

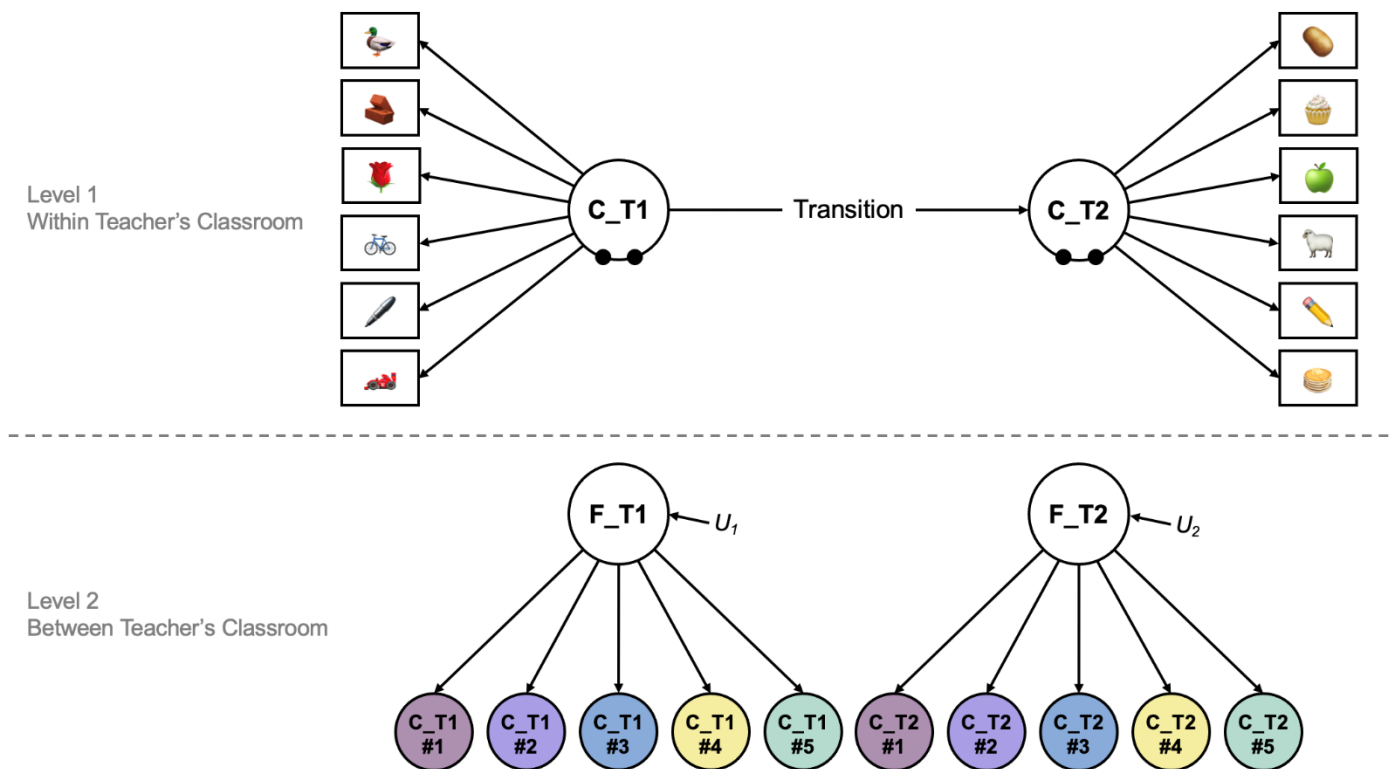
SUPPLEMENTARY MATERIAL - SEM DIAGRAM OF THE MULTILEVEL LATENT TRANSITION ANALYSIS

Belonging to:

Klingbeil, K., & Moons, F. (2025). The Prevalence of the Letter-as-Object Misconception: A Multi-level Latent Transition Analysis on Understanding Variables. *Educational Studies in Mathematics*.

Authors: Katrin Klingbeil & Filip Moons — f.moons@uu.nl

SEM diagram based on Model 3 in Table 1 in Henry & Muthén (2010):



Remarks:

- The SEM diagram depicts the situation where students get version A of the 'Meaning of Letters'-test as pre-test and version B as post-test. For half of the students in our sample, this was the other way around.
- In practice, the two factors (estimated at Timepoints 1 and 2) can only be estimated for 4 out of the 5 latent classes. Since the latent classes are not ordered when the model is estimated, we depict all five classes at Level 2 to make clear that Level 2 (Between Teacher's Classroom) influences latent class membership probabilities at both timepoints.
- Measurement invariance was assumed in the model, ensuring that the number of classes and their item probabilities remain consistent across time points. To enhance the clarity of the diagram, no arrows are drawn between corresponding test items.
- The Mplus code for this model can be retrieved from our Open Science Framework (OSF) repository: https://osf.io/qrgaha/?view_only=ba58ff7309f14d94a890faea6bbac7a2. During the review process, this link provides view-only access. The repository will be made publicly accessible upon the acceptance of this paper.