

# Appetizers



- Getting to know The Netherlands
- Looking at Australia
- Clocks
- Display structures



# Fascination

- How do people cope with the quantitative aspects of the world around us?

**OR**

- How do people cope quantitatively with aspects of the world around us?



# *Mind and gesture, the numeracy of a vocational student*

**ALM 12 Conference**



# Dutch secondary educational system



**In the Dutch educational system there are three streams in secondary education:**

- **Pre-University Education**  
(vwo, 6 years, 12-18 yr, 18%)
- **Senior General Secondary Education**  
(havo, 5 years, 12 – 17 yr, 25%)
- **Pre-Vocational Secondary Education**  
(vmbo, 4 years, 12-16 yr, 55%)

**Most of the students with special needs are in the regular Pre-Vocational Secondary Education.**

- **Special schools for practical training and special needs education.**  
(praktijkonderwijs, LWOO, 4 years, 3% )



# Pre-Vocational Secondary Education



**Pre-Vocational Secondary Education consists of a**

- **theoretical stream**
- **mixed stream**
- **basic stream**                      **16%**

**Mixed and basic stream:**

- **Dutch, English, mathematics, science, history, economics, ...**
- **vocational courses in sectors**  
**(Technology, Personal and Social Services/Health Care, Economics and Agriculture)**



# Numeracy



- **Work definition:**

**“Numerical competency is the intertwined knowledge, skills and dispositions (attitudes) necessary to adequately and autonomously cope with the quantitative aspects of the world around us.”**



# Scope



- **Wiskundige Geletterdheid en Gecijferdheid.**
- **Literacy and numerical literacy (numeracy).**
  - **Mathematical literacy**
  - **Statistical literacy**
  - **Spatial literacy**
  - **Quantitative literacy**
  - **Democratic mathematics**



# History



- **The human mind swells with satisfaction upon ascertained results, and finds pure enjoyment in the contemplation of truths which evince a progressive knowledge respecting the real conditions of the human family.”**  
*(Joseph CG Kennedy, census 1840 official)*

*From: A Calculating People, Patricia Cline Cohen, 1999*





No 3 Second Sheet  
 (No. 4.) <sup>Left</sup> <sub>Top 1/4</sub>

**SCHEDULE of the whole number of persons within the division allo**

**FREE WHITE PERSONS, INCLUDING HEADS OF FAMILIES.**

1840 Census  
 Richmond County

*Top Right 1/4*

NAMES OF HEADS OF FAMILIES	MALES													FEMALES										
	Under 5	5 under 10	10 under 15	15 under 20	20 under 30	30 under 40	40 under 50	50 under 60	60 under 70	70 under 80	80 under 90	90 under 100	100 and upwards	Under 5	5 under 10	10 under 15	15 under 20	20 under 30	30 under 40	40 under 50	50 under 60	60 under 70	70 under 80	80 under 90
David Welch	2	1			1										1			1						
William Sellers		2	2	1							1				1	1								
Joey Walker	1				1												1	1						
William Whitaker	2		5			1															1			
George Stead			1					1									1							
James Palmer	2	1	1				1								1			1						
Herut Howland			1	1				1									1	2				1		
Elizabeth Rachard			1	1	1			1								1		1			1			
Jonathan Palmer										1				1	2	1		1		1	1			
Martin Inglett						1												1	1					

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James Blackston	2	1	1	1				1													1			
William Inglett	1	1	2	1				1									1				1			
Elizabeth Willey	1		1	2													1	1			1			
Mary M. Anderson			1	1													1							
Luriah Blackston																								1
Zephaniah Blackston	1		1			1								1	2	2				1				





# School Mathematics versus Numeracy

- **Avoid the typical school mathematics in adult mathematics / numeracy education.**

**(FitzSimons, 2002)**

**(and many others)**

- **Design pre-vocational education, where you treat the students as adults. With real life assignments and real life responsibilities.**

**(Koops, 2000)**



# Numeracy and Mathematical literacy

- (...) one thing everyone more or less has come to agree on is that mathematical literacy cannot be defined in terms of mathematical knowledge.

**Mathematical literacy is in fact mainly about the functional aspect of mathematical knowledge. It is about individual competencies to use mathematical knowledge in a practical, functional way; mathematical literacy in order to .... or mathematical literacy for ... (...)**

**(Jablonka, 2003)**



# Research set-up



- Real life assignments
- Observations, pictures
- Stimulated recall
- Analyzing the video's
  - Window
  - Flowerbed 0: Outside
  - Flower bed 1: Ik ben niet zo'n rekenaar
  - Flower bed 2: Haakse hoek
  - Garbage bin



# Pitfalls



- **Oversimplified ideas on numeracy**
- **The formatting power of school mathematics**
- **Deficit thinking**

**→→ Ethnographical approach**



# Analyses of the video's



- **Matching numbers with the sizes of the product of parts of the products.**
- **Interpreting numbers a symbol for a kind of screw, drill or other things.**
- **Using the numbers as a measure instruction**
- **Using the numbers to make a list of needed parts, counting**
- **Hardly any operations with numbers showed up. In cases where addition had to be made, they all use a calculator or even Excel in a very natural way.**
- **Matching complex plans and schemes with the real product**
- **Hardly any mathematical language to express their numerical or spatial competences.**
- **Use of gestures to support the expressions of numerical competences.**



# Conclusions



- **Students have competences in a large number of areas that we can categorize as numerical or spatial competences and if-then reasoning.**
- **Students can reason well if they are working in the situation or if they literally have the product in hand.**
- **Gestures and physical visualizations are important components in the students' numeracy repertoire.**





# Recommendations

- **Stop exercising with formal operations**
- **Work on numerical competences with students in direct and practical situations.**
- **Try to link mathematical words and skills directly and *in situ* to the things they do and show.**
- **Have students collect all sorts of materials and their own productions in numeracy. Collect them in a work folder, file or portfolio and make that the topic of the lessons.**





# Integrating numeracy and vocational



- It is almost impossible to integrate the mathematics courses and the vocational courses if they are separated in place and time. It is hard to integrate that what is not there.
- Do not work on integration, but work on an integral approach (start with the tasks and not with the curricula).



# Interested?

To obtain the files from the hand outs or the articles, please send an e-mail to

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Or visit the website

**[www.gecijferdheid.nl](http://www.gecijferdheid.nl)**

