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Realising Potentials through Education:
Shaping the Minds and Brains for the Future

Thinking Twice About Reciprocal Effects Between Dynamic Constructs in Learning and Instruction

Educational researchers are often interested in knowing whether two dynamic constructs influence each other over time. For example, studies have investigated reciprocal effects between student achievement and academic self-concept (Marsh et al., 2018) or emotions (Pekrun et al., 2017), between reading and spelling skills (Georgiou et al., 2020), or between teachers' self-efficacy and exhaustion (Kim & Burić, 2020). Many other examples can be found in the field, which provide much of the empirical evidence for validating theories or conducting meta-analyses. Yet, methodological extensions in the past decade (Berry & Willoughby, 2017; Curran et al., 2014; Hamaker et al., 2015; Usami et al., 2019) suggest that conventional models used to build this evidence (e.g., cross-lagged panel model, path analysis) are vulnerable to statistical artifacts—known as "smushed effects"—that confound processes of change situated within individuals (i.e., how students evolve relative to themselves) as opposed to between individuals (i.e., how students evolve relative to other students).

These extensions cast serious doubts about the state of knowledge. Indeed, many studies have now shown that what previously appeared to be bidirectional relations between dynamic constructs (using conventional techniques), actually turned out to be unidirectional or non-existent relations once smushed effects were overcome by using more reliable techniques (e.g., random intercept cross-lagged panel model; Burić et al., 2022; Núñez-Regueiro et al., 2021; Torppa et al., 2020). More recent extensions also suggest that some influences become more evident if we further disaggregate short-term and long-term dynamics of change in the modeling strategy (Marsh et al., 2024; Muthén & Asparouhov, 2024; Núñez-Regueiro et al., 2024). The aim of this keynote address will be to discuss the relevance of these methodological extensions, highlighting their assumptions about processes of change in dynamic constructs and drawing implications for theories in the field of learning and instruction.

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