

Learning to Learn



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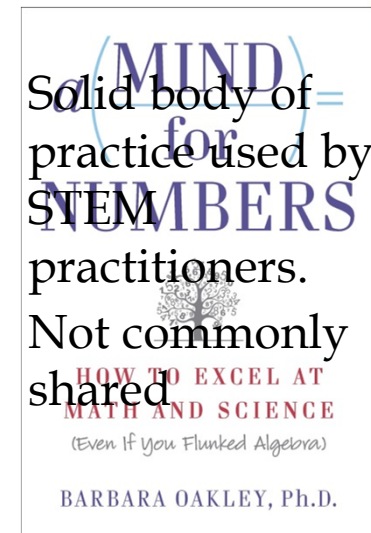
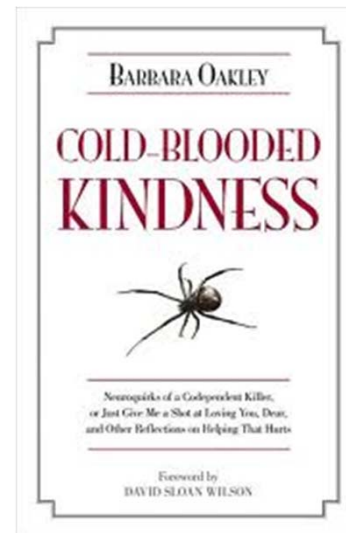
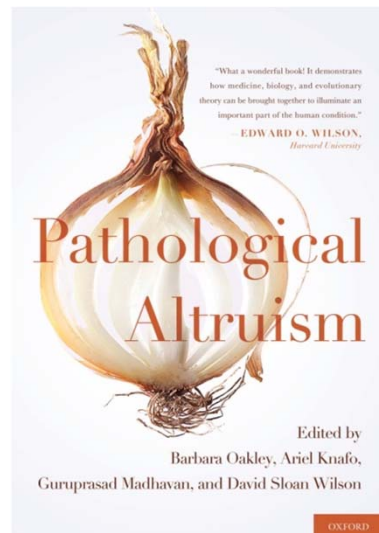
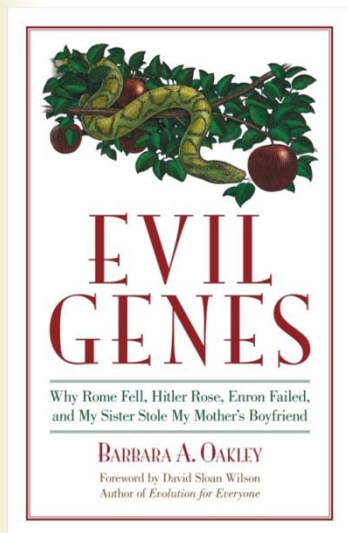
Philip Oakley

How did you do it?

Oakley, BA. "Concepts and implications of altruism bias and pathological altruism."

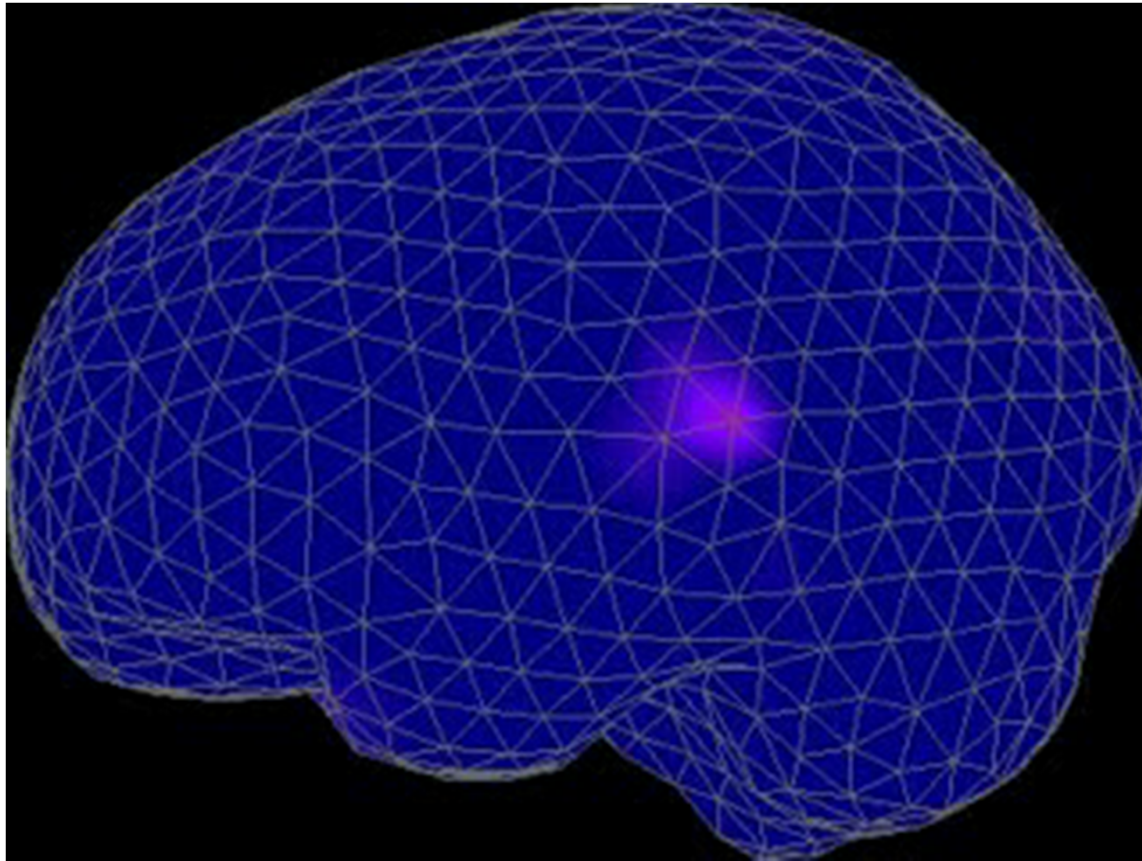
Proceedings of the National Academy of Sciences **110**, 2 (2013): 10408-10415.

