NAEP, TIMSS and PISA: Using National and International Assessment Resources to Improve Teaching & Learning

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Session Organization

PART I:
Basic information about the Assessments

PART II:
Exploring Available Resources and Their Uses
### Quick Fact Check

1. Which of the following subjects are assessed by NAEP?
   - a. Arts, Geography, Economics
   - b. Civics, U.S. History, Writing
   - c. Reading, Mathematics, Science
   - d. All of the above

### International Sampler

2. Compared to the international average, U.S. Grade 8 science teachers tend to rely more on textbooks as the primary basis for lessons. (T/F)

3. In 2009, what percentage of U.S. students reported that the teacher “never or hardly ever” has to wait a long time for students to quiet down.
   - a. 93%
   - b. 88%
   - c. 79%
   - d. 62%
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International Assessments: TIMSS and PISA

Benefits of Participation in International Assessments

- Learn about education “inputs” and “outputs”
  - Contextual information: teacher recruitment, teacher preparation, curriculum, instructional methods, student attributes
- Consider transferability of policies and practices used by high-performing countries
- Participating countries can learn from the experiences of others.
TIMSS Snapshot

- Trends in International Mathematics and Science Study (Sponsored by the IEA)
- Grades 4 & 8 every four years since 1995
- Measures MATH and SCIENCE content knowledge, applying concepts, and using reasoning to solve complex problems.
- “Context” information collected through questionnaires.
  - Principals
  - Teachers
  - Students

Who Participates in TIMSS?

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### TIMSS: Who are the High Achievers?

<table>
<thead>
<tr>
<th>Country</th>
<th>Grade 8 Math ‘07</th>
<th>Country</th>
<th>Grade 8 Science ‘07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese Taipei</td>
<td>598</td>
<td>Singapore</td>
<td>567</td>
</tr>
<tr>
<td>Korea</td>
<td>597</td>
<td>Chinese Taipei</td>
<td>561</td>
</tr>
<tr>
<td>Singapore</td>
<td>593</td>
<td>Japan</td>
<td>554</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>572</td>
<td>Korea</td>
<td>553</td>
</tr>
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<td>Japan</td>
<td>570</td>
<td>England</td>
<td>542</td>
</tr>
<tr>
<td>Hungary</td>
<td>517</td>
<td>Hungary</td>
<td>539</td>
</tr>
<tr>
<td>England</td>
<td>513</td>
<td>Czech Republic</td>
<td>539</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>512</td>
<td>Slovenia</td>
<td>538</td>
</tr>
<tr>
<td>United States</td>
<td>508</td>
<td>Hong Kong</td>
<td>530</td>
</tr>
<tr>
<td>Lithuania</td>
<td>506</td>
<td>Russian Federation</td>
<td>530</td>
</tr>
</tbody>
</table>

### TIMSS: U.S. Performance Trends

- **MATHEMATICS**
  - Grade 4: 2007 performance better than ‘03 and ‘95
  - Grade 8: Scores in 2007 higher than ’95

- **SCIENCE**
  - Grades 4 & 8: Performance unchanged 1995-2007
PISA Snapshot

- Program for International Student Assessment (sponsored by the OECD)
- Administered every 3 years since 2000
- Assesses 15-year-old students
- Measures *application* of knowledge and skills in *reading, mathematics, and science*
- Contextual information collected from students and schools

Who Participates in PISA?

[Map showing participating countries]
## PISA: Who are the High Achievers?

<table>
<thead>
<tr>
<th>Country</th>
<th>Math '09</th>
<th>Country</th>
<th>Science '09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanghai-China</td>
<td>600</td>
<td>Shanghai-China</td>
<td>575</td>
</tr>
<tr>
<td>Singapore</td>
<td>562</td>
<td>Finland</td>
<td>554</td>
</tr>
<tr>
<td>Hong Kong-China</td>
<td>555</td>
<td>Hong Kong-China</td>
<td>549</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>546</td>
<td>Singapore</td>
<td>542</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>543</td>
<td>Japan</td>
<td>539</td>
</tr>
<tr>
<td>Finland</td>
<td>541</td>
<td>Korea, Republic of</td>
<td>538</td>
</tr>
<tr>
<td>Liechtenstein</td>
<td>536</td>
<td>New Zealand</td>
<td>532</td>
</tr>
<tr>
<td>Switzerland</td>
<td>534</td>
<td>Canada</td>
<td>529</td>
</tr>
<tr>
<td>Japan</td>
<td>529</td>
<td>Estonia</td>
<td>528</td>
</tr>
<tr>
<td>Canada</td>
<td>527</td>
<td>Australia</td>
<td>527</td>
</tr>
</tbody>
</table>

## PISA: U.S. Performance Trends

- **READING LITERACY**
  - No measurable change when comparing 2009 to 2003 and 2000.

- **MATHEMATICS LITERACY**
  - Average score in 2009 was higher than 2006 but not measurably different from 2003.

- **SCIENCE LITERACY**
  - Scores improved in 2009 compared to 2006.
National Assessment of Educational Progress: Our Nation’s “Report Card”

NAEP Snapshot

- Established by Congress in 1969 to answer questions about student academic performance
- Currently, assessments in math, reading, science, writing, arts, civics, economics, geography and U.S. history
- Administered in some form annually
- Taken by a representative cross-section of students/schools.
Who Participates in NAEP?

