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RESEARCH ARTICLE

The influence of external concept structures on an individual's knowledge structures

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Abstract
This experimental investigation considers how the inherent conceptual structure of external representations influences individuals' knowledge structure, and in addition proposes a measure of global collective knowledge to account for the influence of pre-existing knowledge structure. In two studies, undergraduates in a hospitality management course completed a pre-knowledge structure (pre KS) measure, a prior knowledge pretest, then read parallel versions of either a text or a table about the Internet of Things, then completed a post knowledge structure (post KS) measure, and finally completed a comprehension posttest. Analysis of the comprehension posttest data showed that the text group significantly outperformed the table group ($p < .05$) mainly due to performance on factual and main idea items, but not inference items. The pre- and post-KS data were analyzed as Pathfinder networks. Descriptive comparisons of between group networks (group–group) and within group networks (pre-post) showed that the table and text between-group networks were quite alike before reading and were even more alike after reading (i.e., peer convergence of local collective knowledge structure). The within-group network overlap from pre-to-post was also substantial. In addition, pre-to-post similarity with the expert shows the *text* group networks became more like the expert referent but the *table* group networks became less like the expert referent. Exploratory findings for this global collective knowledge network approach based on Google Ngram frequency dependencies were partially supported. For theory building, the results show how the influence of external representations can be framed in terms of a representation's inherent conceptual structure. For practice, this listwise measure for eliciting knowledge structure provides a quick way to elicit individual and group-level knowledge structure networks that can be used in ordinary classrooms for formative and summative assessment.

Keywords Tables and texts · Knowledge structure · Collective knowledge · Pathfinder networks · Comprehension

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