



## DEPARTMENT OF EDUCATION AND SPECIAL EDUCATION

### **QRM1803 Measurement: Theory and applications in educational research, 7.5 credits**

Mätlära: Teori och tillämpning i utbildningsvetenskaplig forskning, 7,5 högskolepoäng

*Third-cycle level / Forskarnivå*

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### **Confirmation**

This syllabus was confirmed by the Department of Education and Special Education on 2018-06-20, and is valid from Autumn semester 2018.

#### *Responsible department/equivalent*

Department of Education and Special Education, Faculty of Education

### **Entry requirements**

For admission to the course, the applicant has to be registered as a doctoral student in the third cycle or have a doctoral degree. The applicant should also have documented prior knowledge corresponding to the learning goals in the basic course QRM1800 “Basic statistics for educational research, 7,5 credits”, or similar.

### **Learning outcomes**

The course provides an introduction to classical test theory (CTT) and Item Response Theory (IRT). The overall aim is that participants will acquire knowledge and understanding of different measurement theories in relation to construction, analysis and evaluation of measurement instruments used in educational research. The course has an applied focus, and after successful completion of the course, the participant is expected to have sufficient knowledge and skills to be able to independently apply the theories, procedures and methods treated in the course on own instruments and own data. The participants should also be able to critically review and evaluate educational research studies where measurement instruments have been used, and where CTT and/or IRT has been applied. After completion of the course, the participant should be able to do the following:

#### *Knowledge and understanding*

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- Account for key terms and assumptions in CTT and IRT, and be able to explain the main differences between the two frameworks
- Describe and explain different applications of CTT and IRT, respectively
- Describe common statistical techniques used for equating or estimating comparability between different instruments
- Explain the meaning of the concepts reliability and validity in relation to CTT and IRT, respectively

### *Competence and skills*

- Explore measurement properties of scales and test items/indicators using CTT- and IRT methods
- Perform data analyses with the purpose of identifying possible bias/DIF
- In written form report analyses performed using CTT and IRT methods, and reflect, compare and evaluate findings from both types of analyses

### *Judgment and approach*

- Discuss the applicability of the different theories and methods treated in the course in relation to own research questions/own data
- Critically review and evaluate studies based on applications of CTT and IRT, respectively
- Discuss and problematise strengths and weaknesses of test theoretical assumptions and methods in relation to research questions within the field of educational sciences.

## **Course content**

Measurement theory focuses on the properties of measures used for observation, collection and analysis of data. Creating reliable measures, which can be evaluated through statistical analyses and logical/theoretical considerations, is an important objective of measurement theory. The course will therefore cover the basics of classical test theory (CTT) and Item Response Theory (IRT, also called modern test theory). Strengths and weaknesses of the two frameworks will be addressed, as will some of their applications in educational research and practice. Topics treated in the course include basic models and assumptions underlying classical test theory, estimation of reliability, bias, analysis of items and scales in tests, questionnaires or other instruments. Similarly, the course content includes IRT models and assumptions related to these, parameter estimation and estimation of model fit, and how IRT is used in construction and evaluation of items, scales and tests. The course will cover the most commonly used IRT models for dichotomous and polytomous indicators. An ambition with the course is that the course participants will acquire a test-theoretical understanding, along with theoretical and practical competence to perform tasks such as developing and evaluating tests and other measurement instruments. Therefore, the course mixes theory with practical tasks and tasks that encourages critical reflection. The participants will get training in applying different methods, performing analyses with different software, explore measurement properties of tests and questionnaires, interpret outcomes, and evaluate usefulness and consequences.

## **Types of instruction**

The course starts with two and half days of on-campus lectures and hands-on training in

performing analyses on educational data using CTT and IRT techniques and statistics. After the on-campus meeting, the course continues as an on-line course, with lectures, assignments and seminars over the internet. (GU's learning platform).

Course participants are expected to take responsibility for their own learning, independently and together with peer students, by reading the course literature and actively participate in seminars and group work, and by performing the practical exercises and complete the tasks that are assigned by the course leader.

### ***Language of instruction***

The course is given in Swedish but can be given in English if necessary.

Swedish or English

## **Grades**

The grade Pass (G) or Fail (U) is given in this course.

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## **Types of assessment**

The course is examined by theoretical and practical assignments continuously during the course. Participants will get to analyze data with CTT as well as IRT techniques, assemble, report and interpret results. Participants will also be required to reflect on different test theoretical assumptions, either orally or in written form. A pass grade requires active participation in assignments and seminars, and attendance at all mandatory tasks.

## **Course evaluation**

Course evaluation will be carried out after the course. The evaluation will be used as advice for the future development and planning of the course.

## **Other information**

This is a third-cycle course and a basic course within the national school of Quantitative Research Methods in education (QRM) for researchers. More information about QRM is available at [www.qrm.gu.se](http://www.qrm.gu.se).

### *Collaborating departments*

Department of Education and Special Education, University of Gothenburg in collaboration with Department of Applied Educational Science, Umeå University.

### *Technical equipment*

In order to participate in the course, access to own computer / laptop is needed together with computer accessories for online communication (camera, headphones, mic) and the required statistical software (see list of literature).

*Participant limitation and priority*

The number of participants is limited to 15. Priority will be given to doctoral students within the Educational sciences if the number of applicants for the course is exceeding the number of places.