EUROPEAN YEAR OF SKILLS

Numeracy in Practice

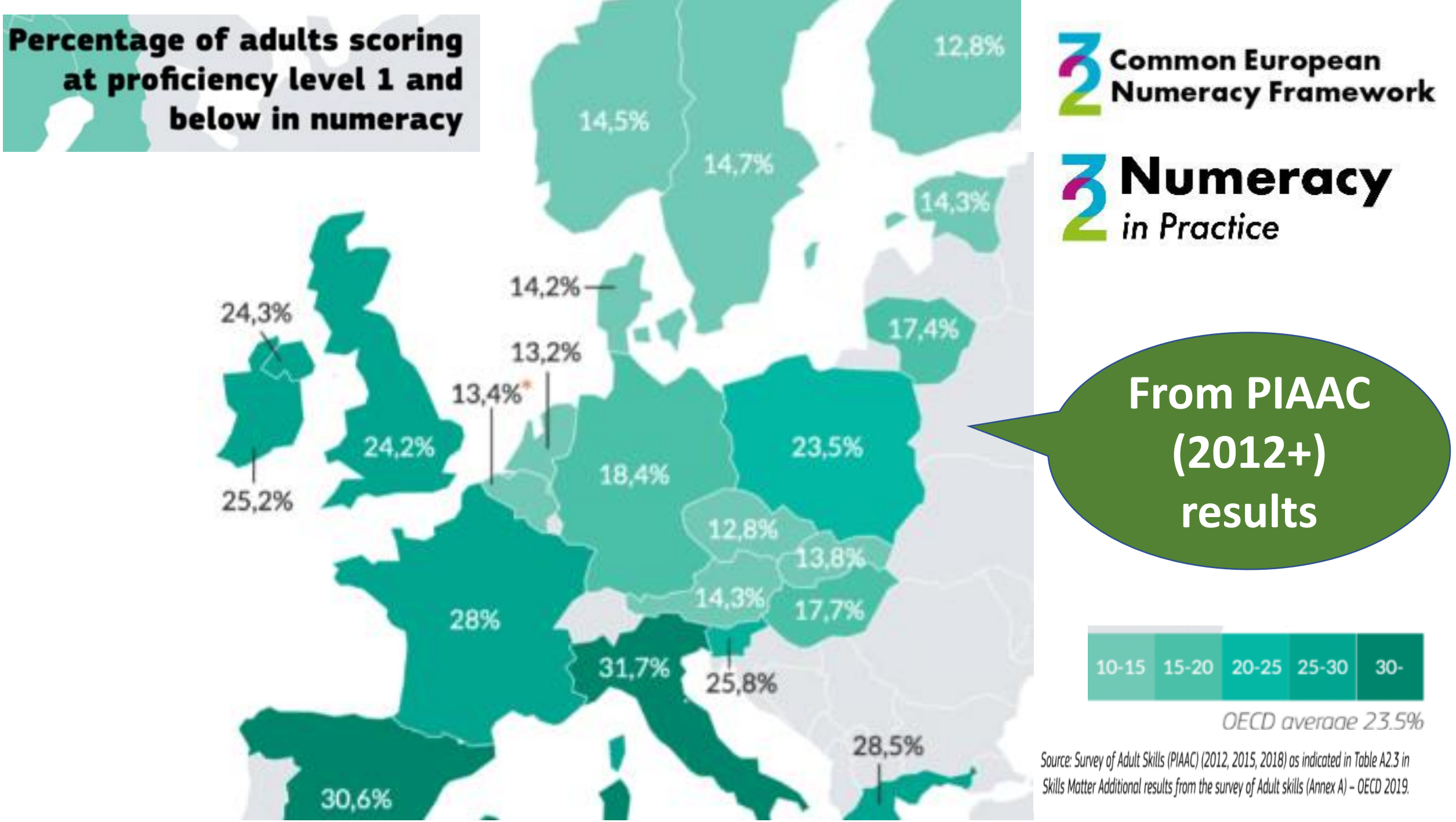
European Basic Skills Network

Preliminary results

Co-funded by the Erasmus+ Programme of the European Union

UNIVERSITY OF APPLIED SCIENCES UTRECHT

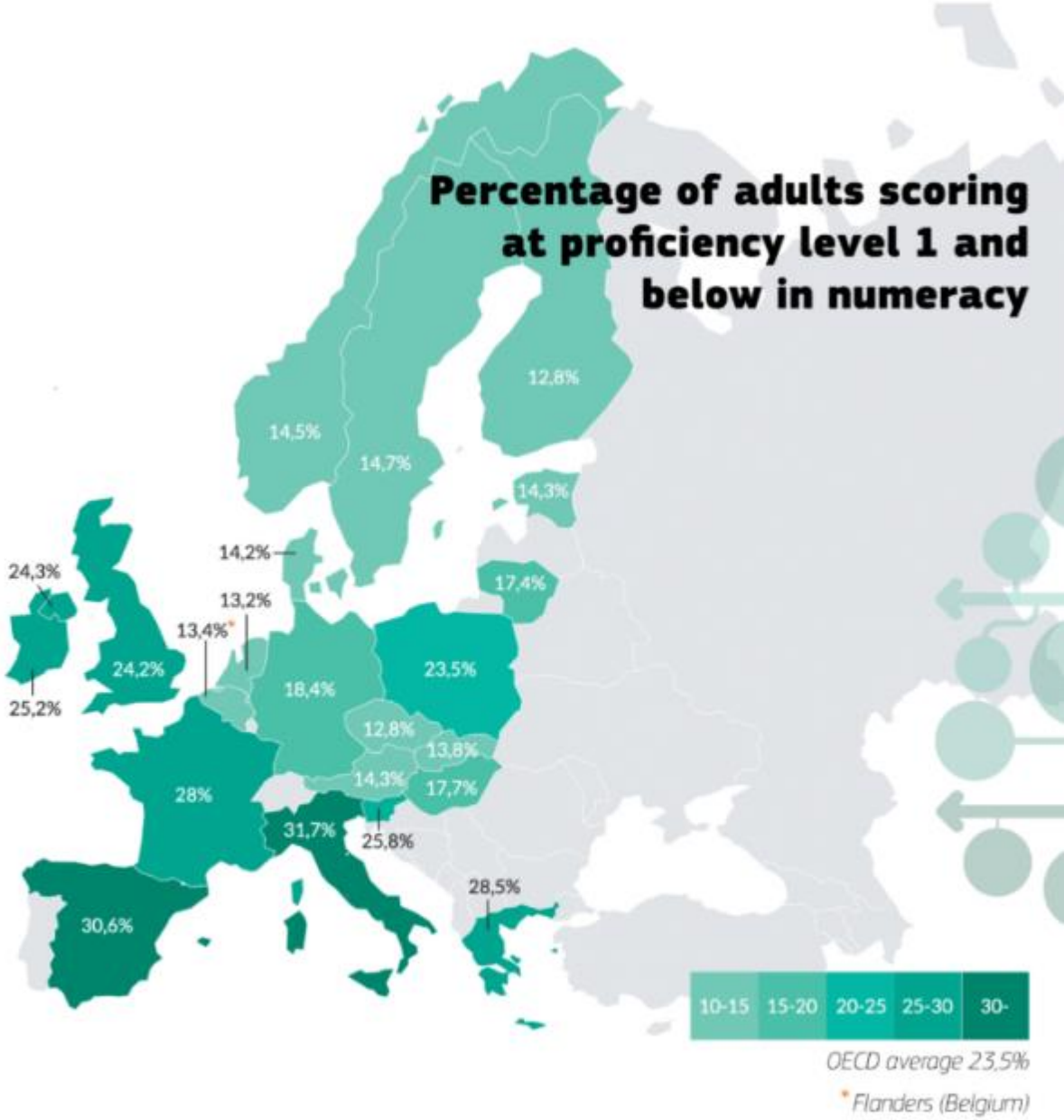
erasmus+


Percentage of adults scoring at proficiency level 1 and below in numeracy
12,8%
14,5%
14,7%
14,3%
14,2%
24,3%
17,4%
13,2%
13,4%*
24,2%
23,5%
18,4%
25,2%
12,8%
13,8%
14,3%
17,7%
28%
31,7%
25,8%
28,5%
30,6%
Common European Numeracy Framework
Numeracy in Practice
From PIAAC (2012+) results
10-15
15-20
20-25
25-30
30-
OECD average 23.5%
Source: Survey of Adult Skills (PIAAC) (2012, 2015, 2018) as indicated in Table A2.3 in Skills Matter Additional results from the survey of Adult skills (Annex A) – OECD 2019.

Serious challenges

