



# Applications of latent-variable models in educational psychology: The need for methodological-substantive synergies <sup>☆</sup>

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## Abstract

As emphasized in the call for papers by Jonna Kulikowich and Gregory Hancock, the primary goal of this special issue of *Contemporary Educational Psychology* is to assemble a collection of illustrative empirical studies in educational psychology that utilize one or more state-of-the-art latent variable modeling procedures. Distinguishing these articles from those in leading measurement and statistical journals, Kulikowich and Hancock encouraged the submission of manuscripts from authors (or teams) with strong backgrounds in both latent variable methodology and substantive issues in educational psychology. In this respect, they sought to provide an outlet for articles representing a synergy between sophisticated methodology and meaningful substantive issues. Here we briefly review why we think that this is such an important undertaking; consider some of the problems that such undertakings must address; emphasize a construct validity approach to the interpretations based on such studies; and highlight some of the key issues in the particular articles in this special issue.

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<sup>☆</sup> We note that authors of articles in this special issue were, in some cases, asked to revise their manuscripts in relation to our comments on their original draft papers. Because of this iterative process some of our comments in relation to these particular articles might be more relevant to earlier versions of the articles than the final published version. Even when this is the case, however, it is still instructive to present the original concern as a general issue that might be relevant to other researchers pursuing methodological-substantive synergies.

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## **1. Methodological-substantive synergies**

As quantitative educational psychologists, we live in exciting times. We are armed with a bevy of new and evolving quantitative tools to address a range of substantive and policy related questions, with statistical power and flexibility that was previously unimaginable. However, this power comes at a cost to the educational psychology research discipline. In order to remain current as researchers—or even informed consumers of this research—we must become conversant with an ever-increasing range of new latent variable statistical procedures. In order to make best use of these new tools, we must pursue research that is at the cutting edge of both latest methodological developments and substantive issues—methodological-substantive synergies. This is not to say, of course, that publications that are aimed primarily at methodological concerns or those aimed primarily at substantive issues cannot make important contributions. However, it is our contention that: (a) some of the best methodological research is based on the development of creative methodological solutions to problems that stem from substantive research (e.g., multilevel regression in school/class and student level analyses); (b) new methodologies provide important new approaches to current substantive issues (e.g., latent growth analyses that allow growth data to be collected at varying points on the time line); and (c) methodological-substantive synergies are particularly important in applied areas like educational psychology where single infallible indicators are typically not available.

Fostering methodological-substantive synergies is difficult. Ideally, these synergistic publications are of interest to both methodologists and substantively oriented researchers. However, with a few notable exceptions, most journals and their readerships are oriented primarily towards one or the other. Furthermore, there may be some potential biases against such synergistic studies even being accepted for publication. In our own experience, for example, we often receive editorial comments that our research is either too substantively oriented (for methodological journals) or too methodologically oriented (for substantive journals).

There also seems to be an inherent bias in the methodological standards required of synergistic papers compared to those with a more substantive orientation. Editors are likely to seek reviews from methodological specialists who focus on some of the messy statistical issues that are inherent in applied research but that have not—or perhaps cannot—be fully addressed in the analyses. However, from a substantive perspective, the critical issue is whether the potential problem is substantively important; that is, whether it makes a meaningful difference in the substantive interpretation of the results with the new statistical procedures. Importantly, this process results in methodologically oriented substantive studies being judged in relation to a higher methodological bar than more purely substantive papers. For example, consider the issue of hierarchically ordered data (e.g., students are nested within classes and classes are nested within schools), which is typical in educational psychology. In the not-too-distant past (or, perhaps, presently), such problems were likely to be ignored by substantively oriented reviewers but were more likely to be highlighted by methodologically oriented reviewers. Hence studies with a strong methodological orientation that ignored this potential problem were likely to be rejected even though a uniform

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