

Exploring Feedback Behaviour: A Multivariate Multilevel Modelling Approach

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In educational studies, computer-based assessments provide the opportunity to collect multiple outcomes of student performances. This may concern measurements of ability but also speed of working. Recently, the possibility of providing students instant feedback has been further explored. When missing skills are identified, relevant feedback can be provided to help students to build necessary skills. This can be arranged by a process that generates feedback. Such a feedback procedure can be started using an information retrieval system, where students can directly retrieve relevant information.

Various computer-based assessment studies have investigated the effects of feedback on student learning (van der Kleij, Eggen, Timmers, & Veldkamp, 2012a, 2012b). Individual homogeneity in the use of feedback is generally assumed, but it can be expected that students differ in their feedback use. Furthermore, to better understand student's information seeking behaviour, implicit feedback measures such as click through rates and popup opening times can be used. The idea is that by learning about preferences of students using an in-depth analysis of student's seeking behaviour, the efficiency and accuracy of the system's feedback information can be further improved and used to individuate system responses.

From a statistical point of view, multiple multilevel data sets are observed from different sources. In a Bayesian framework, a multivariate multilevel modelling approach will be shown that can handle the multiple sources of multilevel data of mixed response types. The hierarchical modelling approach will capture the complex data structure with item observations nested in latent measurements, and multiple latent measurements nested in subjects. The assessment data consist of discrete test scores and continuous response times, which are indicators of ability and speed of working, respectively. The feedback behaviour data represent click through data and attention times. Although attention times contain all information about feedback use, observed feedback use will be separately treated since it is informative about the decision of using feedback, where attention times are considered informative about utilizing feedback information.

The model is applied to data retrieved from a computer-based formative assessment (CBFA) at a Dutch university of applied sciences, where the opportunity to consult feedback was provided to first-year bachelor students of Law, Health, and Business Administration. It will be shown that heterogeneity in using feedback can be partly explained by student achievement and working speed. Student achievement also explained a significant amount of variation in attention times and number of pages consulted.