# TIMSS 2015 Completed
# TIMSS 2019 Underway

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58th IEA General Assembly
October 2017, Budapest

eTIMSS 2019

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

# Since Last General Assembly…

- **TIMSS and TIMSS Advanced 2015 completed**
- **TIMSS 2019 well underway**
  - **Transition to eTIMSS**
  - **TIMSS 2019 development**

# TIMSS 2015 International Reports and Results – Nov 2016


TIMSS 2015

TIMSS Advanced 2015

IEA

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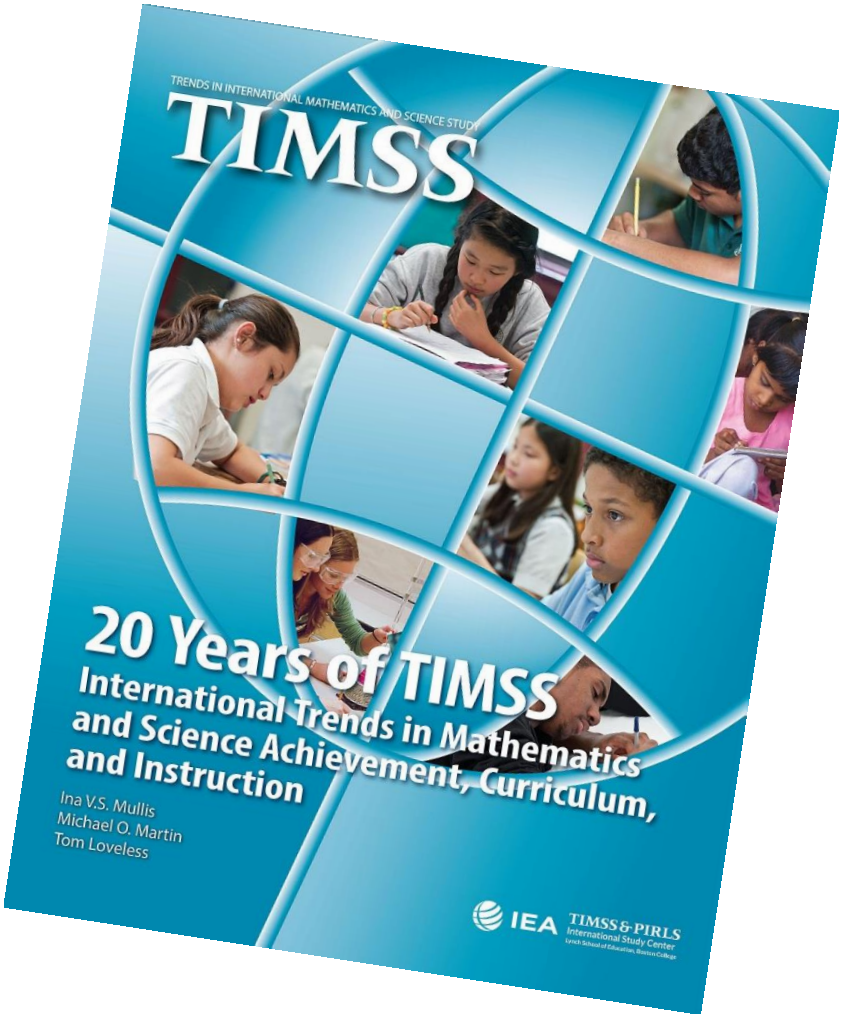
# Successful Release!

- Excellent coverage from quality news media all around the world
- Heavy traffic on TIMSS reports website
  - 75,000 unique clicks from around the world on November 29 alone
- High visibility on social media
  - Twitter posts from @timssandpirls generated 60,000 impressions

# 20 Years of TIMSS – Policy Report

- Achievement trends, overall and by gender
- Curriculum
- Instruction
- Equity and excellence
- Attitudes towards mathematics



TIMSS 2015 Methods and Procedures

## METHODS AND PROCEDURES IN TIMSS 2015

Michael O. Martin, Ina V.S. Mullis, and Martin Hooper

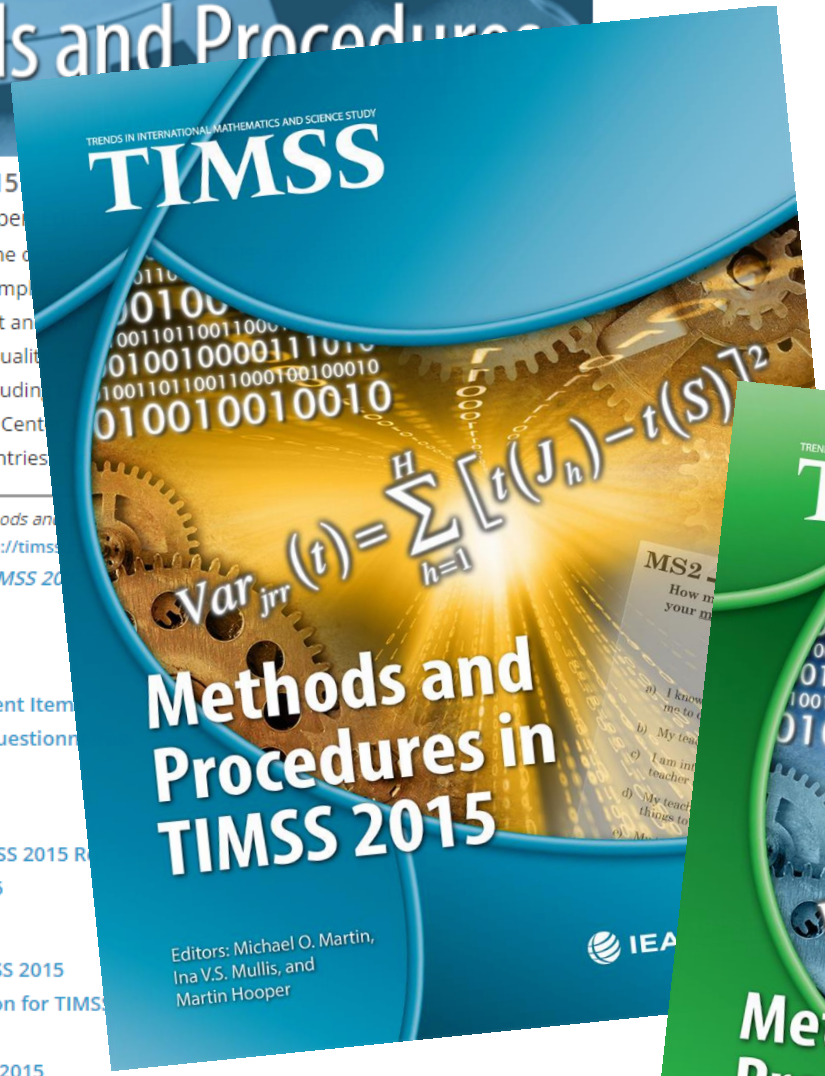
*Methods and Procedures in TIMSS 2015* documents the d
questionnaires and describes the methods used in sampl
construction, and the construction of the achievement an
*Methods and Procedures* documents the numerous qualit
all those involved in the TIMSS 2015 assessments, includin
IEA Secretariat, the IEA Data Processing and Research Cent
Coordinators and their teams in the participating countries

