AI in the classroom: Are we building better thinkers or better shortcuts?

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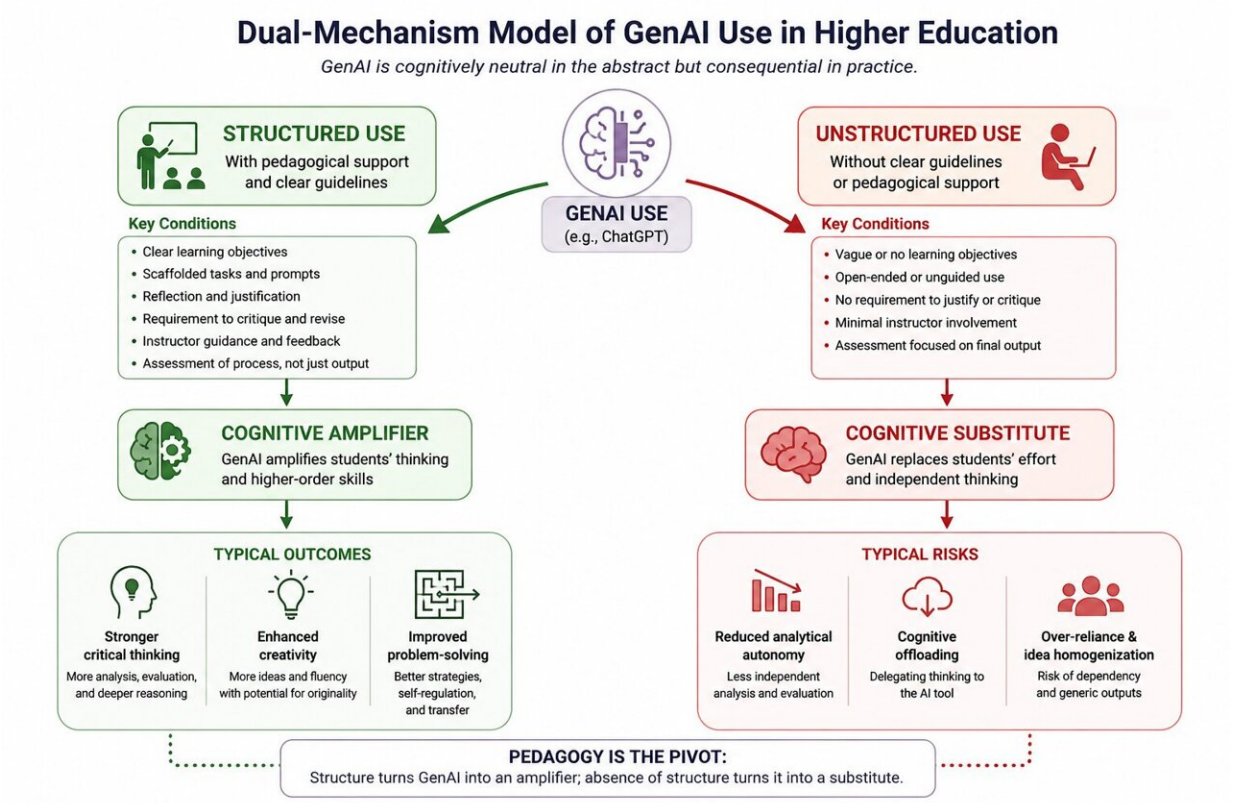
AI chatbots like ChatGPT have made their way into college life, sparking an important debate: Do these tools actually help students become better thinkers, or are they just a shortcut? Universities want to

foster critical thinking, creativity and problem-solving, which makes it essential to explore how AI influences these areas.

A recent review of 89 studies, published in *Frontiers in Psychology*, sheds some light on the issue. It found that generative AI can enhance students' thinking, but this happens only when the tools are used in certain ways. About 40% of the studies noted positive cognitive effects from AI, while around 17% pointed to drawbacks, showing that how this technology is woven into learning makes a big difference in outcomes.

