

Measuring the unobservable: Introduction to latent variables and factor analysis using Mplus

A New Directions Pre-Conference Workshop
Saturday 7 December at Yokohama National University

Overview:

Often the type of information in which we are most interested in education and the social sciences are the things that we cannot observe directly. For example, student motivations or self-concept, teacher expectancy levels, and indeed learner aptitude or ability. In order to gain insights in these areas, we use observed evidence often gained from questionnaire responses or test item results to hypothesise or infer the levels of these unobservable constructs or traits. There are a wide range of statistical approaches that are used to evaluate these data. A common approach to these topics uses factor analysis, a technique that originated in psychology, but has application across many disciplines.

The aim of this workshop is to introduce participants to exploratory and confirmatory factor analysis (EFA and CFA). No prior experience of running this type of analysis is required, and the software used to run the analysis (Mplus) will be fully introduced during the workshop. Only the (free) demo version of the software is needed. In addition to a practical focus on data format, syntax, and interpreting model output, relevant theoretical issues surrounding estimation and model assumptions will also be covered.

The 1-day workshop will include focused teaching sessions on key concepts interspersed with hands-on practical application.

Contents:

Seminar sessions will introduce latent variables and their value in test and questionnaire data analysis, plus address a number of relevant theoretical issues surrounding latent variable modelling. These sessions will be interspersed with practical opportunities for participants to learn about:

- Formatting data, creating and running latent variable models using Mplus.
- Conducting EFA and CFA analysis in Mplus, and interpreting the output.
- Assessing fit, improving and comparing models.
- Employing multi-group analysis techniques.
- Time-permitting: Using Mplus for Item Response Theory analysis.

Background or prior knowledge required:

- Broad awareness of statistical concepts, such as dependent/independent variables.
- Some understanding of the principles behind regression modelling.
- Familiarity with use of questionnaires as a research instrument.

Pre-workshop activities:

- **Essential:** Download and install the Mplus demo version on laptop computer to be brought to the workshop.
- **Optional:** In order to view diagrams within Mplus, 64-bit Java is also required.

Maximum number of participants:

- Up to 30.

Workshop facilitators:

Dr. Karen Dunn is a Senior Researcher in measurement and evaluation at the British Council. She holds a PhD in Applied Social Statistics and Masters in Language Studies. The focus of Karen's PhD research was on using Explanatory Item Response Theory modelling approaches to investigate word difficulty for L2 learners of English. Karen has delivered a number of short courses for the Postgraduate Statistics Centre in Lancaster on Factor Analysis and Structural Equation Modelling, and has also contributed to both face-to-face and online postgraduate statistics courses for both the Linguistics and Psychology departments at Lancaster University. Her current research interests involve looking into the scoring validity of reading reordering tasks, investigating the factorial structure of a test to assess grammar and vocabulary, and linking motivational profiles of teenage language learners to proficiency outcomes.



Dr. Janina Iwaniec is a Lecturer in TESOL at the University of Bath. In her PhD in Applied Linguistics, she used the mixed methods (QUANT-qual) approach to investigate the motivation of Polish learners to study English, developing, in the process expertise in questionnaire design. Her teaching experience involves delivering a range of linguistics courses at both undergraduate and postgraduate levels at Lancaster University. She currently teaches courses on second language acquisition and quantitative research methods at postgraduate course at the University of Bath. Her research interests include investigating how language learning motivation is affected by other variables in a variety of contexts.