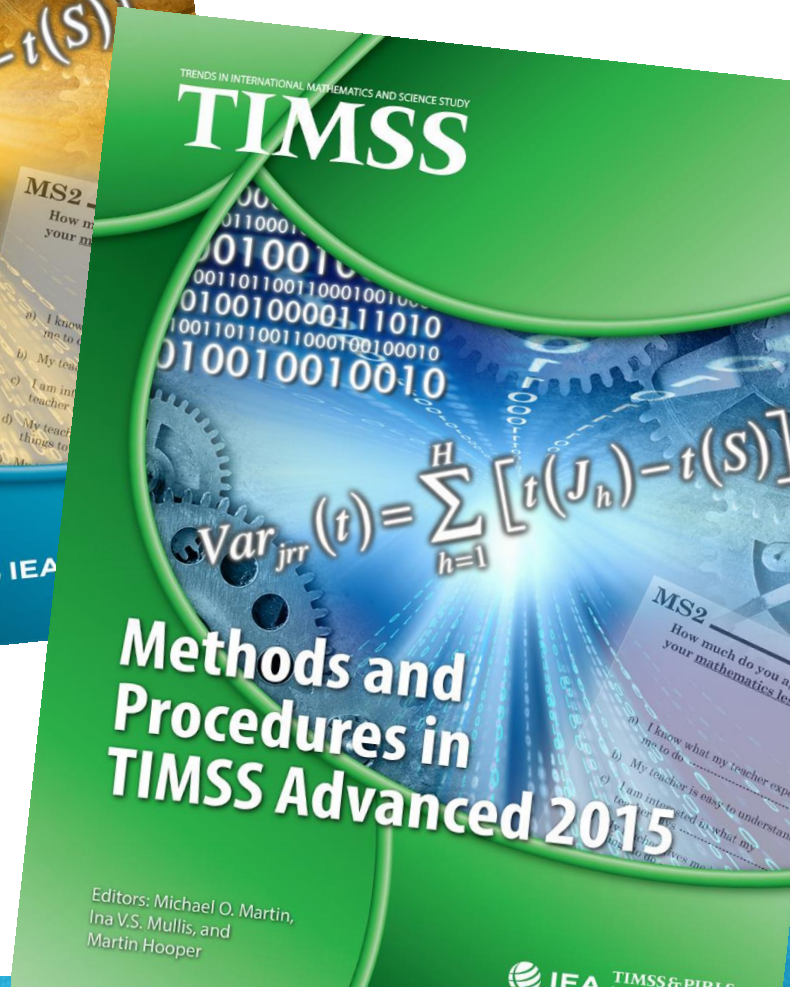
Martin, M. O., Mullis, I. V. S., and Hooper, M. (Eds.). (2016). *Methods an*
College, TIMSS & PIRLS International Study Center website: http://tims

Download the full *Methods and Procedures in TIMSS 20*

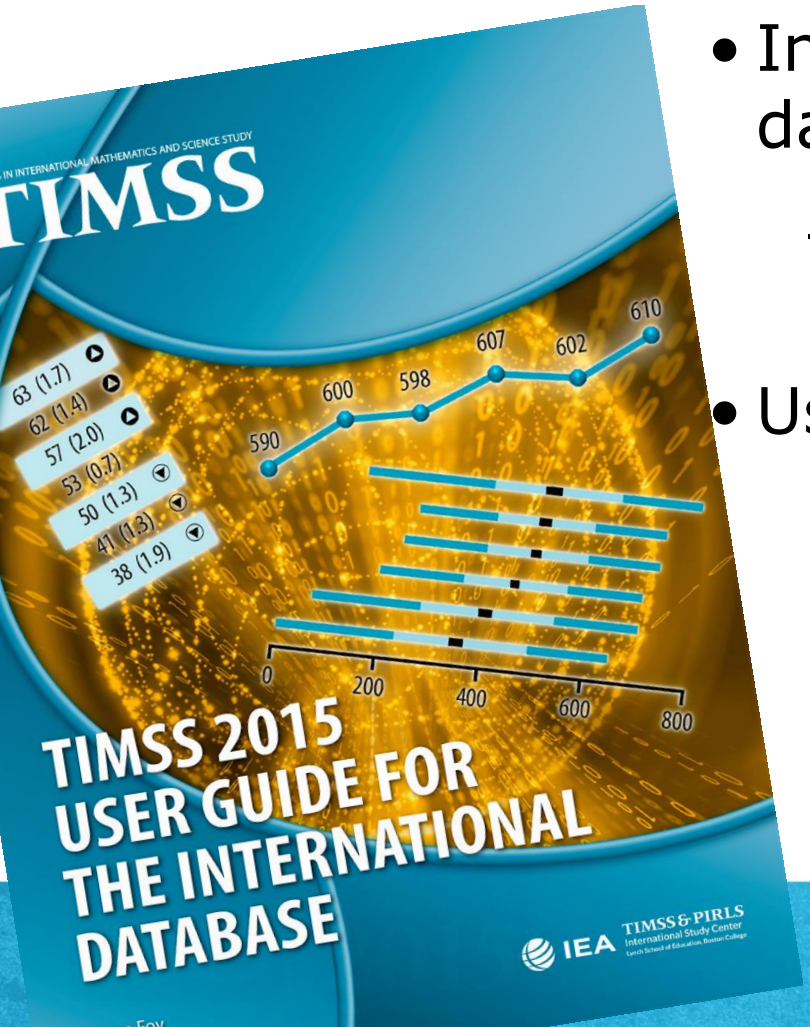
### CHAPTERS





# TIMSS and TIMSS Advanced 2015 International Databases




- International data
  - SPSS and SAS formats
- User Guides

# Transitioning to eTIMSS

# Path to eTIMSS 2019

- Sept 2016 – prePilot – small tryout
- May 2017 – eTIMSS Pilot
  - Item equivalence study to study mode effect
  - Counterbalanced design – same students paper and eTIMSS trend items
- April 2018 – Field Test
  - Newly developed eTIMSS items
- Oct 2018 – June 2019 – Data Collection
  - eTIMSS + bridge to paperTIMSS

# eTIMSS Pilot – Item Equivalence Study – May 2017

- Dual purpose
  - Practice e-assessment systems
  - Prepare for linking to paperTIMSS
- Examine measurement properties of TIMSS trend items in paper and eTIMSS form
  - Are items equally difficult when presented in paper and digital form?

