Evolution of the Portuguese Basic and Secondary Education: Through the Lens of the International Large Scale Student Assessments

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Summary

1. Why should we care about ILSSA?

2. Concurrent Validity of ILSSA vs. National Exams

3. Evolution of the Portuguese Basic and Secondary Education: Mathematics & Language

4. ILSSA Driven Policy and Practices Changes

5. Final thoughts...
1. Why should we care about ILSSA?
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Data from international standardized assessments can be useful in research on causal/correlational factors within or across education systems (Rey, 2010).

"TIMSS has contributed to the practice of evidence-based decision making in today’s shifting landscape of education policy"

Ina S. Mullis, TIMSS & PIRLS Study Center

S. Breakspear (2012) on PISA:

• Policy-makers in most participating countries see PISA as an important indicator of system performance;
• PISA reports impact policy problems and set the agendas for national policy debate;
• Policymakers accept PISA as a valid and reliable instrument for internationally benchmarking system performance and changes over time;
• Countries have started policy reforms in response to PISA reports.

“Your education today is your economy tomorrow!”

Andreas Schleicher, OECD


1. Why should we care about ILSSA?

15 years of PISA results

20 years of TIMSS 4 results
1. Why should we care about ILSSA?

Three major players for basic and secondary education: PISA, TIMSS & PIRLS

What is PISA?
Programme for International Student Assessment: “(...) assesses the extent to which 15-year-old students, near the end of their compulsory education, have acquired key knowledge and skills that are essential for full participation in modern societies.”

Science Literacy: “the ability to engage with science related issues, and with the ideas of science, as a reflective citizen”.

Reading Literacy: “understanding, using, reflecting on and engaging with written texts, in order to achieve one’s goals, knowledge and potential, and to participate in society”.

Mathematical Literacy: “capacity to formulate, employ and interpret mathematics in a variety of contexts; reasoning and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena”.

Collaborative Problem Solving: “ability to work with two or more people to solve a problem.”

(OECD, 2016)
1. Why should we care about ILSSA?

Three major players for basic and secondary education: PISA, TIMSS & PIRLS

What is TIMSS?

Trends in International Mathematics and Science Study: International Math and Science curricula assessment of 4th and 8th grade students. For example, for TIMSS 4th Grade:

Content Domains:

Mathematics:
- Numbers: 53%
- Geometric Shapes and Measures: 33%
- Data Display: 14%

Science:
- Life Sciences: 46%
- Physical Sciences: 35%
- Earth Sciences: 19%

Cognitive Domains:

Knowing: (41%)
Applying: (38%)
Reasoning: (21%)

(IEA, 2016)
1. Why should we care about ILSSA?

Three major players for basic and secondary education: PISA, TIMSS & PIRLS

What is PIRLS?
Progress in International Reading Literacy Study: Reading Literacy assessment of 4th grade students.
“the ability to understand and use those written language forms required by society and/or valued by the individual. Readers can construct meaning from texts in a variety of forms. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment.”

Purposes for Reading:
- Literacy Experience 50%
- Acquire and Use Information 50%

Processes of Comprehension:
- Focus & Retrieve Info 20%
- Make Straightforward Inferences 30%
- Evaluate & Critique 20%
- Interpret & Integrate Info 30%

(EA, 2017)
2. Concurrent Validity of ILSSA vs. National Exams
2. Concurrent Validity of ILSSA vs. National Exams

Do the tests measure the knowledge / skills of the students they are supposed to measure?

- Framework established by panel of (international) educational experts; Curricula overlap analysis;
- Rigorous translation, adaptation and cross-cultural validation - countries and consortia;
- Appropriate (statistical) estimation methods for large-scale sampling studies with planned missingness test design; Estimation of abilities by IRTs; Estimation of plausible values for student performance by latent regression models;
- Strong item-total correlation.

Are the tests reliable?

- Coding of responses under strict quality control (Coding Guides; Training; Monitoring of coding reliability);
- Non-public trend items;
- Anchoring of results to a $T_0$.

Do ILSSA show Concurrent Validity with National High Stake Exams?
2. Concurrent Validity of ILSSA vs. National Exams
The Portuguese Educational System (2016)
2. Concurrent Validity of ILSSA vs. National Exams

The 2015 Mathematics case-study
National Exams vs. TIMSS Grade 4, PISA (grades 9 & 10) and TIMSS Advanced (Grade 12)

Mathematics grade 4

Mathematics grade 9

Mathematics grade 12

\[ r = 0.71 \pm 0.01 \]  
\( (n = 3,904) \)

\[ r = 0.64 \pm 0.01 \]  
\( (n = 4,178) \)

\[ r = 0.71 \pm 0.01 \]  
\( (n = 2,934) \)
2. Concurrent Validity of ILSSA vs. National Exams

No perfect fit between national high stake exams vs. ILSSA!

Why?
2. Concurrent Validity of ILSSA vs. National Exams

a. No ‘perfect’ match of content domains...

