

Athens, Greece - PIAAC Launch event - March 31, 2014

## **Adult Numeracy: What it means, why it matters?**

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## **Adult Numeracy: What it means, why it matters?**

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### **My topics:**

1. Introduction: macro issues, broad questions
2. Examples: challenging findings about adults' skills
3. More about adult numeracy skills/competencies
4. Numeracy in PIAAC: process, analytic potential
5. Summary & discussion

**Macro issues driving this talk:**

**Adults marginalized in education** - The 2.5% rule  
**Economic & social trends:** pensions, employment, migration & diversity, health, self-service technologies,  
**Challenge to us:** Lifespan view on skills, policies, research,

**WHAT DO WE KNOW / NEED TO KNOW ABOUT ...**

- a. **Numeracy skills/competencies in the adult world?**  
Distributions, correlates, influences.... Outcomes
- b. **Links to mathematics (statistics) education at school?**  
Cognitive (knowledge & skills), dispositions, behaviors;  
Skill transfer?...Skill retention & loss?
- c. **Policy & Interventions:** Where? When? How? How much?

**Background: Adult Numeracy**

(school)		(real world tasks)
<b>Mathematics</b>	Mathematical literacy	<b>Numeracy</b>

**Numeracy** is the knowledge and skills required to effectively manage and respond to the mathematical demands of diverse situations. (PIAAC Numeracy Expert Group 2009)

**Numerate behavior** is observed when people manage a situation (task) or solve a problem in a real **context**; it involves **responding** to information about **mathematical ideas** that may be **represented** in a range of ways; ...requires the activation of a range of enabling knowledge, factors and processes.

Quantity & number  
Dimensions & Shape  
Patterns & Change  
Data & Chance



CLIMATE REPORT



March 31, 2014

## U.N. forecast: Hotter, drier, hungrier

The impact of emissions will be more severe and possibly irreversible, a U.N. intergovernmental panel report says, exacerbating food and fresh water supplies. [FULL STORY](#) | [WAKE UP](#)

## Numeracy-related constructs (overlapping)

**Numeracy**

Statistical  
literacy

Mathematical  
literacy

Health Literacy  
Medical Numeracy

Quantitative  
Literacy

Financial  
literacy

Science literacy

**Literacy**

ICT literacy  
PS-TRE

**Special Eurobarometer 342**

## Consumer Empowerment

**SAMPLE: Overall N = 56,400**

27 EU countries + Iceland + Norway

Multi-stage proportional random sampling

N=2000 per country (some=1000) in 2010

**QA43: Thinking now about savings and deposit accounts,  
which of the following would be the best interest rate:**

**1%, 2%, 3%, 4%**

### **Summary (partial):**

#### **Eurobarometer 342: consumer empowerment**

- “Less than 50% of EU consumers surveyed felt confident, knowledgeable and protected as consumers”
- “Only 45% showed they have basic numerical skills as measured by answering all 3 simple questions...”
- ... many other findings ...

#### **Questions and challenges:**

- **Effect of school-based learning? Skill loss?**
- **The competent & empowered individual:** Skills & knowledge, confidence, actual behaviors, in context

**“What are the competencies needed/expected of citizens from all walks of life, for effective functioning in the information age? [at work, home, in civic life, etc]?”**

#### **DeSeCo: Definition & Selection of Competencies**

OECD (Rychen & Salganic, 2003)

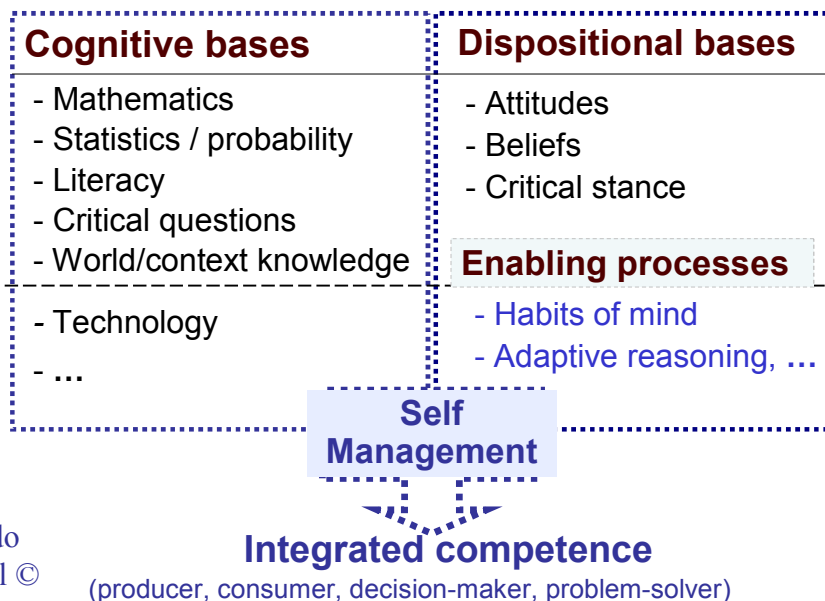
**Competence:** The ability to successfully meet complex demands in a particular context through the mobilization of psycho-social resources.