Tarcher-Penguin
July 31, 2014

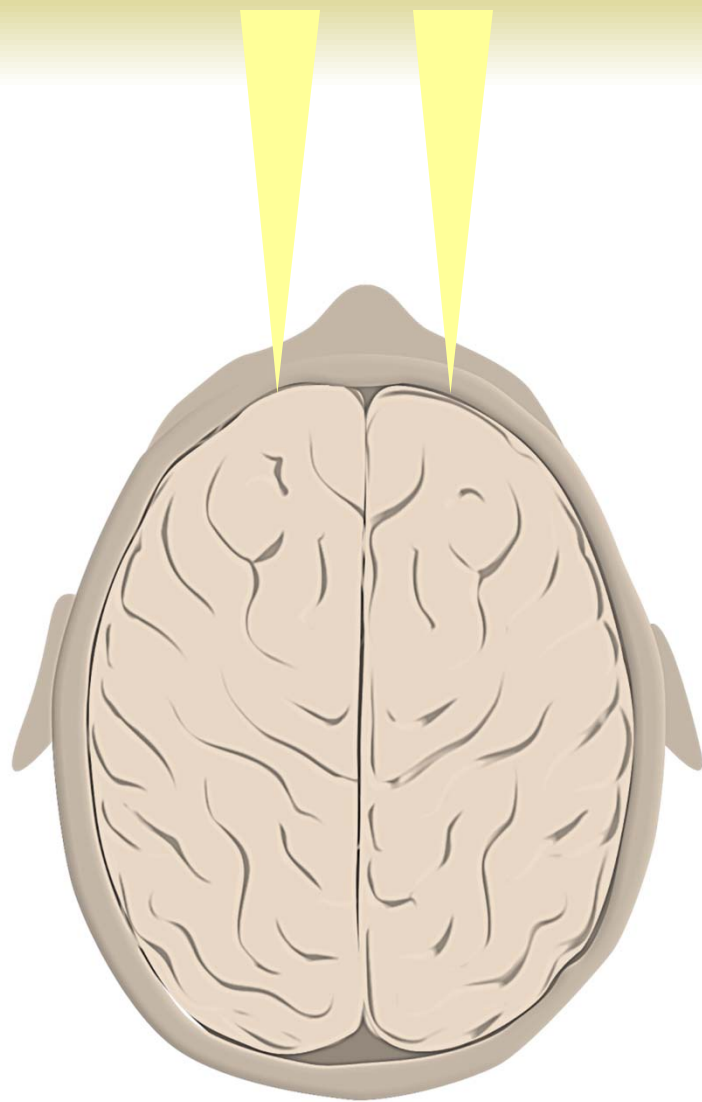


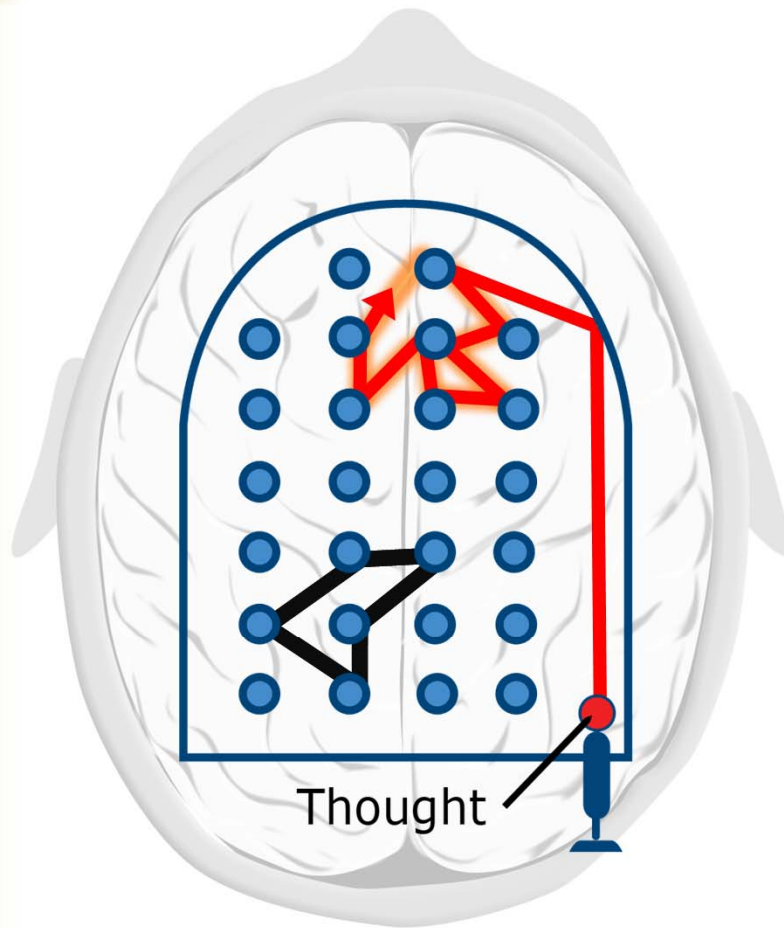
Upcoming MOOC from Coursera!

