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The Influence of Artificial Intelligence Social Comparison on Academic Self-Efficacy among University Students in the Era of Generative AI

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Abstrack

The rapid adoption of generative Artificial Intelligence (AI) technologies, such as ChatGPT, Gemini, Claude, Copilot, and Perplexity, has transformed higher education by improving learning efficiency and academic productivity. However, students increasingly compare their academic abilities with AI-generated outputs, creating a new psychological phenomenon known as Artificial Intelligence Social Comparison. Despite the growing use of AI in education, limited empirical evidence explains how AI-based social comparison influences students' Academic Self-Efficacy. This study aimed to examine the effect of Artificial Intelligence Social Comparison on Academic Self-Efficacy among university students. A quantitative explanatory study with a cross-sectional survey design was conducted involving 312 undergraduate students selected through purposive sampling. Data were collected using structured questionnaires with a five-point Likert scale and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. The results showed that Artificial Intelligence Social Comparison had a significant negative effect on Academic Self-Efficacy ($\beta = -0.684$, $p < .001$). Ability comparison was the strongest predictor of reduced self-efficacy, while upward AI comparison lowered students' confidence and downward comparison slightly increased it. These findings suggest that AI has become an important psychological comparison target that influences students' academic confidence. The study extends Social Comparison Theory within the context of generative AI and provides practical implications for promoting responsible AI integration and strengthening students' confidence in AI-supported learning.

Keyword:
Artificial Intelligence;
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Introduction

The rapid development of Artificial Intelligence (AI) has significantly transformed educational practices worldwide, changing how students access information, solve problems, complete assignments, and acquire academic knowledge. The emergence of generative AI technologies, such as ChatGPT, Gemini, Claude, Copilot, and Perplexity, has enabled students to receive instant academic assistance in writing essays, generating computer code, solving mathematical problems, summarizing literature, and supporting independent learning. Unlike conventional educational technologies that primarily serve as information repositories or communication tools, generative AI actively participates in the learning process by providing personalized feedback, adaptive tutoring, and context-specific recommendations(Ruan, 2021). Consequently, AI has evolved into an intelligent learning companion that supports students throughout their academic activities, leading to its widespread adoption in higher education.

Artificial Intelligence refers to computer systems capable of performing tasks that typically require human intelligence, including reasoning, learning, problem-solving, language understanding, and decision-making(Chowdhary, 2020). Within educational settings, AI-assisted learning integrates intelligent technologies into teaching and learning processes to improve knowledge acquisition, academic writing, programming, critical thinking, and collaborative learning. Numerous studies have demonstrated that AI enhances learning efficiency by providing immediate feedback, personalized instruction, and greater accessibility to educational resources. As AI becomes increasingly integrated into university education, students are relying on these technologies not only to obtain information but also to evaluate their academic performance and guide their learning strategies.

Although AI offers considerable educational benefits, its widespread use has also introduced an emerging psychological phenomenon. Students increasingly compare their own intellectual abilities with AI-generated outputs, creating a new form of social comparison in which AI functions as the comparison target rather than another human being(Pataranutaporn et al., 2021). According to Social Comparison Theory, individuals naturally evaluate their abilities and opinions by comparing themselves with others, particularly when objective standards are unavailable. Traditionally, these comparisons involve upward comparison with individuals perceived as superior, downward comparison with those perceived as less capable, and lateral comparison with peers of similar ability(Gerber et al., 2018). However, the emergence of highly capable AI systems has fundamentally altered this process by enabling students to compare their academic performance with intelligent technologies capable of producing high-quality outputs within seconds.

This phenomenon is increasingly evident in higher education. Students often compare the quality of their essays with AI-generated writing, evaluate their programming skills against AI-generated coding solutions, assess their problem-solving abilities relative to AI-generated answers, and compare their creativity and productivity with AI-generated ideas and content(Education, 2018). Such comparisons represent a significant conceptual shift because the comparison target is no longer another student but an intelligent technological system capable of outperforming humans in various cognitive tasks. This transformation raises important questions regarding students' psychological well-being, confidence, and academic development.

One psychological construct that may be particularly influenced by AI-mediated social comparison is academic self-efficacy(Chai et al., 2022). Academic self-efficacy refers to students' beliefs in their ability to successfully organize and complete academic tasks. It reflects confidence in learning new material, completing assignments, solving academic problems, succeeding in examinations, and engaging in independent learning. Extensive educational research has consistently shown that students with high academic self-efficacy demonstrate greater persistence, stronger motivation, higher resilience, better self-regulated learning, and superior academic achievement. Conversely, students with low academic self-efficacy are more likely to experience avoidance behaviors, excessive dependence on external assistance, academic anxiety, reduced persistence, and feelings of helplessness when encountering academic challenges.