# eTIMSS Pilot – Item Equivalence Study – May 2017

- Four separate assessments
  - Fourth and eighth grades; mathematics and science
- Based on all trend items from 2015
  - Fourth grade: 93 in mathematics; 93 in science
  - Eighth grade: 114 in mathematics; 118 in science
- Each item in two modes
  - paperTIMSS: identical to 2015 – same booklets
  - eTIMSS: items converted to Item Builder

# eTIMSS Pilot – Item Equivalence Study – (cont.)

- 800 students per country; purposive sample
  - 24 countries at fourth grade
  - 14 countries at eighth grade
- Data available for analysis
  - 21 countries at fourth grade: 16,894 students
  - 11 countries at eighth grade: 9,164 students
- Excellent basis for analysis

# eTIMSS Pilot – Item Equivalence Study – (cont.)

- Each student full TIMSS experience in **both** modes, eTIMSS and paper
  - 4 item blocks, 2 mathematics 2 science
- Counterbalanced design
  - Half students paper first; half eTIMSS first
- eTIMSS data processed through eTIMSS systems
  - Item building, translating, player, uploading, scoring

# eTIMSS Pilot – Item Equivalence Study (-cont)

- Administration largely successful, but some issues with "e"
  - Not all trend items completely convertible
  - First experience with TIMSS e-systems
  - Some countries encountered difficulties

# eTIMSS Pilot – Item Equivalence Study (-cont)

Analysis of data

- Examined item equivalence across modes: eTIMSS vs. paperTIMSS
  - Item by item p-values
- Two item groups
  - Most items look identical in paperTIMSS and eTIMSS
  - Some items quite different appearance, so treated differently in analysis

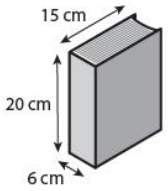
# Essentially Identical

M051533

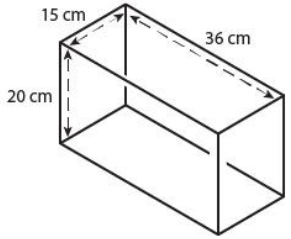
Ryan is packing books into a rectangular box.

All the books are the same size.

**Book**




**Box**




How many books will fill the box?

Answer: _____

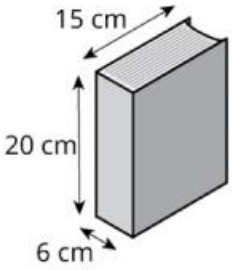
IEA eTIMSS 2019

TIME LEFT 0

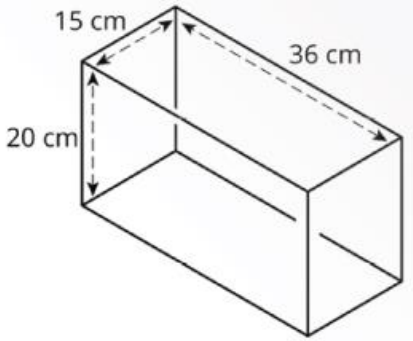
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

**1** Ryan is packing books into a rectangular box.
All the books are the same size.

**Book**




**Box**




How many books will fill the box?

Answer:

eTIMSS 2019

# Readily Adaptable

One evening Peter went outside and made a drawing of a house, a tree, and the Moon. About 2 weeks later, Peter's brother, John, went outside and made a drawing of the same house, the same tree, and the Moon.

When they compared their drawings, they saw that they drew the Moon differently.

Peter's Drawing



John's Drawing

Whose drawing of the moon is correct?

(Check one box.)

- ☐ Only Peter's drawing of the moon can be correct.
- ☐ Only John's drawing of the moon can be correct.
- ☐ Both drawings of the moon can be correct.

Explain your answer.

S061150

eTIMSS 2019

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IEA eTIMSS 2019

TIME LEFT 0

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

**1** One evening Peter went outside and made a drawing of a house, a tree, and the Moon. About 2 weeks later, Peter's brother, John, went outside and made a drawing of the same house, the same tree, and the Moon.

When they compared their drawings, they saw that they drew the Moon differently.

Whose drawing of the moon is correct?

(Check one box.)

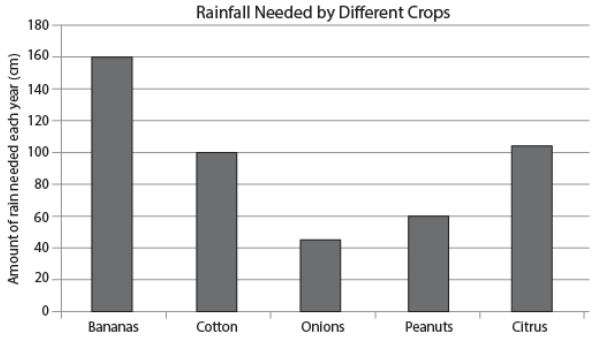
- ☐ Only Peter's drawing.
- ☐ Only John's drawing.
- ☐ Both drawings.

Explain your answer.

eTIMSS 2019

# Not Directly Adaptable

The amount of rainfall needed by different crops is shown in the graph below.

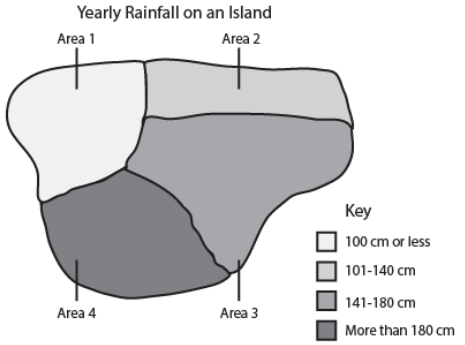



A. A farmer wants to plant crops in an area that gets about 60 cm of rain each year. Which crops will probably grow best in this area?

