

Critical areas for assessing skill transfer: Statistics education and PIAAC

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Levels/units of analysis when assessing stat knowledge & skills

Individual learner
Class / Course
Program / Curriculum

Key challenge:

How to assess?

(content already
determined by
curriculum/teacher)

School / State / Nation

International

TIMSS, PISA PIAAC

What to assess?

(the definition of target
skills is itself a topic for
discussion and
consensus-building)

OECD surveys

PISA: Program for International Student Assessment

Age 15 students “...are prepared to meet the challenges of today’s knowledge societies... what they can do with what they learn at school...”

Literacy, Math, Science Cycle: 3 years.

PIAAC: Program for International Assessment of Adult Competencies

Prior non-OECD surveys: ALL (Adult Literacy and Lifeskills survey)
IALS (International Adult Literacy Survey)

PIAAC methodology & Content

(tentative, as of summer 2007)

Adults ages 16 to 65+.

Household survey interview (CAPI + written)

Cycle: 5 years.

Competencies:

- **Document Literacy** (forms, graphs, tables, ...)
- **Numeracy** Number, Dimension & shape,
Patterns & relationships, Data & Chance
- **Problem-solving in technology-rich env.??**
- ...
- **Background Questionnaire: bio-data,
economic & social outcomes, ...**

PIAAC ‘competency’: Interest, attitude, and ability of individuals to access, manage, integrate, and evaluate information, construct new knowledge, and communicate with others in order to function effectively in the information age

Numeracy (tentative): The ability to access, use, apply, interpret, and communicate mathematical information and ideas, in order to effectively manage and respond to the mathematical demands of diverse situation in the information age.

Enabling processes: attitudes, beliefs, interests

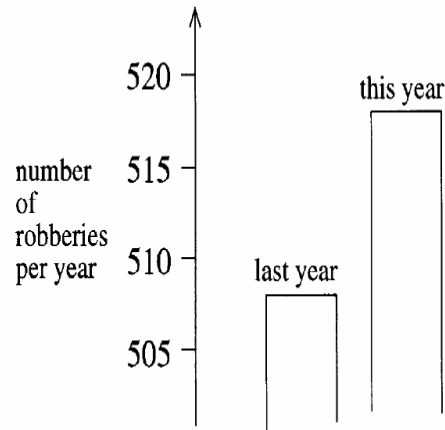
Questions & Challenges

- 1. What are critical areas in which adults should possess statistical literacy (as part of Numeracy and Document Literacy competencies)?**
- 2. What are good tasks for assessing key statistical literacy (data, probability) of adults:**
 - a. relevant & realistic across countries**
 - b. elicit open responses that can be scored reliably**
 - c. suitable for household interview (computer/ written)**
 - d. show good psychometric properties (validity, reliability, fairness)**

**TIMSS 1996
Mathematical Literacy
Final year**

A TV reporter showed this graph and said:

“There has been a huge increase in the number of robberies this year”



Do you consider the reporter’s statement to be a reasonable interpretation of the graph?

Briefly explain.