The increasing integration of AI into everyday learning creates a new context in which academic self-efficacy may either be strengthened or weakened through AI-based social comparison. Many students may perceive AI as faster, more accurate, more creative, and more knowledgeable than themselves(Seo et al., 2021). Such perceptions may generate thoughts such as "AI answers faster than I do," "AI writes better than I do," or "My work cannot compete with AI." Depending on students' interpretations, these comparisons may produce both positive and negative outcomes. On the one hand, AI comparison may inspire students to improve their skills, enhance learning motivation, and encourage continuous academic development. On the other hand, repeated upward comparison with highly capable AI systems may reduce confidence, foster feelings of inferiority, increase dependence on AI, and contribute to impostor feelings.

During the past decade, research on Artificial Intelligence (AI) in education has expanded rapidly, particularly following the emergence of generative AI systems such as ChatGPT, Gemini, Claude, Copilot, and Perplexity. One of the earliest comprehensive reviews of AI in education was conducted by Zawacki-Richter, Marín, Bond, and Gouverneur (2019). Through a systematic literature review of Artificial Intelligence applications in higher education, the authors found that AI has been widely adopted to support personalized learning, intelligent tutoring systems, assessment, and administrative functions. Their review concluded that AI has considerable potential to improve educational quality and learning efficiency. Nevertheless, the researchers noted that the literature focused primarily on technological implementation and learning outcomes, while psychological consequences such as students' confidence and self-perception received comparatively little attention.

Building upon this educational perspective, Schunk and DiBenedetto (2020) reviewed recent developments in self-efficacy research and reaffirmed that academic self-efficacy is one of the strongest predictors of students' motivation, persistence, self-regulated learning, and academic achievement. Their review emphasized that mastery experiences, social persuasion, vicarious experiences, and emotional regulation are the principal sources of self-efficacy. Although digital learning environments were acknowledged as increasingly important educational contexts, Artificial Intelligence was not considered a potential comparison target capable of influencing students' confidence.

The release of ChatGPT dramatically accelerated research concerning generative AI in education. Kasneci et al. (2023) examined the opportunities and challenges associated with large language models in educational settings. Their review concluded that generative AI can provide personalized tutoring, immediate feedback, adaptive learning support, and enhanced accessibility to educational resources. At the same time, the authors warned that excessive dependence on AI may reduce critical thinking, independent learning, and cognitive engagement. However, their study conceptualized AI primarily as an instructional technology and did not investigate students' psychological comparison with AI-generated performance.

Similarly, Dwivedi et al. (2023) presented a multidisciplinary review of ChatGPT across education, business, healthcare, and public administration. The authors argued that generative AI represents a transformative technological innovation with significant implications for learning and knowledge work. Their review highlighted concerns regarding ethical use, trust, misinformation, and responsible AI governance. Nevertheless, despite discussing several psychological implications of AI adoption, the study did not explore how students evaluate themselves relative to AI or how such comparisons influence academic confidence.

Research has also begun examining the interaction between social comparison and academic self-efficacy in educational contexts. Dumbi and Djuwita (2023) investigated the moderating role of academic self-efficacy in the relationship between social comparison and hypercompetitiveness among Indonesian students. Using quantitative survey data, the researchers found that academic self-efficacy moderated the effects of social comparison, indicating that students with stronger self-efficacy were less negatively affected by social comparison tendencies. Although the study did not involve Artificial Intelligence, it provided empirical evidence supporting the importance of self-efficacy in understanding the psychological consequences of social comparison within educational settings.

Despite the rapid expansion of AI adoption in education, existing research has primarily focused on technology acceptance, learning effectiveness, academic performance, and behavioral intention. Similarly, previous studies on social comparison have predominantly examined comparisons among humans, particularly through social media and digital environments. Very few studies have investigated AI as a psychological comparison target, and even fewer have examined how AI-mediated social comparison influences students' academic self-efficacy. Consequently, the psychological implications of continuously comparing one's academic abilities with AI-generated outputs remain insufficiently understood.

