Using a multivariate, multi-level model to understand how youths' in-the-moment engagement predicts changes in youths' interest

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Background

- Though many have argued that out-of-school-time (OST) programs have an important role to play in youths' development of interest, relatively little is known about whether and how youths' interest develops in such contexts.
- Contemporary motivational theory suggests that interests emerge from the interactions of an individual in a particular environment, rather than residing entirely within the individual (Hidi, Renninger, & Krapp, 2016) .

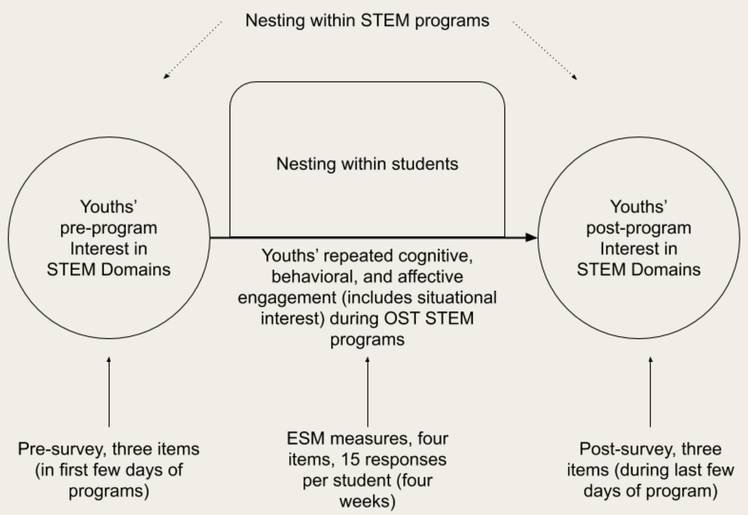
Research Questions

How does youths' in-the-moment engagement relate to changes in their interest in STEM from before to after their involvement in summer STEM OST programs?

Research Context and Design

- 204 youth participating in nine, three-week summer STEM OST programs.
- Observational study using pre- (n = 181) and post-program survey measures (n = 159) of youths' interest in STEM and Experience Sampling Method (ESM) measures of students' engagement (n = 2,970).

Data Structure



Methodological Approach

- We estimated **a multivariate, multi-level model** using Markov Chain Monte Carlo (MCMC) via the *MCMCglmm R* package (Hadfield, 2010), wherein the key outcome was the correlation between engagement post-interest.
- The model includes both youths' engagement (nested in students) and their post-program interest in one model, which can be challenging to do when using a multi-level modeling approach.
- Also, a feature of MCMC is that its use allows for the recognition of complex data structures, such as the nesting within students (and/or the *program* or the *moment*), which can be challenging to do when using a latent variable modeling approach.

Results

- Youths' in-the-moment engagement was a significant, positive predictor (effect size r = .27) of youths' post-program interest in STEM, accounting for their pre-program interest in STEM and gender.
- Pre-interest was related to in-the-moment engagement (β = 0.10 [0.01, 0.20], p = .028) and to post-interest (β = 0.48 [0.35, 0.65], p < .001).

Significance

- This study demonstrates how the use of MCMC may be a natural fit for analyses when a goal is to embrace and study multivariate motivational and engagement-related processes in complex, real-world settings.
- There are many phenomena (and data structures) in education that bear resemblance to those found in this study: longer-term outcomes that are the consequence of momentary outcomes and complex data structures.
- Future work can use MCMC to extend this approach to recognize additional levels of nesting and/or cross-classification and to examine the effects of both engagement and its *rate of change* upon interest development.

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Resources associated with this project can be found here: https://osf.io/tk3dn/