Measuring Literacy and Numeracy Skills in Adults: Trends and Innovations

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Educational Testing Service
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Overview

• Three critical elements for innovating while maintaining trends:
  • Assessment Frameworks
  • Test Development Approach
  • Psychometrics

• Reading and Numeracy Components
  • Innovations & Purpose
Assessment frameworks have multiple goals:

- Define the construct
- Identify and define the cognitive processes required
- Specify the content and contexts that should be represented
- Provide test developers with a roadmap for creating the assessment
  - Describe the factors that drive difficulty
  - Propose a distribution of tasks and task characteristics to represent the construct

Responsive to societal shifts and changing demands

- Increase in digital forms of reading and information gathering
- Increase in digital device use and dynamic applications
Framework Development

• Starts with the former framework
  • Maintain representation of the core aspects of the domain
  • Build on the core aspects to make updates that reflect changes in society and adults’ lives

• Subject Matter Expert Groups

<table>
<thead>
<tr>
<th>Literacy</th>
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<tbody>
<tr>
<td><strong>Chair:</strong> Jean-François Rouet, University of Poitiers*</td>
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<tr>
<td>Anne Britt, Northern Illinois University</td>
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<tr>
<td>Egil Gabrielsen, University of Stavanger*</td>
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<tr>
<td>Johanna Kaakinen, University of Turku</td>
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<td>Tobias Richter, University of Würzburg</td>
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<tbody>
<tr>
<td><strong>Chair:</strong> Dave Tout, ACER*</td>
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<tr>
<td>Isabelle Demonty, University of Liège</td>
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<tr>
<td>Javier Díaz-Palomar, University of Barcelona</td>
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<tr>
<td>Vince Geiger, Australian Catholic University</td>
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<tr>
<td>Kees Hoogland, HU University of Applied Sciences Utrecht</td>
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<td>Terry Maguire, National Forum for the Enhancement of Teaching and Learning*</td>
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</tbody>
</table>
Example from Literacy

• Cycle 1 – text medium (70-80% print; 20-35% digital)
  • Print texts could be perfectly replicated on paper
  • Digital texts included features that would be lost
    • Several looked and functioned like websites, but had minimal content

• Cycle 2 – sources (60% single; 40% multiple)
  • Texts with different authors, written at different times
  • Sources can corroborate or contradict
  • Information must be integrated
  • Can be two distinct texts or a discussion thread
  • Today’s readers must grapple with multiple sources of information for any internet search
Examples From Numeracy

• Cycle 1 – Responses facet
  • Reacting to a numeracy problem with different responses or actions

• Cycle 2 – Cognitive processes
  • More explicitly connects to how adults deal with solving a problem

<table>
<thead>
<tr>
<th>Cycle 1</th>
<th>Cycle 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify/locate/access (10%)</td>
<td>Access and assess situations mathematically (25-35%)</td>
</tr>
<tr>
<td>Act on/use (50%)</td>
<td>Act on and use mathematics (30-40%)</td>
</tr>
<tr>
<td>Interpret/evaluate/communicate (40%)</td>
<td>Evaluate, critically reflect, make judgments (25-35%)</td>
</tr>
</tbody>
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• Cycle 2 – Representations
  • Formally represented in the definition and test development process
  • Text or symbols, images of physical objects, structured information and dynamic applications
The approach used to balance innovation and trends

- **Literacy**
  - Single Source: Print Texts, Limited Websites
  - New Single Source: Print Texts, Websites
  - Multiple Sources: Free Navigation Websites

- **Numeracy**
  - Static: Act On and Use, Content Variety
  - New Static: Act On and Use + Content Variety
  - Dynamic: Evaluate, Data & Chance
Test Development Focus by the Numbers

• Literacy – Source
  • Trend items were classified according to source for Cycle 2
  • Test development focused slightly more on creating multiple sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Trend</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>19</td>
<td>32</td>
</tr>
<tr>
<td>Multiple</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>TOTAL</td>
<td>28</td>
<td>52</td>
</tr>
</tbody>
</table>