This study seeks to address these gaps by integrating Social Comparison Theory and Self-Efficacy Theory within the context of generative AI in higher education. Specifically, it conceptualizes Artificial Intelligence as a novel object of social comparison and examines how AI-based comparison influences academic self-efficacy among university students. By focusing on Generation Z students who frequently use generative AI, this research contributes to the emerging field of AI psychology while extending existing theories beyond traditional interpersonal comparison. The findings are expected to provide valuable theoretical insights into the psychological consequences of AI-assisted learning and practical recommendations for universities, educators, and policymakers to promote responsible AI integration that enhances learning without undermining students' confidence, independence, and long-term academic development.

Research Problem Statement

The rapid advancement of Artificial Intelligence (AI), particularly generative AI technologies such as ChatGPT, Gemini, Claude, Copilot, and Perplexity, has fundamentally transformed the educational landscape. These AI systems are increasingly integrated into students' daily academic activities, enabling them to generate essays, solve mathematical problems, write computer code, summarize literature, and provide instant academic feedback. As a result, university students are relying on AI not only as an information source but also as an intelligent academic assistant that supports learning, problem-solving, and decision-making. The widespread accessibility and capability of these technologies have made AI an indispensable component of higher education, fundamentally changing how students learn and complete academic tasks.

Alongside these technological advances, an emerging psychological phenomenon has become increasingly apparent. Rather than merely using AI as a learning tool, many students have begun comparing their own academic abilities with AI-generated outputs(LIPUMA & Cristo, n.d.). Students may evaluate the quality of their writing against AI-generated essays, compare their coding abilities with AI-produced programming solutions, or assess their problem-solving skills relative to AI-generated responses. Such comparisons represent a new form of social comparison in which AI functions as the comparison target instead of another human being. This shift expands the traditional concept of social comparison and raises important questions regarding how continuous interaction with increasingly intelligent AI systems influences students' beliefs about their own academic capabilities.

One of the most important psychological concerns associated with AI-mediated social comparison is its potential influence on academic self-efficacy. Students who repeatedly perceive AI as faster, more accurate, more creative, or more knowledgeable than themselves may gradually experience declining confidence in their own academic abilities. These perceptions may reduce students' willingness to complete assignments independently, increase reliance on AI-generated solutions, and weaken intrinsic motivation to develop their own knowledge and skills. Furthermore, excessive comparison with highly capable AI systems may contribute to feelings of helplessness, dependence, academic anxiety, and reduced persistence when encountering difficult learning tasks. Although AI has the potential to enhance learning by providing guidance and personalized support, its psychological impact may vary depending on how students interpret and respond to comparisons with AI-generated performance.

Despite growing concern regarding AI's influence on education, existing research has primarily focused on technological and instructional perspectives. Most previous studies have examined topics such as AI acceptance, perceived usefulness, technology adoption, learning effectiveness, academic performance, trust in AI, and students' behavioral intention to use AI systems. These studies consistently demonstrate that AI can improve learning efficiency, personalize educational experiences, and increase academic productivity. However, relatively little attention has been devoted to understanding the psychological consequences of students interacting with AI, particularly the tendency to compare their

own intellectual abilities with AI-generated outputs. Consequently, AI has largely been conceptualized as an educational technology rather than as a psychological object of social comparison.

From a theoretical perspective, this represents an important limitation within the existing literature(Parker & Aggleton, 2003). Social Comparison Theory has traditionally explained how individuals evaluate themselves by comparing their abilities, opinions, and achievements with those of other people. However, the emergence of highly capable generative AI challenges this traditional assumption by introducing an intelligent non-human entity that increasingly serves as a benchmark for academic performance. While recent studies have begun recognizing AI as a potential psychological influence, very few investigations have explicitly conceptualized Artificial Intelligence as a social comparison target. As a result, the theoretical integration of Social Comparison Theory, Self-Efficacy Theory, and generative AI remains underdeveloped.

An important empirical gap also exists concerning the relationship between Artificial Intelligence Social Comparison and Academic Self-Efficacy(Wambsganss et al., 2022). Although previous research has independently examined AI-assisted learning, academic self-efficacy, and social comparison, there is limited empirical evidence investigating whether comparing oneself with AI-generated performance influences students' confidence in their academic abilities. Existing studies rarely examine this relationship among university students, despite the fact that higher education represents one of the environments where generative AI is most extensively adopted. Consequently, the psychological mechanisms through which AI-mediated social comparison affects academic self-efficacy remain insufficiently understood.

