Investigating Generative AI's Impact on Cognitive Effort and Long-Term Memory in Adolescents: A Mixed-Methods Study

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Abstract

Despite the growing prevalence of generative AI in education, little research has been done on how its use may affect students' long-term memory due to a reduced cognitive effort to process simplified second hand AI information. This study looks at whether increased reliance on generative AI tools for learning correlates with reduced cognitive engagement and lower long-term retention of academic material among adolescent students. A mixed-methods study was utilized. Part 1 involved a survey of 67 high school students assessing AI usage frequency, study habits, and perceived effectiveness through a qualitative approach. Part 2 employed a quantitative approach, including an experimental assessment with 10 participants who engaged with two passages, one with AI assistance and one without, followed by a test two weeks later to measure retention. Qualitative results showed students generally perceived AI tools as helpful for understanding but expressed uncertainty when asked about its impact on long-term retention. Quantitative data revealed minimal differences in test performance between AI and non-AI groups, though in nonfiction comprehension when AI was used, scores had a slight positive shift. These findings suggest that while AI tools enhance immediate comprehension, their influence on deeper cognitive processing and memory retention may be more limited, raising the question as to whether or not the trade-off between convenience and depth for learning will be beneficial for an AI-integrated society.

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