

Educational myths: What's brains got to do with this?

Prof. dr. Paul A. Kirschner

Welten Institute / Open University of the Netherlands

Welten Institute

Research Centre for Learning, Teaching and Technology

research **ED**
Amsterdam 2017

Open Universiteit
welten-institute.org



Your attention please...



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Who here is a ...

- student?
- teacher?
- student teacher?
- administrator?
- parent?
- politician?
- researcher?
- other???



What's an urban legend?

- story or description (often fictitious)
- broadly circulated / often told
- often seen by narrator and listener as true
- that one wants to believe
- but without real proof





What's an urban legend?

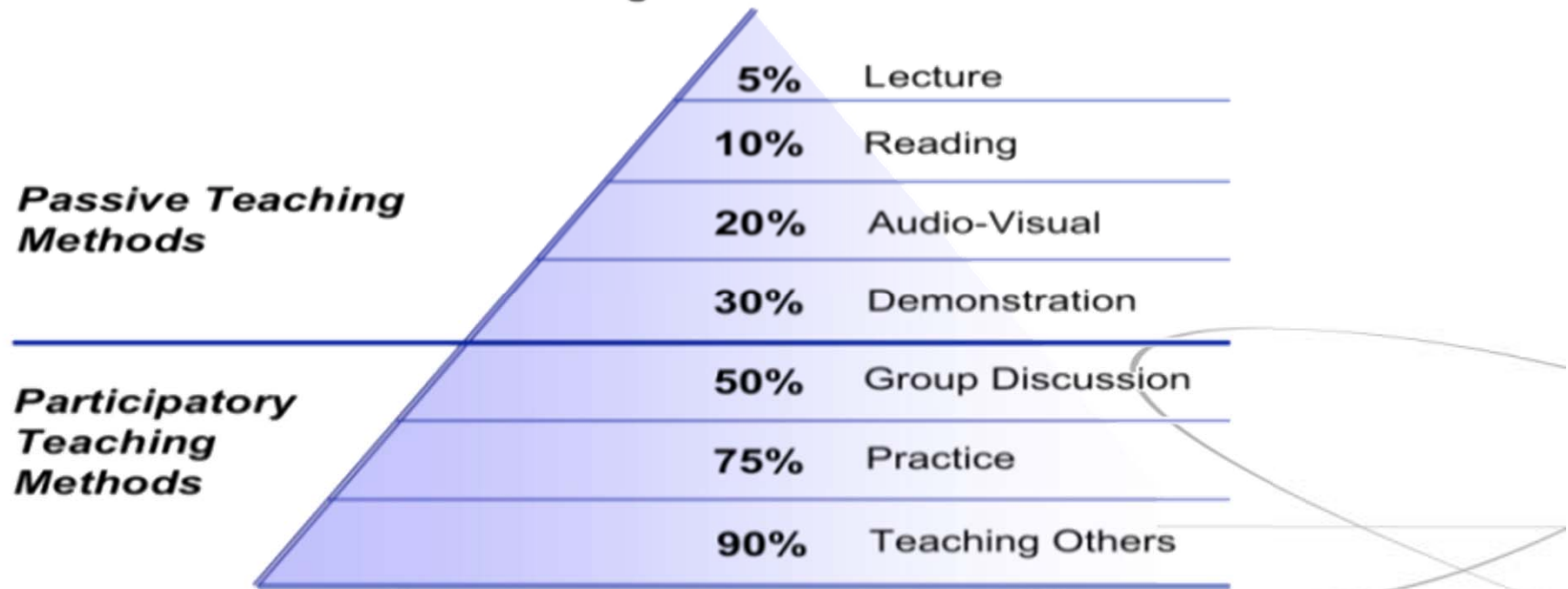
- story or description (often fictitious)
- broadly circulated / often told
- often seen by narrator and listener as true
- that one wants to believe
- but without real proof

...also in education?



Ever heard of the Learning Pyramid*?

Average Retention Rates



*Adapted from National Training Laboratories. Bethel, Maine



Three assertions made by eduquacks

- Kids can multitask
- Kid is a homo zappiëns
- Kids don't need factual knowledge any more