Brain activity: Hearing a single word

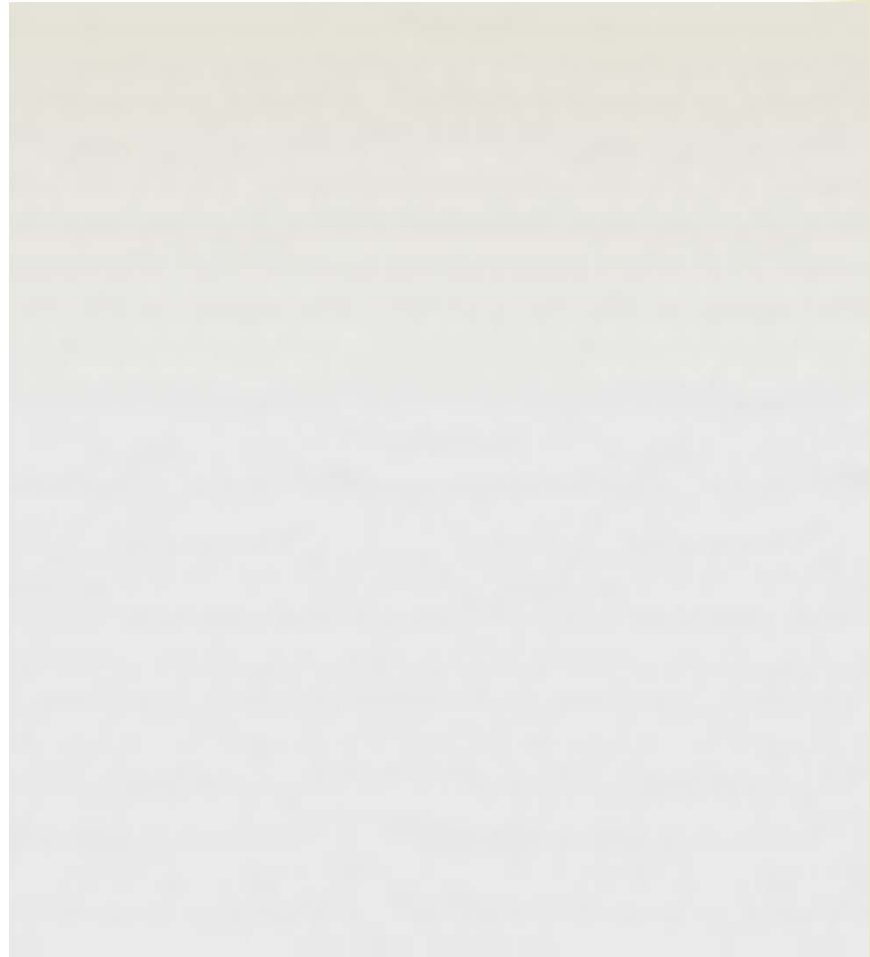


Based on material from Baars & Gage - Chapter 1, in turn based on material from Friedemann Pulvermüller