Ⓐ onions only
Ⓑ onions and peanuts
Ⓒ cotton and citrus
Ⓓ bananas, citrus, and cotton

S061115_1

B. Another farmer lives on a tropical island in the ocean and wants to plant bananas. A diagram of the island is shown below.

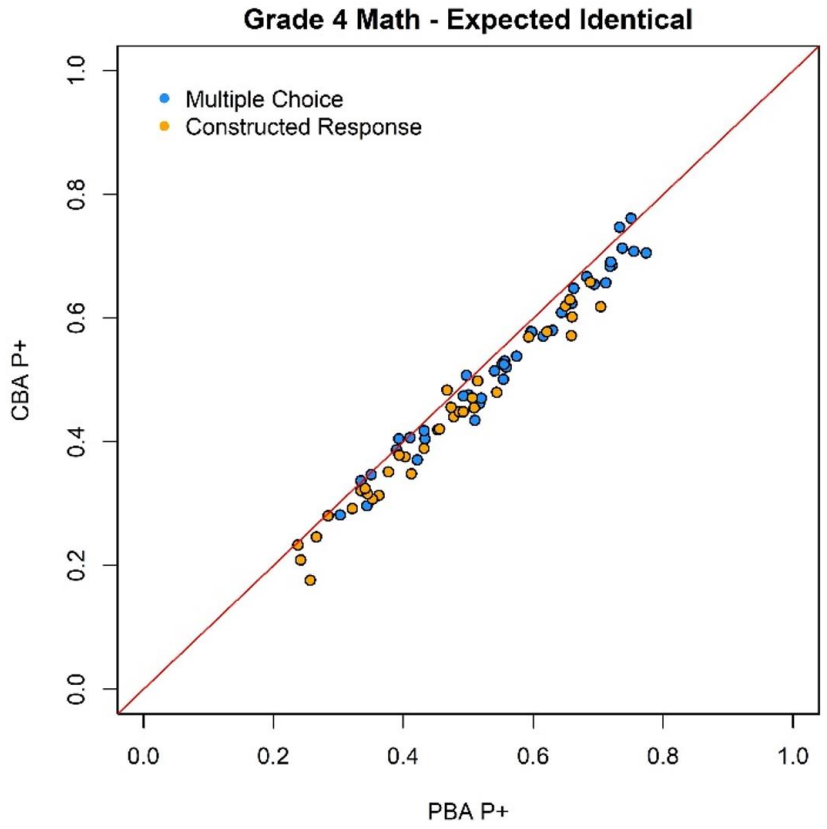


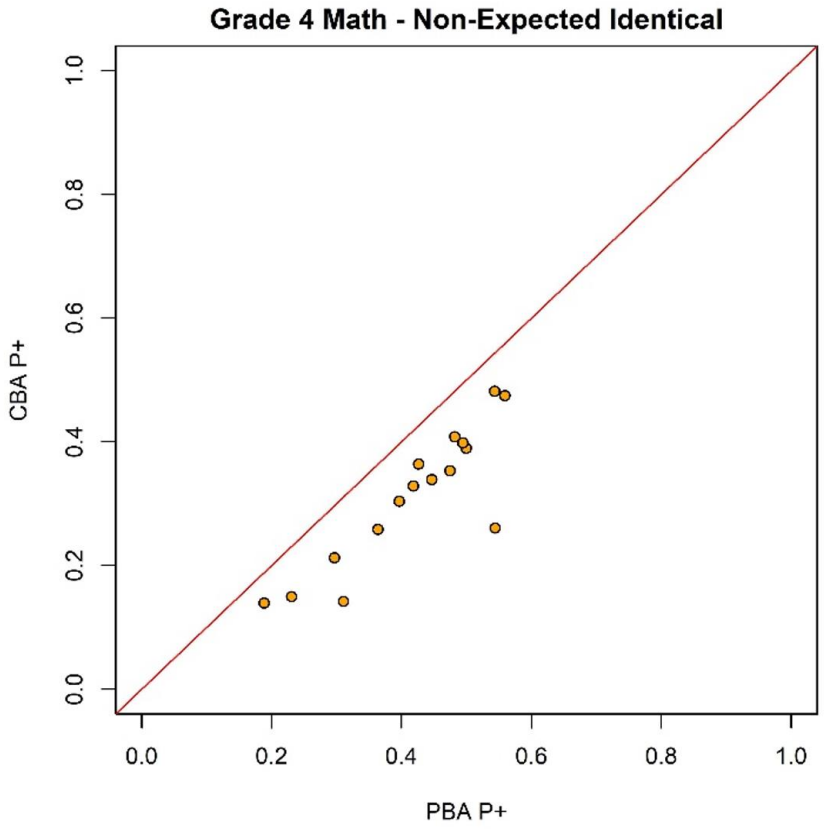

Based on the diagram of the island and the information in the graph in part (A), in which area should the farmer plant bananas?

