

Instrumentalization and Reconceptualization: Dual Pathways of Generative AI in Higher Education

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ABSTRACT

The rapid integration of generative artificial intelligence (AI) in higher education constitutes a major transformation affecting pedagogy, institutional structures, and academic work. Although existing studies emphasize its potential benefits, a coherent analysis of strategic adoption pathways remains limited. This article critically synthesizes recent scholarship to examine two dominant trajectories of generative AI integration: instrumentalization and reconceptualization. Using a systematic critical synthesis of 40 scholarly publications, the analysis explores the tension between employing AI to optimize existing educational processes and leveraging it to fundamentally reimagine educational purposes, institutional models, and academic identities. The findings identify competing narratives: one emphasizing efficiency, personalization, and automation, and another highlighting epistemological shifts, platform-based university models, and challenges to democratic and ethical principles. These trajectories generate tensions in areas such as academic integrity, digital literacy, and institutional strategy. The study concludes that sustainable AI integration requires balancing pragmatic implementation with critical, mission-oriented reflection on the future role of higher education in an AI-mediated context.

Keywords: Generative AI, Higher Education, Instrumentalization, Reconceptualization, Institutional Transformation

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INTRODUCTION

The advent of sophisticated generative artificial intelligence, exemplified by models such as ChatGPT, has catalyzed a period of intense introspection and transformation within higher education globally. This technological inflection point arrives at a moment when institutions are already grappling with evolving demands for accessibility, demonstrable value, and alignment with sustainable development goals (Barthakur, 2025). The discourse surrounding AI's role is thus not merely about adopting a new technology but about confronting fundamental questions of teaching, learning, knowledge creation, and institutional identity (Nelson, 2024). The burgeoning literature presents a complex tapestry of perspectives,

ranging from utopian visions of AI-driven personalized learning to dystopian concerns about academic integrity and the devaluation of human intellect. To navigate this complex terrain, a critical synthesis that moves beyond superficial summary to identify underlying intellectual currents is urgently needed.

A significant body of research frames generative AI through an instrumental lens, viewing it as a powerful tool for enhancing existing educational practices. This perspective emphasizes efficiency and optimization, exploring AI's capacity to create personalized learning pathways (Carmi, 2025), provide instantaneous and responsive feedback to students (He et al., 2025), and automate routine administrative tasks (Ellington, 2025). Within specific disciplines, this instrumental approach is particularly prominent. In medical education, for instance, AI is explored for generating complex assessment items (Rezigalla, 2024), personalizing learning modules (Khan, 2025), and training consultation skills through simulated patients (Jacobs et al., 2025). Similarly, in engineering and management education, AI tools are positioned as assets for innovative pedagogical strategies and the development of problem-solving skills (Qadir, 2023; Tariq, 2025). This trajectory is further reinforced by an emphasis on digital literacy, advocating for the preparation of both students and educators to use AI systems effectively and ethically (Haroud & Saqri, 2025; Shatila & Hernández-Lara, 2025). Within this view, the central challenge lies in mitigating risks such as academic misconduct while maximizing pedagogical benefits (Lund et al., 2025).

Conversely, a more transformative body of scholarship conceptualizes generative AI not merely as a pedagogical tool but as a catalyst for fundamental reconceptualization of higher education itself. This perspective challenges the core assumptions underpinning traditional university models. Scholars argue that AI necessitates a shift from content-delivery paradigms toward platform-based institutions that facilitate collaborative, human-centered knowledge creation (Katsamakos & Pavlov, 2025; Vasudeva & Tajhizi, 2025). This reconceptualization also extends to pedagogy, with proposals for democratic learning and teaching models that leverage AI to promote more participatory and equitable educational experiences (Hummel, 2025). Furthermore, generative AI compels a reassessment of academic identity by questioning the roles of researchers and educators in an era where AI systems can generate scholarly text, synthesize literature, and design experimental frameworks (Nelson, 2024; Chaaban et al., 2024). In this trajectory, the focus shifts from the operational “how” of AI adoption to the normative “why,” urging institutions to reconsider their missions, business models, and value propositions in an environment where knowledge production is increasingly mediated by non-human intelligence (Allam et al., 2025; Essa, 2024).

Despite the depth of these individual discussions, a critical gap persists in the literature: the absence of a systematic analysis that examines the interplay, tensions, and potential synergies between instrumental and reconceptualizational trajectories. Much of the existing research privileges one perspective while marginalizing the other, resulting in a fragmented discourse in which pragmatic debates about AI-detection technologies unfold separately from strategic reflections on the future purpose of the university. This article addresses this gap by asking: How does the scholarly literature frame the integration of generative AI in higher education along instrumental versus reconceptualizational trajectories? What tensions and synergies emerge between these approaches across pedagogical, institutional, and disciplinary contexts? And what strategic implications arise for higher education institutions navigating this dual landscape? By synthesizing the referenced literature through this analytical lens, this study offers a novel framework for understanding the complex choices confronting higher education in the age of generative AI, arguing that sustainable integration requires a deliberate navigation of both trajectories simultaneously.