Kids can multitask

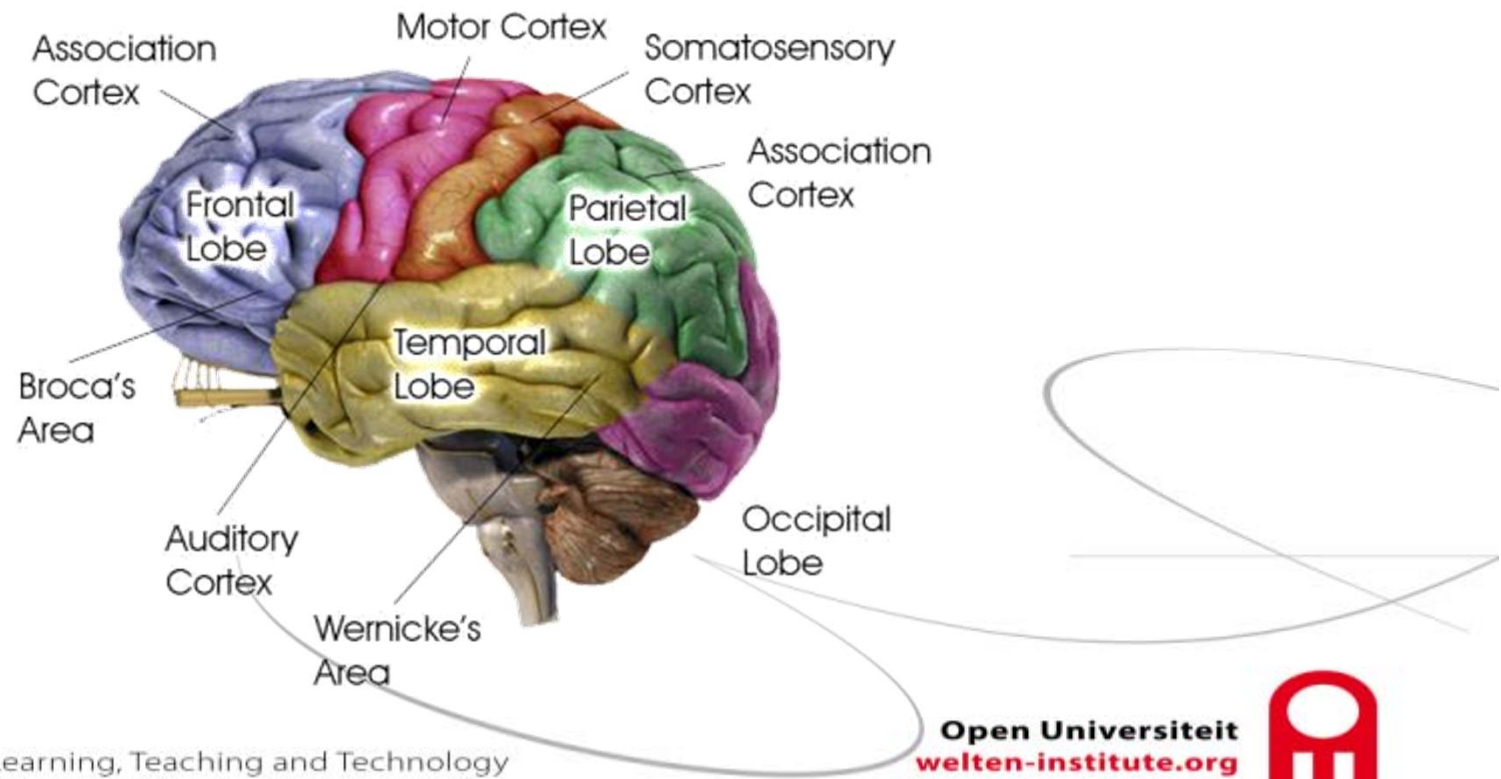


Multitasking

- Two or more conscious thought or information processes at the same time
- No loss of speed
- No loss of accuracy

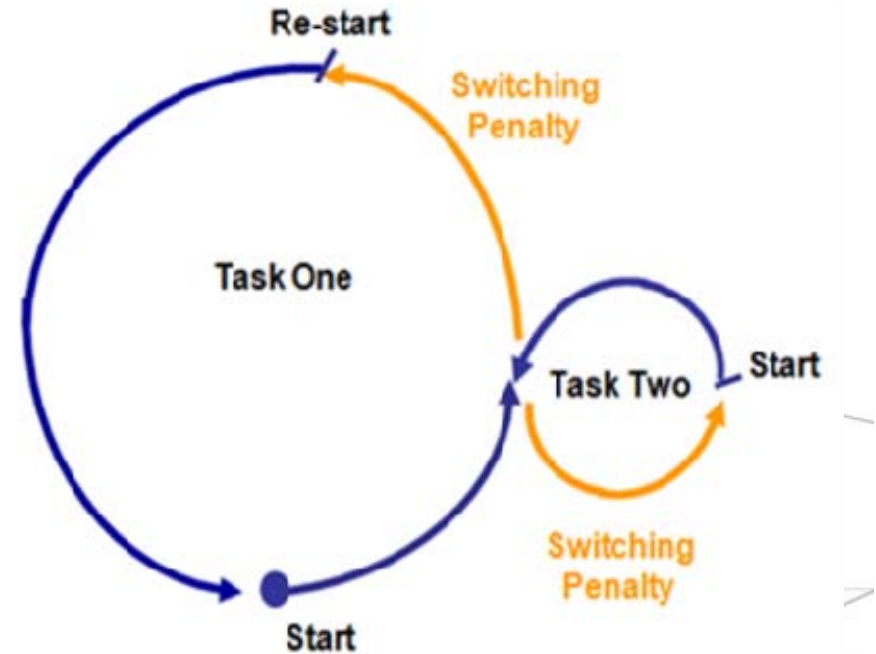


Houston, we have a problem!