Too many European citizens lack the necessary numeracy competencies to participate autonomously and effectively in our technologized and number-drenched society…..

- …. and consequently many citizens are overlooked for certain jobs and have problems in their daily life, dealing with the abundance of number-related issues (OECD, UNESCO, EU)
- Awareness of the importance of numeracy for personal empowerment and becoming a critical citizen.



Source: Survey of Adult Skills (PIAAC) (2012, 2015, 2018) as indicated in Table A2.3 in Skills Matter Additional results from the survey of Adult skills (Annex A) – OECD 2019.

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The Mathematisation of Society

Wallpaper Calculator

Wall width (m)

Wall width

Wall height (m)

Wall height

Wallpaper width (cm)

Wallpaper width

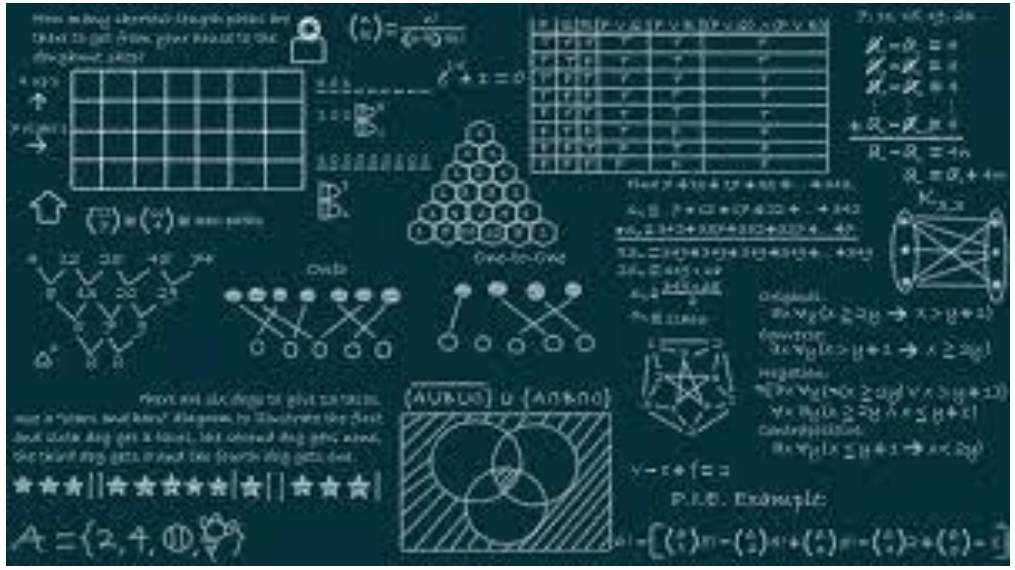
Roll length (m)

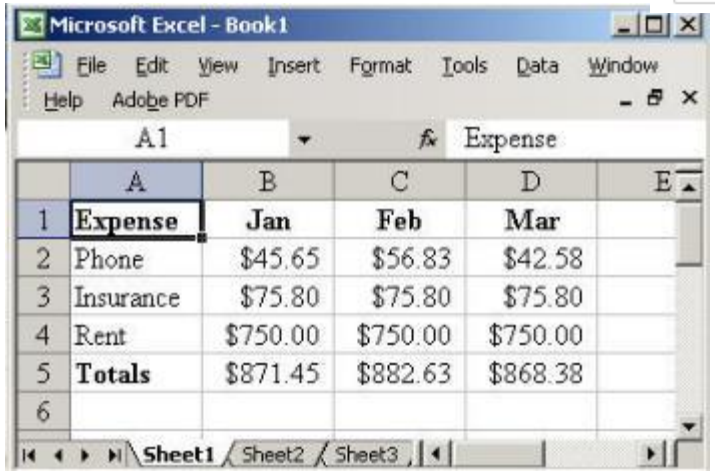
Roll length

Pattern Repeat (cm)