- All states must participate in Grades 4 & 8 Math and Reading.
- Other grades/subjects optional for states
  - In 2011, all states volunteered for Grade 8 Science
    - International benchmarking opportunity
  - CT participates in all components of NAEP
    - Gr. 12 State NAEP in 2009
  - CT State law requires district/school participation

NAEP: Who are the High Achievers?*

- Depends on the subject/grade

<table>
<thead>
<tr>
<th>READING</th>
<th>MATH</th>
<th>SCIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>MA</td>
<td>MA</td>
</tr>
<tr>
<td>MA</td>
<td>MN</td>
<td>MT</td>
</tr>
<tr>
<td>NH</td>
<td>NH</td>
<td>ND</td>
</tr>
<tr>
<td>NJ</td>
<td>NJ</td>
<td>NH</td>
</tr>
<tr>
<td>VT</td>
<td>VT</td>
<td>VA/SD</td>
</tr>
</tbody>
</table>
## NAEP: Connecticut Performance Trends

- **READING**
  - Stable Grade 4 performance with improvements since the early ’90’s. Grade 8 increased over last 7 years.

- **MATHEMATICS**
  - ’07 to ’09, no improvement at Grade 4, but higher than all other years.
  - Grade 8 scores were the highest ever reported.

- **SCIENCE:** Trend broken in 2009

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## CT TIMSS Participation 2011

- Rare opportunity
- NAEP/TIMSS Linking Study
  - 60 CT schools participated (Gr. 8 only)
- Why were we selected?
  - Geography
  - NAEP performance
  - Trend data
- Why did we apply?
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Comparison of Assessments

CMT/CAPT
TIMSS
PISA
NAEP

RESOURCES for Improving Teaching and Learning in Your District
Sample Test Questions

Are you smarter than an 8th grader?

TIMSS Grade 8 Math

1. The number of 250 milliliter bottles that can be filled from 400 liters of water is
   a) 16
   b) 160
   c) 1,600
   d) 16,000
2. Household appliances convert electricity into one or more different forms of energy. An electric fan can best be described as converting electricity into

a) heat energy only
b) heat energy and sound energy only
c) heat energy, sound energy, and mechanical energy only
d) heat energy, sound energy, mechanical energy, and chemical energy

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**What Thinking Processes Does TIMSS Measure?**

<table>
<thead>
<tr>
<th>Cognitive Domains</th>
<th>Math</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GRADE 4</td>
<td>GRADE 8</td>
</tr>
<tr>
<td>Knowing</td>
<td>40%</td>
<td>35%</td>
</tr>
<tr>
<td>Applying</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Reasoning</td>
<td>20%</td>
<td>25%</td>
</tr>
</tbody>
</table>
What Thinking Processes Does NAEP Measure?

<table>
<thead>
<tr>
<th>SCIENCE PRACTICE</th>
<th>% OF STUDENT RESPONSE TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade 4</td>
</tr>
<tr>
<td>Identifying Science Principles</td>
<td>30</td>
</tr>
<tr>
<td>Using Science Principles</td>
<td>30</td>
</tr>
<tr>
<td>Using Scientific Inquiry</td>
<td>30</td>
</tr>
<tr>
<td>Using Technological Design</td>
<td>10</td>
</tr>
</tbody>
</table>

How is PISA Different?

- Substantial reading of contextual scenarios
- Clusters of questions
- Must extrapolate from reading and life experiences to respond
- Passages provide background and contextual information; students apply knowledge to make “well-founded arguments” or “evidence-based conclusions”
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NAEP Resources

- NAEP Data Explorer
- NAEP Questions Tool
- Test Yourself
- Item Maps
- State Comparisons
- State and District Profiles

NAEP Science Performance Tasks

- Model science investigations
- Aligned to CT science standards
- See “Floating Pencil” handout
Featured Resource: NAEP Questions Tool

- Online access to a searchable database of 2000+ released NAEP items in a variety of subjects over many years
  - http://nces.ed.gov/nationsreportcard/itmrls/
- Tutorial:
- How could YOU use released items?
  - models of well-designed items
  - build diagnostic, formative and summative assessments
  - gain insights into student misunderstanding

TIMSS Resources

1. Released items, scoring guides and results by country:
2. Performance reports
   - Scores and trends
   - Student attitudes
   - Teacher background
   - Classroom characteristics & instructional methods
   - School characteristics (demographics, attendance, parent involvement, lab/computer access)
3. Lesson videos and Video Study
TIMSS VIDEOS:
Windows on the World of Math and Science Teaching

- Purposes of the study:
  - Document Gr. 8 teaching practices in various countries.
  - Identify typical teaching practices in each country
  - Explore correlations between test scores and teaching practices
  - Cross-section of schools in high-achieving countries
  - Videotaped classes randomly selected
  - 5 posted lessons are “illustrative” of trends

http://timssvideo.com/
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TIMSS Video Resources

- Lesson Graphs
- Teacher Comments
- Researcher Comments

Possible Uses of Lesson Videos

- Compare “initiation” and “closure” (first 5 min and last 5 min) of three different lessons.
- Compare teacher/student interactions in three different lessons
- Observe teacher expectations, or learning goals for students
- Observe teacher role/student role
- Learning environment
- Teacher question types
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Reflections

- Final questions and comments
- Workshop evaluation form

Questions and further information, contact:
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