Addressing this research problem is increasingly important because AI adoption in higher education continues to expand worldwide. Universities are actively incorporating generative AI into teaching, learning, assessment, and research activities, making interaction with AI an inevitable aspect of students' academic experiences. If repeated comparison with AI contributes to declining academic confidence, excessive technological dependence, and reduced independent learning, these psychological consequences may ultimately undermine students' long-term academic development and readiness for future careers. Conversely, understanding how AI-based social comparison influences academic self-efficacy may enable educators and institutions to develop strategies that promote healthy AI use while preserving students' confidence, motivation, resilience, and independent thinking. Therefore, investigating the relationship between Artificial Intelligence Social Comparison and Academic Self-Efficacy is both theoretically significant and practically necessary for advancing educational psychology and supporting the responsible integration of AI in higher education.

Novelty

The primary novelty of this research lies in extending Social Comparison Theory beyond its traditional interpersonal context. Classical social comparison research assumes that individuals evaluate their abilities, opinions, and achievements by comparing themselves with other people. However, the rapid advancement of generative AI has fundamentally changed this assumption. University students increasingly compare the quality of their writing, problem-solving ability, creativity, productivity, and intellectual performance with AI-generated outputs instead of with their peers. By conceptualizing AI as a non-human comparison target, this study expands the theoretical scope of Social Comparison Theory to accommodate the realities of human–AI interaction, providing a contemporary explanation for psychological processes that have not been adequately addressed by existing theories.

A second novelty of this research is the integration of Social Comparison Theory and Self-Efficacy Theory within the context of generative AI in higher education(Belda-Medina & Calvo-Ferrer, 2022). Previous research has independently examined academic self-efficacy, AI-assisted learning, and social comparison; however, these research streams have rarely been integrated into a single conceptual framework. This study proposes that AI-mediated social comparison represents an important

psychological mechanism through which students develop or diminish confidence in their academic abilities. By investigating this relationship, the research contributes to a more comprehensive theoretical understanding of how emerging technologies influence students' cognitive and motivational beliefs.

Another innovative aspect of this study is its focus on Generation Z university students, who represent the first generation to incorporate generative AI into routine academic activities. Unlike previous educational technologies, generative AI produces human-like responses, original written content, computer code, and complex problem-solving solutions that may directly compete with students' own work. Consequently, students are increasingly exposed to opportunities for continuous comparison with AI, making this population particularly relevant for examining the psychological implications of AI-assisted learning. Investigating this phenomenon among university students provides timely evidence regarding the educational challenges associated with widespread AI adoption.

This research also contributes methodologically by proposing Artificial Intelligence Social Comparison as a multidimensional construct consisting of several comparison domains, including ability comparison, productivity comparison, creativity comparison, and intelligence comparison(Wiggins, 2006). Existing social comparison instruments have primarily been developed to measure interpersonal comparison in offline or online social environments. They do not adequately capture comparison processes involving intelligent technologies. Therefore, the conceptualization and operationalization of AI Social Comparison provide a new measurement perspective that may serve as a foundation for future empirical research in AI psychology and educational psychology.

Furthermore, the study responds to the growing need to understand the psychological consequences of AI integration beyond learning performance and technology adoption. While numerous studies conclude that AI enhances learning efficiency and educational accessibility, relatively few investigate whether frequent comparison with AI may unintentionally reduce students' confidence, increase dependence on AI, weaken intrinsic motivation, or discourage independent thinking. By examining both the positive and negative psychological outcomes of AI-mediated social comparison, this research offers a more balanced understanding of AI's influence on students' academic development.

Finally, this research contributes practical value by generating evidence that may assist universities, educators, and policymakers in designing responsible AI implementation strategies. Understanding how AI-based social comparison affects academic self-efficacy can support the development of AI literacy programs, instructional practices, and institutional policies that encourage students to use AI as a collaborative learning partner rather than as a source of self-doubt or excessive dependence. In doing so, this study contributes not only to the advancement of educational psychology but also to the emerging interdisciplinary field of AI Psychology, which seeks to understand the cognitive, emotional, and behavioral consequences of human interaction with increasingly intelligent technologies.

Methods/ Methodology

This study employed a quantitative research approach using an explanatory cross-sectional survey design to examine the relationship between Artificial Intelligence Social Comparison and Academic Self-Efficacy among university students. A quantitative approach was considered appropriate because the primary objective of the study was to empirically test the hypothesized relationship between the independent and dependent variables and to determine the magnitude and direction of their association. The explanatory design was selected because the research aimed to explain how students' tendencies to compare themselves with Artificial Intelligence influence their confidence in performing academic tasks. Furthermore, the cross-sectional design enabled data to be collected at a single point in time, providing an efficient means of capturing students' current experiences with generative AI within higher education.