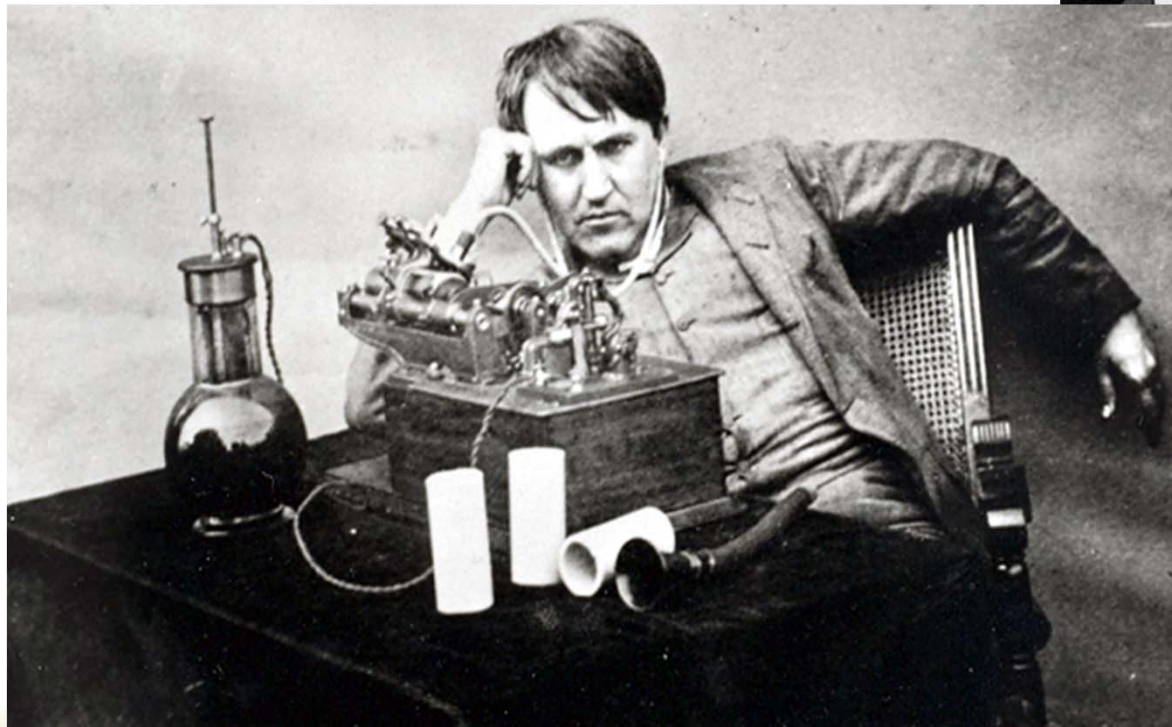


Focused Mode

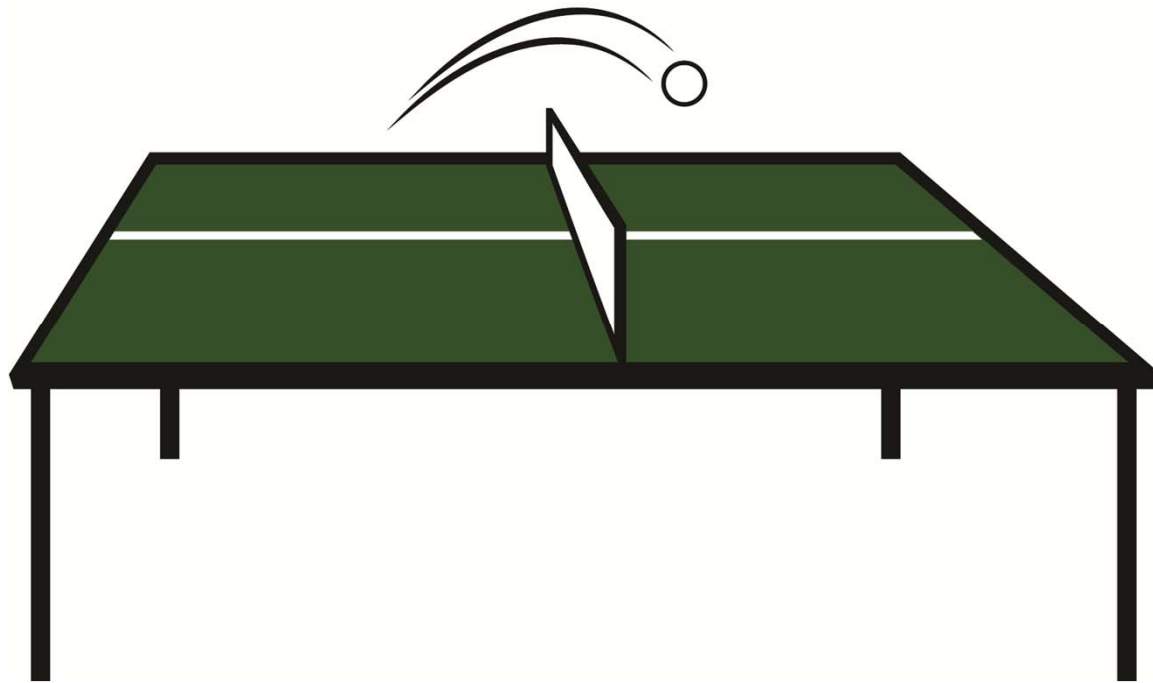


Diffuse Mode

- Andrews-Hanna, J. R. "The brain's default network and its adaptive role in internal mentation." *Neuroscientist* 18, no. 3 (2012): 251-70.
- Immordino-Yang, M. H., J. A. Christodoulou, and V. Singh. "Rest is not idleness: Implications of the brain's default mode for human development and education." *Perspectives on Psychological Science* 7, no. 4 (2012): 352-364.
- Raichle, Marcus E, Ann Mary MacLeod, Abraham Z Snyder, William J Powers, Debra A Gusnard, and Gordon L Shulman. "A Default Mode of Brain Function." *Proceedings of the National Academy of Sciences* 98, no. 2 (2001): 676-82.



It takes time



Focusing intently in ONE session to figure something out can be the *worst* approach possible

It takes time



Focusing intently in ONE session to figure something out can be the *worst* approach possible

Take home message for your students

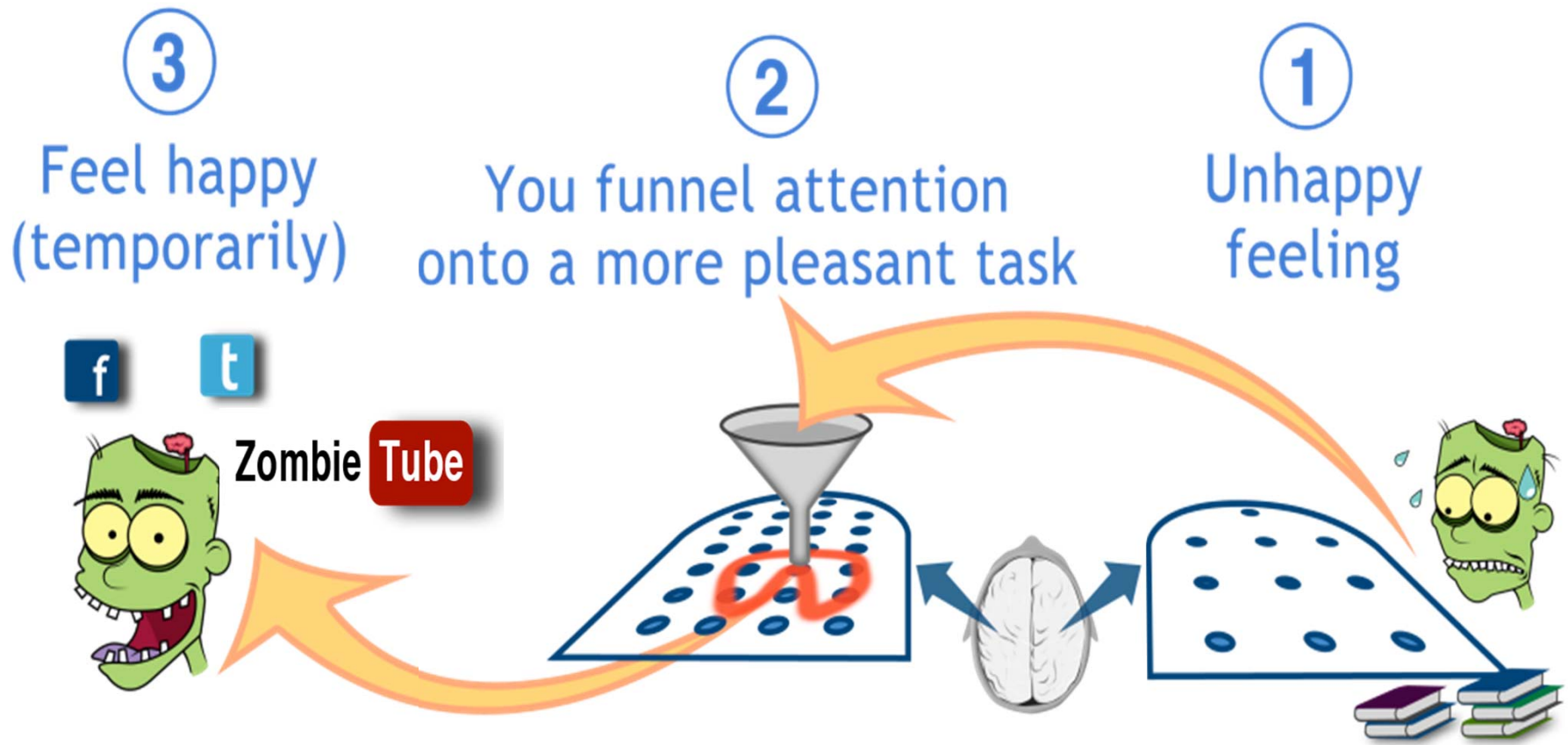
- Learning new knowledge is like mastering a sport.
- When you get stuck, you need to take a break, alternate your mode of thinking.