Pattern offset

Calculate





	A	B	C	D
1	**Expense**	**Jan**	**Feb**	**Mar**
2	Phone	$45.65	$56.83	$42.58
3	Insurance	$75.80	$75.80	$75.80
4	Rent	$750.00	$750.00	$750.00
5	**Totals**	$871.45	$882.63	$868.38
6				

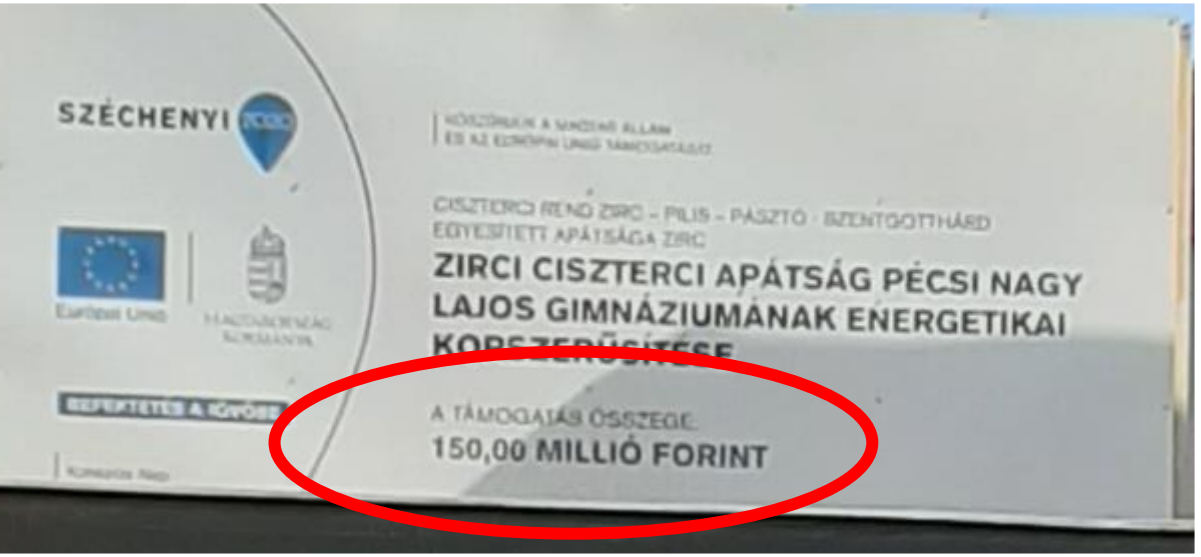
Sheet1 Sheet2 Sheet3

[Video](#)

Mathematisation of Society - minidoc as part of Inaugural Lecture Kees Hoogland (2nd June 2021)

Numeracy • 10 weergaven • 1 week geleden

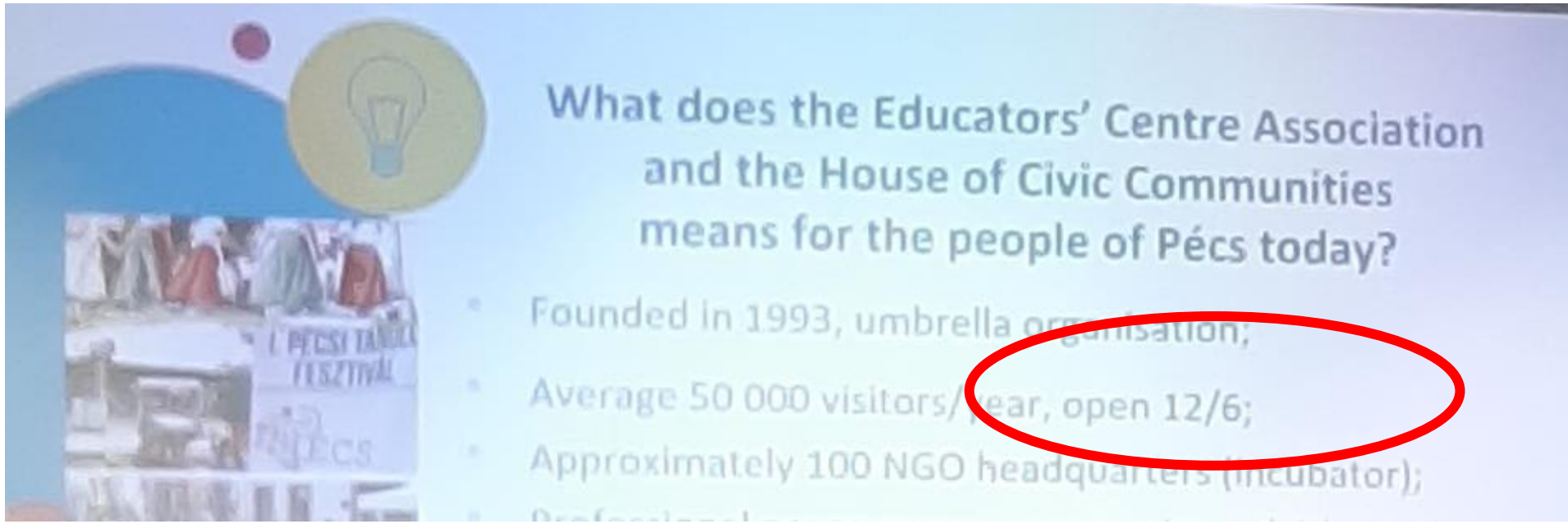
Mathematisation of Society - minidoc as part of Inaugural Lecture Kees Hoogland (2nd June, 2021)
Producer: Marleen Stoker at Mokermedia marleenstoker.com


SZÉCHENYI
ZIRCI CISZTERCI APÁTSÁG PÉCSI NAGY LAJOS GIMNÁZIUMÁNAK ENERGETIKAI
A TÁMOGATÁS ÖSSZEGE:
150,00 MILLIÓ FORINT

T 150
1,1
1,2

PSM-137

SZ
3 1


What does the Educators' Centre Association and the House of Civic Communities means for the people of Pécs today?
Founded in 1993, umbrella organisation;
Average 50 000 visitors/year, open 12/6;
Approximately 100 NGO headquarters (incubator);

What are basic skills in numeracy ?