The 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."

## Some thoughts about needed competencies:

- w **Task demands in adult world: broader, different than typical school-based content**
- w **Representation & Communication:**
  - Central role of **text**, Prose and Document Literacy
  - Need for language comprehension, diverse styles
- w **Need for *critical* interpretation, in context**
- w **Connections:** e.g., probability, statistics, math, science  
Statistics as models of phenomena & trends
- w **Adults have to be active: engage, manage, ...**  
“Consumer”, “Decision-maker” vs. “Math Producer”

## A model of Numeracy



## Numeracy in PIAAC

### Numeracy Expert Group

- Iddo Gal (Israel)(Chair)
- Dave Tout (Australia)
- Myrna Manly (USA)
- Sean Close (Ireland)
- Silvia Alatorre (Mexico)
- Lene Johansen (Denmark)
- Jeff Evans (UK)
- Terry Maguire (Ireland)



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### Coverage: Facets of Numerate behavior...

Involves managing a situation or solving a problem...

1. in a real context...

everyday life, work, societal, further learning

2. by responding...

10% - identify, locate or access

40% - act upon, use: order, count, estimate, compute,

30% - interpret, evaluate measure, model

20% - communicate

3. to mathematical content/ information/ ideas...

30% - quantity & number

20% - dimension & shape

30% - patterns, relationships, change

20% - data & chance

4. represented in multiple ways:

- objects & pictures

- numbers & mathematical symbols, formulae

- diagrams & maps, graphs, tables

- texts

- technology-based displays



## Numeracy: Scale development grid

Content area		Item level				
		1	2	3	4	5
		5%	25%	40%	25%	5%
Quantity & number	30%					
Dimension & shape	25%					
Patterns & change	20%					
Data & chance	25%					

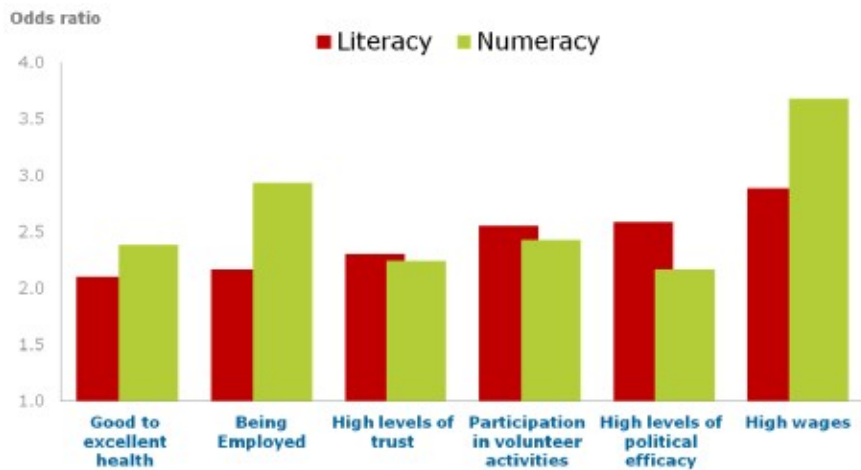
## Numeracy: Factors affecting difficulty of items

	Category	Range	Score
Text	1. Type of match/ problem transparency	Obvious/explicit to embedded/hidden	1 - 3
	2. Plausibility of distractors	No distractors to several distractors	1 - 3
Math	3. Complexity of Mathematical info/ideas	Concrete/simple to abstract/complex	1 - 5
	4. Type of operation/skill	Simple to complex	1 - 5
	5. Expected number of operations	One to many	1 - 3
Possible complexity rating:			<b>5 - 19</b>



## Likelihood of positive social and economic outcomes among highly proficient adults

(scoring at Level 4/5 compared with those scoring at Level 1 or below)



Source: OECD 2013

## Summary & Discussion

1. Large-scale surveys (PIAAC) as catalysts for policy formulation
2. New research challenges, opportunities, tools  
e.g., skill transfer, skill retention / loss, technology
3. Lifespan perspective (adult world) on nature of mathematical & Statistical skills / competencies
  - s Wider range of tasks/contexts, literacy aspects
  - s Cognitive, dispositions/attitudes, behaviors
  - s *Changing the culture*: developing numeracy is different that learning formal mathematics

## Summary & Discussion (cont.)

### 4. Implementation issues: The “place” of competencies and of **Numeracy** in particular:

- s Not a by-product. Need to teach for it directly
- s In the curriculum: sequence, connections,...
- s In the mind of the actors: teachers, trainers, curriculum developers, principals, policy-makers, ....  
Teaching for transfer, Merging literacy components
- s In the mind of learners: motivation, Math anxiety, ...

### 5. Mutual learning: Adult educators <> Schools