But wait!

Procrastination – A Habit

Steel, P. "The nature of procrastination: a meta-analytic and theoretical review of quintessential self-regulatory failure." *Psychological Bulletin* 133, no. 1 (2007): 65-94.

Boice, Robert. *Procrastination and Blocking: A Novel, Practical Approach*. Westport, CT: Praeger, 1996.





- **Do NOT focus on finishing a task**
- **Set finish time**
- **Eat your frogs first**
- *Beware following your passion*

Boice, Robert. *Procrastination and Blocking: A Novel, Practical Approach*. Westport, CT: Praeger, 1996.

Newport, Cal. *So Good They Can't Ignore You: Why Skills Trump Passion the Quest for Work You Love*. New York, NY: Business Plus, 2012.

Tests are the best!

- Flashcards are friends.

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- Dunlosky, John, et al. "Improving Students' Learning with Effective Learning Techniques: Promising Directions from Cognitive and Educational Psychology." *Psychological Science in the Public Interest* 14, no. 1 (2013): 4-58.
- Keresztes, A., D. Kaiser, G. Kovacs, and M. Racsmany. "Testing Promotes Long-Term Learning Via Stabilizing Activation Patterns in a Large Network of Brain Areas." *Cerebral Cortex*, no. (Advance access published Jun 24) (Jun 24 2013).
- Pyc, Mary A, and Katherine A Rawson. "Why Testing Improves Memory: Mediator Effectiveness Hypothesis." *Science* 330, no. 6002 (2010): 335-35.
- Roediger, Henry L, and Jeffrey D Karpicke. "The Power of Testing Memory: Basic Research and Implications for Educational Practice." *Perspectives on Psychological Science* 1, no. 3 (2006): 181-210.

Take home message for students: Illusions of competence in learning

- Students fool themselves.
- All the time.
- Testing early and often allows you to do early “surgical” intervention.
- Offer pointed encouragement – not a crutch.
 - “A Thirty-Year Follow-up of Treatment Effects,”
Joan McCord, *American Psychologist*, 1978.

- Karpicke, Jeffrey D, Andrew C Butler, and Henry L Roediger III. "Metacognitive Strategies in Student Learning: Do Students Practice Retrieval When They Study on Their Own?" *Memory* 17, no. 4 (2009): 471-79.
- McCord, J. (1978). A thirty-year follow-up of treatment effects. *American Psychologist*, 33(3), 284.

Key Points

- *Recall is critical in learning!*
- Avoid highlighting
- Avoid passive rereading
- A critical problem – students' erroneous belief that understanding is enough.



- Karpicke, J. D., and J. R. Blunt. "Retrieval Practice Produces More Learning Than Elaborative Studying with Concept Mapping." *Science* 331, no. 6018 (Feb 11 2011): 772-5.
- Dunlosky, John, Katherine A Rawson, Elizabeth J Marsh, Mitchell J Nathan, and Daniel T Willingham. "Improving Students' Learning with Effective Learning Techniques: Promising Directions from Cognitive and Educational Psychology." *Psychological Science in the Public Interest* 14, no. 1 (2013): 4-58.
- Rohrer, Doug, and Harold Pashler. "Recent Research on Human Learning Challenges Conventional Instructional Strategies." *Educational Researcher* 39, no. 5 (2010): 406-12.

Interleaving

- Don't just do the same types of problems over and over again.