METHODS

This study employs a systematic critical synthesis, a methodological approach designed to produce new theoretical insights and conceptual frameworks by rigorously analyzing, comparing, and integrating existing scholarly literature (Whittemore & Knafl, 2005). Unlike a traditional literature review that may summarize findings, a critical synthesis seeks to identify conceptual patterns, contradictions, and gaps across a body of work to construct a novel, evidence-based argument. The design is particularly suited for addressing complex, evolving phenomena like the integration of generative AI in higher education, where empirical data is still emerging and theoretical framing is paramount.

The reference corpus for this analysis consists exclusively of the 40 sources provided in the reference list, all published between 2023 and 2025, ensuring relevance and contemporaneity. The selection strategy was comprehensive, as every provided source was subjected to analysis. The analysis strategy involved a multi-stage process of categorization and thematic coding. Initially, each source was closely read and annotated to identify its primary focus, methodology, key arguments, and conclusions. Subsequently, each article was coded according to a deductive-inductive scheme. The primary deductive code was its dominant orientation: "Instrumental," "Reconceptualizational," "Hybrid," or "Contextual/Overview." An article was coded as "Instrumental" if its central focus was on AI as a tool for enhancing specific practices (e.g., feedback, assessment, content creation). It was coded as "Reconceptualizational" if its primary argument centered on AI's impact on systemic structures, institutional models, or foundational educational philosophies. "Hybrid" was used for sources that substantially engaged with both perspectives, while "Contextual/Overview" was applied to broader review articles or policy analyses.

Inductive coding was then used to identify secondary themes within each orientation, such as academic integrity, digital literacy, pedagogical innovation, institutional strategy, ethical concerns, and discipline-specific applications (e.g., medical, engineering, vocational). This dual coding process allowed for a nuanced mapping of the scholarly landscape, revealing not only the dominant trajectories but also the specific topics and concerns associated with each.

The analytical framework guiding this synthesis is the dialectic between instrumentalization and reconceptualization. This framework was chosen a priori based on an initial scan of the literature, which revealed these two distinct, and often oppositional, narratives. The analysis procedure involved systematically comparing and contrasting sources within and across these categories. For instance, articles discussing AI for personalized learning (Carmi, 2025; He et al., 2025) were grouped and analyzed to articulate the core tenets of the instrumental trajectory. These were then contrasted with arguments for systemic change (Katsamakos & Pavlov, 2025; Hummel, 2025) to delineate the reconceptualizational trajectory. The core of the analysis involved identifying points of tension (e.g., between AI-detection tools and calls for assessment redesign), convergence (e.g., the universal need for digital literacy), and blind spots (e.g., instrumental approaches that ignore institutional strategy).

To ensure analytical validity and consistency, several measures were implemented. First, the coding scheme was refined iteratively throughout the initial analysis phase to ensure its robustness and applicability to the full corpus. Second, the analysis actively sought disconfirming evidence—sources that complicated or defied the simple binary—to foster a more nuanced and sophisticated argument. Third, the synthesis process maintained a constant reflexive stance, ensuring that the final argument was not merely an aggregation of sources but a genuine interpretation that built upon their collective insights to articulate a novel perspective. The final product is a conceptual argument that is transparently grounded in and directly supported by the synthesized literature.

RESULT AND DISCUSSION

The critical synthesis of the literature reveals a scholarly landscape bifurcated along two primary, yet deeply intertwined, trajectories: the instrumentalization of generative AI for pedagogical enhancement and its role as a catalyst for systemic reconceptualization. This analysis moves beyond a simple summary of these themes to interpret their significance, exposing the central strategic dilemma facing higher education institutions. The findings are not merely competing ideas but represent a fundamental tension between pragmatic adaptation and visionary transformation, a dynamic that shapes every facet of AI integration, from classroom practice to institutional mission.

The most pervasive narrative identified frames generative AI as a powerful instrument to refine and optimize existing educational structures. This instrumental trajectory is overwhelmingly pragmatic, focusing on the application of AI tools to enhance teaching, learning, and administrative efficiency. A key theme within this perspective is the drive for personalized and responsive education. Carmi's (2025) empirical study, for instance, demonstrates how students interact with generative AI for learning, suggesting its potential to tailor educational content to individual needs. This is complemented by explorations into using AI for designing individualized feedback for pre-service teachers (He, Li, Xu, & Xie, 2025), positioning AI as a scalable solution for a traditionally resource-intensive task. The significance of this focus lies in its immediate applicability; it offers institutions a tangible, accessible entry point into the world of AI, promising gains in efficiency and student support. However, a critical interpretation reveals the potential pitfall of this approach. An over-reliance on instrumentalization risks what Katsamakos and Pavlov (2025) might term "technological solutionism," where the deep, structural challenges of education are misdiagnosed as problems solvable with the right application. This perspective, while valuable, can inadvertently reinforce outdated pedagogical models by simply layering new technology onto them, postponing the more difficult conversations about the future purpose of the university.