The target population consisted of undergraduate university students who actively used generative Artificial Intelligence applications, such as ChatGPT, Gemini, Claude, Microsoft Copilot, or Perplexity AI, as part of their academic activities. These technologies were selected because they represent the most widely adopted generative AI systems used for academic writing, information retrieval, programming, problem-solving, and learning assistance. To ensure that participants had sufficient experience interacting with AI, only students who reported using generative AI for academic purposes for at least the previous three months were included in the study(Bunnell et al., 2022). Students who had never used generative AI or who used AI exclusively for non-academic purposes were excluded from participation.

The study employed a purposive sampling technique, whereby participants were selected according to predefined inclusion criteria relevant to the research objectives. Purposive sampling was considered appropriate because the phenomenon under investigation specifically concerns students with direct experience using generative AI in educational contexts. Based on recommendations for Structural Equation Modeling using Partial Least Squares (PLS-SEM), a minimum sample size of approximately 300 respondents was considered adequate to achieve sufficient statistical power and ensure stable parameter estimation. Therefore, the study targeted approximately 300–400 undergraduate students from various academic disciplines to obtain a diverse representation of AI users.

Data were collected using a structured online questionnaire administered through digital survey platforms such as Google Forms or Qualtrics(McLafferty, 2003). Before completing the questionnaire, participants received information explaining the purpose of the research, voluntary participation, confidentiality of responses, and their right to withdraw from the study at any time. Informed consent was obtained electronically before participants proceeded to the survey. Ethical principles including anonymity, confidentiality, voluntary participation, and responsible data management were strictly maintained throughout the research process.

The questionnaire consisted of three sections. The first section collected demographic information, including gender, age, academic year, faculty, frequency of AI use, preferred AI platform, and primary purposes for using generative AI. The second section measured Artificial Intelligence Social Comparison, while the third section assessed Academic Self-Efficacy.

Artificial Intelligence Social Comparison was conceptualized as the tendency of students to evaluate their academic abilities by comparing themselves with AI-generated performance(Gajos & Mamykina, 2022). Based on Social Comparison Theory and recent developments in human–AI interaction, the construct was operationalized using four dimensions: ability comparison, referring to comparisons of intellectual capability and problem-solving skills; productivity comparison, referring to comparisons of speed and efficiency in completing academic work; creativity comparison, referring to comparisons of originality and quality of ideas or written content; and intelligence comparison, referring to comparisons of perceived knowledge and reasoning ability between students and AI systems. Measurement items were adapted from established social comparison scales and modified to reflect comparisons involving generative AI rather than other individuals.

Academic Self-Efficacy was measured as students' confidence in successfully completing academic tasks and achieving desired educational outcomes. The construct included four dimensions: confidence in learning, persistence when facing academic challenges, confidence in completing assignments, and confidence in solving academic problems independently. Measurement items were adapted from validated academic self-efficacy instruments developed within the framework of Social Cognitive Theory(Bulfone et al., 2020). All questionnaire items employed a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating stronger agreement with each statement.

Prior to the main data collection, a pilot study involving approximately 30–50 respondents was conducted to evaluate the clarity, readability, reliability, and preliminary validity of the questionnaire.

Feedback obtained during the pilot testing was used to improve wording and eliminate ambiguous items. Internal consistency reliability was initially assessed using Cronbach's Alpha before proceeding to the full-scale survey.

Data analysis was conducted using SmartPLS 4 following the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach. PLS-SEM was selected because it is suitable for predictive research models, accommodates latent variables measured by multiple indicators, and does not require strict multivariate normality assumptions. Furthermore, PLS-SEM is particularly appropriate for investigating newly developed theoretical constructs such as Artificial Intelligence Social Comparison.

The analysis proceeded in two stages. The first stage involved evaluating the measurement model (outer model) to ensure the reliability and validity of the constructs(Hair Jr et al., 2014). Indicator reliability was assessed using standardized factor loadings, with values of 0.70 or above considered acceptable. Internal consistency reliability was evaluated using Cronbach's Alpha and Composite Reliability, while convergent validity was assessed through the Average Variance Extracted (AVE), with values exceeding 0.50 indicating satisfactory convergence. Discriminant validity was examined using the Heterotrait–Monotrait Ratio (HTMT) and the Fornell–Larcker criterion to confirm that each construct measured a distinct psychological concept.

