Open Maths at the Open University 2018

Informatica Studiedag

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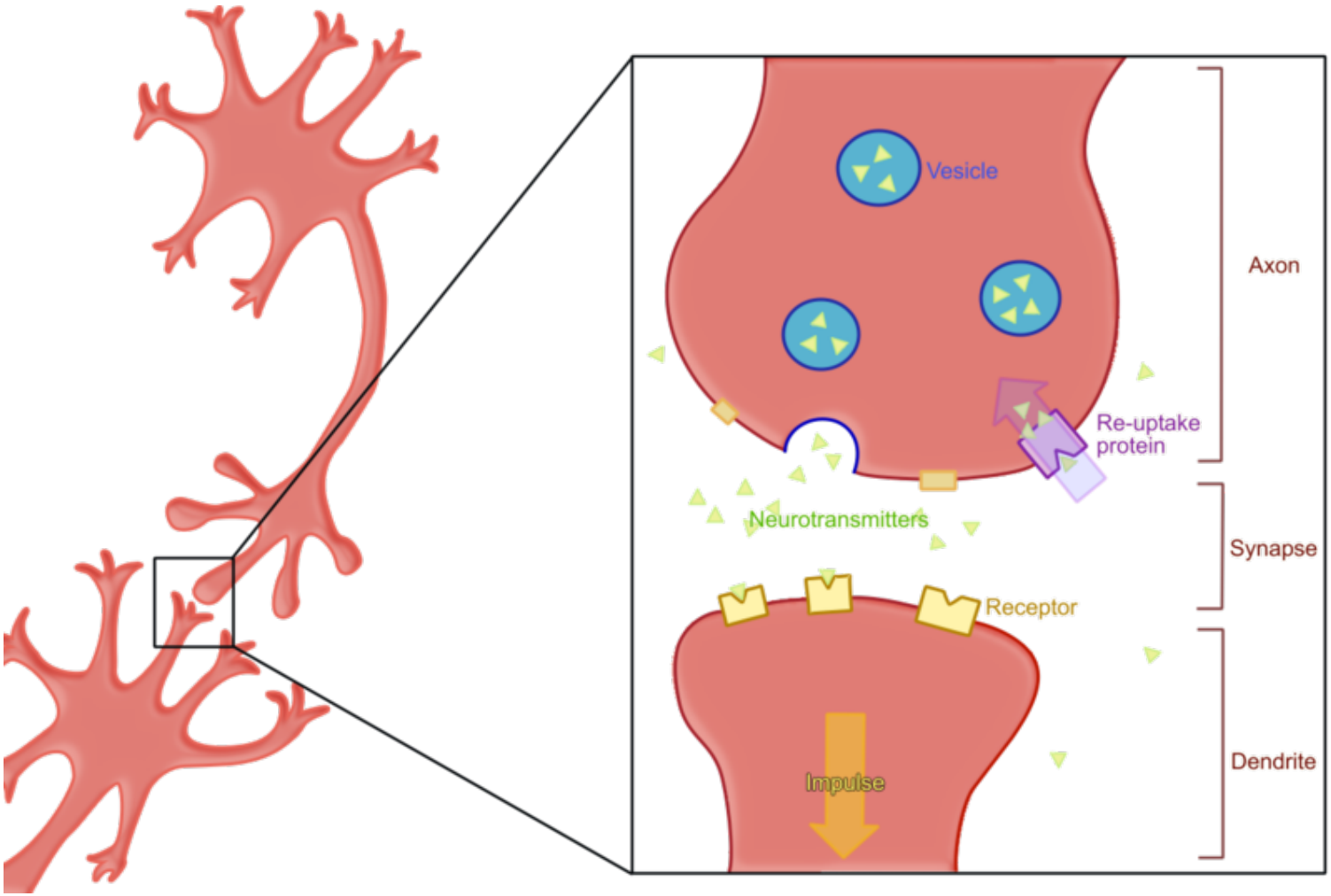
Mistakes and learning

