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Second-Order Meta-Analysis: Effects of Technology on Students' Achievement

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Abstract:

In some large areas of interest, such as technology integration in education, the number of meta-analyses being conducted and published is growing at a rate that is unmanageable for most consumers. One challenge arising from such situations is that while each addresses the overall topic, they differ either with regard to different factors, or they focus on a specific issue. This makes interpretation of the overall effect in a given area very difficult, especially when nominal outcomes contradict one another. A systematic quantitative synthesis of meta-analyses (also called second-order meta-analysis) is an emerging technique that can resolve this shortcoming by synthesizing the outcomes of numerous meta-analyses implicating hundreds of primary studies. This approach also overcomes limitations of narrative reviews and vote-counts, and may be easier to complete than conducting a full-scale comprehensive meta-analysis to answer one big question. This research project aimed at developing a systematic methodology for synthesizing meta-analytic results that takes methodological quality into consideration and testing it in answering the questions: does technology use enhance student achievement in formal face-to-face classroom settings as compared to traditional settings and if so, to what extent. The literature searches and review processes resulted in 37 meta-analyses involving 1253 different primary-studies comparing student achievement in technology-enhanced classroom instruction to technology-free instruction. After examining the lists of primary studies, 25 meta-analyses incorporating 1055 studies were found to have greatest coverage of the overall set of primary studies while having minimal overlap in primary literature. In this presentation we will discuss some issues pertinent to the implementation of a second-order meta-analysis while reflecting on our experience. Issues include assessing the methodological quality of the included meta-analyses, resolving overlap and dependency in primary studies, tests of homogeneity, and explaining variability through moderator analyses. Findings from the implementation of the methodology with technology integration literature will be presented in addition to a validation process that was conducted through synthesizing 574 effect sizes from individual studies that were extracted from 13 meta-analyses that provided sufficient information. We will also discuss advantages and disadvantages of the second-order meta-analysis approach as compared to the implementation of a full scale meta-analysis to address the same research question. Moreover, findings from the critical assessment of the methodological quality of the included meta-analyses will be presented, and recommendations for improving the quality of future meta-analyses are suggested, including the need for greater systematicity, rigour and transparency in implementation and reporting.