Task switching

- Switch between two or more processes requiring thinking
- Reinstatement searches
- Schema switching
- Loss of time / more mistakes



Experiment 1



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Task 1

H U M A N S C A N ' T M U L T I T A S K !

Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Task 1

H U M A N S C A N ' T M U L T I T A S K !

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23





Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Task 2

T A S K S W I T C H I N G I S D O A B L E

Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Task 2

T

Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Task 2

T

1

Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Task 2

T A

1

Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Task 2

T A

1 2

Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org





Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Experiment 2



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



BLUE

GREEN

RED

PURPLE

BLACK

PURPLE

BLACK

BLUE

GREEN

RED

GREEN

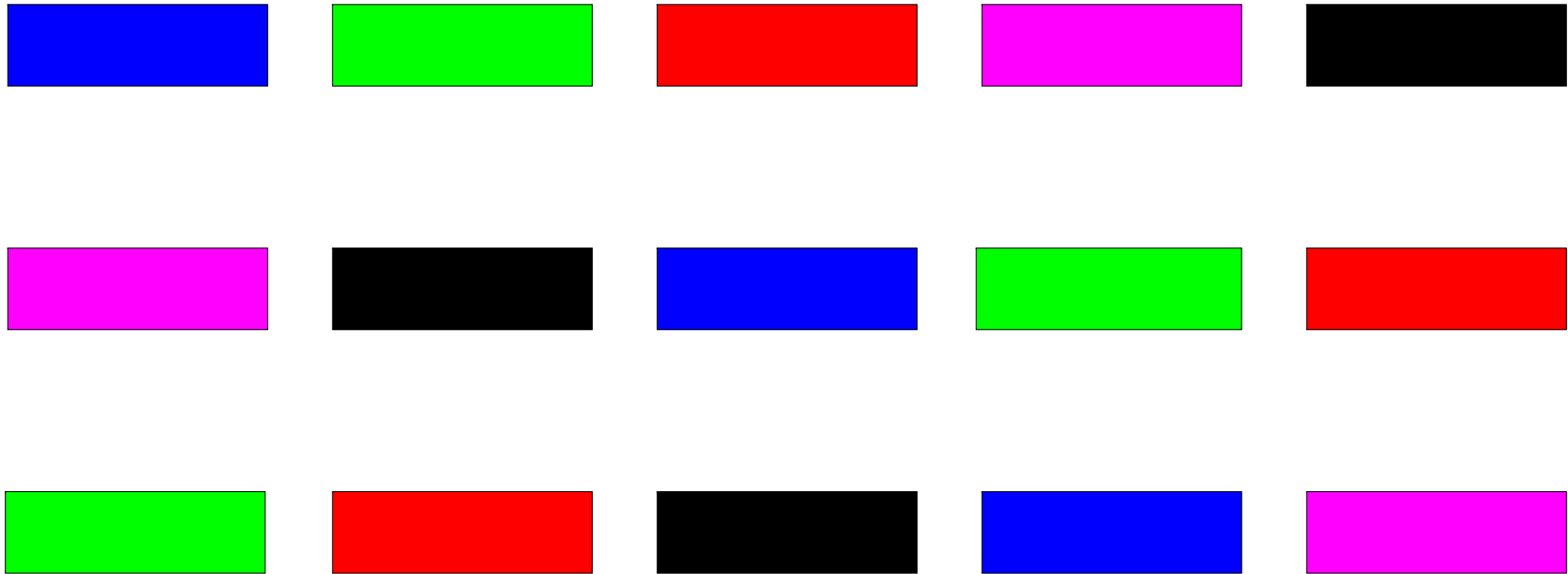
RED

BLACK

BLUE

PURPLE





Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



BLUE

GREEN

RED

PURPLE

BLACK

BLACK

PURPLE

BLUE

GREEN

RED

GREEN

RED

BLACK

BLUE

PURPLE



Stroop effect (1935)