Brain activities



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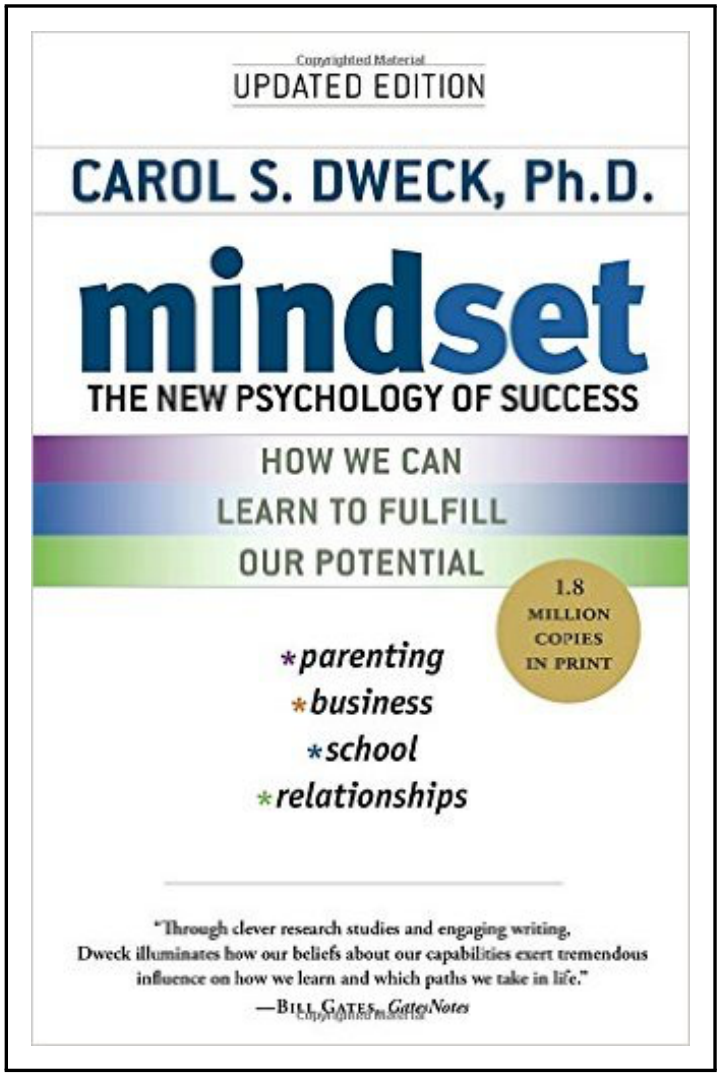
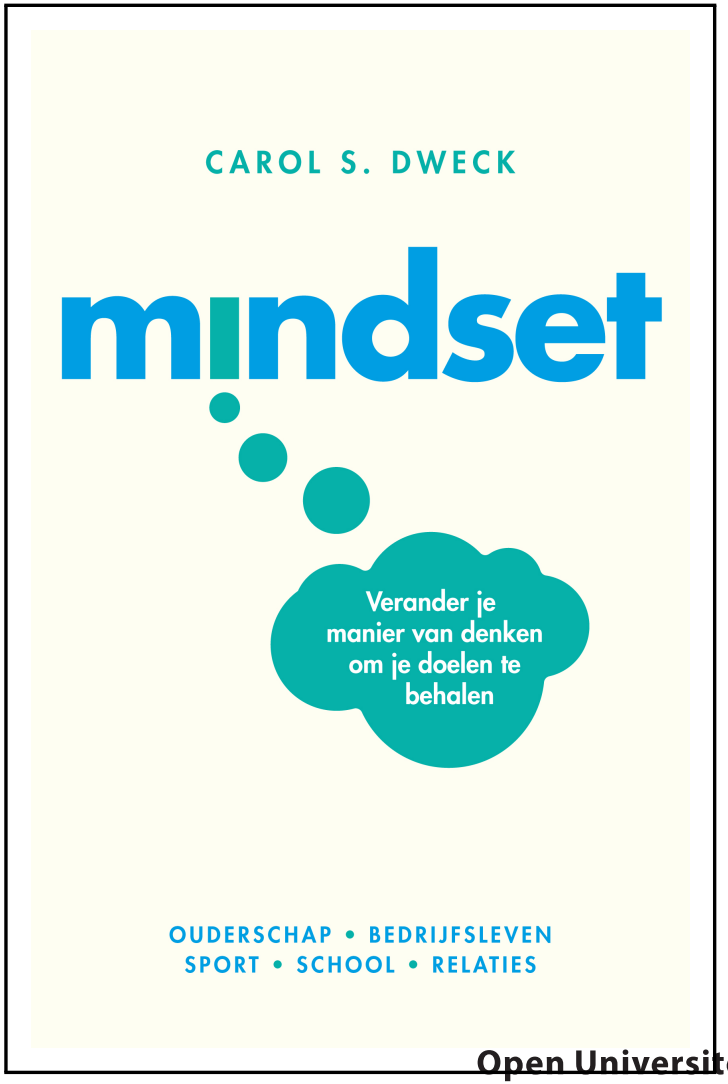
Carol Dweck