Ⓐ Area 1
Ⓑ Area 2
Ⓒ Area 3
Ⓓ Area 4

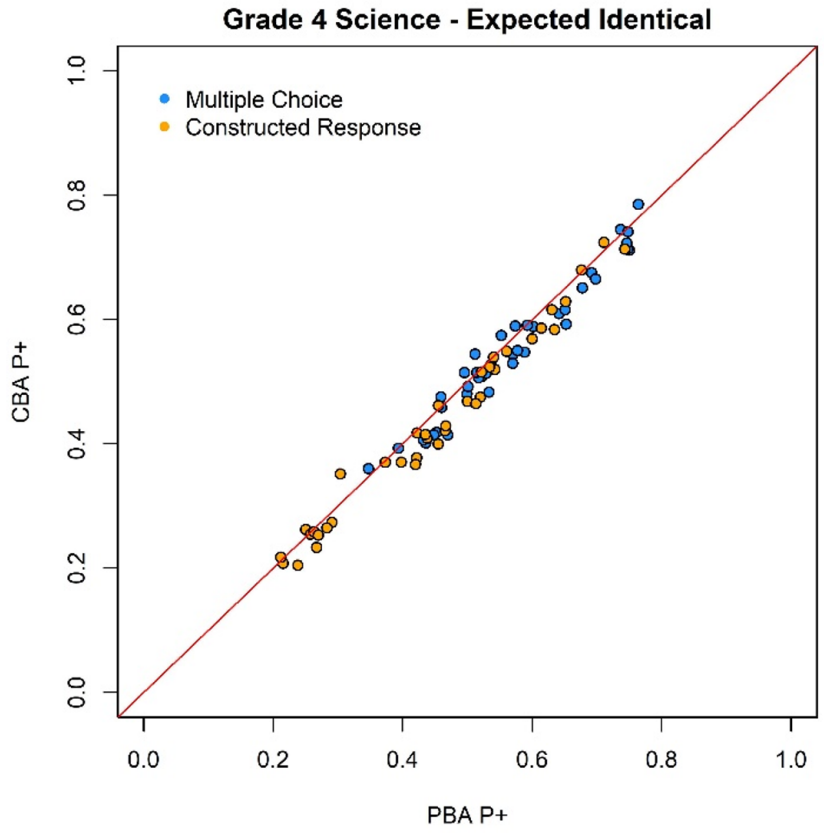
S061115_2

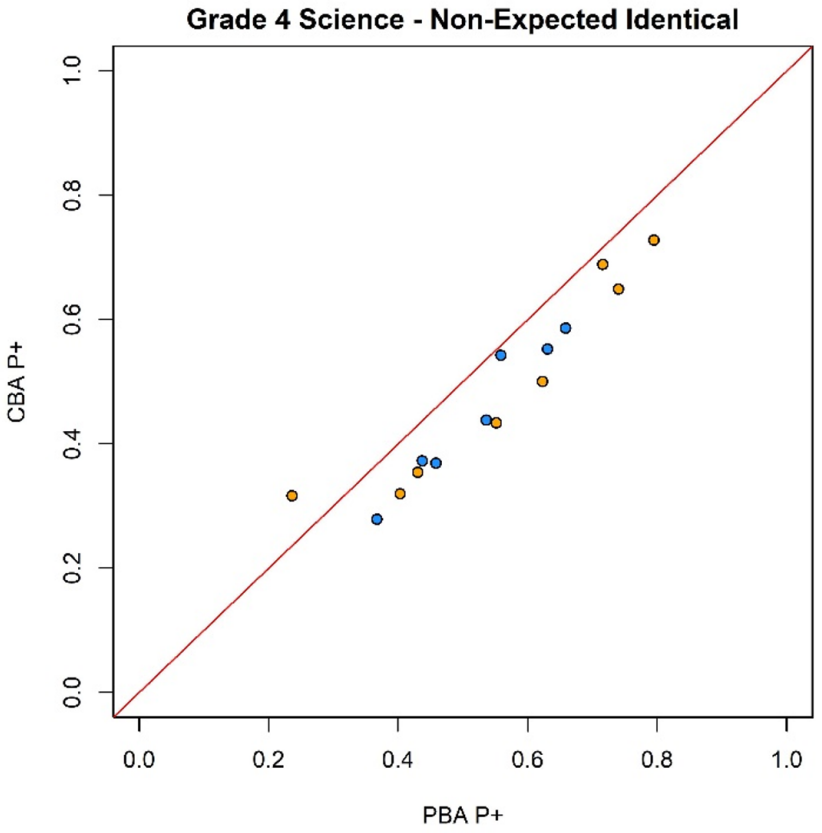
# Fourth Grade Mathematics



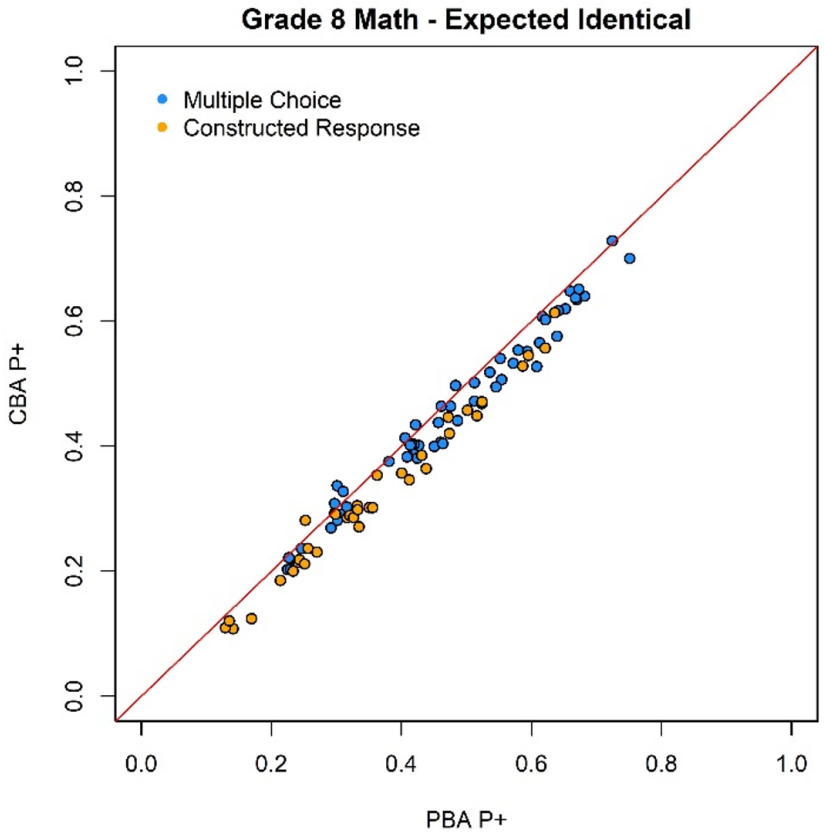



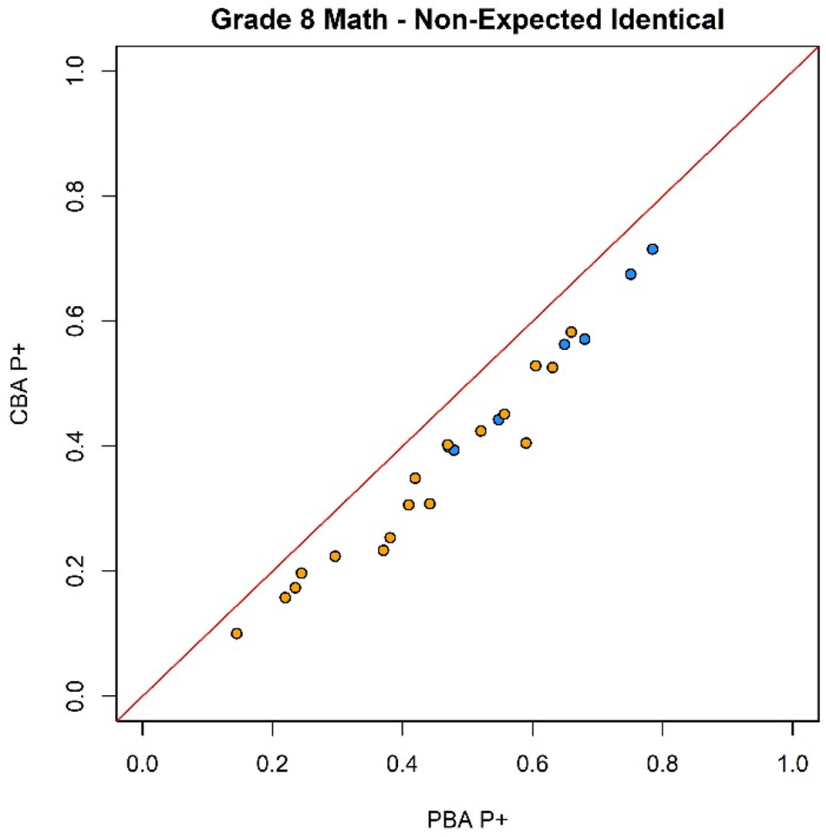
# Fourth Grade Science



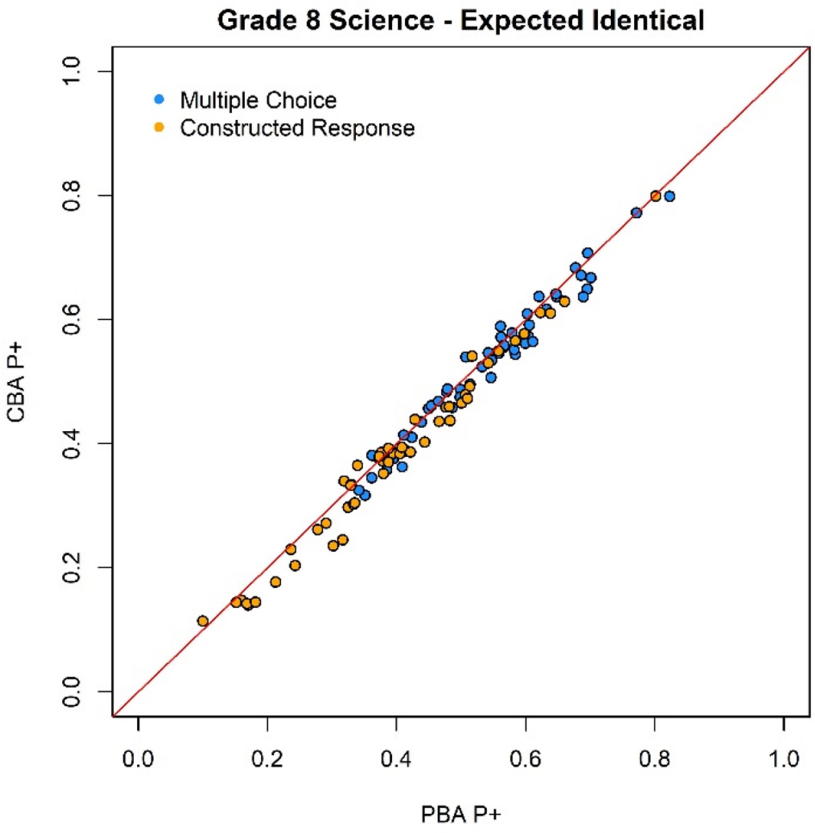



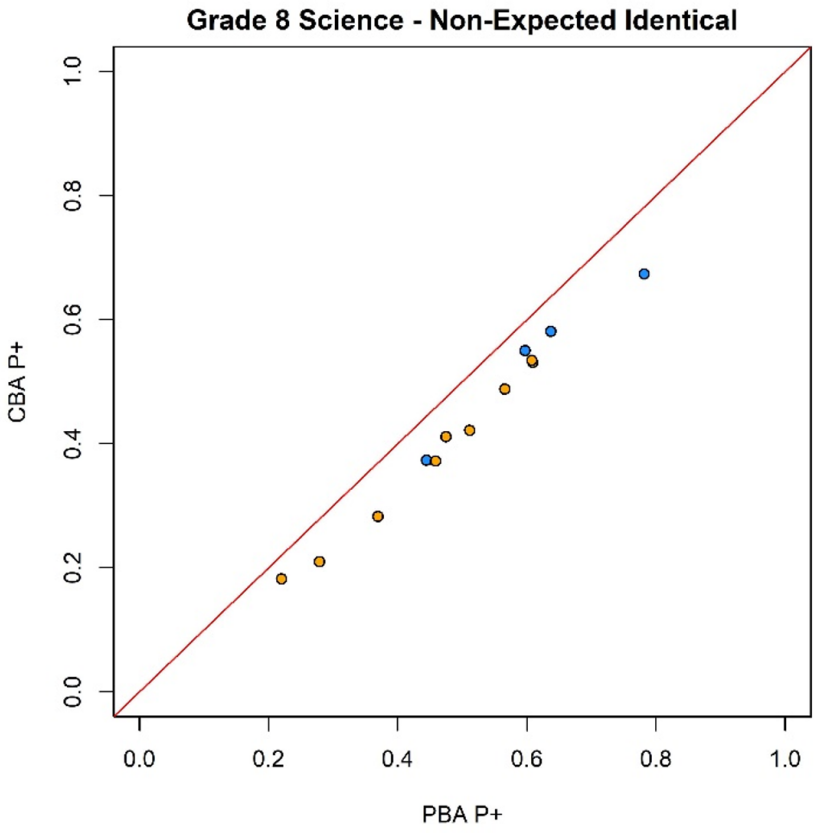
# Eighth Grade Mathematics



# Eighth Grade Science



# eTIMSS Pilot – Item Equivalence Study (-cont)

- Item-by-item analyses showed consistent modest mode effect
  - Items generally **less difficult in paper**
  - More so for **mathematics** than science
- Indicates 2019 trend linking needs a bridge
  - Cannot rely on items being equivalent in eTIMSS and paperTIMSS
  - Instead must match score distributions for eTIMSS and paperTIMSS trend items
  - Same approach as TIMSS 2007 Bridging