**Percent Correct for Example Item 6
Final Year of Secondary School***

Country	Percent Partially Correct	Percent Fully Correct	TCI	Example 6 Graph with robberies per year.
¹ Cyprus	13 (2.2)	5 (1.7)	48%	<p>A TV reporter showed this graph and said:</p> <p><i>“There’s been a huge increase in the number of robberies this year.”</i></p> <p>Do you consider the reporter’s statement to be a reasonable interpretation of the graph? Briefly explain.</p> <p><i>I don't think it is a reasonable interpretation of the graph because if there was only a small increase in the number of robberies, you would only see a small increase in the height of the bars.</i></p> <p>USA: 41% partial 14% full</p>
Czech Republic	26 (2.1)	6 (1.2)	78%	
Hungary	25 (1.0)	4 (0.7)	65%	
¹ Lithuania	17 (2.6)	2 (0.4)	43%	
¹ New Zealand	38 (3.2)	33 (3.2)	70%	
² Russian Federation	13 (1.8)	7 (1.8)	46%	
Sweden	29 (1.8)	37 (2.2)	71%	
Switzerland	27 (2.2)	23 (1.5)	82%	
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix B for Details):				
Australia	39 (2.3)	26 (2.8)	68%	
² Austria	28 (2.4)	19 (2.4)	76%	
Canada	35 (2.6)	23 (1.5)	70%	
France	25 (2.7)	22 (2.3)	84%	
Iceland	25 (1.4)	38 (1.9)	55%	
¹ Italy	13 (1.9)	12 (2.1)	52%	
Norway	24 (1.3)	34 (1.4)	84%	
United States	41 (1.8)	14 (1.3)	63%	
Countries with Unapproved Student Sampling (See Appendix B for Details):				
Germany	26 (2.8)	20 (2.4)	75%	
Countries With Unapproved Sampling Procedures and Low Participation Rates (See Appendix B for Details):				
Denmark	25 (1.7)	26 (1.9)	58%	
¹ Netherlands	27 (2.0)	30 (2.6)	78%	
Slovenia	31 (2.1)	6 (1.4)	88%	
South Africa	12 (2.1)	3 (1.0)	49%	
International Average Percent Correct	26 (0.5)	19 (0.4)		

Relevance of large-scale assessments for class assessments

- show that it is possible to reliably assess levels of performance/understanding (partial credit rubrics)
- provide frameworks/theories of domains for assessment of relevance to society, policy makers, and educators
- illustrate “complexity schemes”, i.e., maps of factors that contribute to task difficulty (important for task development *and* interpretation)

Document Literacy

(Kirsch & Mosenthal, 1985 - 2004)

The knowledge and skills required to locate and use information contained in various document formats (applications, forms, schedules, maps, tables, graphs).

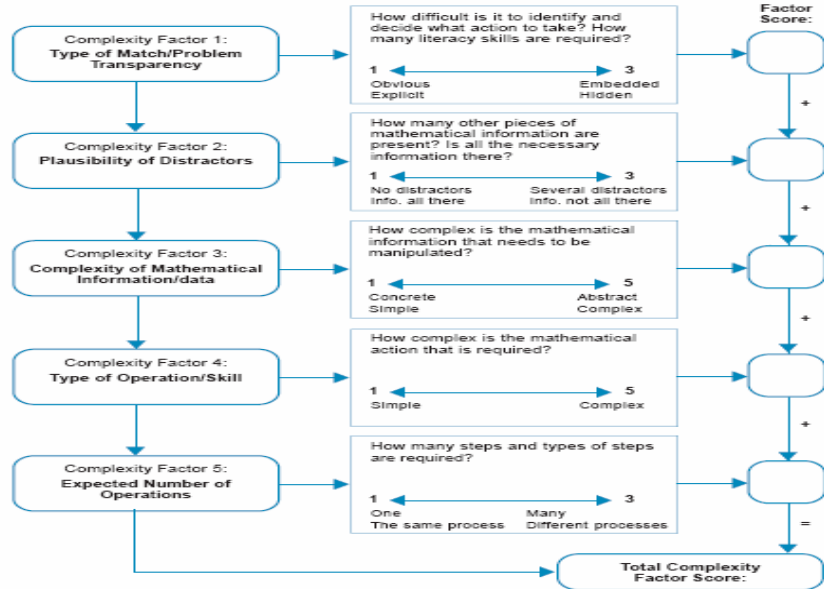
simple lists
combined lists
intersecting lists
nested lists



Cognitive processes: Locating / matching - cycling -
integrating - generating – inferring

ALL: complexity scheme for numeracy items (tentative)

Complexity Flow chart



Challenges for the future

1. What are the critical areas in which adults should possess statistical literacy? (general, specific)
 - Can we identify central tasks adults face?
2. How can we prepare students for “skill transfer” to such tasks / areas?
 - How can we assess “skill transfer” in this regard? (performance + understanding, argumentation, ...)
3. How can we evaluate, and improve, the reliability, validity, interpretability, and relevance of assessments, to: students, teachers, society?