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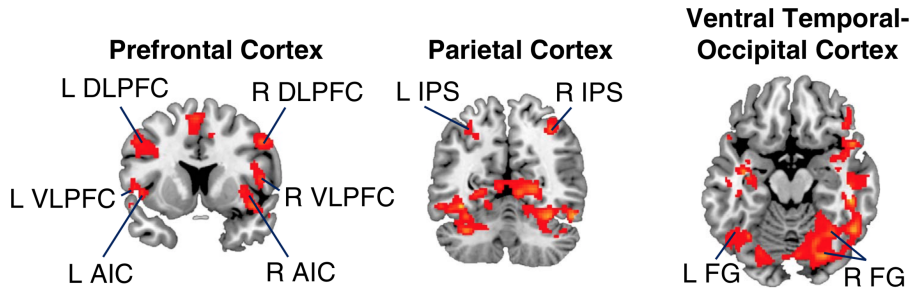
Mindsets

	Fixed mindset	**Growth mindset**
Beliefs	My talent is a fixed trait	My talent is a malleable quality
Goals	I want to look smart	I want to learn new things
Effort	I had to work hard; how embarrasing!	I worked hard; I'm proud of it
Failure	It is not my fault	What can I learn from this?

Neuroplasticity

- A new thought, feeling or experience changes the brain
- Rewiring: New connections between neurons (synapses) and new pathways
- The more you practice, the stronger a pathway is
- So, learning is changing the brain and (good!) practicing makes the pathways stronger

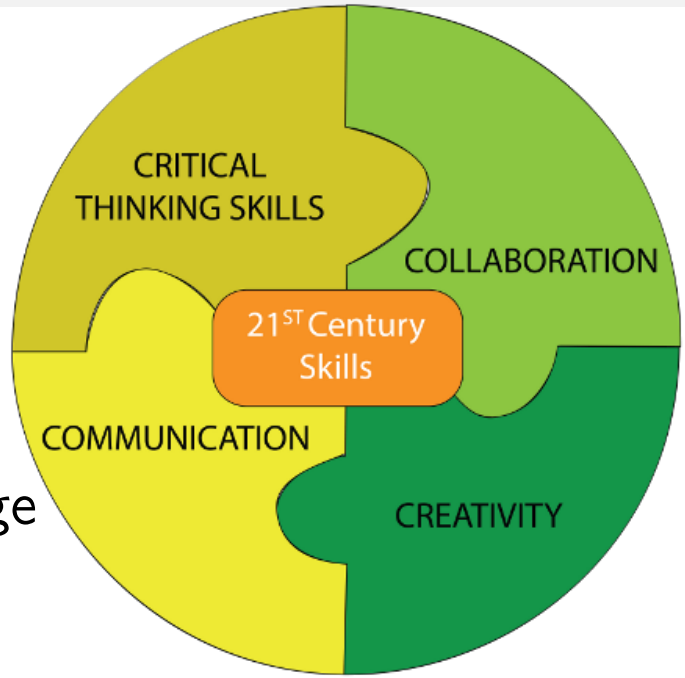


Iuculano, T. *et al.* (2015). Cognitive tutoring induces widespread neuroplasticity. . . . *Nature communications*, 6, 8453.

So far...

- Number flexibility is paramount
- Mistakes play a crucial role in learning
- Your view about learning (growing) ability influences how efficiently you can learn
- Fun and perseverance are important parts of mathematics

Openness in *Open* Maths



Paradigm shifts:

- apply methods ⟶ think creatively
- importance of speed ⟶ depth of knowledge
- failure ⟶ useful mistake
- talent ⟶ growth
- focus on results ⟶ focus on interesting strategies
- competition of individuals ⟶ useful collaboration
- continuous testing ⟶ always learning

Open Maths course

- A brand new course in the Open Maths initiative.
  - Mathematical thinking, learning and problem solving.
  - First in the Netherlands;
  - First in Europe.
  - Methodology primarily from Stanford (other research results are also used; e.g. Harvard, Berkeley).
- Pilot in 2018–2019
  - 12 students at Radboud (currently running);
  - Blended learning at the Open University;
  - Research;
  - Feedback is appreciated.