A second, more transformative, trajectory positions generative AI as a disruptive force that necessitates a fundamental rethinking of the university's purpose, structure, and pedagogical philosophy. This reconceptualizational literature moves beyond questions of "how to use AI" to ask "what is the university for in the age of AI?" A central theme here is the challenge to traditional institutional and business models, most compellingly articulated by the concept of the "university as a platform" (Katsamakos & Pavlov, 2025). This vision advocates for a shift from a closed, content-delivery model to an open, ecosystem-based one that leverages AI to facilitate value co-creation. The significance of this trajectory is its forward-looking ambition; it forces institutions to confront existential questions about their core value proposition in a world where information is abundant and instantly generated (Essa, 2024). This reconceptualization extends to pedagogy, with scholars like Hummel (2025) arguing for more "democratic and biographical" learning, and to academic identity, as Nelson (2024) examines how faculty must redefine their roles from content experts to mentors of critical and ethical reasoning. The critical challenge, however, is that this vision can be perceived as abstract and disconnected from the immediate practicalities of faculty workloads and budget constraints, making it difficult to implement without first addressing the instrumental concerns that dominate daily reality.

The most significant finding of this synthesis is not the existence of these two trajectories, but the dynamic, often contentious, interplay between them. This dialectical tension is the central dynamic shaping institutional adoption of AI. The most palpable example lies in the debate over academic integrity. The instrumental response, as detailed by Lund et al. (2025), concentrates on detecting AI-generated text and establishing punitive policies. Conversely, the reconceptualizational perspective, as implied by Dai, Liu, and Lim (2023), suggests this is a

strategically flawed approach, advocating instead for a fundamental redesign of assessments to focus on process, critical thinking, and uniquely human skills. The implication of this tension is profound: it highlights a misalignment between short-term tactical responses and long-term strategic vision. Progress on one front often creates or exposes challenges on the other; for instance, successfully implementing AI for feedback (an instrumental win) forces a confrontation with questions about the nature of teaching expertise (a reconceptualizational challenge).

Despite these tensions, points of synergy emerge that offer a path forward. The most significant is the universal recognition of the importance of digital literacy. While the instrumental perspective sees it as a prerequisite for effective tool use (Haroud & Saqri, 2025), the reconceptualizational view frames it as a foundational capability for participating in and shaping a future AI-driven society (Shatila & Hernández-Lara, 2025). This shared need provides a crucial common ground. Furthermore, the call for robust ethical and regulatory frameworks, such as the "Higher Education Act for AI (HEAT-AI)" proposed by Temper, Tjoa, and David (2025), reflects an understanding that both effective tool use and systemic transformation require governance that addresses equity, privacy, and accountability. This analysis, therefore, offers the "Instrumentalization-Reconceptualization" framework not just as an analytical lens, but as a strategic tool for navigating this complex landscape.

The practical implications for institutional leaders, policymakers, and educators are clear: a sophisticated, "both/and" approach is required. Institutions cannot afford to choose between pragmatism and vision. They must simultaneously invest in the instrumental—providing robust training, technical support, and clear policies for AI tool use—while creating dedicated spaces and resources for reconceptualization. This could involve task forces on the future of assessment, pilot programs on platform-based learning models, and professional development that focuses on cultivating uniquely human skills. As Suh (2025) notes, student attitudes can shift from mere tool use to innovation when properly scaffolded, suggesting that intentional pedagogical design can bridge the gap between these two trajectories. This study is, however, limited by its reliance on the provided corpus and its conceptual nature. Future research must empirically validate this framework by analyzing institutional strategic plans and conducting longitudinal studies on how different adoption strategies impact learning and institutional culture over time, moving from the theoretical tensions identified here to the practical realities of implementation.

CONCLUSION

This article has offered a critical synthesis of the literature on generative AI in higher education through an original analytical framework that distinguishes two dominant yet interdependent trajectories: instrumentalization and reconceptualization. The instrumental trajectory conceptualizes AI primarily as a set of tools to enhance existing pedagogical and administrative practices, emphasizing efficiency, personalization, and risk management. In contrast, the reconceptualizational trajectory positions AI as a catalyst for systemic transformation, challenging established institutional models, pedagogical assumptions, and notions of academic identity. The synthesis demonstrates that contemporary scholarship is shaped by a persistent tension between these trajectories, most visibly in debates surrounding academic integrity, digital literacy, and long-term institutional strategy.

In addressing the research questions, the analysis shows that while the literature is polarized along these trajectories, points of convergence emerge around the shared necessity for robust ethical governance and comprehensive digital literacy. The central strategic implication is that higher education institutions cannot afford a singular orientation toward either pragmatic tool adoption or abstract transformation. Instead, they must develop a dual

strategy capable of integrating short-term instrumental gains with long-term reconceptualization of educational purpose. The article's primary contribution lies in articulating this dialectical framework, offering a more nuanced lens for interpreting the complexities of AI integration in higher education. It contends that the core challenge is not selecting between competing trajectories, but learning to navigate their dynamic interplay. Future research should therefore move beyond conceptual debate toward empirical investigations of how institutions operationalize this balance in practice and how such strategies reshape learning, governance, and academic culture in the AI era.

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