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A computational cognitive modeling approach to understand test-takers strategy use in drag-and-drop math questions

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Abstract

Computer-based educational assessments often include questions with a drag-and-drop response. Logged data obtained from drag-and-drop responses allow us to go beyond scores, investigating the response strategies test-takers use to reach an answer. There is no previously published research on strategies used by test-takers in answering drag-and-drop questions. We tested 476 MTurk participants under five conditions where key design features of mathematics questions were manipulated. Regardless of the design manipulations, participants mostly used one of the two possible systematic response strategies. Using PRIMs cognitive architecture (Taatgen, 2013), we constructed computational cognitive models to simulate the differences between these two strategies. The models were able to capture participants reaction time patterns. Our conclusion based on the models is that most participants apply a cognitively less demanding strategy by offloading cognition on action, which is in line with the idea of strategy selection as rational metareasoning (Falk & Griffiths, 2017).