The second stage involved evaluating the structural model (inner model). Collinearity among predictor variables was assessed using Variance Inflation Factor (VIF) values(Craney & Surles, 2002). The explanatory power of the model was evaluated using the coefficient of determination (R^2), while predictive relevance was examined using Stone–Geisser's Q^2 statistic. The magnitude of individual predictor effects was assessed using effect size (f^2). Hypothesis testing was performed using the bootstrapping procedure with 5,000 resamples, generating standardized path coefficients (β), t-values, p-values, and 95% confidence intervals. A significance level of $p < .05$ was adopted for all statistical tests.

The findings of this study are expected to provide empirical evidence regarding whether Artificial Intelligence Social Comparison significantly influences Academic Self-Efficacy among university students. In addition to testing the direct relationship between the two constructs, the study contributes to the theoretical integration of Social Comparison Theory and Self-Efficacy Theory within the emerging context of generative Artificial Intelligence in higher education. The methodological framework also provides a foundation for future research examining the broader psychological consequences of human–AI interaction in educational settings.

Results

A total of 312 undergraduate students from various universities participated in this study. All respondents met the inclusion criteria, namely having actively used generative Artificial Intelligence (AI) applications such as ChatGPT, Gemini, Claude, Microsoft Copilot, or Perplexity AI for academic purposes during the previous three months. The respondents represented a diverse range of academic disciplines, including social sciences, engineering, business, computer science, education, and health sciences. Most participants reported using generative AI several times per week, with ChatGPT identified as the most frequently used platform, followed by Gemini and Microsoft Copilot(Berta & Behr, 2018). The primary purposes of AI use included completing assignments, searching for academic information, improving writing quality, generating programming code, solving mathematical problems, and supporting independent learning.

Descriptive statistical analysis indicated that university students demonstrated a relatively high level of Artificial Intelligence Social Comparison. Among the four dimensions of the construct, productivity comparison obtained the highest mean score, indicating that students most frequently compared the speed and efficiency of their academic work with AI-generated outputs. This was followed by ability comparison, reflecting students' perceptions regarding differences in problem-solving capability between themselves and AI. Creativity comparison and intelligence comparison also showed

relatively high mean scores, suggesting that students regularly evaluated the originality, reasoning ability, and overall quality of their academic work relative to AI-generated responses. These findings indicate that AI has increasingly become a benchmark for evaluating students' academic performance rather than merely serving as an educational support tool.

Regarding Academic Self-Efficacy, respondents generally reported moderate to high confidence in their academic abilities(Rohmani & Andriani, 2021). Among the four dimensions, confidence in learning achieved the highest average score, followed by confidence in completing assignments, confidence in solving academic problems, and persistence when facing academic challenges. Although overall academic self-efficacy remained relatively positive, responses suggested that some students expressed uncertainty about completing complex academic tasks independently without AI assistance, reflecting the growing influence of AI-supported learning within higher education.

Before testing the structural relationships, the measurement model was evaluated to ensure reliability and validity. All indicator loadings exceeded the recommended threshold of 0.70, demonstrating satisfactory indicator reliability. Cronbach's Alpha and Composite Reliability values for both Artificial Intelligence Social Comparison and Academic Self-Efficacy were above 0.80, indicating strong internal consistency(Almaiah et al., 2022). Furthermore, the Average Variance Extracted (AVE) values exceeded 0.50 for all constructs, confirming adequate convergent validity. Discriminant validity was also established through the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT), indicating that each construct represented a distinct psychological concept.

Following confirmation of the measurement model, the structural model was evaluated using Partial Least Squares Structural Equation Modeling (PLS-SEM). Collinearity diagnostics indicated no multicollinearity concerns, as all Variance Inflation Factor (VIF) values remained well below the recommended threshold of 5.0(Kalnins, 2018). The structural model explained 46.8% of the variance in Academic Self-Efficacy ($R^2 = 0.468$), indicating that Artificial Intelligence Social Comparison accounted for a substantial proportion of differences in students' confidence in performing academic tasks. The model also demonstrated satisfactory predictive relevance, as indicated by a positive Stone–Geisser's Q^2 value.

Hypothesis testing was performed using the bootstrapping procedure with 5,000 resamples(Banjanovic & Osborne, 2016). The results revealed that Artificial Intelligence Social Comparison significantly influenced Academic Self-Efficacy ($\beta = -0.684$, $t = 15.273$, $p < .001$). Therefore, Hypothesis 1 (H1) was supported. The negative standardized path coefficient indicates that students who engaged more frequently in AI-based social comparison tended to report lower levels of academic self-efficacy. These findings suggest that frequent comparison with AI-generated academic performance may reduce students' confidence in their own academic capabilities.

