Measuring Literacy and Numeracy Skills in Adults: Trends and Innovations

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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

PIAAC Assessment Frameworks

- 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

Literacy
Chair: Jean-François Rouet, University of Poitiers*
Anne Britt, Northern Illinois University
Egil Gabrielsen, University of Stavanger*
Johanna Kaakinen, University of Turku
Tobias Richter, University of Würzburg

Numeracy
Chair: Dave Tout, ACER*
Isabelle Demonty, University of Liège
Javier Díaz-Palomar, University of Barcelona
Vince Geiger, Australian Catholic University
Kees Hoogland, HU University of Applied Sciences Utrecht
Terry Maguire, National Forum for the Enhancement of Teaching and Learning*

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

Cycle 1	Cycle 2
Identify/locate/access (10%)	Access and assess situations mathematically (25-35%)
Act on/use (50%)	Act on and use mathematics (30-40%)
Interpret/evaluate/communicate (40%)	Evaluate, critically reflect, make judgments (25-35%)

- Cycle 2 – Representations
  - Formally represented in the definition and test development process
  - Text or symbols, images of physical objects, structured information and dynamic applications
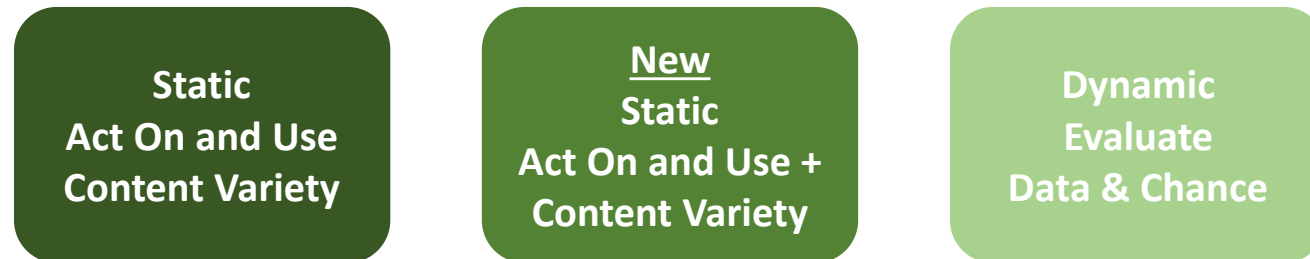
Test Development Approach

- The approach used to balance innovation and trends

- Literacy

- Numeracy

Trend Items	New Items with Trend Features	New Items
Single Source Print Texts Limited Websites	**New Single Source Print Texts Websites**	**Multiple Sources Free Navigation Websites**
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

Source	Trend		New	
Single	19	68%	32	62%
Multiple	9	32%	20	38%
TOTAL	28	100%	52	100%

Test Development Focus by the Numbers

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

Cognitive Process	Trend		New	
Access and Assess	7	22%	16	33%
Act On and Use	20	62%	18	38% ⬇
Evaluate, Critically Reflect and Make Judgments	5	16%	14	29%
TOTAL	32	100%	48	100%

  - Dynamic applications are new to Cycle 2

Representation	Trend		New	
Images of Objects	5	16%	6	12%
Structured Information	21	65%	18	38%
Text or Symbols	6	19%	9	19%
Dynamic Applications			15	31% ⬆
TOTAL	32	100%	48	100%

Psychometrics

- 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

Literacy		
Trend	32	40%
New	48	60%
Total	80	100%

Numeracy		
Trend	28	35%
New	52	65%
Total	80	100%

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?

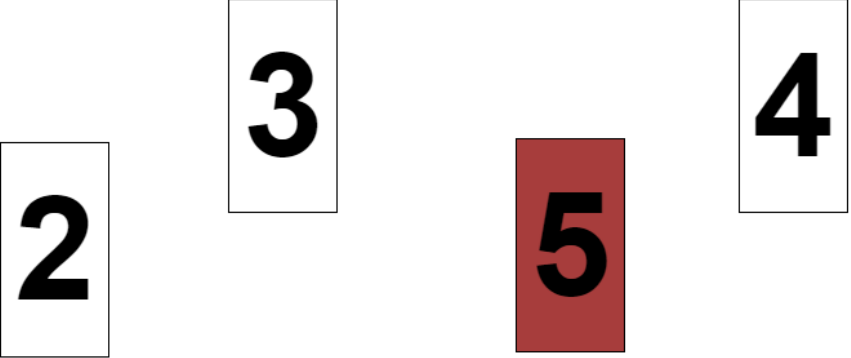Review this example. Then tap on the NEXT arrow to see Example 2.

Numeracy Components, cont.

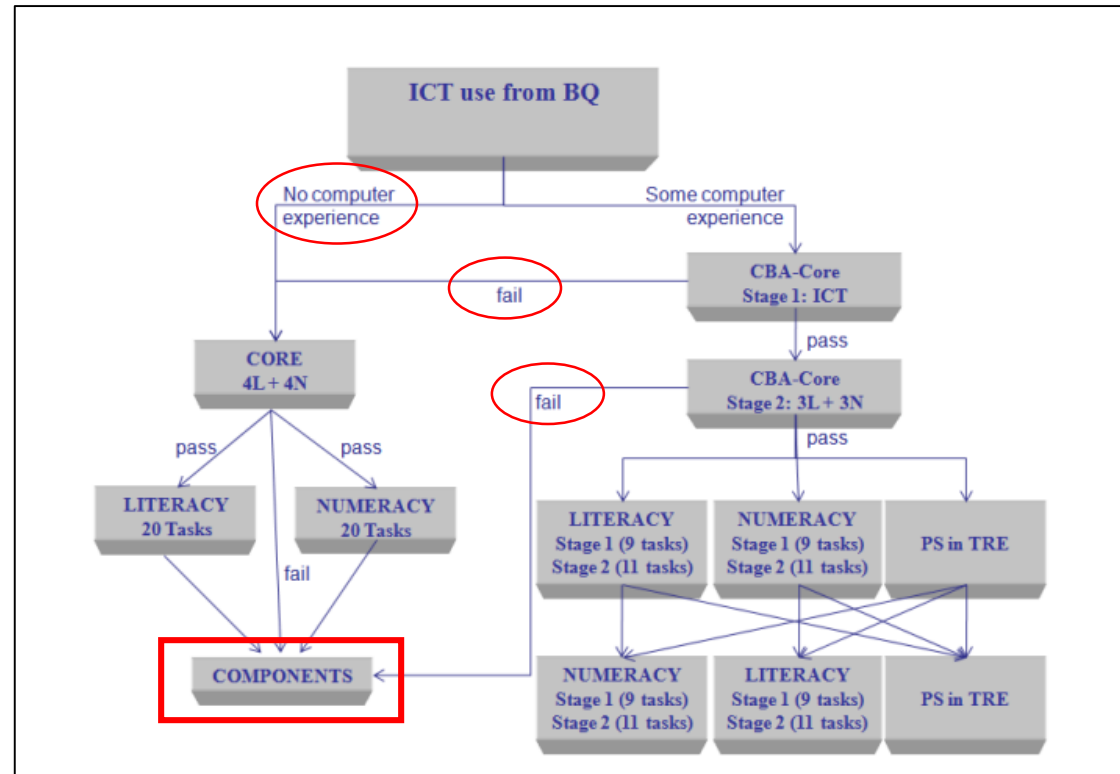- Which is Biggest?

Example 1: Which is Biggest?

Review this example. Then tap on the NEXT arrow to continue.

3

2

5

4

Cycle 1 Design and Implementation

- 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

Cycle 2 Design and Implementation

- 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*