Conceptualizing the Antecedents of Teacher Innovative Behavior in the Digital Age

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ABSTRACT

Based on Social Cognitive Theory, this conceptual paper proposes a comprehensive framework to unpack the psychological mechanisms and boundary conditions that translate human-AI collaboration into teacher innovative behavior. Specifically, the model identifies AI self-efficacy as the central cognitive mediator that bridges teachers' collaborative experiences with AI to their proactive innovations. Furthermore, the framework positions organizational innovative climate as a crucial contextual moderator, highlighting that a supportive, resource-rich school environment is essential to amplify the positive effects of teachers' AI self-efficacy on innovative actions. Ultimately, this study provides educational policymakers and administrators with a theoretical roadmap to mitigate technology-induced burnout by actively cultivating teachers' psychological capital and fostering an innovation-oriented school culture.

Keywords: Human-AI Collaboration, Teacher Innovative Behavior, AI Self-Efficacy, Innovative Climate

INTRODUCTION

Teacher Innovative Behavior (TIB) refers to educators' self-initiated generation, adoption, and implementation of novel teaching methods, technologies, or pedagogical strategies to enhance student engagement and learning outcomes (Kuril et al., 2023; Thurlings et al., 2015). TIB optimizes learning environments, leading to higher student engagement and intrinsic motivation (Liu et al., 2024). Higher levels of TIB predict higher intrinsic goal orientation in students (Maun et al., 2023) and enhanced learning satisfaction (Suyudi et al., 2022). Meanwhile, TIB is also vital for the sustainability and survival of schools in a competitive, rapidly changing global educational market (Lambriex-Schmitz et al., 2020; Thurlings et al., 2015). In the digital and artificial intelligence (AI) era, the educational ecosystem is experiencing a profound paradigm shift from traditional, teacher-centered instructional models to a Human-AI collaboration paradigm (OECD, 2026).

Generative AI and advanced educational technologies have transitioned from tools to foundational structural components of the learning environment. These intelligent systems offer opportunities for personalizing student learning and reducing the administrative burden on teachers (Gupta, 2024; Nemani, 2025). However, they also encounter cognitive loads, task complexity, and tech-learning anxiety when collaborating with AI (Gao et al., 2026; Wu et al., 2024). For instance, recent empirical studies highlight that the introduction of AI into the educational workplace often triggers a double-edged sword effect (Yin et al., 2025). On the one hand, high-quality human-AI collaboration can function as a potent job resource that empowers employees and enhances creative self-efficacy (Sun et al., 2026). On the other hand, it can also act as a demanding stressor that provokes professional insecurity and burnout, thereby inhibiting an educator's willingness to innovate (Jooss et al., 2025). Therefore, it is necessary to understand how to effectively facilitate the translation of human-AI collaboration into sustained TIB without subjecting teachers to cognitive exhaustion.

Further, existing literature presents contradictory findings regarding the relationship between human-AI collaboration and employee innovative behavior. While some research indicates that AI collaboration stimulates

creativity (Tan, 2023; Sethi & Jain, 2024), other studies suggest that over-reliance on AI can induce technological anxiety, diminish independent critical thinking, and stifle creative output (Gao et al., 2026; Nemani, 2025). Through the lens of Social Cognitive Theory (SCT, Bandura, 1986), there is a critical need to unpack the psychological mechanism that mediates this relationship. Few studies have positioned AI self-efficacy as the central psychological bridge to link human-AI collaboration and teacher innovative behavior.

Although individual psychological capital is vital, SCT emphasizes that human functioning is the product of a triadic reciprocal interaction between personal factors, behaviors, and the external environment (Bandura, 2001). In the current literature, scholars have treated innovative school climate as a direct antecedent to innovative behavior (Mokhlis & Abdullah, 2025). This approach overlooks its critical function as a boundary condition. It remains underexplored how organizational innovation climate provides the environmental support to moderate the translation of teachers' AI self-efficacy into innovative behavior.

In the present study, we propose a conceptual framework to unlock the internal psychological mechanisms driving TIB and suggested the external organizational boundary conditions in this process. We contribute to the literature in two ways. First, we elucidate the mechanism from human-AI collaboration to teacher innovative behavior by identifying AI self-efficacy as the central cognitive factor. Second, we propose the moderation effect of innovative climate, demonstrating how a supportive external environment strengthens the relationship between internal efficacy beliefs and outward innovative actions.

