

Finding Effective Methods for Mathematics Learning: Concept Mapping as an Assessment Task

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Finding the most effective ways to teach and learn mathematics at university is becoming a critical problem in higher education as rapid advances in related fields demand graduates with advanced mathematics knowledge and skills. In this short communication, we report on a study undertaken in a large university classroom setting ($N = 355$). An instructional innovation was designed, developed, implemented, and evaluated in a mathematics course involving novel assessment tasks—Knowledge Organisers (Jeong & Evans, 2021). The tasks comprised prompts for students to generate examples and non-examples (Fukawa-Connelly & Newton, 2014; Mason & Watson, 2008) and construct concept maps of the key concepts covered in the course (Novak & Cañas, 2008). The original design of the initiative was based on the current understanding of human cognitive architecture and cognitive science research (Sweller et al., 2019). A concept map is a visualisation of a group of related abstract concepts with their relationships identified by connections using directed arrows, which can be viewed as an externalisation of a schema to be stored in a learner’s long-term memory (Schroeder et al., 2018). By utilising a mixed-methods approach and triangulation of the findings from qualitative and quantitative analyses, we were able to discern critical aspects pertaining to the feasibility of implementation and evaluate learners’ perceptions. Students’ performance on concept mapping is positively correlated with their perceptions of the novel tasks and the time spent to complete them. Qualitative analysis showed that students’ perceptions are demonstrably insightful about the key mechanisms that supposedly make the novel tasks beneficial to their learning. Based on the results of the data analyses and their theoretical interpretations, we offer practical recommendations and suggest future research directions.

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