<table>
<thead>
<tr>
<th>Mathematics G4</th>
<th>TIMSS 4 %</th>
<th>National Exams %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Domains</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Numbers</td>
<td>50.0</td>
<td>44.0</td>
</tr>
<tr>
<td>Geometric Shapes and Measures</td>
<td>35.0</td>
<td>43.0</td>
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<tr>
<td>Data Display</td>
<td>15.0</td>
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<tr>
<td>Cognitive Domains</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Knowing</td>
<td>40.0</td>
<td>43.0</td>
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<tr>
<td>Applying</td>
<td>40.0</td>
<td>36.0</td>
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<tr>
<td>Reasoning</td>
<td>20.0</td>
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<table>
<thead>
<tr>
<th>Mathematics G9</th>
<th>PISA 2015 %</th>
<th>National Exams %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Domains</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Quantity (PRT - Numbers and Operations)</td>
<td>25.0</td>
<td>12.0</td>
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<tr>
<td>Space and Shape (PRT - Geometry and Measure)</td>
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<td>40.0</td>
</tr>
<tr>
<td>Change and relationships (PRT - Algebra)</td>
<td>25.0</td>
<td>35.0</td>
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<tr>
<td>Uncertainty and data (PRT - Data Display)</td>
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<td>13.0</td>
</tr>
<tr>
<td>Cognitive Domains</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Knowing</td>
<td>-</td>
<td>37.0</td>
</tr>
<tr>
<td>Formulating</td>
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<td>Applying</td>
<td>50.0</td>
<td>38.0</td>
</tr>
<tr>
<td>Interpreting/Reasoning</td>
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<td>25.0</td>
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<thead>
<tr>
<th>Mathematics G12</th>
<th>TIMSS ADV %</th>
<th>National Exams %</th>
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<tr>
<td>Content Domains</td>
<td>%</td>
<td>%</td>
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<td>Algebra</td>
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<tr>
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<tr>
<td>Geometry</td>
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<td>Probabilities and Combinatorics</td>
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<tr>
<td>Cognitive Domains</td>
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<tr>
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<td>Formulating</td>
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<tr>
<td>Applying</td>
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<tr>
<td>Reasoning</td>
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2. Concurrent Validity of ILSSA vs. National Exams

b. Different purposes...

**PORTUGUESE NATIONAL EXAMS**

- **MANDATORY**
  - 4th grade & end of ISCED 1 (6th grade)
  - At the end of ISCED 2 (9th grade).
  - At the end of ISCED 3 (12th grade).
  - Account for 25-30% final grade.

- **PUBLIC & HYBRID ITEMS**
  - Items become public after being applied.
  - Hybrid items (evaluate content and cognitive domains).

- **CERTIFICATION**
  - Certify students’ knowledge and skills by the end of school cycles.
  - 12th grade exams’ results are used for students admission to higher education.

**LARGE SCALE STUDENTS ASSESSMENTS**

- **VOLUNTARY**
  - Schools are invited to participate.
  - 4th grade and 9th grade parents give consent.
  - Age based (PISA grades 7-11) or grade based (TIMSS)

- **NON-PUBLIC & SINGLE-DOMAIN ITEMS**
  - Trend items from past cycles to evaluate trends in education systems.
  - Items evaluate single cognitive/content domains.

- **AIM TO COMPARE COUNTRIES’ EDUCATIONAL SYSTEMS**
  - Diagnose/evaluate students knowledge and skills according to international standards.

- ILSSA and National Exams have common normative references on the national mathematics curriculum for grades 4 and 12.
- Mobilization of knowledge, applying and reasoning competencies.
2. Concurrent Validity of ILSSA vs. National Exams

c. Students’ expectations & Teachers’ participation.

HLM
MATH G9 PRT – PISA MATH LITERACY

\[ R^2 = 0.15^{***} \]
\[ S^2_{SDR} = 0.848^{***} \]

\[ R^2 = 0.60^{ns} \]
\[ S^2_{SDR} = 0.398^{ns} \]
3. Evolution of the Portuguese Basic & Sec. Education
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... as assessed by PISA Mathematics Literacy and Portuguese Mathematics Grade 9 high stake exams
3. Evolution of the Portuguese Basic & Sec. Education

... as assessed by PISA Reading Literacy and Portuguese Language Grade 9 high stake exams
4. ILSSA Driven Policy and Practices Changes
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On Exams’ format:

- Item types and Coding/grading...

TIMSS 4th Grade Mathematics

National Exam Grade 4 Mathematics
4. ILSSA Driven Policy and Practices Changes

On Teaching Practices and Curriculum...

• Mathematics Grade 4:
  Definition of Goals and Objectives for Math Learning, e.g. recommendation to add more teaching hours to “numbers and fractions”...

• Advanced Mathematics Grade 12:

“(...) analysis of these elements [TIMSS Advanced framework], as well as curricula from other countries not participating in TIMSS Advanced, reveals that the inclusion in the curriculum of some fundamental themes, currently absent from the Secondary Education in Portugal, contributes decisively to the alignment of national curricular options with the international plan. As an example, refer to those in the Primitive and Integral Calculus domain. Some topics have also been reinforced, such as use of trigonometry solve triangles problems or the study of limits of successions and functions (...). (p. 4)

4. ILSSA Driven Policy and Practices Changes

On External Assessments Policies
(Census/Random samples; Low Stakes/High Stakes)

Note:
PISA 2000 Math Literacy without grades 5 and 6: 457
5. Final thoughts...
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• ILSSA give valid and reliable indicators of a National Education System performance per comparison to international frameworks

  Assuming all standards for sampling, testing and coding are respected.

• ILSSA allow for National Education Trends in Students’ achievement

  Trend items to anchor results between cycles – contrary to what happens with National Public Exams.

• ILSSA frameworks are established by international well known experts

  Can serve as guidelines or offer suggestions for national curricula improvement.

• ILSSA allows for Assessment knowledge building (e.g. Items’ types and Coding practices)

  National Assessment Agencies can use this knowledge to improve validity and reliability of national and local assessments.

• ILSSA promote Education as a Worldwide Asset?

  Can ILSSA promote a Worldwide valid curricula?
Thank You

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