BFLPE_Model

Yi-Jhen Wu

19 3 2021

Purpose

This document is to document a multilevel with a random intercept for a big-fish-pond effect **(BFLPE)**. Mplus (**click me**) was used to run the model.

Model 1: Random-Intercept Model (Figure 1)

The individual level (Level 1): individual reading performance to predict individual self-concept. The class level (Level 2): the average of individual reading performance for each class to predict individual self-concept.
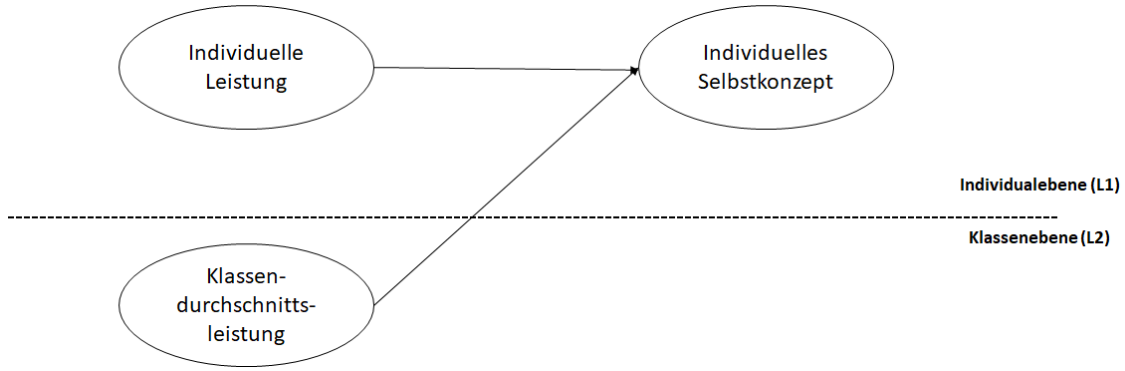

Figure 1: Reading perfromance to self- concept

Model 1 can be expressed mathematically:

- i represents an individual, j represents a class, $IndSk_{ij}$ is individual self-concept, $IndLeis_{ij}$ is individual reading performance, $KLeis_j$ is the average of reading performance in class. γ_{ij} is a random effect at the individual level.
- β_{0j} is a random effect and each school has own intercept. γ_{00} is a grand mean. υ_{0j} is a random effect at the class level.
- β_{1j} is a slope for the predictor of $IndSk_{ij}$. It is a fixed effect and there is only one slope across classes.

Individual level (L1)
$$IndSk_{ij} = \beta_{0j} + \beta_{1j} * IndLeis_{ij} + \gamma_{ij}, \gamma_{ij} \sim \mathsf{Norm}(0, \sigma_\gamma^2)$$

Class level (L2)

$$\beta_{0j} = \gamma_{00} + \gamma_{01} * KLeis_j + \upsilon_{0j}, \upsilon_{0j} \sim \mathsf{Norm}(0, \sigma_\gamma^2)$$

$$\beta_{1j} = \gamma_{10}$$

Model1 Mplus code:

USEVAR = dPolSk_r dPolLeis; MISSING = all(-9999);
CLUSTER = klasid;

ANALYSIS: TYPE = TWOLEVEL;

DEFINE: center (groupmean);

MODEL:

`%WITHIN%`

dPolSk_r ON dPolLeis(b_within);

`%BETWEEN%`

dPolSk_r ON dPolLeis (b_between);#Mplus automatically

MODEL CONSTRAINT: !Define and estimate the composition effect new(context); context = b_between - b_within;

Note. Mplus automatically calculated the average of reading performance for each class because you did not make a claim in the USEVAR.

Mplus output:

```
MODEL RESULTS

                                             Two-Tailed
                   Estimate     S.E.  Est./S.E.    P-Value

Within Level

 DPOLSK_R    ON
    DPOLLEIS        0.787    0.110      7.136      0.000      β1j=0.787

 Residual Variances
    DPOLSK_R        0.487    0.016     30.039      0.000

Between Level

 DPOLSK_R    ON
    DPOLLEIS        0.624    0.152      4.095      0.000      β1j=0.624

 Intercepts
    DPOLSK_R        2.003    0.111     18.036      0.000      γ00=2.003

 Residual Variances
    DPOLSK_R        0.008    0.006      1.293      0.196

New/Additional Parameters
    CONTEXT        -0.163    0.199     -0.819      0.413
```

Figure 2: Model Results from Mplus