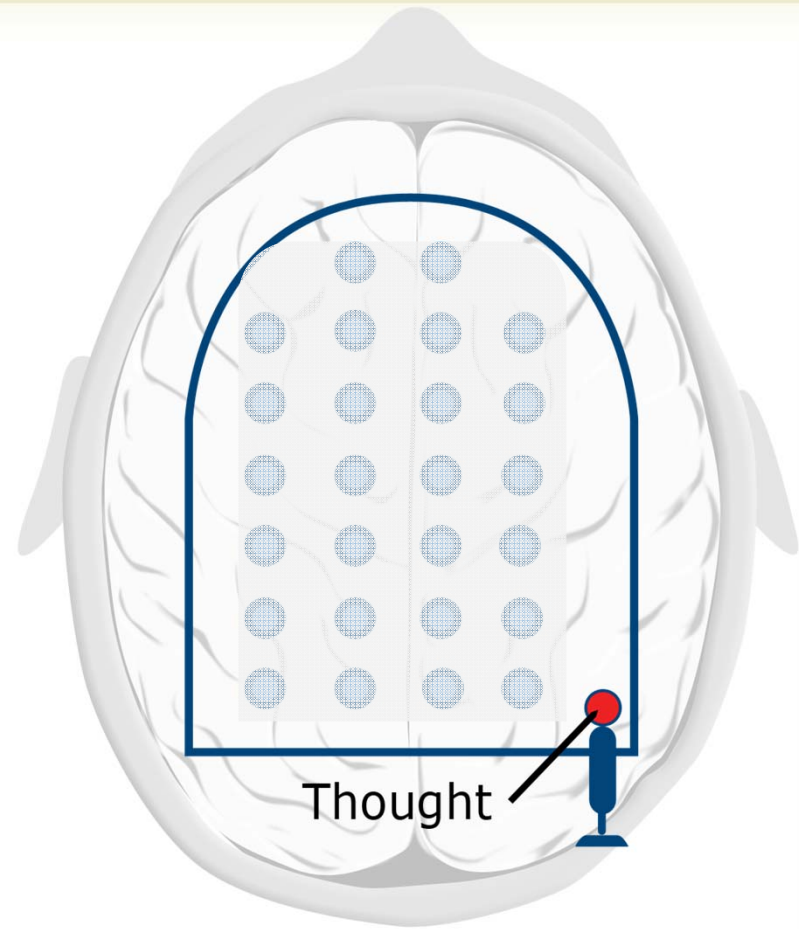


Rohrer, D., Dedrick, R. F., & Burgess, K. (in press). "The benefit of interleaved mathematics practice is not limited to superficially similar kinds of problems." *Psychonomic Bulletin & Review*.



**Sleep is the *ultimate*
diffuse mode**

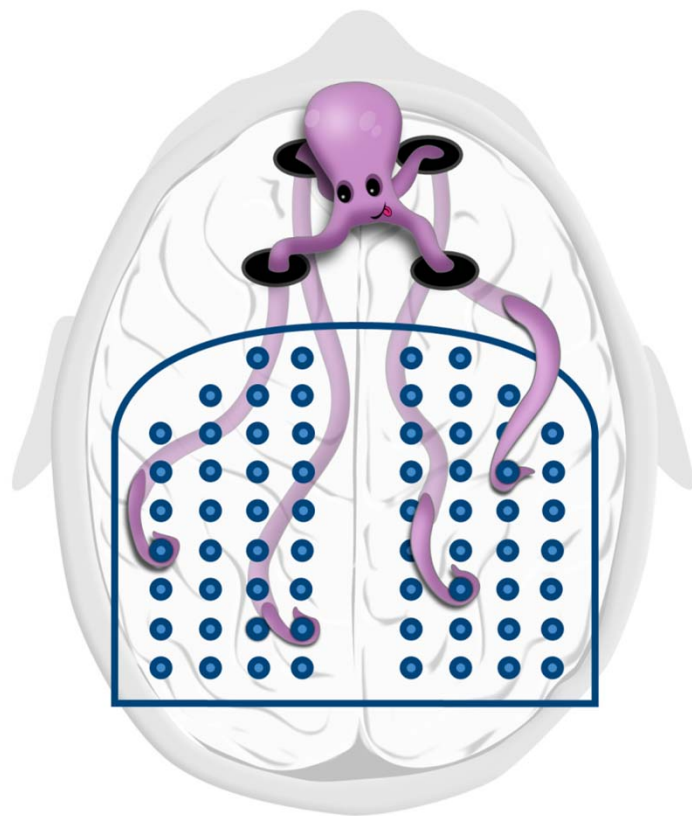
Xie, Lulu, *et al.* "Sleep Drives Metabolite Clearance from the Adult Brain." *Science* 342, no. 6156 (2013): 373-77.



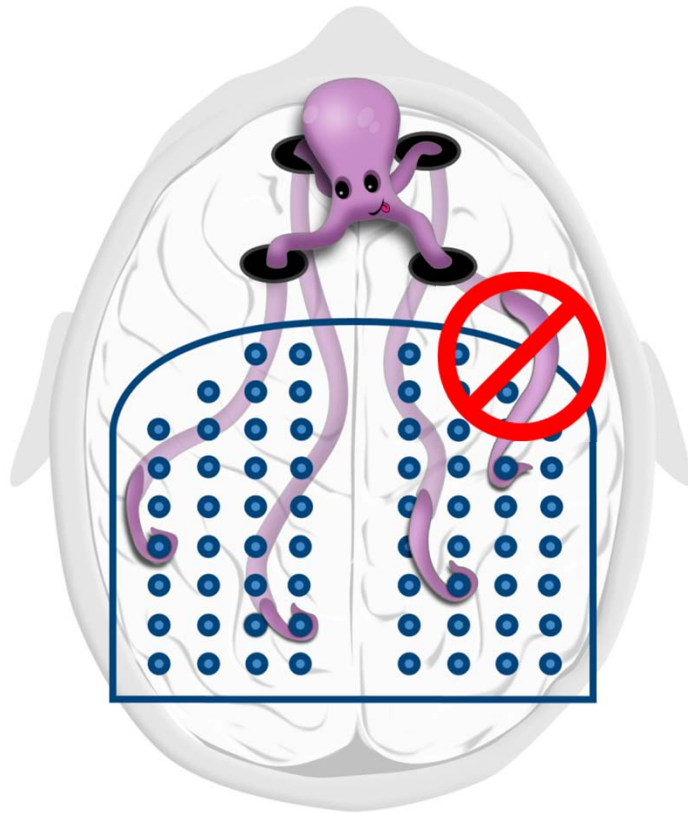
**Without sleep, focused
mode connections stop
working!**