# eTIMSS Pilot – Item Equivalence Study (-cont)

- Replicated TIMSS IRT achievement scaling on pilot data to estimate size of mode effect
- Estimated mean scale score differences
  - 4th grade
    - Mathematics: 14
    - Science: 8
  - 8th grade
    - Mathematics: 14
    - Science: 7

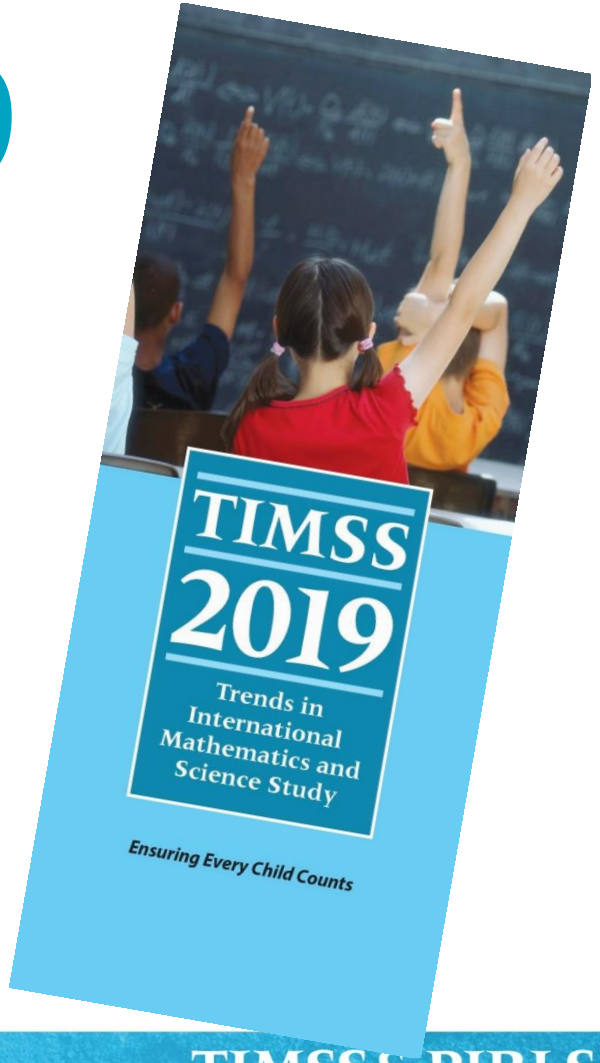
# TIMSS/eTIMSS Scaling Plans for 2019 to Adjust for Mode Effect

- As planned from the beginning, eTIMSS 2019 includes paperTIMSS bridge
  - Equivalent representative samples of students taking eTIMSS and paperTIMSS
  - Bridge data includes all of the trend items from 2015
- Achievement distributions for eTIMSS and paperTIMSS equated through equivalent samples
  - Equivalent groups linking design

# TIMSS/eTIMSS Scaling Plans to Adjust for Mode Effect (cont.)

- Bridging procedure ensures that eTIMSS 2019 data are on the TIMSS achievement scale
  - Used since 1995 to measure trends from assessment to assessment
- Also worth noting that the mode effect size in TIMSS 2019 may be reduced
  - Improvements in e-assessment systems (e.g., number pad)

# TIMSS 2019
# Development




eTIMSS 2019

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# Countries Planning to Participate

Albania
Armenia
Australia
Austria
Azerbaijan
Bahrain
Belgium (Fl.)
Bosnia and Herzegovina
Bulgaria
Canada
Chile
Chinese Taipei
Croatia
Cyprus
Czech Republic
Denmark
Egypt
England
Finland
France
Georgia
Germany
Hong Kong SAR
Hungary
Iran
Ireland
Israel
Italy
Japan
Jordan
Kazakhstan
Korea
Kosovo
Kuwait
Lebanon
Lithuania
Macao SAR
Macedonia
Malaysia
Malta
Montenegro
Morocco
Netherlands
New Zealand
Northern Ireland
Norway
Oman
Pakistan
Philippines
Poland
Portugal
Qatar
Romania
Russian Federation
Saudi Arabia
Serbia
Singapore
Slovak Republic
Slovenia
South Africa
Spain
Sweden
Turkey
United Arab Emirates
United States

**Benchmarking Participants**

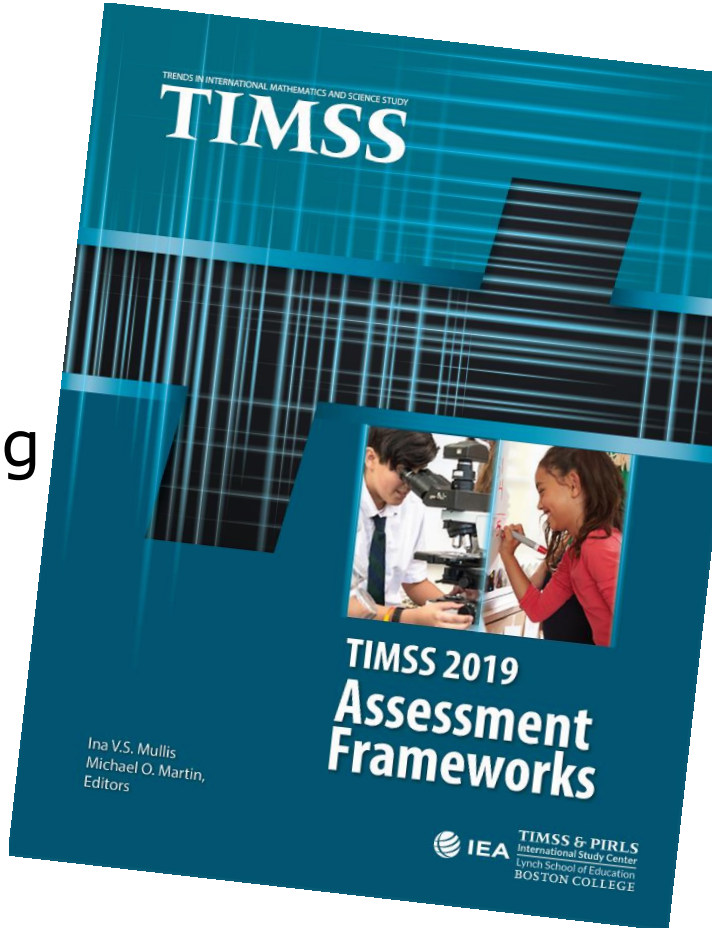
Ontario, Canada
Quebec, Canada
Moscow City, Russia
South Africa (Eng/Afr/Zulu)
Madrid, Spain
Abu Dhabi, UAE
Dubai, UAE