- Basic skills = what you need to deal with the world in which you live in an inclusive, autonomous, and adequate way.
- Each time frame calls for skills that are relevant and important in that specific time frame.

So, this automatically implies LLL

Reading, writing, arithmetic

19th century

3Rs: Reading, ‘Riting ‘Rithmetic

1 x 2 = 2 x 2 = 4 3 x 2 = 6 4 x 2 = 8 5 x 2 = 10 6 x 2 = 12 7 x 2 = 14 8 x 2 = 16 9 x 2 = 18 10 x 2 = 20	1 x 3 = 2 x 3 = 3 x 3 = 9 4 x 3 = 12 5 x 3 = 15 6 x 3 = 18 7 x 3 = 21 8 x 3 = 24 9 x 3 = 27 10 x 3 = 30	1 x 4 = 2 x 4 = 3 x 4 = 4 x 4 = 16 5 x 4 = 20 6 x 4 = 24 7 x 4 = 28 8 x 4 = 32 9 x 4 = 36 10 x 4 = 40	1 x 5 = 2 x 5 = 3 x 5 = 4 x 5 = 5 x 5 = 25 6 x 5 = 30 7 x 5 = 35 8 x 5 = 40 9 x 5 = 45 10 x 5 = 50
1 x 6 = 2 x 6 = 3 x 6 = 4 x 6 = 5 x 6 = 6 x 6 = 36 7 x 6 = 42 8 x 6 = 48 9 x 6 = 54 10 x 6 = 60	1 x 7 = 2 x 7 = 3 x 7 = 4 x 7 = 5 x 7 = 6 x 7 = 7 x 7 = 49 8 x 7 = 56 9 x 7 = 63 10 x 7 = 70	1 x 8 = 2 x 8 = 3 x 8 = 4 x 8 = 5 x 8 = 6 x 8 = 7 x 8 = 8 x 8 = 64 9 x 8 = 72 10 x 8 = 80	1 x 9 = 2 x 9 = 3 x 9 = 4 x 9 = 5 x 9 = 6 x 9 = 7 x 9 = 8 x 9 = 9 x 9 = 81 10 x 9 = 90

9.65

a. $\frac{5}{33} + \frac{9}{22} =$

b. $\frac{7}{24} - \frac{3}{16} =$

c. $\frac{13}{12} + \frac{4}{15} =$

d. $\frac{4}{9} \times \frac{4}{11} =$

e. $\frac{7}{5} : \frac{5}{7} =$

Language and (contextual) Maths

20th century

9.68

a. $\frac{\frac{5}{6} + \frac{2}{5}}{\frac{2}{3} + \frac{1}{6}} =$

b. $\frac{\frac{3}{4} + \frac{4}{3}}{\frac{3}{4} - \frac{1}{3}} =$

Numeracy, Literacy, Digital skills

21st century

Numeracy in Practice

Common European Numeracy Framework

Numeracy as social practice (NSP)

"… aggregate of skills, knowledge, beliefs, dispositions, habits of mind, communication capabilities, and problem-solving skills that individuals need in order to autonomously engage and effectively manage numeracy situations that involve numbers, quantitative or quantifiable information, or visual or textual information that is based on mathematical ideas or has embedded mathematical elements". (See Gall, 2000, p.6)

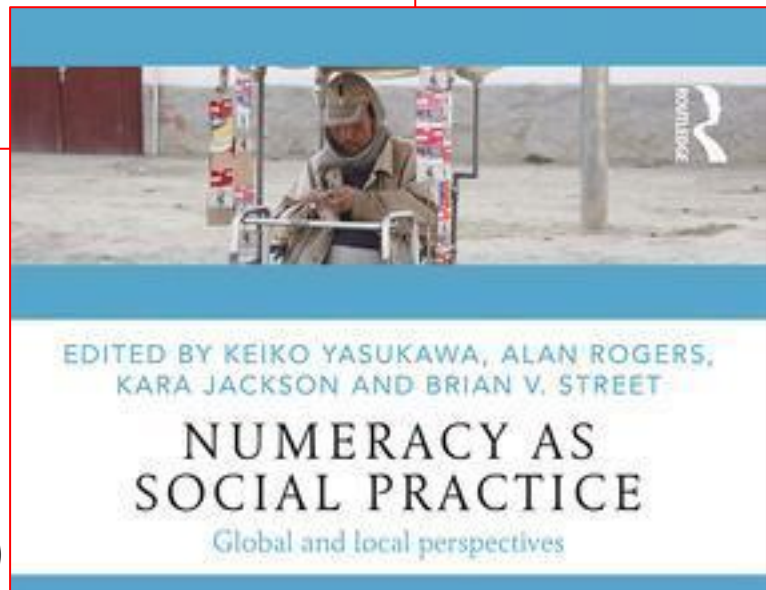
Conceptually inspired by:

- Situated cognition
- Cultural-historical activity theory (CHAT)
- Literacy as social practice (LSP)
- Ethnomathematics

"A social practice view of numeracy not only takes into account the different contexts in which numeracy is practised, such as school, college, work and home, but also how people's life and histories, goals, values and attitudes will influence the way they carry out numeracy".

(See Oughton, 2013)

The framework acknowledges the great efforts from the past:
ALL, IALS, PIAAC, ACER, …, …, …
It will be developed further by many.



