Cognitive Offloading: Implications of AI Dependency for Senior High School Learners' Deep Learning and Retention

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Abstract

This study investigated Senior High School learners' engagement with Artificial Intelligence (AI) tools, their effects on deep learning, and the relationship between AI dependency and memory retention. A mixed-methods design combined descriptive statistics and Pearson's r correlation with thematic analysis guided by Braun and Clarke's (2021) framework. Participants were 736 students from two private institutions in Quezon City and Manila who completed a validated, self-developed questionnaire via Google Forms. Findings showed that learners used AI tools only occasionally, most often generative AI and grammar/writing assistants for translation, grammar checking, and quick fact-finding. Such practices reflect cognitive offloading—delegating routine tasks to external systems to conserve mental effort (Sparrow et al., 2011). While offloading supported efficiency, students did not perceive AI as enhancing critical thinking, conceptual understanding, application, or long-term retention. They acknowledged its supportive role but recognized the risks of over-reliance, where dependence on external aids may reduce active processing and independent reasoning. Correlation results indicated no significant relationship between AI dependency and either retention or deep learning. By contrast, deep learning strongly predicted retention, emphasizing that sustainable academic achievement depends on higher-order, human- centered practices rather than reliance on cognitive offloading. The study recommends balanced AI integration that uses offloading for efficiency but prioritizes critical engagement, digital literacy, institutional support, and ethical policy. Future research should examine AI's long-term impact on creativity, reasoning, and durable knowledge.

Keywords: cognitive offloading, AI dependency, deep learning, memory retention, senior high school learners