From math breakthroughs to the homogenization of ideas

The quick uptake of the technology underscores the urgency of this research. Recent data shows that 88% of undergraduates now use generative AI for assignments, a huge increase from 53% just a year ago. Today, nearly 92% of students use some form of AI in their coursework; the tool is no longer a novelty, it's a standard part of the academic toolkit.



This adapted Dual-Mechanism Model illustrates the study's central idea: generative AI does not influence learning in a single, predictable way. When used within structured teaching environments—supported by guidance, reflection, critique, and clear learning goals—AI can act as a cognitive amplifier, helping students deepen critical thinking, creativity, and problem-solving. But when used without pedagogical structure, the same tools can become a cognitive substitute, encouraging over-reliance, reduced analytical independence, and cognitive offloading. The model emphasizes that educational design—not the technology alone—shapes the outcome. Credit: Generated using AI tools for illustrative purposes

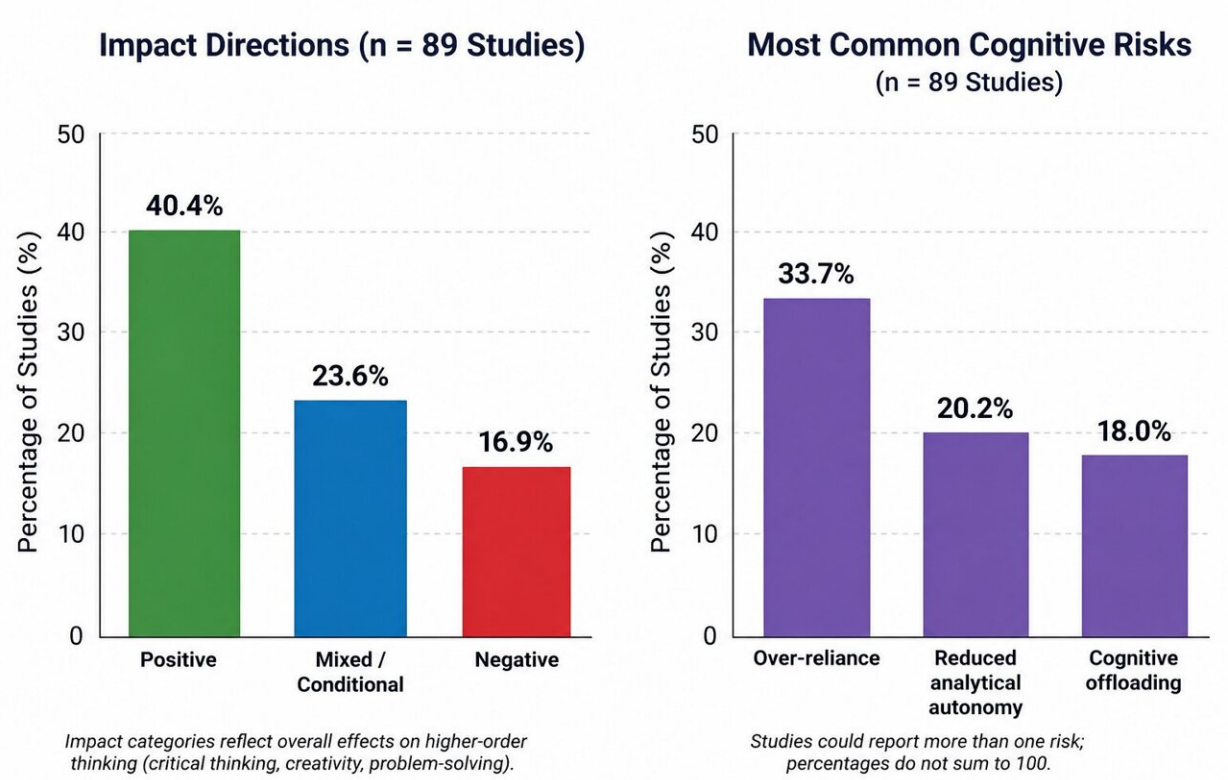
However, as highlighted by the review, the influence of the toolkit varies with the problem being solved. Problem-solving was where consistent improvements were seen. In the reviewed studies, students who used

ChatGPT as a "scaffold," with the AI generating initial ideas followed by manual improvement, had much better scores in math and engineering design problems.