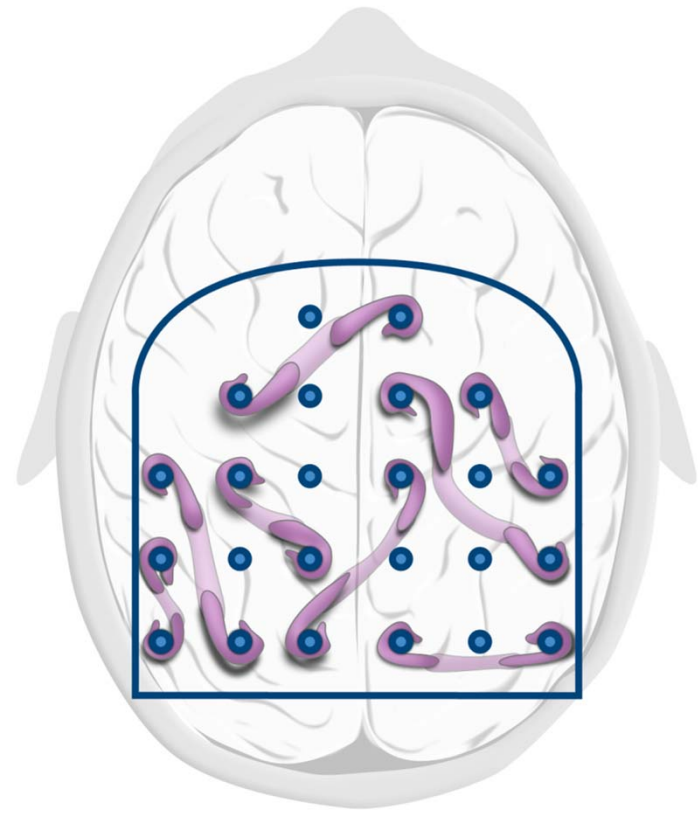
Working memory



Focused mode



Focused mode



Diffuse mode

Working memory and chunking

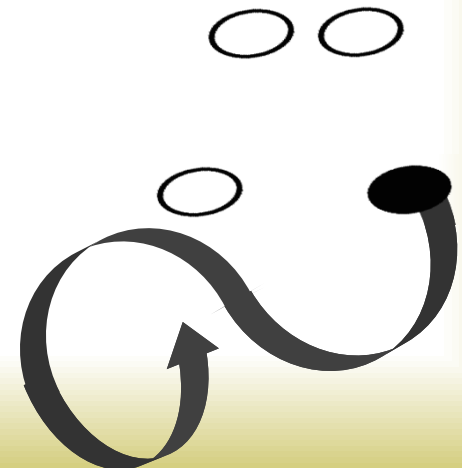
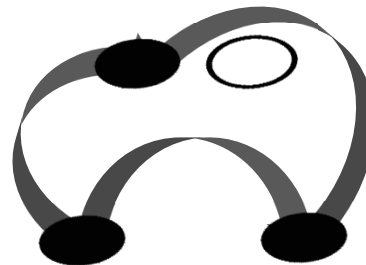
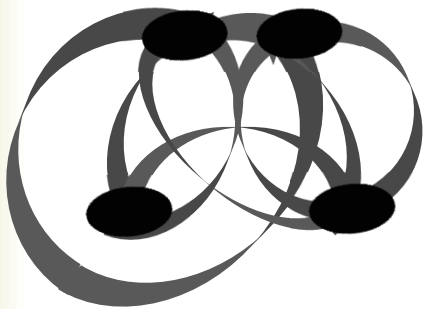