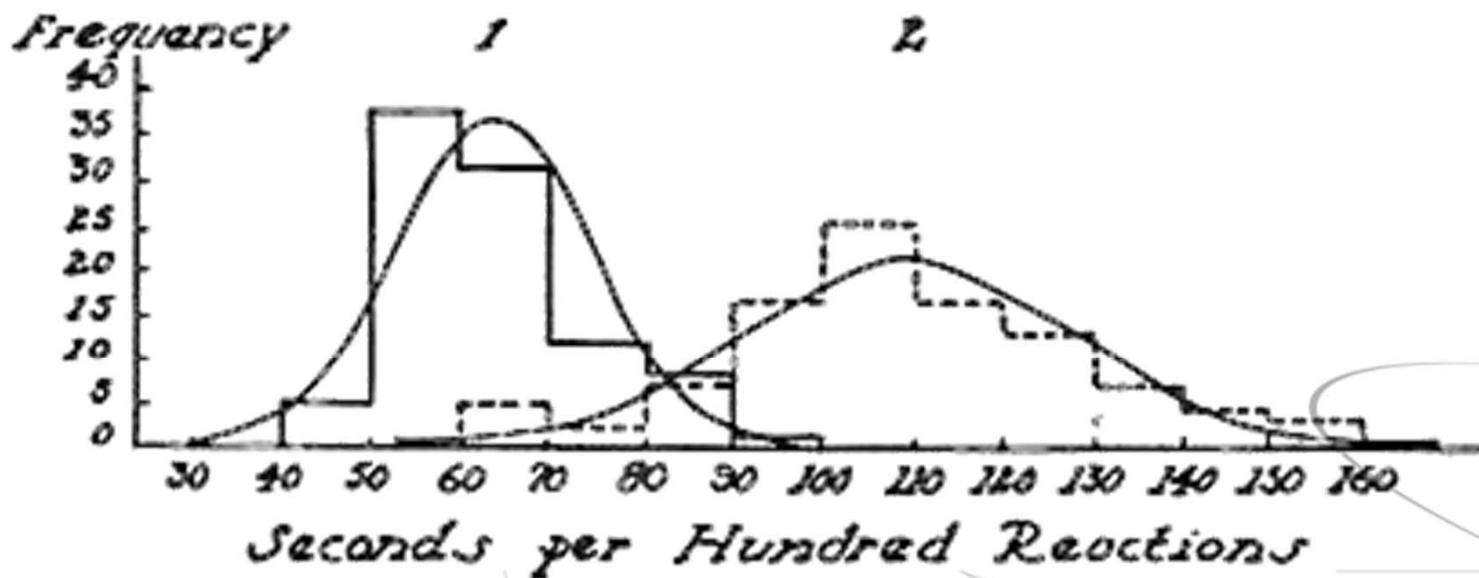


FIG. 1. Showing the effect of interference on naming colors. No interference (1); interference (2).



Twitter break!



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Some examples from research

- Reading / studying to mastery



Some examples from research

- Reading / studying to mastery
- Social media and academic achievement



Some examples from research

- Reading / studying to mastery
- Social media and academic achievement
- Driving a car: normal, on the phone, drunk



Cell phones and drunk driving

TABLE 1: Means and Standard Errors (in Parentheses) for the Alcohol, Baseline, and Cell Phone Conditions

	Alcohol	Baseline	Cell Phone
Total accidents	0	0	3
Brake reaction time (ms)	779 (33)	777 (33)	849 (36)
Maximum braking force	69.8 (3.7)	56.7 (2.6)	55.5 (3.0)
Speed (mph)	52.8 (2.0)	55.5 (0.7)	53.8 (1.3)
Mean following distance (m)	26.0 (1.7)	27.4 (1.3)	28.4 (1.7)
SD following distance (m)	10.3 (0.6)	9.5 (0.5)	11.8 (0.8)
Time to collision (s)	8.0 (0.4)	8.5 (0.3)	8.1 (0.4)
Time to collision < 4 s	3.0 (0.7)	1.5 (0.3)	1.9 (0.5)
Half recovery time (s)	5.4 (0.3)	5.3 (0.3)	6.3 (0.4)



Strayer, D. L., Drews, F. A., and Crouch, D. L. (2006). A comparison of the cell phone driver and the drunk driver. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 381-391.

...cell phone drivers were more likely to **fail to stop** at four-way intersections and more likely to be **involved in rear-end collisions** than drivers not using a cell phone. In fact, even when cell phone drivers were directing their gaze at objects in the driving environment they often **failed to see them** because **attention was directed elsewhere**...talking on a cell phone creates a form of inattention blindness, muting driver's awareness of important information in the driving scene.

...compared **hand-held** and **hands-free** cell phones and found that the **impairments to driving are identical**...There was no evidence that hands-free cell phones were any safer to use while driving than hand-held devices.



Even worse...