(See Yasukawa et al., 2018)

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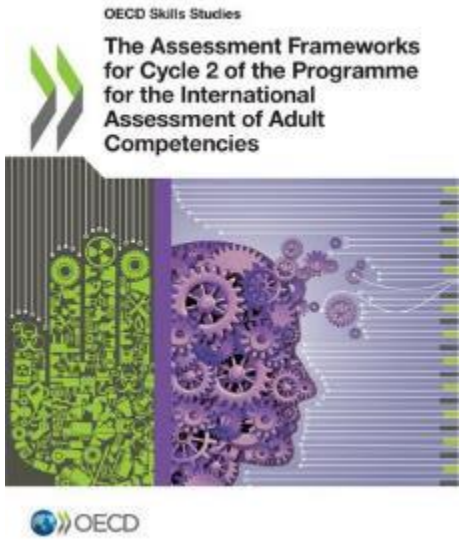
The Numerate world 21st c.AD

Numeracy in Practice

Cognitive processes	*Manifestations*
Interpretation	Product labels, advertisements, brochures, ….
Understanding of hidden algorithms	Apps, websites, …
Valuating	Money, prices, …
Measuring	Length, weight, …
Estimating	Ubiquitous, ….
Critical thinking	Politics, intimidation with numbers
Knowing reference numbers	Body, country, world
…	…
…	…
…	…

Numerate beh practices



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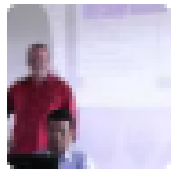


Why is numeracy important?

New ChatGPT

Numeracy is important for seve

1. Everyday Life: Numeracy ski
calculating bills, budgeting f
ingredients for cooking or de
informed decisions and solvi
2. Employment Opportunities:
various fields. Many jobs req
trends, and make accurate c
employability and open door
3. Financial Literacy: In an incre
understanding personal fina
planning. By developing num
avoid scams, and plan for a s
4. Critical Thinking and Problem
problem-solving abilities. It e
patterns, draw conclusions, a
overall critical thinking skills,
problems, and make informe

5. Participation in Society: Numeracy is essential for active participation in society. It enables individuals to understand statistics, graphs, and charts presented in the media, evaluate research findings, and critically assess claims based on numerical data. Numeracy empowers individuals to engage in discussions, make informed decisions, and actively contribute to social and political discourse.
6. STEM Education and Career Paths: Numeracy is a foundational skill for science, technology, engineering, and mathematics (STEM) disciplines. Proficiency in numeracy is necessary for understanding and applying mathematical concepts in fields like engineering, physics, computer science, and economics. Strong numeracy skills can open doors to STEM education and careers.

Overall, numeracy is important because it equips individuals with the skills to navigate the complexities of the modern world, make informed decisions, solve problems, and participate actively in society. It empowers individuals to critically analyze information, pursue educational and career opportunities, and lead financially secure lives.

European Numeracy Projects

- Erasmus+ project 1: Common European Numeracy Framework
  - running from December 2018 - November 2021
  - 4 countries + networks e.g., ALM and EBSN
  - Developing a framework and professional development modules (PDM)

Common European Numeracy Framework

- Erasmus+ project 2: Numeracy in Practice NiP
  - running from January 2022 – December 2024
  - 11 countries (IR, NL, BE, FR, AU, SP, IT, SL, GR, TU, PO) + networks e.g., ALM, EBSN, …
  - Upscaling provisions and professional development
  - Working on awareness and critical mass
  - Attracting attention from Canada, USA, South America, Africa, Asia, Australia, ..

