

FURTHER EDUCATION | WORKSHOP

Introduction into Longitudinal Structural Equation Modeling using R

Instructor: Dr. Timo Gnambs

Date & Time: Wednesday, February 03, and Friday, February 05, 2027
09:00 a.m. to 16:00 p.m. (s.t.)

Place: LifBi, Wilhelmsplatz 3, 96047 Bamberg, Room 01.13

Registration: To register, please send an email to weiterbildung@lifbi.de by January 15, 2027
Registration is mandatory. The number of participants is limited to 16.

Short Outline

Structural equation modeling (SEM) is a comprehensive multivariate statistical technique for examining complex relationships among observed and unobserved (latent) variables. It enables researchers to test and evaluate how well theoretical models with direct and indirect effects between multiple variables are supported by empirical data. In addition, SEM is particularly well suited for addressing longitudinal research questions, such as changes in variables over time and their reciprocal influences.

The first part of this two-day workshop focuses on the general SEM framework and its strength in modeling latent variables while accounting for measurement error. It introduces the theoretical foundations, the specification of measurement models, and the implementation of SEM using the R package *lavaan*. The second part extends these concepts to multivariate models, with a focus on applications to longitudinal data. Participants will learn about residualized change models and latent change models to examine bivariate relationships and mean-level change over time. The workshop concludes with an outlook on applying these approaches to the study of competence development using data from educational large-scale assessment such as the *National Education Panel Study* (NEPS).

Target Group and Learning Objectives

The workshop is aimed at doctoral and early-career researchers with little or no prior experience with SEM. By the end of the workshop, participants will:

- have a solid understanding of the fundamental concepts of SEM
- be able to specify, estimate, and interpret measurement models for latent variables
- understand how to specify, estimate, and interpret SEMs
- have an overview of different longitudinal SEM approaches
- be able to implement and interpret SEM analyses using the R package *lavaan*



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The workshop is mainly aimed at members of LifBi and BAGSS. In case of any vacant places, it is open to anyone interested.

Prerequisites

Participants should have a basic knowledge of linear regression analysis and experiences with statistical analyses in *R*. In addition, all participants require their own laptop with the open source software *R* (<https://cran.r-project.org/>), preferably with a graphical user interface such as *RStudio* (<https://posit.co/download/rstudio-desktop/>), and the *R* package *lavaan* (<https://cran.r-project.org/web/packages/lavaan/>).

About the Trainer

Dr. Timo Gnambs is the head of the research unit educational measurement at the Leibniz Institute for Educational Trajectories (LifBi) in Bamberg. He studied psychology at the University of Vienna (Austria) and received his PhD from Erlangen-Nuremberg University (Germany). His research focuses on psychological assessments, psychometrics, and meta-analytic methods. He has published numerous peer-reviewed articles in national and international journals including *Assessment*, *Behavior Research Methods*, and *Research Synthesis Methods*.