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## Reducing cognitive load: The effects of gesturing on children's effective working memory capacity

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### Abstract

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## REDUCING COGNITIVE LOAD: THE EFFECTS OF GESTURING ON CHILDREN'S EFFECTIVE WORKING MEMORY CAPACITY

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Research within the theoretical framework of embodied cognition has shown cognitive and sensorimotor processes to be closely intertwined. For example, one type of sensorimotor process that has been shown to be effective for learning math and science concepts is expressing information in gesture or observing someone who expresses information in gesture (e.g., Singer & Goldin-Meadow, 2005). That is, gesture and speech appear to form an integrated, synergistic system in which effort expended in one modality can lighten the load on the system as a whole (e.g., Goldin-Meadow, Nusbaum, Kelly, & Wagner, 2001). Importantly, Goldin-Meadow et al. (2001) have shown that expressing information in speech (i.e., explaining how one arrived at solutions to math problems) combined with gesture places less demands on working memory (WM) than expressing the same information in speech alone. To explain this phenomenon, it has been suggested that gesture conveys the same basic idea as speech, but it does so using a visuospatial rather than a verbal representational format. The addition of this distinct representational form thus may enrich the way information is coded, thereby facilitating information processing and reducing effort because of the larger motor movements involved. Despite the established load-reducing benefits of gesturing, it is unclear whether gesturing influences the processing of information directly (by increasing effective working memory capacity) or indirectly (e.g., by facilitating encoding). The current study thus aimed to investigate whether children's performance on a working memory test requiring participants to remember and reproduce complex instructions involving shapes and spaces of different sizes, colours and shapes is enhanced by: (i) expressing information in gesture; (ii) observing an instructor expressing information in gesture; or (iii) both, as compared to a normal testing situation in which they do not make or observe gestures. Sixty year 6 students were randomly assigned to one of the conditions in a 2(Making Gestures: yes vs. no) x 2 Observing Gestures: yes vs. no) between subjects design. The results of this study have important theoretical (advancing cognitive load theory principles) and practical educational implications (understanding the impacts of gesture on children's effective working memory capacity). The study has just been conducted, and results will be available at the time of the conference.