Numeracy in Practice

Co-funded by the Erasmus+ Programme of the European Union

What matters to improve numerate behavior

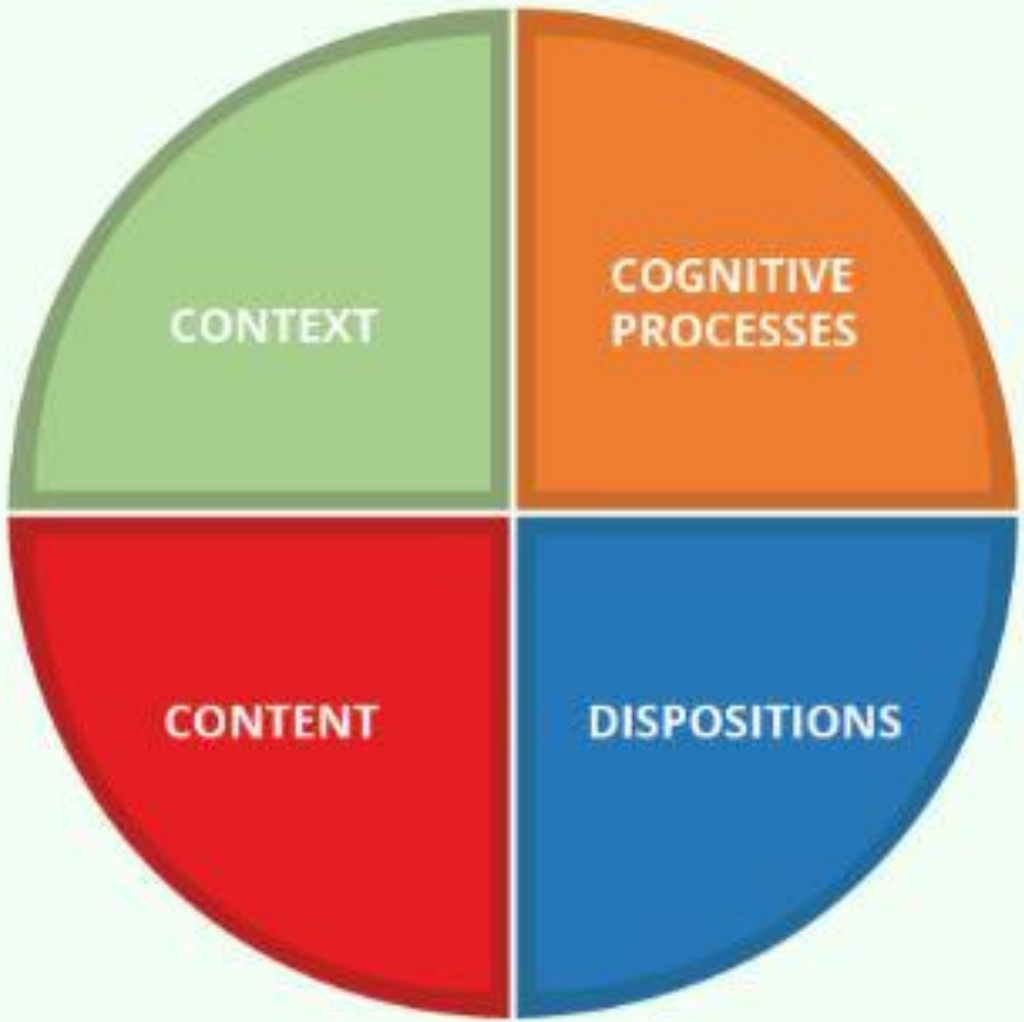
Common European Numeracy Framework

Context

Everyday life
Work-related
Citizenship
Further learning
Finances
Health and care
Recreation

Knowledge and skills

Quantity and number
Dimension and shape
Pattern, relationships and change
Data and chance
Using a calculator
Using spreadsheets
Using digital skills



Higher order skills

Managing situations
Analysing situations
Processing information
Reasoning
Mathematising
Problem solving
Critical thinking

Dispositions

Self-confidence
Affection
Beliefs
Collaborations
Flexibility
Math anxiety
Math difficulties

Quali aspetti favoriscono la pratica del contare

Contesto

Vita di ogni giorno
Ambiente lavorativo
Cittadinanza
Formazione ulteriore
Economia/Finanza
Salute e Cura
Svago/Tempo libero

Abilità di livello superiore

Gestire le situazioni
Analizzare le situazioni
Elaborazione delle informazioni
Ragionamento
Trattare matematicamente
Problem solving
Pensiero critico

Conoscenza di contenuti e abilità

Quantità e numero
Dimensione e forma
Modelli, relazioni e cambiamento
Dati e probabilità
Uso della calcolatrice
Utilizzo di app e fogli di calcolo
Competenze digitali

Disposizioni

Fiducia in se stessi
Motivazione
Idee positive di sè
Spirito di collaborazione
Flessibilità
Bassa ansia rispetto alla matematica
Desiderio di apprendimento

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¿Qué es lo que importa para mejorar el comportamiento numérico?

Contexto

Vida cotidiana
Relacionado con el trabajo
Ciudadanía
Aprendizaje a lo largo de la vida
Finanzas
Salud y cuidados
Ocio

Habilidades de orden superior

Gestionar situaciones
Analizar situaciones
Procesar información
Razoanar
Matematización
Resolución de problemas
Pensamiento crítico

Conocimiento y habilidades del contenido

Cantidades y numeración
Dimensión y forma
Patrones, relaciones y cambio
Datos y probabilidad
Usar una calculadora
Usar aplicaciones y hojas de cálculo
Habilidades digitales

Disposiciones

Autoconfianza
Motivación
Creencias positivas (propias)
Colaboración
Flexibilidad
Ansiedad matemática baja
Capacidad de aprendizaje

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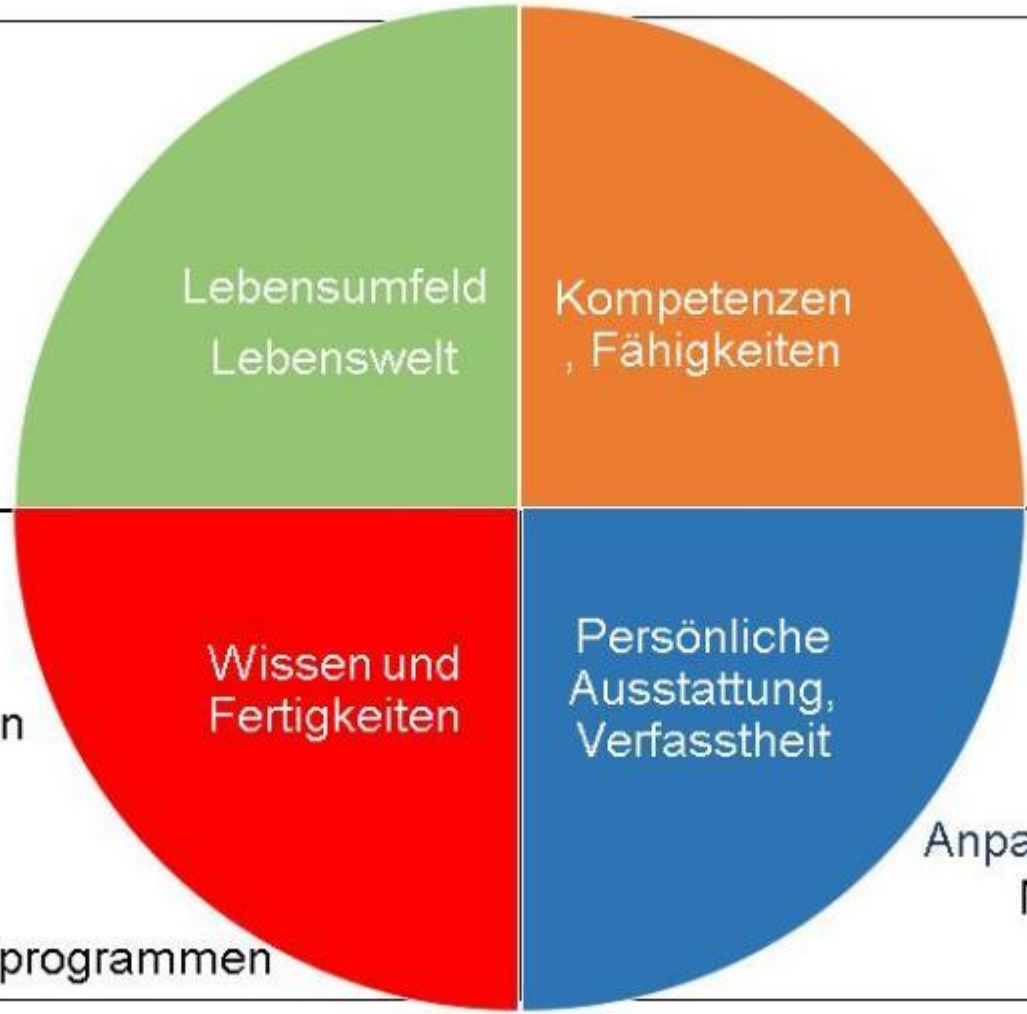
Worauf es ankommt, den Umgang mit zahlenbezogenen Sachverhalten zu verbessern