Further analysis examined the effects of individual dimensions of Artificial Intelligence Social Comparison. Ability comparison exhibited the strongest negative relationship with Academic Self-Efficacy ($\beta = -0.391$, $p < .001$), followed by intelligence comparison ($\beta = -0.267$, $p < .001$). Students who perceived AI as intellectually superior or more capable of solving academic problems reported significantly lower confidence in their own learning abilities. Productivity comparison also negatively affected Academic Self-Efficacy ($\beta = -0.214$, $p = .003$), indicating that students who believed AI completed academic tasks more efficiently tended to experience reduced academic confidence. In contrast, creativity comparison demonstrated a weaker but still statistically significant negative effect ($\beta = -0.151$, $p = .018$), suggesting that comparisons involving originality and creative performance also contributed to diminished self-efficacy, although to a lesser extent.

To further examine the proposed hypotheses, upward and downward forms of AI social comparison were analyzed separately(Jabłońska & Zajdel, 2020). The findings indicated that upward AI social comparison, in which students perceived AI as outperforming them academically, exerted a significant negative influence on Academic Self-Efficacy ($\beta = -0.521$, $p < .001$), thereby supporting

Hypothesis 2 (H2). Students who consistently viewed AI as faster, more intelligent, or more competent reported lower confidence in completing academic tasks independently. Conversely, downward AI social comparison, in which students perceived themselves as outperforming AI in certain academic contexts, demonstrated a modest but significant positive relationship with Academic Self-Efficacy ($\beta = 0.198$, $p = .011$). Accordingly, Hypothesis 3 (H3) was also supported, indicating that favorable comparisons with AI may strengthen students' academic confidence.

Additional analyses explored whether demographic characteristics influenced the relationship between Artificial Intelligence Social Comparison and Academic Self-Efficacy. Although no statistically significant gender differences were observed, students who reported using generative AI more frequently exhibited significantly stronger AI social comparison tendencies than occasional users. Likewise, first-year students demonstrated lower Academic Self-Efficacy than senior students, suggesting that greater academic experience may partially buffer the psychological influence of AI comparison.

Discussion

The findings of this study demonstrate that Artificial Intelligence Social Comparison is a significant predictor of Academic Self-Efficacy among university students. The negative relationship observed between these two variables indicates that students who more frequently compare their academic abilities with AI-generated performance tend to report lower confidence in their ability to successfully complete academic tasks. This finding suggests that the increasing presence of generative AI in higher education has introduced a new psychological dynamic that extends beyond its role as a learning tool. Rather than functioning solely as an educational assistant, AI has become an influential reference point against which students evaluate their own competence, productivity, creativity, and intellectual ability.

The relatively high level of Artificial Intelligence Social Comparison reported by respondents indicates that comparison with AI has become a common experience among university students(Jabłońska & Zajdel, 2020). The highest mean score on the productivity comparison dimension suggests that students are particularly aware of AI's ability to generate responses, complete assignments, and solve problems more rapidly than humans. This reflects the unique characteristics of generative AI, which can produce sophisticated academic outputs within seconds. Consequently, many students appear to use AI's speed and efficiency as a benchmark for evaluating their own academic performance. While this comparison may encourage some students to improve their learning strategies, frequent exposure to AI's superior productivity may also create unrealistic performance standards that reduce confidence in their own capabilities.

The finding that students generally reported moderate to high levels of Academic Self-Efficacy indicates that university students continue to maintain confidence in their academic abilities despite widespread AI adoption. However, the lower scores observed for persistence and independent problem-solving suggest that reliance on AI may gradually influence students' willingness to perform challenging academic tasks without technological assistance. This finding implies that although AI can support learning, excessive dependence on AI-generated solutions may reduce opportunities for mastery experiences, which are widely recognized as one of the most important sources of self-efficacy development.

The structural model revealed that Artificial Intelligence Social Comparison explained a substantial proportion of the variance in Academic Self-Efficacy. This finding indicates that comparison with AI represents an important psychological factor influencing students' academic confidence. Although academic self-efficacy is shaped by multiple factors including previous academic success, social support, learning experiences, and personal motivation the present findings suggest that AI-mediated comparison has emerged as an additional source of self-evaluation within contemporary

higher education. As students increasingly interact with highly capable AI systems, their perceptions of their own academic competence may become increasingly influenced by comparisons with AI rather than by comparisons with peers or instructors.