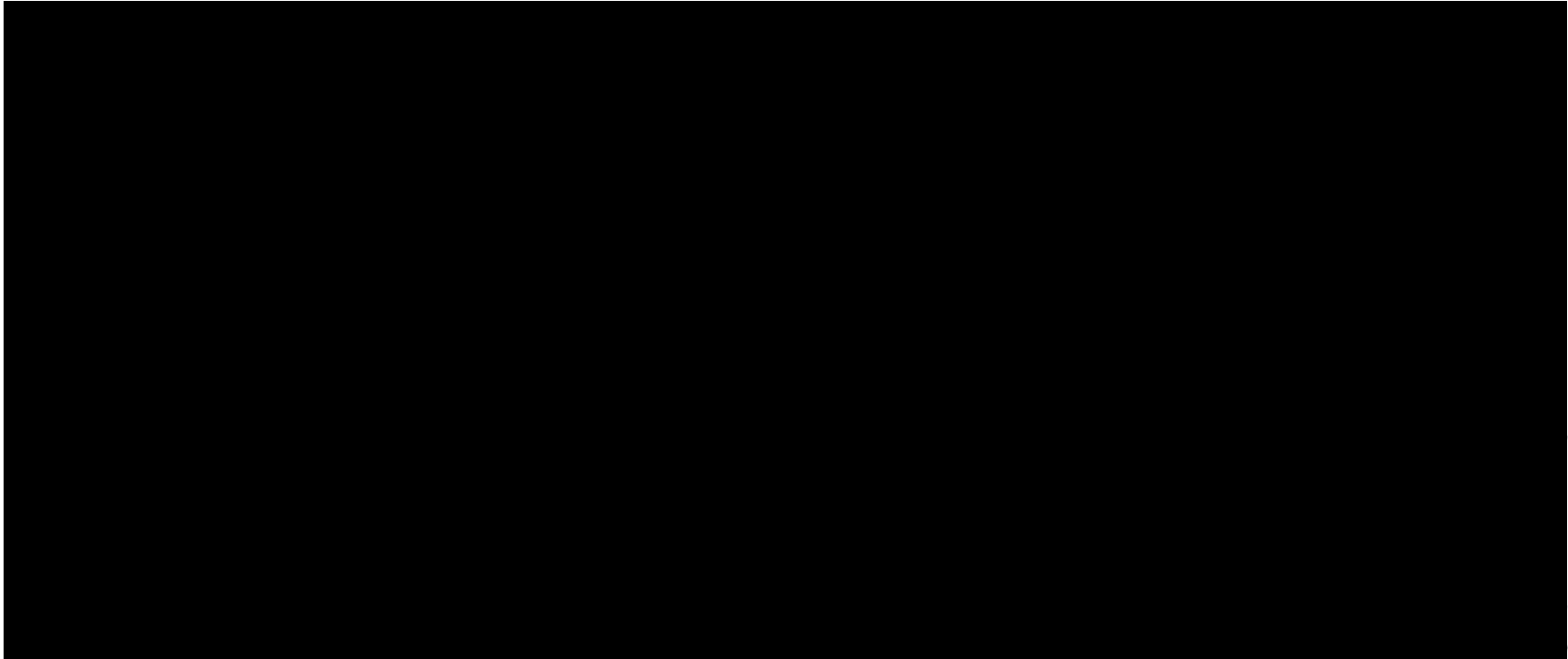
... heavy media multitaskers are more **susceptible to interference** from irrelevant environmental stimuli and from irrelevant representations in memory. This led to the surprising result that heavy media multitaskers performed worse on a test of task-switching ability, likely due to **reduced ability to filter out interference** from the irrelevant task set.



Some examples from research

- Reading / studying to mastery
- Social media and academic achievement
- Driving a car: normal, on the phone, drunk
- The old switcheroo





Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Multitasking? No!

- Even almost automated processes are hard to carry out simultaneously (Herman et al., 2011)
- Two things consecutively are more effective and efficient than two simultaneously (Meyer, 2005)
- Even at the neuron level there's a bottleneck that leads to mistakes and delays (Janssen et al., 2010)



Effects?

- Lower scores / Less learnt
- Longer study time to achieve mastery
- Missing important things / Death
- Lowered concentration in the long term



Knowledge acquisition isn't necessary because...

- “kids are *homo zappiëns* and can intelligently use ICT”
- “knowledge is a perishable as fresh fish / half-life of knowledge is decreasing”
- “it's all there on the Internet”



Kids are media-wise digital natives



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Homo zappiëns / Digital native

Generation of learners that independently, playfully, and without instruction develop metacognitive skills enabling them to:

- discover facts and rules
- learn in networks
- experiment effectively
- learn collaboratively
- learn actively
- organise their learning
- solve (learning) problems



...but unfortunately

- kids know little of tools for knowledge creation and sharing
- kids need to learn to use tools for learning; they use them primarily for passive consumption
- the omnipresent availability of technology hasn't led to (increased) information search-, find-, or –evaluation skills