Umfeld
Alltagsleben
Arbeitswelt
(Staats-)Bürger*innenschaft
Lebensbegleitendes Lernen
(Haushalts-)Budget
Vorsorge und Gesundheit
Erholung

Fähigkeiten, Kompetenzen
Situationen bewältigen
Situationen analysieren
Informationen verarbeiten
Argumentieren
Mathematisieren
Probleme lösen
Kritisches Denken



Wissen und Fertigkeiten
Anzahl und Menge
Größe und Form
Muster, Beziehungen, Veränderungen
Daten und Wahrscheinlichkeiten
Digitale Kompetenzen
Verwenden eines Taschenrechners
Verwenden von Tabellenkalkulationsprogrammen

Persönliche Verfasstheit
Selbstvertrauen
Motivation
(Positiver) Selbstwert
Zusammenarbeit
Anpassungsfähigkeit, Vielseitigkeit
Mathematikangst/Zahlenangst
Lernvermögen/Lernpotenzial

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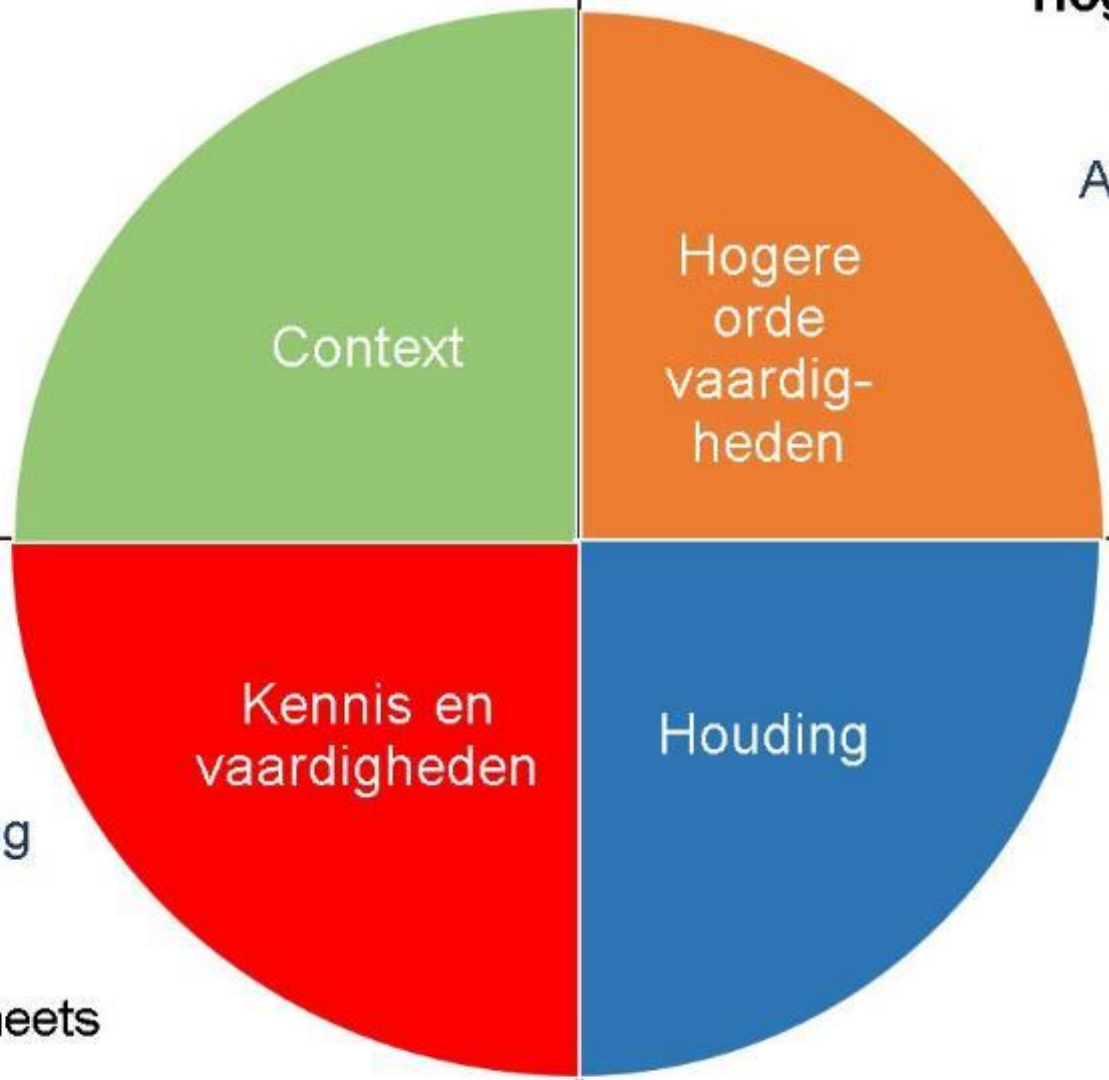
Factoren die gecijferd gedrag verbeteren

Context

Dagelijks leven
Werksituatie
Burgerschap
Verder leren
Financiën
Gezondheid en welzijn
Recreatie / Spel

Hogere orde vaardigheden

Hanteren van de situatie
Analyseren van de situatie
Informatie interpreteren
Redeneren
Mathematiseren
Probleemoplossen
Kritisch denken



