

IERI Monograph Series

Issues and Methodologies in Large-Scale Assessments

SPECIAL ISSUE 1

**Sample Size Requirements in HLM:
An Empirical Study**



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A joint publication between the International Association for the Evaluation of Educational Achievement (IEA) and Educational Testing Service (ETS)

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Foreword

For more than four years, members of the International Association for the Evaluation of Educational Achievement (IEA) and Educational Testing Service (ETS) have worked together within the IEA-ETS Research Institute (or IERI) on projects designed to improve the science of large-scale assessments of educational achievement. IERI undertakes activities focused on three broad areas of work: research studies related to the development and implementation of large-scale assessments, professional development and training, and dissemination of research findings and information gathered through large-scale assessments.

To date, IERI has published four volumes of the periodical *Issues and Methodologies in Large-Scale Assessments*. These volumes usually contain six to seven peer-reviewed papers. This publication is the first special issue. It is special because it contains only one (extended) paper. The paper's authors address a matter concerning hierarchical linear models (HLMs) that is highly relevant for researchers engaged in planning international large-scale studies, namely the relationship between the sample sizes at each level of a hierarchical model and the precision of the outcome model. Increasing or reducing the number of units of observation has significant implications for the costs of large-scale assessment studies. Consequently, it is of utmost importance to have the best figures possible at hand when planning large-scale assessment studies that produce data subject to later analysis via HLM and other multilevel approaches.

Given that HLM is such a popular method of analyzing large-scale assessment data, many researchers already consider the requirements for HLM analysis in their study designs. While several rules of thumb on the number of observations necessary at each level of analysis exist, an in-depth study addressing the sample-size requirements of the type presented in this paper has not previously been available.

We hope you will find reading this paper as interesting as we did. We also hope you will consider supporting this periodical by submitting papers presenting your own methodological research on international large-scale assessments to IERI. Finally, we would like to express our gratitude for the generous support given to this report by the National Center for Education Statistics in the United States.

Matthias von Davier and Dirk Hastedt

Editors of the IERI periodical *Issues and Methodologies in Large-Scale Assessments*

ABOUT IEA

The International Association for the Evaluation of Educational Achievement (IEA) is an independent, non-profit, international cooperative of national research institutions and governmental research agencies. Through its comparative research and assessment projects, IEA aims to:



- Provide international benchmarks that may assist policy-makers in identifying the comparative strengths and weaknesses of their education systems
- Provide high-quality data that will increase policy-makers' understanding of key school- and non-school-based factors that influence teaching and learning
- Provide high-quality data that will serve as a resource for identifying areas of concern and action, and for preparing and evaluating educational reforms
- Develop and improve the capacity of educational systems to engage in national strategies for educational monitoring and improvement
- Contribute to development of the worldwide community of researchers in educational evaluation.

Additional information about the IEA is available at www.iea.nl and www.iea-dpc.de.

ABOUT ETS

Educational Testing Service (ETS) is a non-profit institution whose mission is to advance quality and equity in education by providing fair and valid assessments, research, and related services for all people worldwide. In serving individuals, educational institutions and government agencies around the world, ETS customizes solutions to meet the need for teacher professional development products and services, classroom and end-of-course assessments, and research-based teaching and learning tools. Founded in 1947, ETS today develops, administers, and scores more than 24 million tests annually in more than 180 countries, at over 9,000 locations worldwide.



Additional information about ETS is available at www.ets.org.