But not all skills were equally resistant to such effects. In creative thinking, scientists found a two-sided impact: On one hand, the AI gave students more ideas; on the other, those ideas were too similar when students did not question them. Independent reasoning turned out to be even more vulnerable. Although experiments sometimes showed an improvement in reasoning skills, there were also instances in which reasoning was harmed by use of the program.

Scaffolds or shortcuts: How teaching shapes AI's impact

The difference lay in how AI was used. When students got clear instructions—for example, to critique, revise or debate the AI output—learning gains were common. One summary notes that "structured integration, through scaffolding, argumentation, or reflective cycles, produces more positive and durable cognitive outcomes than unguided use."



Impact directions and cognitive risks associated with generative AI use in higher education. Across 89 reviewed studies, reported cognitive outcomes were uneven: 40.4% found positive effects, 23.6% reported mixed or context-dependent effects, and 16.9% identified negative effects. The most frequently reported risks were over-reliance (33.7%), reduced analytical autonomy (20.2%), and cognitive offloading (18.0%). Percentages for risks are non-exclusive because individual studies could report multiple concerns. Adapted from Tables 3–4 in the reviewed study. Credit: Generated using AI tools for illustrative purposes

Giving AI tasks like brainstorming or draft writing while requiring students to think through the steps themselves turned out well. As Fawzia Omer Alubthane, the author of the study, writes, "GenAI functions as a cognitive amplifier under structured pedagogical conditions and as a

cognitive substitute under unguided use."

Unfortunately, many studies found the opposite situation: More than half of the classroom experiments had no specific strategy, essentially handing ChatGPT to students and saying "go." In those cases, the risks showed up. About 42.7% of studies flagged at least one cognitive risk. Overreliance was most common (33.7% of studies), along with drops in analytical autonomy (20.2%) and what researchers call "cognitive offloading" (18.0%).

In practice, this meant some students stopped doing their own detailed analysis or evaluation, instead accepting AI summaries without reflection.

This "cognitive offloading" can be subtle: answering questions without the usual mental effort. The review warned that if students are rewarded only for correct answers (not how they got there), ChatGPT can become an easy substitute for thinking. In fact, the author notes, "GenAI is cognitively neutral in the abstract and cognitively consequential in practice"—meaning the technology itself doesn't force thinking either way.

Its effect depends entirely on the teaching context. Left unchecked, generative AI may train students to produce polished answers without developing true reasoning.

Teaching (not cheating): Making AI work for learning

The takeaway is that control is in the hands of instructors. Instead of trying to outlaw AI or allowing students to get carried away with it, the classroom can use these technologies responsibly. The literature recommends using AI technologies for simple, low-level tasks (for instance, summarizing background information) while giving the harder

work—analysis and synthesis of information—to students.

There are various ways instructors can incorporate AI technologies into the regular classroom routine, for instance, by asking students to analyze or critique AI outputs and argue or reflect on them.

The study stresses that it's not ChatGPT alone that transforms learning—it's how we integrate it. As Alubthane puts it, a tool that is "capable of performing many of the cognitive operations that universities exist to develop" must be handled with deliberation. With thoughtful pedagogy, AI can become "a genuine amplifier of human cognitive capacity"; without it, AI risks becoming "a highly capable substitute for the very thinking" that education aims to build.

More information: Fawzia Omer Alubthane, Amplifier or substitute? A systematic review of generative AI's impact on higher-order cognitive skills among university students, *Frontiers in Psychology* (2026). DOI: 10.3389/fpsyg.2026.1863931