Theoretical Framework

The conceptual framework is based on SCT, which emphasizes the dynamic interplay between personal factors, environmental influences, and behavioral outcomes (Bandura, 1986). According to SCT, individuals' cognitive processes, such as self-efficacy beliefs, play a pivotal role in motivating and regulating their behaviors. In the context of human-AI collaboration in educational settings, teachers' AI self-efficacy, defined as their confidence in their ability to effectively utilize AI tools to enhance teaching practices and achieve educational goals, is posited to serve as a key personal cognitive mediator. This is because teachers with high AI self-efficacy are more likely to perceive AI as a valuable and manageable resource, thereby being more inclined to engage in innovative behaviors when integrating AI into their teaching (Kong et al., 2025). Furthermore, the theoretical framework also incorporates the concept of innovative climate, which refers to the shared perceptions within an organization regarding the extent to which innovation is valued, supported, and rewarded (Newman et al., 2020). Drawing on SCT's emphasis on environmental factors, we argue that the innovative climate within a school or educational institution can act as a contextual moderator. Specifically, a positive innovative climate, characterized by encouragement for risk-taking, provision of resources for innovation, and recognition of creative efforts, can amplify the positive impact of AI self-efficacy on teacher innovative behavior (Al-Mahdy & Elwakil, 2026). Conversely, a less supportive or restrictive climate may dampen the translation of high AI self-efficacy into actual innovative actions (Ding et al., 2025). Thus, the theoretical framework integrates both individual cognitive (AI self-efficacy) and organizational contextual (innovative climate) factors to comprehensively explain the pathway from human-AI collaboration to teacher innovative behavior.

Human-AI collaboration and Teacher Innovative Behavior

In the field of education, human-AI collaboration reflects the cooperation of artificial intelligence and teaching philosophies (Lee et al., 2024). AI helps teachers to concentrate on crafting adaptive and individualized learning experiences rather than labor-intensive administrative duties (Wang et al., 2021). It can also provide holistic support, helping students navigate peer interactions, manage academic anxiety, and develop stronger emotional self-regulation (Palmquist et al., 2025; Sethi & Jain, 2024). The SCT posits that human behavior is the result of triadic reciprocal interactions among environmental, internal cognitive states, and actions. Human-AI collaboration serves as an integration of personal and environmental inputs. When teachers actively collaborate with AI, the generated positive feedback and novel insights promote the traditional teaching modes to transform into more dynamic, personalized, and learner-centered processes (Tan, 2023; Mousa, 2025). This also encourages them to experiment with novel pedagogical designs and proactive instructional interventions (Chu & Ashraf, 2025; Sajja et al., 2025). Thus, we propose that:

Proposition 1: Human-AI collaboration positively predicts teacher innovative behavior.

The Mediating Role of AI Self-Efficacy

AI self-efficacy represents an educator's specific cognitive belief and confidence in their capability to effectively manage, utilize, and innovate using artificial intelligence technologies (Al-Mahdy & Elwakil, 2026). According to SCT, when teachers interact with AI to navigate complex tasks and receive adaptive instructional insights, the accumulated mastery experiences help to shape AI self-efficacy, which results in innovative actions. Previous studies have supported the role of self-efficacy to promote teacher innovative behaviors. For instance, teachers with high teaching self-efficacy are more willing to experiment with new teaching methods and strategies in the classroom, as they believe in their ability to handle potential challenges and achieve positive teaching outcomes (Huang et al., 2026). When teachers possess a strong sense of AI self-efficacy, they are more likely to actively explore the various possibilities offered by AI technologies, such as using AI-powered educational platforms to personalize learning for students, or develop innovative AI-based teaching materials (Al-Mahdy & Elwakil, 2026). Conversely, teachers with low AI self-efficacy may feel overwhelmed by the complexity of AI tools, doubt their own ability to integrate AI into teaching practice, and thus be reluctant to take risks or try innovative approaches involving AI (Kong et al., 2025). Therefore, AI self-efficacy acts as an important bridge between teachers' experiences with AI and their subsequent innovative behaviors. We propose that:

Proposition 2: AI self-efficacy mediates the relationship between human-AI collaboration and teacher innovative behavior.