Kennis en vaardigheden

Hoeveelheden en getallen
Afmeting en vorm
Patronen, relaties en verandering
Data en kans
Gebruik van rekenmachine
Gebruik van apps and spreadsheets
Digitale vaardigheden

Houding

Zelfvertrouwen
Motivatie
Positief zelfbeeld
Samenwerking
Flexibel
Weinig rekenangst
Leerbaar

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Co jest istotne w kwestii poprawienia umiejętności matematycznych

Kontekst
Życie codzienne
Praca
Obywatelstwo
Uczenie się przez całe życie
Finanse
Opieka zdrowotna
Odpoczynek

Umiejętności wyższego rzędu

Panowanie nad sytuacją
Analizowanie sytuacji
Przetwarzanie informacji
Rozumowanie
Myślenie mtematyczne
Rozwiązywanie problemów
Krytyczne myślenie

Wiedza merytoryczna i umiejętno

Ilości i liczby
Wymiary i kształty
Wzory, związki i zmiany
Dane i prawdopodobieństwo
Używanie kalkulatora
Używanie aplikacji i arkuszy kalkulacyjnych
Umiejętności cyfrowe

Usposobienie

Pewność siebie
Motywacja
Wiara w swoje umiejętności
Zespołowość
Elastyczność
Brak strachu przed matematyką
Umiejętność uczenia się

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Ambitions for the current project

- Exemplary materials (bottom up)
- Local development, such as local professional development (LTTA)
- Influencing regional/national/international policies
  - Common European Numeracy Framework
  - Professional development modules at website
  - Working towards critical mass
  - Small scale partnerships (30k, 60k) with more and other countries
  - …

Project results

ID	Leading	Title	Start	End
1	Spain	Information and awareness packages	01-01-2022	01-03-2024
2	Austria	Teaching and learning materials - examples	01-01-2022	01-03-2024
3	Netherlands	(local) Professional development materials - examples	01-01-2022	01-03-2024
4	Ireland	White papers on what works in numeracy education	01-08-2023	31-03-2024

1 see page 64 in application
2 see page 78 in application
3 see page 93 in application
4 see page 107 in application

International and local courses & events

- 2x International course
  - 1st in Netherlands (11 and 12 October 2022), every partner organisation sends two persons
  - 2nd in Spain (5 and 6 Sept 2023), every partner organisation sends two persons

- 11x 2x local/regional/national course min. 5 participants from own institute per course
  unlimited external participants
  - 1st in November 2022
  - 2nd in November 2023
- 11x National Multiplier events (spring 2024)

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Numeracy in Practice

Common European Numeracy Framework

HOME FRAMEWORK PROF DEVELOPMENT MATERIALS RESEARCH

NUMERACY IN THE 21ST CENTURY

Too many European citizens lack the necessary numeracy competencies to participate autonomously and effectively in our technologized and number-drenched society .... and consequently many citizens are overlooked for certain jobs and have problems in their daily life, dealing with the abundance of number-related issues (OECD, UNESCO, EU)

Common European Numeracy Framework

try it now!

THE MODULES

DISPOSITIONS

- Math anxiety, Math difficulties
- Self confidence
- Collaborations, Flexibility

COGNITIVE PROCESSES

CONTEXT

CONTENT

[Example: Math Anxiety]

try it now!

THE LTTA's

Common European Numeracy Framework

ENGLISH

GERMAN

SPANISH

1. Vorwissen und spezieller Schulungsbedarf

2. Aspekte von Numeracy und CENF

3. Gesellschaftliche Transormation und Kompetenzen des 21 Jahrhunderts

Educational activities

- Numeracy conversations
- Counteract math anxiety (Talk about it!)
- Exploring the quantitative world around you
  e.g., using pictures of real-life situations
- Working on awareness of personal successful numerical behaviour
- Discuss and work on themes (finance, health, climate, ….)
- Discuss and work on numbers in media, news, advertisements

X1 / X2

Y1 / Y2

Educational activities

- Thematic courses/meetings
  - Better trading on E-Bay
  - Educational games
  - Budgeting, planning, saving
  - Cooking
  - Et cetera
- Discussing weekly experiences: critical dialogue
- Adult education: integrate into language lessons and into language support...
- Adult education: integrate into digital skills courses

Placemat-voorkant

Gecijferdheid telt mee

gecijferdheidteltmee.nl

HOGESCHOOL UTRECHT

Pro biblio

Gecijferdheid telt mee

gecijferdheidteltmee.nl

HOGESCHOOL UTRECHT

Pro biblio

For information, collaboration, and comments, please contact Kees Hoogland

kees.hoogland@hu.nl

UNIVERSITY OF APPLIED SCIENCES UTRECHT

Kees Hoogland | professor Mathematical and Analytical Competences of Professionals | Knowledge Centre Learning and Innovation | HU University of Applied Sciences Utrecht | Padualaan 97 | 3584 CH Utrecht | The Netherlands | Ph.+316 3410 1701 |
https://www.gecijferdheid.nl/kees-hoogland-appointed-professor-of-mathematical-and-analytical-competences-of-professionals/?lang=en

- Programme manager of Erasmus+ project: Common European Numeracy Framework
- Member of the OECD - Numeracy Expert Group - PIAAC 2nd cyle
- Trustee of Adults Learning Mathematics – A research Forum
- Fellow of the International Society for Design and Development in Education
- Chair of the Thematic Working Group - Adult Mathematics Education - at CERME 12 (Bolzano, Italy, 2-6 February 2022)

Just published:

- ALM: key-note https://www.gecijferdheid.nl/adult-numeracy-practices-imperative-implications-for-education/
- Springer: National Reflections on the Netherlands Didactics of Mathematics: https://link.springer.com/book/10.1007/978-3-030-33824-4
- ZDM: "Computer-based assessment of mathematics into the twenty-first century: pressures and tensions" https://rdcu.be/Oz4e

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Numeracy • 10 weergaven • 1 week geleden

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Producer: Marleen Stoker at Mokermedia marleenstoker.com