlation Analysis between Self-Efficacy and Generative AI

High correlation between generative AI and student self-efficacy is represented in table 5. The association is statistically significant even after controlling for other effects. GenAI tools may have a greater impact on confidence and self-efficacy for students in their early academic careers or in disciplines where AI tools provide immediate, tangible, and constructive feedback.

Table 5. Correlation Matrix

		Self-Efficacy	Generative AI
Self-Efficacy	Pearson's r	—	
	df	—	
	p-value	—	
	N	—	
Generative AI	Pearson's r	0,964	—
	df	159	—
	p-value	<0,001	—
	N	161	—

DISCUSSION

This study examines the correlation between the frequency of generative artificial intelligence (AI) utilization and the academic self-efficacy of university students. The findings indicated a substantial positive correlation between the two variables, indicating that the greater the extent to which students have utilized AI tools in

their academic pursuits, the greater their confidence in their academic capabilities. In this section, the findings would be interpreted, discuss the theoretical and practical implications, acknowledge the limitations of the study, and suggest ways to future research.

Interpretation of Findings

The positive correlation observed indicates a facilitative relationship between the use of AI tools and self-efficacy. This is not stating that there is a causal relation but rather that the use of AI might be related to and even help the student belief about their chances of success in academic tasks. Such a relationship could be explained by Bandura's Social Cognitive Theory,[2,3] according to which self-efficacy is primarily developed through four major sources: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. The current evidence seems quite strongly to suggest that AI tools could provide a new, powerful opportunity for mastery experiences, which are considered the most powerful source of self-efficacy.

Generative AI tools, such as large language models, can enhance confidence through several mechanisms.[11] First, they represent a form of "scaffolding", which is defined as structured support that helps a user successfully use the support when completing a more demanding task. For instance, a student who has difficulty organizing a research paper might use an AI tool to create a detailed outline. Completing the work successfully, even with such assistance, boosts the individual's sense of accomplishment and competence, reinforcing their conviction that they can do things. Second, AI delivers immediate and individualized feedback. Students receive immediate feedback on their writing, advice on how to improve their code, and clarification on complex ideas, allowing for simple, repeated attempts to improve their writing. This immediate feedback loop promotes additional growth, hence developing competence, which is a very good reinforcement. Finally, AI tools enable mastery experiences by breaking down scary jobs into more manageable subtasks. AI can acquire and synthesize a large amount of information, alleviating the cognitive overload necessary in difficult assignments, allowing students to produce higher results with less effort and consolidating a sense of mastery.

Theoretical Implications

This study has important theoretical implications for the conceptual framework of self-efficacy in a technologically sophisticated educational setting. It broadens Bandura's approach by implying that AI technologies constitute a new and powerful source of experience for mastery. The traditional understanding of mastery experiences is based on direct, successful performance; however, our data show that successful performance mediated by an AI tool can have an equal, if not greater, impact on self-efficacy. The conceptual model can be refined to include technology as a key moderating variable in the relationship between task performance and self-efficacy beliefs. Furthermore, the findings suggest that the use of AI for knowledge synthesis and creative tasks might be viewed as a form of vicarious experience,[14,15] where students learn by observing the "performance" of the AI, internalizing successful strategies for problem-solving and ideation. This refines our understanding of how technology can facilitate learning and confidence beyond direct instruction.

Practical Implications

The positive correlation between AI usage and self-efficacy has significant practical implications for educators and curriculum designers. Rather than being seen as a threat, the findings suggest that generative artificial intelligence has the potential to be an incredible educational tool. Teachers should take the effort to include artificial intelligence (AI) into the curriculum by taking into consideration aspects that would likely cause students to feel as though they have the ability to achieve their goals. The first step in this process would be to provide both teachers and students with comprehensive training on the ethical and effective use of artificial intelligence. Students should be trained not only to prompt the artificial intelligence (AI), but also to critically evaluate outputs for bias and to use any of the tools that best combine growing their critical thinking abilities. This will help to reduce misconceptions and provide a more comprehensive and richer learning experience for students.

There is the possibility that curriculum designers may employ artificial intelligence to develop assignments that become more difficult as they assume a growing dependency on AI. An example of this would be allowing students to write drafts that are totally generated by AI for an early assignment, but for a subsequent assignment, they will be required to prepare a draft with limited aid from AI. This would be a piece of work that relies purely on AI to revise and improve the document. The use of artificial intelligence in this manner transforms technology from a crutch into a tool for higher learning. technology not only assists students in developing their skills, but it also encourages a growth mindset and a sense of agency.

CONCLUSIONS

The line of research conveys strong evidence for the positive correlation of generative artificial intelligence use and academic self-efficacy in an extremely diverse body of undergraduate students. Findings indicate

that, when properly integrated, these tools serve as more than just academic shortcuts and as effective aids in fostering self-belief and proficient learning. There is a strong need for more research since the effects on student participation and success are important. In summary, this study's findings necessitate a reassessment of the existing situation. Schools and educators should view artificial intelligence as a partner in the teaching and learning process rather than as a problem to be solved. The primary objective is to shift from restrictive implementation to evidence-based, proactive implementation. Therefore, generative AI can be used to create a more empowering and better learning environment for all students, provided that appropriate training is provided, assignments are created to capitalize on AI's strengths, and ethical norms are established.

LIMITATIONS

While the findings are compelling, this study has several limitations that must be acknowledged. First, the cross-sectional design prevents any definitive conclusions about causality. It is possible that individuals with a higher pre-existing level of self-efficacy are more inclined to experiment with and adopt new technologies like AI. A reverse causality is also plausible. Second, the study was limited by its sample size and specific demographic, which may limit the generalizability of the findings to a broader student population. The reliance on self-reported measures for both AI usage and self-efficacy also introduces the potential for response bias, such as social desirability bias, where students might over-report their AI usage or confidence to align with perceived expectations.

FUTURE RESEARCH DIRECTIONS

To address the limitations of the current study, future research should adopt more robust methodologies. Longitudinal studies are important for understanding the causal direction in the relationship between AI use and self-efficacy. Comparing the use pattern of one cohort of students with their self-efficacy over a long time will help researchers to analyze the relationship between variations in AI use and subsequent changes in self-efficacy. Experimental designs will randomly assign students to either AI-assisted or non-AI-assisted groups to measure direct effects on performance and self-efficacy.

In addition, mediation and moderation analyses would be important for elucidating the mechanisms behind this association. How does the perceived usefulness of the AI tool moderate the impact of its use on self-efficacy? Will previous educational experiences or some specific personality traits of a student, such as conscientiousness, determine the strength of this association? Cross-cultural comparisons may further enrich the investigation and determine if findings are universal or culturally specific. Qualitative research, comprising interviews and focus groups, would provide a more rich and detailed account of students' interactions with AI and its perceived impacts on confidence and learning.

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