Attention Deficit Hyperlink Disorder or Butterfly Defect



Welten Institute
Research Centre for Learning, Teaching and Technology

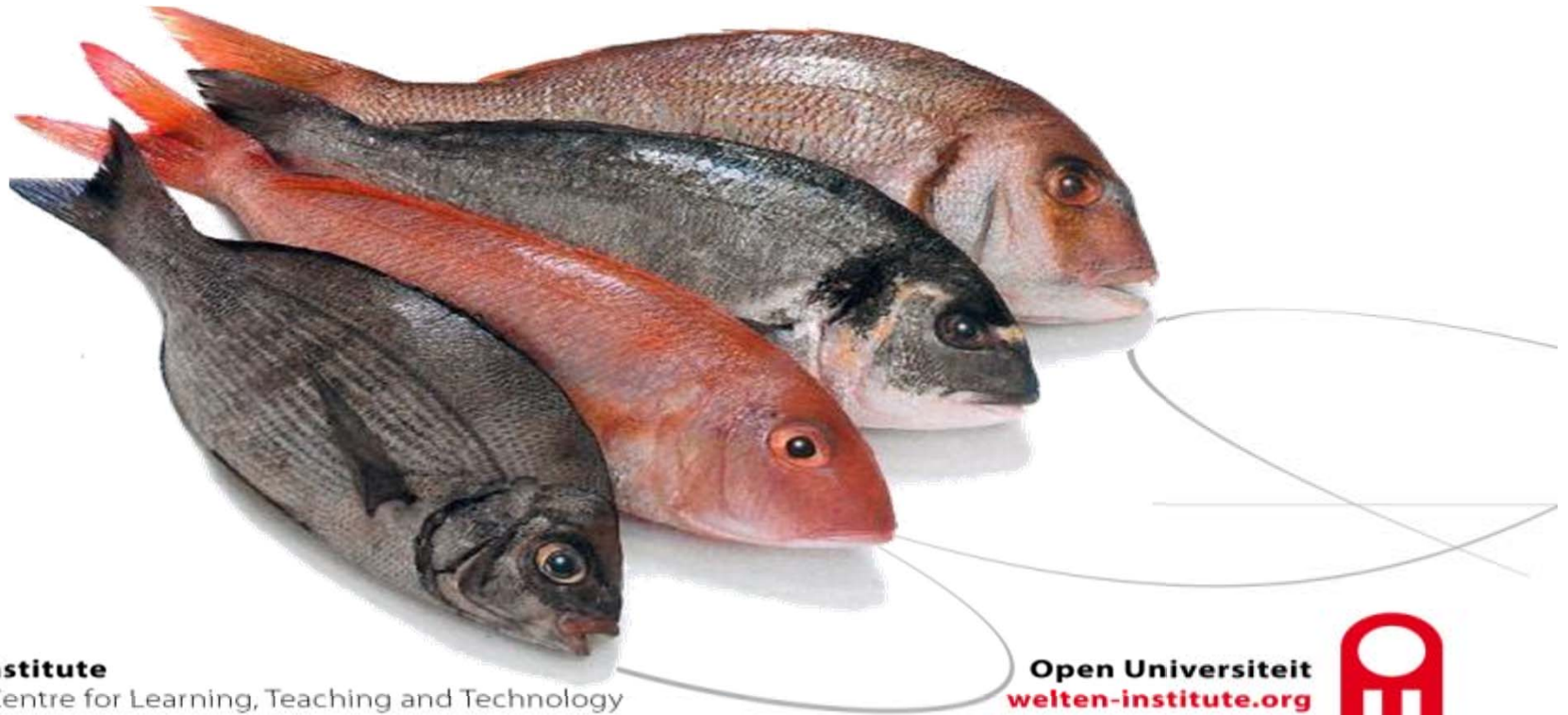
Open Universiteit
welten-institute.org



Attention Deficit Hyperlink Disorder?



Knowledge is perishable as fresh fish



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



Decreasing knowledge half-life?

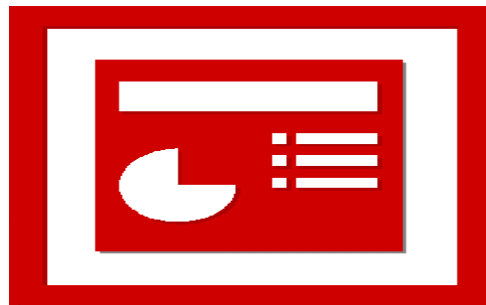
- Enormous increase in available information
- Enormous increase in available sources
- But what's "old" isn't all of a sudden wrong
- Old is absolutely essential to evaluate and choose new information



