IEA

Researching education, improving learning

Multilevel Linear Modeling (MLM) and Structural Equation Modeling (SEM) with Large-Scale Assessment Data

Background and Objectives

This virtual workshop contains two modules with the first focusing on MLM (October 26-30th 2020) and the second focusing on SEM and ML-SEM (November 23-27th 2020).

Both Multilevel modeling (MLM) and Structural equation modeling (SEM) are commonly used statistical techniques for the advanced analysis of large-scale assessment data in the field of education. In the scope of two separate modules, participants will be introduced to the theory and application of both techniques, considering in particular features specific to large-scale assessment data.

Both modules begin with the methodological introduction and underlying assumptions of each method. Further, on line hands-on-trainings offer opportunities to practice both MLM and SEM using data from a selected large-scale study (IEA TIMSS 2019). Methodological concepts related to the complex study and sampling design of large-scale assessments are presented and discussed providing recommendations on optimal implementation of models with data from such assessments. Hands-on-training conducted through the workshop at several occasions provide opportunities to exercise statistical applications of the presented models. The last part of the SEM module builds upon the knowledge from the MLM module presenting how to combine these two techniques in one joint multilevel structural equation model (ML-SEM) approach.

Although participants can book each module independently, prior knowledge of MLM is required to benefit from the ML-SEM presentations and hands-on trainings during the SEM workshop.

Read below for the workshop description and registration details.

Workshop module 1: Multilevel Linear Modeling (MLM) with Large-Scale Assessment Data

Start: Oct 26th 2020

End: Oct 30th 2020

Instructors: Justin Wild, Ph.D. & Dr. Agnes Stancel-Piątak

Description

MLM reflects the hierarchical structure of education systems allowing for the analyses of associations at different levels of the system. Individual observations and cluster level observations can be modeled in a joint two-level model, but the results are obtained separately for each level. Three-level models allow for the incorporation of an additional level, such as the country level. MLM can provide more reliable and less biased results than traditional analysis methods for clustered data. Participants will be introduced to the theory and application of MLM, considering in particular features specific to large-scale assessment data. Through hands-on-trainings, participants will gain practical experience in applying MLM to large-scale assessment data using Mplus.

Workshop module 2: Structural Equation Modeling (SEM): Foundations and Multilevel Advancement

Start: Nov 23rd 2020

End: Nov 27th 2020

Instructors: Dr. Agnes Stancel-Piątak, Justin Wild, Ph.D., Minge Chen, Ph.D., Nadine Twele

Description

SEM is used to analyze constructs that are not directly observable such as personal traits (e.g., student motivation) or characteristics of the environment related to learning processes (e.g. school climate). In SEM, observable indicators are combined into one factor to reflect the latent (not directly observable) psychological or sociological phenomena. SEM further allows for analysis of the relationships between latent constructs and can provide more precise parameter estimates than analysis with single manifest (observable) indicators.

Participants will be introduced to the theory and application of SEM, considering in particular features specific to large-scale assessment data. The last part of the SEM module builds upon the knowledge from the MLM module presenting how to combine these two techniques in one joint multilevel structural equation model (ML-SEM) approach. Through hands-on-trainings, participants will gain practical experience in applying SEM, and ML-SEM to large-scale assessment data using Mplus.

Expected outcomes for participants

After the workshop participants will be able to:

- ✓ Understand the theoretical principals and assumptions associated with MLM and SEM;
- ✓ Understand the methodological implications related to the complex study design of large-scale assessments relevant for conducting MLM and SEM;
- ✓ Specify MLM, SEM, and ML-SEM models using Mplus considering the complex design of large-scale data;
- ✓ Interpret and present results of MLM, SEM, and ML-SEM analyses, with an emphasis on educational research and policy.

Target audience and requirements

Workshop participants will require solid knowledge of inferential statistics (such as regression, correlation, and variance analysis). Familiarity with the following software would be an advantage:

- SPSS and their application to large-scale assessment data
- Mplus knowledge and/or familiarity with syntax based analysis

Data for exercises is provided during the workshop.

Software used	Mplus
Language of Instruction	English
Duration	***Workshop module 1:*** 4.5 days ***Workshop module 2:*** 4.5 days
Course Level	Intermediate
Topics[1]	***Workshop module 1:*** • Introduction to MLM • MLM in Mplus using ILSAs • MLM (Two-level model) • MLM (Three-level model) ***Workshop module 2:*** • Introduction to SEM • Overview of Common Factor Model and CFA • Model-data Fits and Model Comparison • SEM and Path Analysis • Introduction to ML-SEM, ML-SEM in Mplus, & ML-SEM in Mplus using ILSAs

[1] Listed here are tentative topics for the workshop

Registration and fees

Both workshop modules will be conducted virtually. More information about the registration will be available in August. Registration should be made via the registration website published in due time before the workshop.

It is possible to register for either one or both of the workshop modules. Discounted rates are available for participating in both workshop modules as well as for early bird registrants and students.

Workshop module 1: Multilevel Linear Modeling (MLM) with Large-Scale Assessment Data

	Fee	
General Registration	525 €	Discounted rates will be available

Workshop module 2: Structural Equation Modeling (SEM): Foundations and Multilevel Advancement

	Fee	
General Registration	525 €	Discounted rates will be available

Combined (discounted rate apply if you participate in both workshop modules)

	Fee	
General Registration	840 €	Discounted rates will be available

Payment details will be published together with the registration opening.

A detailed agenda will be made available to the participants in due time before the workshop.

For content related information, please contact randa@iea-hamburg.de.

For information on administrative issues, please contact seminar@iea-hamburg.de