

# Structural Equation Modeling (SEM) with Large-Scale Assessment Data

**November 23-27<sup>th</sup>, 2020**

## Trainers

Minge Chen, PhD (IEA Hamburg)  
Justin Wild, PhD (IEA Hamburg)  
Dr. Agnes Stancel-Piątak (IEA Hamburg)  
Nadine Twele (IEA Hamburg)

## Guest speakers

To enhance participants' experiences, the workshop program will accommodate an insightful roundtable discussion on '**Latent Modeling in ILSA: Experiences, Challenges and Solutions**' by the educational experts **Dr Hynek Cígler** (Masaryk university, Faculty of Social Studies. Department of Psychology) and **Eugenio Gonzalez, PhD** (Educational Testing Service, ETS).

## Background and Objectives

This workshop is the follow up of the MLM workshop (REGISTRATION IS CLOSED) and focuses on SEM and ML-SEM.

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 SEM workshop, participants will be introduced to the theory and application of SEM techniques, considering in particular features specific to large-scale assessment data.

Workshop module begins with the methodological introduction and underlying assumptions of the SEM method. Further, on line hands-on-trainings offer opportunities to practice 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 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.

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 how to register.*

## **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 SEM;
- ✓ Understand the methodological implications related to the complex study design of large-scale assessments relevant for conducting SEM;
- ✓ Specify SEM, and ML-SEM models using Mplus considering the complex design of large-scale data;
- ✓ Interpret and present results of 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	5 days
Course Level	Intermediate
Topics <sup>1</sup>	<ul style="list-style-type: none"><li>• Introduction to SEM</li><li>• Overview of Common Factor Model and CFA</li><li>• Model-data Fits and Model Comparison</li><li>• Measurement Invariance</li><li>• SEM and Path Analysis</li><li>• Introduction to ML-SEM, ML-SEM in Mplus, &amp; ML-SEM in Mplus using ILSAs</li></ul>

## Registration and fees

The workshop will be conducted virtually. A prerequisite to follow the content of the ML-SEM part of the second module is the solid knowledge of MLM. Discounted rate is available to students.

You can register by filling the registration form [via this link](#) and sending it by email to [seminar@iea-hamburg.de](mailto:seminar@iea-hamburg.de). You will need to submit the registration form no later than **November 9<sup>th</sup>, 2020**.

### Registration fees

- General Registration - 525,00 €
- Student discount 10% off - 472,50 €

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

For questions, please contact [seminar@iea-hamburg.de](mailto:seminar@iea-hamburg.de).

---

<sup>1</sup> Listed here are tentative topics for the workshop