The moderating role of innovative climate

While AI self-efficacy provides the internal psychological capability to innovate, the realization of this potential is contingent upon the external working environment. Thus, this framework puts innovative climate as a critical moderating variable. Organizational innovative climate is defined as the shared perceptions among employees regarding the extent to which team processes encourage and enable innovation (Newman et al., 2020). In a high innovative climate, organizational norms encourage experimentation and provide resources, such as AI tools and training, thereby facilitating the translation of self-efficacy into innovative behavior (Kundu, A., & Roy, 2023; Huang et al., 2026). In a workplace that promotes innovation, such as by offering workshops on AI applications in education, or providing incentives for innovative practices, teachers with high AI self-efficacy will have more opportunities and motivation to apply their AI capabilities, and then enhance the positive impact of AI self-efficacy on teacher innovative behavior.

Conversely, in a low innovative climate, even teachers with high AI self-efficacy may face barriers such as lack of support, or resistance to change, which could hinder them from translating their confidence in AI into actual innovative teaching practices (Elsayed et al., 2023; Usmanova et al., 2023). If a school does not provide adequate training on AI tools or does not reward teachers for trying new AI-integrated teaching methods, teachers who feel confident using AI might become discouraged and less likely to engage in innovative behaviors. Therefore, we propose that:

Proposition 3: Organizational innovative climate moderates the relationship between AI self-efficacy and teacher innovative behavior, such that the positive relationship is stronger when the organizational innovative climate is high rather than low.

Conceptual Framework

Based on the social cognitive theory (Bandura, 1986), this study proposes a conceptual framework. As shown in Figure 1, human-AI collaboration is regarded as the independent variable and teacher innovative behavior is considered as the dependent variable of this study. Further, we put the AI-self-efficacy as the mediator to explain the mechanism between human-AI collaboration and teacher innovative behavior. In addition, innovative climate is introduced as the moderator to link AI-self-efficacy and teacher innovative behavior.

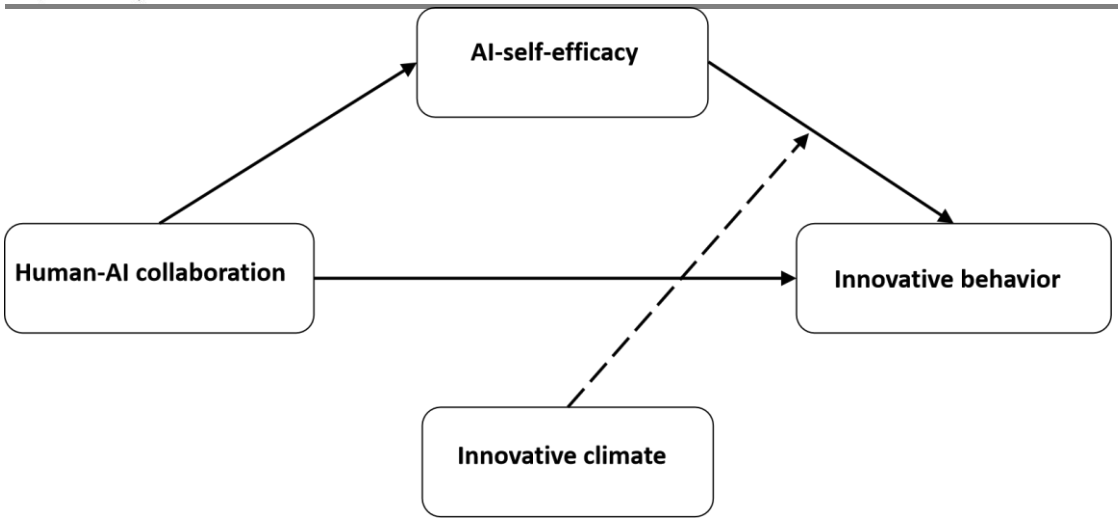

Figure 1: Conceptual Framework

CONCLUSION

The current conceptual paper addresses the critical need to understand how human-AI collaboration can effectively translate into teacher innovative behavior within the rapidly evolving digital educational landscape. Grounded in Social Cognitive Theory, our proposed framework illuminates the triadic interplay between technology, psychological mechanisms, and organizational environments. By identifying AI self-efficacy as the essential cognitive bridge, we clarify how the empowering elements of human-AI collaboration transition into proactive pedagogical innovation, mitigating the risks of technology-induced burnout. Furthermore, by establishing organizational innovative climate as a vital boundary condition, this study emphasizes that a teacher's cognitive beliefs must be coupled with an external environment that supports experimentation, risk-taking, and resource allocation. Ultimately, this comprehensive model offers valuable insights for educational administrators and policymakers, suggesting that to harness the true potential of advanced educational technologies, schools must move beyond mere structural adoption to actively cultivate teachers' psychological capital and foster a supportive, innovation-oriented organizational culture.

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