# TIMSS 2019 Assessment Frameworks Published

- Updated and reviewed by SMIRC
  - Sept–Dec 2016
- Reviewed at 1st TIMSS 2019 NRC meeting
  - Feb 2017, Hamburg
- Online review by countries
  - March 2017

# TIMSS 2019 Assessment Frameworks Published (cont.)

- Updated and reviewed at 1st SMIRC meeting
  - April 2017, Amsterdam
- Basis for item writing workshop at 2nd NRC meeting
  - April 2017, Hamburg
- Published online
  - August 2017



# TIMSS Expert Advisory Groups

- Science and Mathematics Item Review Committee (SMIRC)
  - Science and mathematics experts from participating countries
  - Provides guidance on developing the TIMSS assessments
- Questionnaire Item Review Committee (QIRC)
  - Experienced NRCs with policy or analysis backgrounds
  - Provides guidance on developing the TIMSS questionnaires

# TIMSS 2019 SMIRC

**Mathematics Experts**

Ray Philpot, Australia

Kiril Bankov, Bulgaria

Khattab Mohammad Ahmad Abu Libdeh, Jordan

Arne Hole, Norway

Cheow Kian Soh, Singapore

Mary Lindquist, United States

Linda Hall, United States

# TIMSS 2019 SMIRC

**Science Experts**

Svatava Janouskova, Czech Republic

Emily Jones, England

Jouni Viiri, Finland

Alice Siu Ling Wong, Hong Kong SAR

Berenice Michels, Netherlands

Galina Kovaleva, Russian Federation

Christopher Lazarro, United States

# TIMSS 2019 QIRC

Sue Thomson, Australia

Josef Basl, Czech Republic

Heike Wendt, Germany

Laura Palmerio, Italy

Martina Meelissen, Netherlands

Trude Nilsen, Norway

Vijay Reddy, South Africa

Kyongah Sang, Korea

Jack Buckley, United States

# Continuing the Path of Transitioning to eTIMSS - Field Test

Purpose is to field test new items

- eTIMSS countries field test e-assessment systems and newly developed eTIMSS items
- paperTIMSS countries field test some e-assessment systems and newly developed paperTIMSS items

# Both eTIMSS and paperTIMSS Countries Will Field Test:

- International version of all achievement items prepared in Item Builder
- Using the e-assessment Translation System for translation and translation verification
- After verification
  - eTIMSS assessment to eTIMSS Player
  - paperTIMSS assessment to print

# Developing the TIMSS 2019 Field Test Items

- Developed *TIMSS 2019 Item Writing Guidelines*
  - Jan-Mar 2017
- Reviewed at 1st SMIRC meeting
  - April 2017, Amsterdam
- Item Writing Workshop 2nd NRC meeting
  - April 2017, Hamburg
  - Drafted 600 mathematics and 400 science items

# Developing the TIMSS 2019 Field Test Items (cont.)

- Additional items drafted by ACER (mathematics) and NFER (science)
  - April through July 2017
- Items revised and entered into the Item Builder
  - Ongoing iterative process
- Items reviewed by SMIRC Working Group
  - July 2017, Boston

# Developing the TIMSS 2019 Field Test Items (cont.)

- Items revised and then reviewed at 2nd SMIRC meeting
  - September 2017, Windsor
- Items updated and reviewed by SMIRC Working Group
  - September 2017, Boston
- Items being prepared for review at 3rd NRC meeting
  - November 2017, Melbourne

# TIMSS 2019 Field Test Items

eTIMSS and paperTIMSS items

- Same mathematics and science content
- Different response modes
  - eTIMSS components (e.g., drag and drop, multi-select, drop down menus)
- More computer scoring for eTIMSS items
  - Keypad for numeric responses and new item types
- Tools for eTIMSS – ruler and calculator(8th)

# TIMSS 2019 Field Test Items (cont.)

**Fourth grade – mathematics and science**

- 20 blocks (260 items) eTIMSS/paperTIMSS
- 6 blocks (8 tasks) eTIMSS PSIs
- 65 less difficult mathematics

**Eighth grade – mathematics and science**

- 20 blocks (335 items) eTIMSS/paperTIMSS
- 6 blocks (7 tasks) eTIMSS PSIs

# Developing Prototype Problem Solving and Inquiry Tasks (PSIs)

- Simulate real world/laboratory situations
  - Problem solving in mathematics
  - Inquiry in science
- More engaging, interactive, and visually attractive
- Involves integrating and applying process skills and content knowledge
- Adaptive/responsive way of presenting students with items based on a series of steps

# Developing the PSIs – Extremely Demanding

- Series of Task Force meetings and reviews
  - 2015 and 2016
- Prepilot in Australia, Canada, and Singapore
  - Sept-Oct 2016
- Revised, then reviewed at 1st SMIRC meeting
  - April 2017, Amsterdam
- Being programmed for review - 3rd NRC meeting
  - November 2017, Melbourne

# Developing the Context Questionnaires

- Reviewed 2015 questionnaires for updating at 1st NRC meeting
  - Feb 2017, Hamburg
- Context Questionnaire Framework drafted, online QIRC review, revised and published
  - August 2017
- Questionnaires updated for field test and reviewed at 1st QIRC meeting
  - Sept 2017, Hengelo

# Developing the Context Questionnaires (cont.)

- Revised in preparation for review at 3rd NRC meeting
  - Nov 2017, Melbourne
- Post for translation by countries, together with achievement items
  - Dec 2017

# TIMSS 2019 Operations

- Sampling
  - Ongoing since 1st NRC meeting (Feb 2017)
- Operations Manuals
  - eTIMSS pilot
  - TIMSS/eTIMSS 2019 field test procedures
- Data Management Seminar
  - Oct 2017, IEA Hamburg

# Thank You !

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58th IEA General Assembly
October 2017, Budapest