Contribution ID: **340** Type: **Oral Presentation**

Constructing, Improving, and Shortening Tests for Skill Assessment with Competence-based Test Development

Wednesday 23 July 2025 15:00 (15 minutes)

An assessment conducted within competence-based knowledge structure theory (CbKST) aims to uncover the skills that an individual possesses based on their observed responses to test items. This process involves first deriving the set of items that the individual is capable of solving (the knowledge state) from the set of items they actually solved (the response pattern), and then inferring the set of skills the individual has available (the competence state) from the knowledge state. A good test ensures that uncertainty about the individual' s competence state is as small as possible. Competence-based test development (CbTD) is a recent method for constructing tests proposed within CbKST. It exploits concepts originally introduced in rough set theory to construct tests that are as informative as possible about individuals'competence states (i.e., adding any item does not increase the informativeness of the tests) and, if desired, also minimal (i.e., no item can be eliminated without reducing the informativeness of the tests). Given a fixed set of competence states that exist in a population of individuals and a fixed set of competencies (each of which being the set of skills required to solve an item), CbTD produces tests that differ in the competencies but are all equally informative about individuals'competence states. Both conjunctive and disjunctive tests can be developed. In conjunctive tests, all skills associated with an item are necessary for solving it, whereas in disjunctive tests, any of the skills associated with an item is sufficient for solving it. The talk presents CbTD and illustrates some real-life applications to the construction of a test from scratch, and the improvement and shortening of existing tests.

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Session Classification: Symposium : "Innovations in test development and validation"