It's all on the internet



WIKIPEDIA
The Free Encyclopedia



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



It's all on the internet

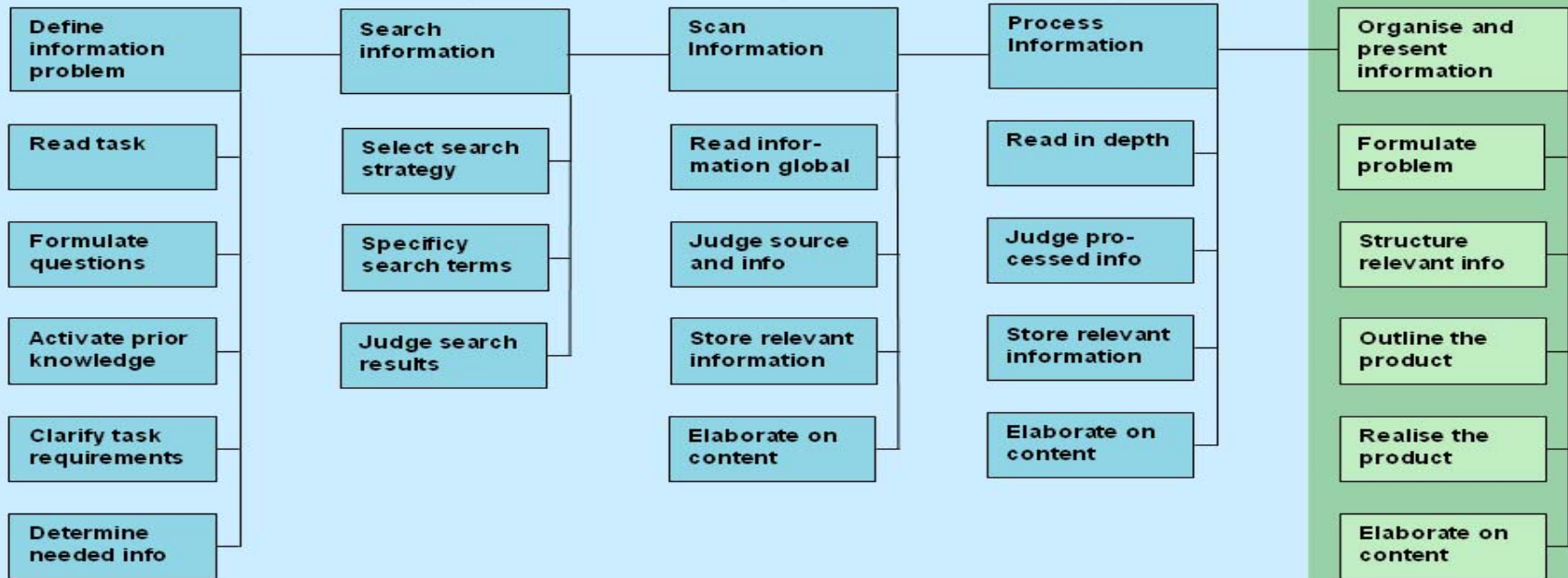
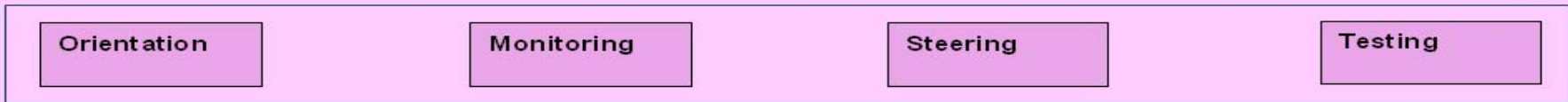
- How do you choose?
- Many, often unreliable sources
- It's not about searching. It's about finding, evaluating, choosing and using



Information Problem Solving while using Internet

Regulation

Regulation



Analysis

Computer skills

Synthesis

Case: Essay Sir Francis Bacon

Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org





Scientist: 1561-1626



Artist: 1909-1992



Francis Bacon - Google zoe...

http://www.google.nl/search?source=ig&hl=nl&rlz=&q=Francis+Bacon&aq=o&aql=&aql=&oq=&gs_rfai=

iGoogle Inloggen Mijn ING Wells Fargo Advisors ... Postvak IN - Outlook ... Today's Paper - New ... UU - Omega

Elke periode
Afgelopen 24 uur

Standaardweergave
Sites met afbeeldingen

Meer opties

Francis Bacon (schilder) - Wikipedia ☆
Francis Bacon (Dublin, 28 oktober 1909 – Madrid, 28 april 1992) was een Engelse expressionistische kunstschilder. Hij maakte portretten van personen, ...
Karakterisering van zijn werk - Levensloop - Techniek
nl.wikipedia.org/wiki/Francis_Bacon_(schilder) - In cache - Vergelijkbaar

Francis Bacon - Wikipedia ☆
Francis Bacon kan verwijzen naar twee personen: Francis Bacon (wetenschapper) (1561-1626), een Brits filosoof, wetenschapper en politicus. ...
nl.wikipedia.org/wiki/Francis_Bacon - In cache - Vergelijkbaar
Meer resultaten van nl.wikipedia.org weergeven

Francis Bacon - Wikipedia, the free encyclopedia ☆ - [Vertaal deze pagina]
Francis Bacon, 1st Viscount St. Alban, KC (22 January 1561 – 9 April 1626) was an English philosopher, statesman, scientist, lawyer, jurist and author. ...
en.wikipedia.org/wiki/Francis_Bacon - In cache - Vergelijkbaar

Francis Bacon (artist) - Wikipedia, the free encyclopedia ☆ - [Vertaal deze pagina]
Francis Bacon (28 October 1909 – 28 April 1992) was an Anglo-Irish figurative painter known for his bold, austere, graphic and emotionally raw imagery. ...
en.wikipedia.org/wiki/Francis_Bacon_(artist) - In cache
Meer resultaten van en.wikipedia.org weergeven

