

ABSTRACTS

Multimedia pre-training and knowledge transfer: The mediation effects of intrinsic and germane cognitive loads

Mounir Saleh - University of Bahrain

For the last two decades, Cognitive Load theory CLT has played a central role in educational research. However, a substantial portion of this type of research includes participants who have no specific interest in the presented material chosen by the researcher and who were only given a range of 2.5-6 minutes of lecture time (deJong, 2010). These experimental aspects undermine the relevance of translating research outcomes into educational practice. In this project, I overcome these limitations through utilizing a core concept (enzyme specificity) for relevant majors (biology/biochemistry) in a real lecture setting (40 minutes of lecture time) in order to examine the external validity of some prior research findings. Also, CLT literature is replete with studies showing that certain instructional techniques foster knowledge transfer through manipulating different types of cognitive load CL. Few studies though suggest statistical models for how these instructional techniques reduce extrinsic CL, manage intrinsic CL, and/or boost germane cognitive load. Additionally, no known research provides empirical evidence on how the interaction of these three types of CL mediates the effect of studied instructional techniques on knowledge transfer. In this project, I partially address this need through examining how manipulation of intrinsic and germane CL mediate the effect of a combined treatment on learning the concept of enzyme specificity. The combined treatment consists of (1) an interactive instructional enzyme model (MR Saleh, 2016) to motivate students to learn about the concept, thus fostering germane CL; and (2) a multimedia pre-training technique that fuels the learner's prior knowledge with discrete facts necessary to understand the presented concept, thus managing intrinsic CL. Upon testing the effect of this combined treatment on 111 college students, desirable learning outcomes were found in terms of cognitive load, motivation, and knowledge transfer. The multimedia pre-training group reported significantly less intrinsic CL, higher motivation, and demonstrated higher transfer performance than the control and post-training groups (37 participants each). These results come in agreement with prior research findings with experimental contexts, thus hinting to their external validity. Based on mediation analysis, I propose two statistical models to explain how the two types of CL played in concert to mediate the effect of the combined treatment on knowledge transfer. One model states that, "Multimedia pre-training increases prior factual knowledge which reduces intrinsic CL which enables engagement in germane CL which in turn causes increased knowledge transfer." Other than mediating the effect of intrinsic CL on transfer, "engagement in germane CL [also] mediates some of the effect of motivation on knowledge transfer" (second model). Apparently, germane CL stands as an intersection point between the two models. However, technical limitations held analysis short of supporting this notion. This project, and the like, may shift the paradigm in CLT research as they go beyond simple forms of "what works" to a deeper understanding of "how it works" thus enabling informed decisions for instructional design and redesign.