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Optimizing Cognitive Load in EMI-STEM Contexts: Technology Integration and Multilingual Strategies in Algerian Higher Education

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ABSTRACT

English Medium Instruction (EMI), as a growing global trend, is gradually being adopted in Algerian higher education as a response to the global dominance of English and the internationalization of academia. While EMI has been incorporated across multiple disciplines, little research has addressed the cognitive challenges teachers and students face while navigating online tools in a non-native language such as English. Teachers and students often use multilingual practices such as code-switching and translanguaging to bridge comprehension gaps, while also relying on digital tools to support content learning. However, there remains a scarcity in examining the extent to which multilingual strategies interact and how they influence cognitive load within the EMI context. Rooted in Cognitive Load Theory (CLT), this study uses a mixed-methods design to examine patterns of multilingual strategy use and technology integration, their effects on cognitive load, and the challenges they present, and how effectively teachers and students manage the mental effort required for content learning. Data were collected from EMI university teachers and undergraduate students across STEM disciplines using surveys and semi-structured interviews. Findings reveal that well-integrated multilingual strategies, when supported by targeted digital tools, significantly reduce cognitive load, enhance comprehension, and foster more active engagement in STEM content learning. The study contributes to bridging the existing gap by informing instructional methods that use technologically-enhanced multilingual strategies to reduce cognitive overload and improve the learning outcomes in EMI contexts.

Keywords: Cognitive load; English Medium Instruction; content learning; digital learning tools; higher education; multilingual practices