An Application of Multilevel Modelling Techniques to the
Longitudinal Study of Student Progress in a Modular
Degree Course

PhD thesis

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Abstract

This thesis presents a longitudinal study of undergraduate achievement within a modular first degree course, analysing the academic records of a cohort of students who graduated from the Modular Degree Programme at Oxford Brookes University. Multilevel models are fitted to the marks achieved by members of this cohort in each module taken. Level 1 units are individual module entries, nested within occasions within individual student's programmes. These models were fitted by maximum likelihood and used to study the effects of both student and module characteristics on performance. The effects of these factors on mean marks, on the consistency of students performance and on the variation between students were studied by including complex variation at level 1 and random effects at student level in the models. In addition, individual progress charts were fitted, showing how patterns of progress vary from one student to another.

Reviewing the hierarchical structure, it was found that a more complex, cross-classified structure is needed to represent the data accurately. This recognises that individual module entries are clustered within modules, as well as within students. Fitting large multilevel cross-classified models is computationally difficult, however newly developed MCMC estimation techniques allowed a model based on the more complex structure and including random effects and complex variation to be fitted. This analysis shows how MCMC estimation techniques can be used to fit a large cross-classified multilevel model, incorporating random effects and complex variation. The results obtained describe students' progress over the period of their degree course and measure the effects, other things being equal, of factors such as assessment methods, age and subject on mean levels of achievement, consistency of performance and the variation between students, providing a model for future studies of achievement within a modular framework.