



Educational Achievement  
for the Evaluation of  
International Assessment

Lynch School of Education, Boston College  
TIMSS & PIRLS International Study

Findings from a Developmental Project

# Mathematics Cognitive Domains on Achievement in the IEA's TIMSS 2003 International Report

© 2005 International Association for the Evaluation of Educational Achievement (IEA)

TIMSS 2003 International Mathematics Report / by Ina V.S. Mullis,  
Michael O. Martin, Pierre Foy.

Publisher:

TIMSS & PIRLS International Study Center,  
Lynch School of Education, Boston College

Library of Congress Catalog Card Number: 2005900696

ISBN: 1-889938-38-6

For more information about TIMSS contact:

TIMSS & PIRLS International Study Center  
Lynch School of Education  
Manresa House  
Boston College  
Chestnut Hill, MA 02467  
United States

tel: +1-617-552-1600

fax: +1-617-552-1203

E-mail: [timss@bc.edu](mailto:timss@bc.edu)

URL: [timss.bc.edu](http://timss.bc.edu)

Boston College is an equal opportunity, affirmative ac

!c

# Contents

- 3 **Chapter 1**  
*The Developmental Project to Report TIMSS 2003 Mathematics Achievement in Cognitive Domains*
- 3 **Overview of TIMSS**
- 3 **The TIMSS 2003 Assessment Frameworks and International Report**



## **73 Appendix B**

*Overview of Procedures TIMSS 2003 Developmental Project*

### **73 Process for Establishing the Mathematics Cognitive Domains for Scaling and Reporting**

### **75 Characteristics of Items Within Cognitive Domains**

76 Exhibit B.1 Characteristics of Items Within Cognitive Domains

### **79 Constructing Achievement Scales in the Mathematics Cognitive Domains**

80 Item Calibration

81 Evaluating the Fit of the IRT Models

81 Generating IRT Proficiency Scores

### **82 Reliability**

83 Exhibit B.2 Reliabilities of Overall Mathematics and Cognitive Domains

### **85 Correlations**

86 Exhibit B.3 Correlations of Mathematics Cognitive Domains with Overall Mathematics

88 Exhibit B.4 Correlations of Mathematics Cognitive Domains

## **93 Appendix C**

*Coverage of TIMSS 2003 Target Populations and Participation Rates*

94 Exhibit C.1 Coverage of TIMSS 2003 Target Populations

96 Exhibit C.2 Participation Rates (Weighted)

## **99 Appendix D**

*Percentiles and Standard Deviations of Mathematics Achievement in the Cognitive Domains*

100 Exhibit D.1 Percentiles of Achievement in Knowing Cognitive Domain

102 Exhibit D.2 Percentiles of Achievement in Applying Cognitive Domain

104 Exhibit D.3 Percentiles of Achievement in Reasoning Cognitive Domain

106 Exhibit D.4 Standard Deviations of Achievement in Knowing Cognitive Domain

108 Exhibit D.5 Standard Deviations of Achievement in Applying Cognitive Domain

110 Exhibit D.6 Standard Deviations of Achievement in Reasoning Cognitive Domain