INFORMATICA STUDIEDAG 7 SEPTEMBER 2018

Open Maths cursus

Opent wiskunde voor jou en stelt jou open voor wiskunde

De eerste stap naar wiskundig succes

Wiskunde wordt vaak gezien als een droog en onpersoonlijk onderwerp met veel symbolen en formules. Studenten die zo over wiskunde denken, worstelen er natuurlijk flink mee.

Eigenlijk is wiskunde een prachtige en verrijkende menselijke bezigheid, met invloed op bijna alle aspecten van ons leven. Wellicht nog belangrijker, recent onderzoek laat zien dat iedereen wiskunde tot op hoog niveau kan bestuderen. Met de juiste toepassing van bevindingen uit de neurowetenschappen en psychologie, kan jij goed zijn in en genieten van wiskunde! In Open Maths, een nieuwe facultatieve cursus aan de Open Universiteit die steunt op state-of-the-art onderzoek, kan je de echte, spannende én nuttige wiskunde ervaren. Met als gevolg dat je beter in staat zal zijn om wiskunde aan de universiteit te leren.

1 JE KUNT HET! Succes door neuroplasticiteit en groeimentaliteit.

2 WEES OPEN! Wiskundig denken: nieuwsgierigheid, inspanning en exploratie.

3 WERK SAMEN! Iedereen ervaart de wereld anders. Verruim je eigen blik en dat van anderen.

Wiskunde en ik
Waarom zou ik goed zijn in wiskunde? En hoe dan? Wat zegt de wetenschap?

Wat is wiskunde eigenlijk?
Het draait allemaal om patronen en verbanden. En het hebben van plezier!

Hoe leer je wiskunde?
De enige trucs: verbanden zoeken, niet opgeven, samenwerken.

Geïnteresseerd? dr. Greg Alpar, greg.alpar@ou.nl

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Learning goals

At the end of the course you will

- appreciate real mathematical thinking;
- be able to reason about logical steps mathematically;
- be able to use visualisation, multiple representations and relations with various mathematical areas while solving problems;
- have the courage and willingness to learn difficult subjects;
- be able to find and apply useful resources for supporting your learning mathematics-related subjects;
- recognise phases of mathematical problem solving when collaboration is useful.

Open Maths course – structure

1. **Maths and you**
   - You see the world uniquely
   - Growth mindset: constant developing
   - Brain plasticity: train your brain to get smarter and smarter
   - Keywords: exploration, mathematical flexibility
2. **What is mathematics?**
   - Maths is often defined as the science of patterns.
   - Mathematics is full of different representations.
   - Collaboration for understanding, perspective and entertainment.
3. **How to learn mathematics at the university?**
   - Search for connections and strive for deep understanding.
   - Use software tools and the internet.
   - Solve problems (from simple to complex).

Open Maths course – details

- **Experimental course this year**
  - 0 ec, (€0,00)
  - You might be asked to participate in some research (e.g. interview)
  - Passive English is required (speaking, writing can be Dutch)
- **First course run**
  - Third quarter (February–April, 2019)
  - It requires about 50 hours study load (≈ 2 ec)
- **First session (mandatory)**
  - 16 February 2019, 13:00–17:00
  - Offline: Studiecentrum Eindhoven
- **The rest of the course**
  - via yOUlearn
  - . . . and possibly online (or blended) sessions
- **Registration: motivation emial**
  - Subject: `Open Maths - Registration request`
  - Why do you want to participate in the Open Maths course?
  - `greg.alpar@ou.nl`

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Conclusion

- Here? Maths and CS help each other
  - M $\longrightarrow$ CS: analysing and formalising methods;
  - CS $\longrightarrow$ M: computational thinking, some proofs.
- Now? Mathematics learning is becoming more fun and more efficient, because
  - we know more about the brain;
  - maths shifts **from computation to thinking**;
  - learning shifts **from methods to creativity**.
- What can you do?
  - Participate in the Open Maths course!
  - Learn more about **learning**
  - If you can't do something? "You can't do it **yet**."

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Thank you!