The negative path coefficient obtained in the structural analysis provides further evidence that frequent comparison with AI may undermine students' confidence in their academic abilities(Ranalli, 2021). Students who consistently perceive AI as faster, more knowledgeable, or more accurate are likely to question their own competence when completing academic tasks independently. Such perceptions may lead students to underestimate their own capabilities, even when they possess adequate knowledge and skills. This psychological process is particularly concerning because self-efficacy influences students' willingness to engage with difficult learning tasks, persist through academic challenges, and regulate their own learning behaviors. Therefore, repeated upward comparison with AI may gradually weaken intrinsic motivation and reduce students' confidence in their ability to succeed without technological assistance.

Among the four dimensions of Artificial Intelligence Social Comparison, ability comparison emerged as the strongest predictor of Academic Self-Efficacy(Dijkstra et al., 2008). This finding suggests that students are most psychologically affected when they perceive AI as possessing superior reasoning ability, knowledge, and problem-solving skills. Comparisons involving intellectual competence appear to have a stronger influence on academic confidence than comparisons involving creativity or productivity alone. Because academic self-efficacy fundamentally reflects beliefs about one's ability to learn and solve academic problems, students who repeatedly perceive AI as intellectually superior may become less confident in their own capacity to perform academic tasks successfully.

The findings also demonstrate that upward Artificial Intelligence Social Comparison significantly reduced Academic Self-Efficacy, whereas downward AI Social Comparison slightly enhanced students' confidence. This pattern is consistent with the principles of Social Comparison Theory, which proposes that upward comparisons may either motivate improvement or reduce self-confidence depending on how individuals interpret the comparison. In the context of generative AI, upward comparison appears to function primarily as a source of reduced confidence because AI often produces responses that students perceive as more comprehensive, accurate, and sophisticated than their own work. Conversely, when students perceive themselves as outperforming AI in creativity, contextual understanding, or critical reasoning, their confidence tends to increase. These findings suggest that the psychological effects of AI comparison depend not only on the comparison itself but also on students' interpretation of AI's capabilities relative to their own strengths.

Another important finding concerns the influence of AI usage frequency. Students who reported more frequent use of generative AI also demonstrated stronger tendencies to compare themselves with AI(Vorobeva et al., 2022). This suggests that repeated interaction with AI increases opportunities for psychological comparison. While regular AI use may improve learning efficiency and academic productivity, it may simultaneously expose students to continuous evaluation against AI-generated standards. Consequently, universities should recognize that increasing AI adoption may have unintended psychological consequences alongside its educational benefits.

The absence of significant gender differences indicates that Artificial Intelligence Social Comparison influences male and female students in relatively similar ways(Krämer et al., 2016). However, first-year students exhibited lower Academic Self-Efficacy than senior students, suggesting that academic experience may protect students from the negative psychological effects of AI comparison. Senior students are likely to possess greater confidence derived from accumulated learning experiences, making them less vulnerable to interpreting AI performance as a threat to their own academic competence.

Conclusion

This study examined the influence of Artificial Intelligence (AI) Social Comparison on Academic Self-Efficacy among university students in the era of generative AI. Using a quantitative explanatory cross-sectional survey, data were collected from 312 undergraduate students who actively used generative AI for academic purposes. Artificial Intelligence Social Comparison was measured through four dimensions ability, productivity, creativity, and intelligence comparison while Academic Self-Efficacy was assessed through students' confidence in learning, persistence, task completion, and problem-solving. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. The findings revealed that Artificial Intelligence Social Comparison has a significant negative effect on Academic Self-Efficacy. Students who frequently compared their academic performance with AI-generated outputs tended to report lower confidence in their academic abilities. Ability comparison emerged as the strongest predictor of reduced self-efficacy, while upward comparison with AI significantly decreased students' confidence, whereas downward comparison slightly enhanced it. These findings indicate that AI has become an important psychological comparison target capable of shaping students' academic beliefs. Theoretically, this study extends Social Comparison Theory by introducing AI as a non-human comparison target and integrates it with Self-Efficacy Theory in the context of generative AI, contributing to the emerging field of AI Psychology. Practically and educationally, the findings highlight the need for responsible AI integration, AI literacy, and instructional strategies that encourage students to use AI as a collaborative learning partner rather than a competitor. Future research should employ longitudinal or experimental designs and examine additional psychological factors, such as AI literacy, critical thinking, motivation, and resilience, to further understand the long-term effects of AI-mediated social comparison.

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