Francis Bacon ☆
De Officiële site van de tentoonstelling Francis Bacon van 27 januari t/m 13 mei 2001 in het Gemeentemuseum Den Haag.
www.bacon.nl/ - In cache - Vergelijkbaar

Francis Bacon - Wikiquote ☆
2 feb 2010 ... Francis Bacon (1561-1626) was een Brits filosoof, wetenschapper en politicus: Nam et ipsa scientia potestas est. Vertaling: Kennis is macht. ...
nl.wikiquote.org/wiki/Francis_Bacon - In cache - Vergelijkbaar

The Estate of Francis Bacon | Home ☆ - [Vertaal deze pagina]
The Estate of Francis Bacon. Biography. Paintings. Exhibitions. News/Media. Bacon's World.
www.francisbacon.com/ - In cache - Vergelijkbaar



What you know determines what you see!



Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org



The new human? No!!

- Low level use and knowledge of tools for creation and sharing of knowledge (Margaryan & Littlejohn, 2008)
- No deep understanding of functions of applications, students must learn to use them to learn. primarily used for passive knowledge consumption (Bullen et al. 2008)
- Ubiquitous availability of technology has not led to better information processing skills (Rowlands et al., 2008)



Are there more?

- Sex-based education / Single sex classrooms
- Learning styles
- Feminisation of education
- Left brained and right brained
- Brain training (Brain Gym)
- 21st Century Skills



A photograph of James Randi, an elderly man with a long white beard and glasses, wearing a pink and white striped shirt. He is holding a black microphone in his right hand and gesturing with his left hand. The background is black.

**“No amount of belief
makes something a fact.”**

-James Randi
Magician / Author / Skeptic
James Randi Educational Foundation

EDUCATIONAL PSYCHOLOGIST, 1–15, 2013
Copyright © Division 15, American Psychological Association
ISSN: 0046-1520 print / 1532-6985 online
DOI: 10.1080/00461520.2013.804395



Do Learners Really Know Best? Urban Legends in Education

Paul A. Kirschner

*Centre for Learning Sciences and Technologies
Open University of The Netherlands*

Jeroen J. G. van Merriënboer

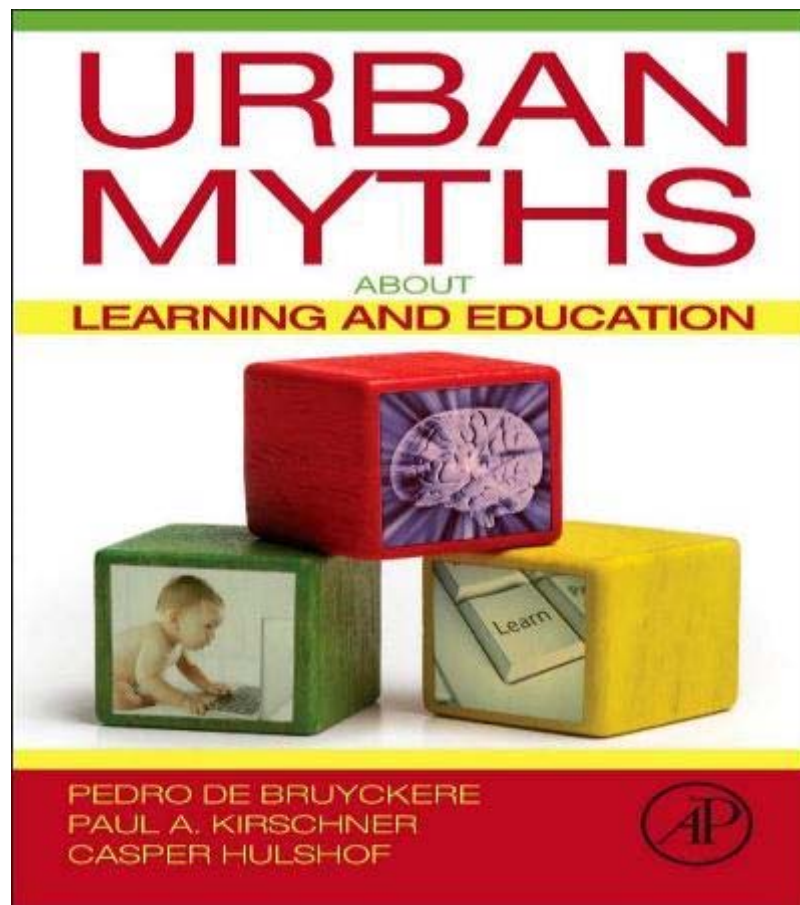
*Department of Educational Development & Research and Graduate School
of Health Professions Education
Maastricht University*

Welten Institute

Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org





Welten Institute
Research Centre for Learning, Teaching and Technology

Open Universiteit
welten-institute.org





paul.kirschner@ou.nl



@P_A_Kirschner

