

REDUCING ‘TIME-TO-RESULT’ IN MULTIDISCIPLINARY EDUCATION THROUGH GENERATIVE AI

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Psychological research has consistently demonstrated that individuals differ in how they perceive, process, and represent information. Among the most widely recognized distinctions are verbal-imagery and analytic-holistic cognitive styles (Croft, 2000). Verbal thinkers typically prioritize the use of linguistic and symbolic systems to structure their knowledge base, favoring sequential and text-based logic. In contrast, imagery thinkers rely predominantly on visual-spatial representations, utilizing mental imagery to synthesize complex ideas. These divergent cognitive profiles do not merely exist in isolation; rather, they significantly influence a student's chosen learning strategies, their unique approach to problem-solving, and the nature of their creative expression.

Despite cognitive diversity, creativity remains a universal human capacity. Artistic and design-oriented expression serves as a common medium through which individuals communicate ideas, emotions, and conceptual frameworks. However, traditional creative processes are often constrained by the requirement for advanced technical skills, which typically demand long-term training and practice. This creates a gap between ideation and execution, particularly for students whose primary academic focus lies outside artistic or design disciplines. As a result, many potentially innovative ideas remain unrealized.

To address this issue, this paper introduces the concept of “time-to-result” (TTR), defined as the time required to transform an initial idea into a complete, functional, and communicable outcome. The concept is theoretically derived from the “time-to-market” (TTM) model in business (TCGen). In an educational context, TTR reflects not only technical execution time but also cognitive effort, the complexity of iteration cycles, and the equity of student access to appropriate tools.

Furthermore, the duration of this cycle has a direct impact on student psychology, as a prolonged TTR may lead to what can be described as “creative fatigue” or “creative exhaustion”. This state occurs when a learner’s intrinsic motivation decreases due to the overwhelming complexity and duration of the production process. This issue is especially relevant for multidisciplinary students, who are frequently required to balance their primary domain-specific learning with the acquisition of additional, demanding technical competencies. In such cases, the significant effort required to master specialized tools can overshadow the original creative intent, ultimately reduce overall student engagement and stifle the potential for innovation.

Generative Artificial Intelligence (GenAI) offers a transformative solution to the challenges of creative fatigue and technical barriers by acting as a sophisticated cognitive and creative mediator. By bridging the gap between a student's mental model and the final product, these tools allow for a more fluid transition from ideation to execution. Recent empirical studies indicate that the strategic integration of GenAI significantly enhances students' creativity, design thinking, and overall problem-solving efficiency ("Exploring the Impact," 2025). Rather than replacing the unique nuances of human creativity, GenAI serves to extend and augment it. It functions as a powerful engine for the rapid translation of abstract, high-level ideas into tangible, high-fidelity outputs. This shift in the creative workflow ensures that the technical complexities of production do not discourage students but rather empower them to experiment more freely. Consequently, the focus of the educational experience moves away from the mechanical struggle of mastering complex software and toward the refinement of the original vision, fostering a more iterative and innovative learning environment.

The intricate interaction between individual cognitive styles and Generative AI (GenAI) tools reveals profound pedagogical implications for modern higher education. By aligning technological affordances with personal cognitive preferences, educators can create a more inclusive learning landscape that enhances accessibility and supports continuous, iterative experimentation. Specifically, verbal thinkers can leverage the capabilities of Large Language Models (LLMs) to logically structure complex ideas, generate expansive descriptions, and refine their abstract conceptual frameworks through conversational prompting. Conversely, imagery thinkers derive significant benefit from text-to-image diffusion models, which empower them to engage in rapid visual prototyping and translate mental images into high-fidelity graphics without the traditional friction of manual drafting (Zhang et al., 2023). This alignment between cognitive preferences and technological affordances enhances accessibility and supports iterative experimentation.

Furthermore, the implementation of an AI-augmented creative cycle serves to significantly reduce iteration time when compared to traditional, manual-heavy approaches. By streamlining the transition from initial concept to final output, these technologies effectively lower the "technical tax" previously levied on multidisciplinary students ("Generative AI Technology," 2025). This acceleration is not merely a matter of speed; it is a fundamental shift in cognitive labor. By automating the more rote or technically demanding aspects of production, GenAI allows students to redirect their intellectual energy toward higher-order cognitive processes specifically analysis, synthesis, and critical evaluation. These competencies are the cornerstones of critical thinking and are increasingly recognized as essential pillars within modern, competency-based education frameworks.

Despite these advantages, the integration of Generative AI (GenAI) into formal educational practice necessitates a rigorous examination of several important ethical considerations. A primary concern among educators is the potential for "deskilling," a phenomenon where an over-reliance on automated tools may inadvertently stifle the

development of traditional technical abilities and foundational manual crafts. Critics argue that if the "heavy lifting" of creation is offloaded to an algorithm, the student may lose the grit and nuanced understanding gained through trial and error. Nevertheless, this paper argues that the nature of human skill is undergoing a transformation rather than a decline. In the modern digital landscape, the pedagogical emphasis is shifting away from the rote mastery of technical software and toward the critical evaluation and curation of AI-generated outputs. This new competency requires a high level of domain knowledge to distinguish between mediocre results and high-quality, ethically sound professional work.

Furthermore, the implementation of GenAI requires a proactive approach to authorship and academic integrity. Because AI-generated content is fundamentally synthesized from vast, existing datasets, it is imperative that educators establish clear guidelines and ethical frameworks to ensure responsible use. The goal is to move toward a "human-in-the-loop" model, where the student remains the primary architect of the creative vision, using AI as a sophisticated assistant rather than a substitute for original thought

In conclusion, the introduction of the time-to-result (TTR) concept provides a robust and necessary framework for evaluating the transformative impact of generative AI on creative processes within higher education. By systematically reducing the temporal and technical friction required to transform abstract ideas into tangible, high-fidelity outcomes, GenAI effectively lowers the entry barriers for students possessing diverse cognitive styles and varying disciplinary backgrounds. This technological mediation ensures that a student's creative potential is no longer strictly capped by their manual technical proficiency but is instead liberated by their ability to direct and curate intelligent systems.

Consequently, the integration of these tools fosters a more inclusive and innovation-driven learning environment, where multidisciplinary collaboration can thrive without the traditional "ideation-execution gap". As the pedagogical landscape continues to evolve, it is imperative that future research explores the long-term cognitive and pedagogical implications of AI-assisted creativity. Understanding how sustained interaction with GenAI influences deep learning, critical thinking, and the fundamental nature of human expertise will be essential for developing the next generation of academic frameworks in an increasingly automated world.

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