- Single: 68% Trend, 62% New
- Multiple: 32% Trend, 38% New

TOTAL: 100%
Test Development Focus by the Numbers

• Numeracy – Cognitive Process & Representation
  • Act On and Use was de-emphasized

<table>
<thead>
<tr>
<th>Cognitive Process</th>
<th>Trend</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access and Assess</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Act On and Use</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Evaluate, Critically Reflect and Make Judgments</td>
<td>5</td>
<td>14</td>
</tr>
</tbody>
</table>

TOTAL: 32 100% 48 100%

• Dynamic applications are new to Cycle 2

<table>
<thead>
<tr>
<th>Representation</th>
<th>Trend</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Images of Objects</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Structured Information</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>Text or Symbols</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Dynamic Applications</td>
<td>15</td>
<td>19</td>
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TOTAL: 32 100% 48 100%
• Linking to Cycle 1 is a critical goal of Cycle 2
• Trend items form the link to Cycle 1 and past surveys
  • Requires a sufficient proportion of high quality trend items to create a foundation for scaling
  • Linkages made from Cycle 1 to IALS and ALL are brought forward into Cycle 2 through the trend items

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<td>80</td>
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Reading and Numeracy Components
Components

• In Cycle 1, there was a portion of the PIAAC population who scored Below Level 1
  • We know what they cannot do, but what CAN they do?
• Component measures are designed to provide information about what adults with low Literacy and Numeracy skills can do
  • They represent skills that are necessary but not sufficient for the range of Literacy and Numeracy tasks in PIAAC
• Reading Components were administered in Cycle 1, however, the design limited the utility of the data
• Numeracy Components have not been administered before
Reading Components

• Sentence Fluency Task – Does a sentence make sense?

  A. The red car had a flat tire.  YES  NO
  B. Airplanes are made of dogs.  YES  NO
  C. The student read the book last night.  YES  NO

• Passage Task – A passage is presented one sentence at a time and the respondent selects the word the best completes the sentence

  The Farming Area

  The western region of the country is well-known for its farms and dairies.
  Popular crops include wheat and **house** / **corn**. The dairy farms produce several kinds of cheese that are famous all over the **world** / **friend**.
Numeracy Components

• Tasks that represent Number Sense
• How Many?

Example 1: How many?

Review this example. Then tap on the NEXT arrow to see Example 2.
• Which is Biggest?

Example 1: Which is Biggest?

Review this example. Then tap on the NEXT arrow to continue.
In Cycle 1, Components were assessed on paper only and to a limited group of respondents.

The data could be used to describe these individuals, but it could not be directly linked to Literacy.
• In the Cycle 2 Main Study, components will be assessed on tablet only and across the full range of skilled respondents
  • All respondents who fail the Locator or pass but score low on the Locator
  • 25% of respondents who score high on the Locator
• Timing data for all items, all respondents
  • Timing data will be informative about the fluency of these tasks
• The goal is to put both reading and numeracy components on the Literacy and Numeracy scales, respectively
  • Component performance can be used to describe the skills of respondents who score Below Level 1 and enhance descriptions of Level 1
Summary

• Innovations and trends must strike a balance for trend domains
• This can be achieved through:
  • Assessment frameworks
  • Test development approaches
  • Psychometric analyses
• Each domain has innovations AND strong connections to trend
• Components will be administered to make greater use of the data in scaling and in describing proficiency
  • Critical for understanding the skills of low proficiency respondents
• Numeracy components will be assessed for the first time!
Thank you!

• For more information on the Literacy and Numeracy frameworks, please visit:
  • https://www.oecd.org/skills/piaac/publications/

• Here, you can download a recent publication:
  • The Assessment Frameworks for Cycle 2 of the Programme for the International Assessment of Adult Competencies