Raw information

Memorization
without
understanding

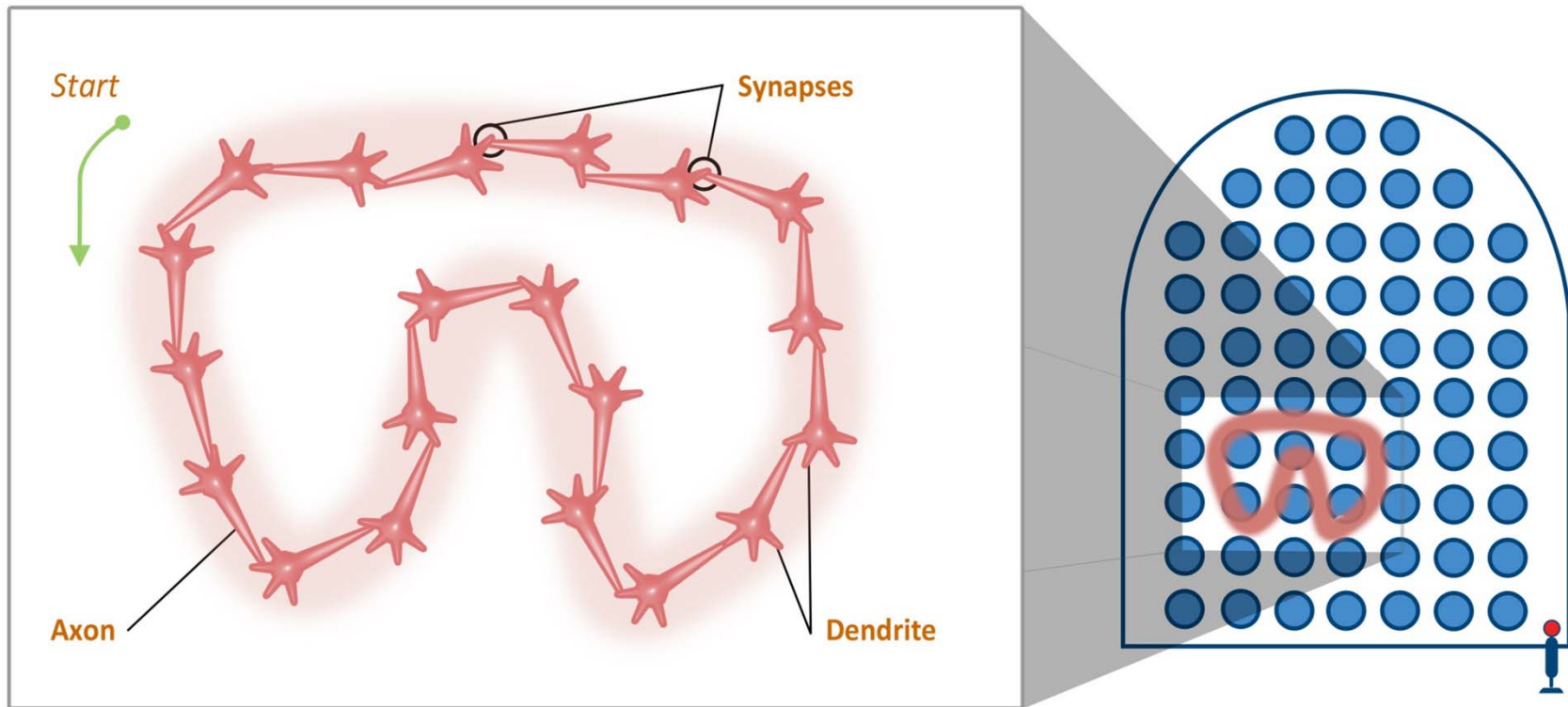


Information is chunked
and understood

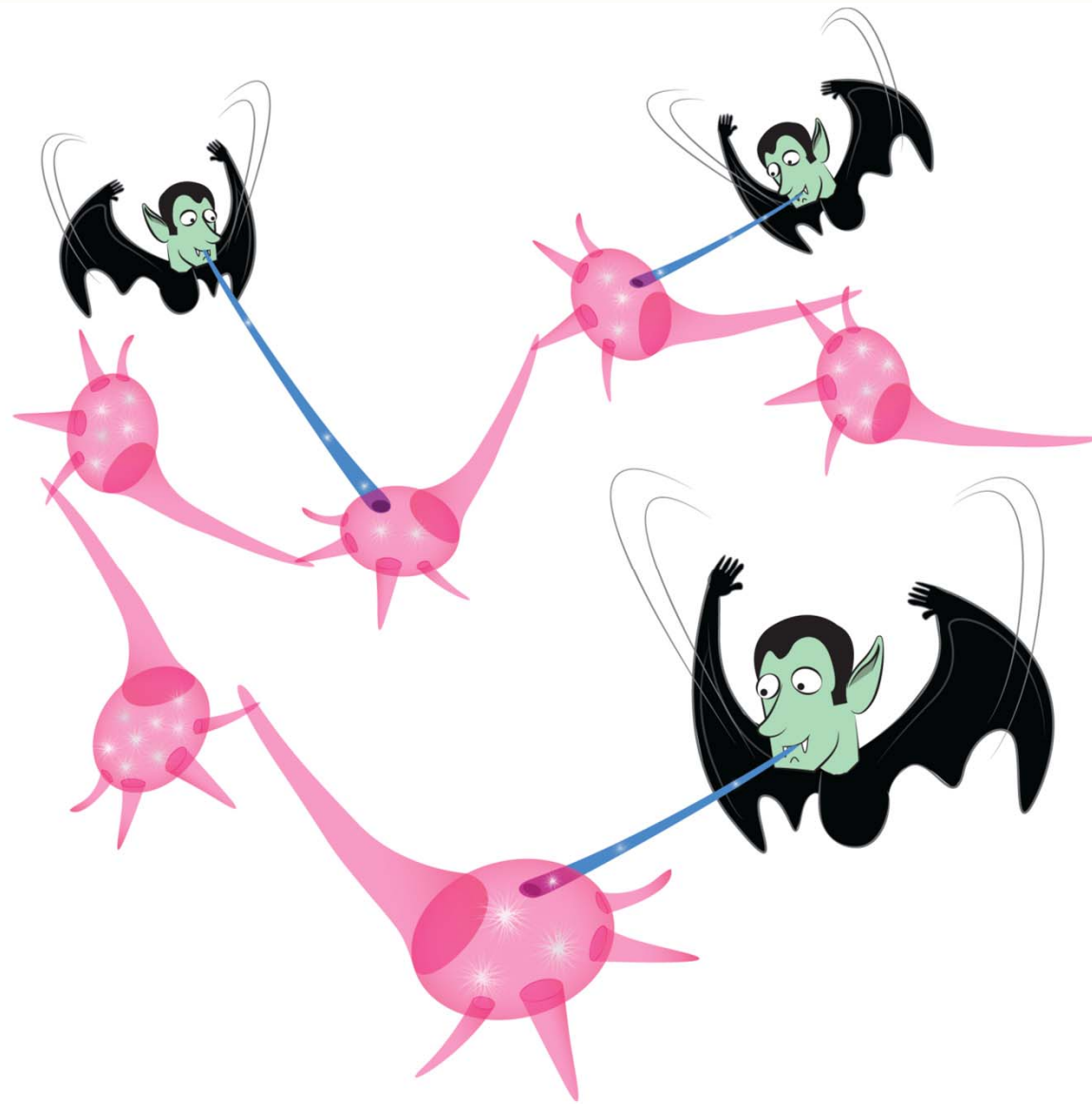


Gobet, Fernand. "Chunking Models of Expertise: Implications for Education." *Applied Cognitive Psychology* 19, no. 2 (2005): 183-204.

Practice Makes Permanent

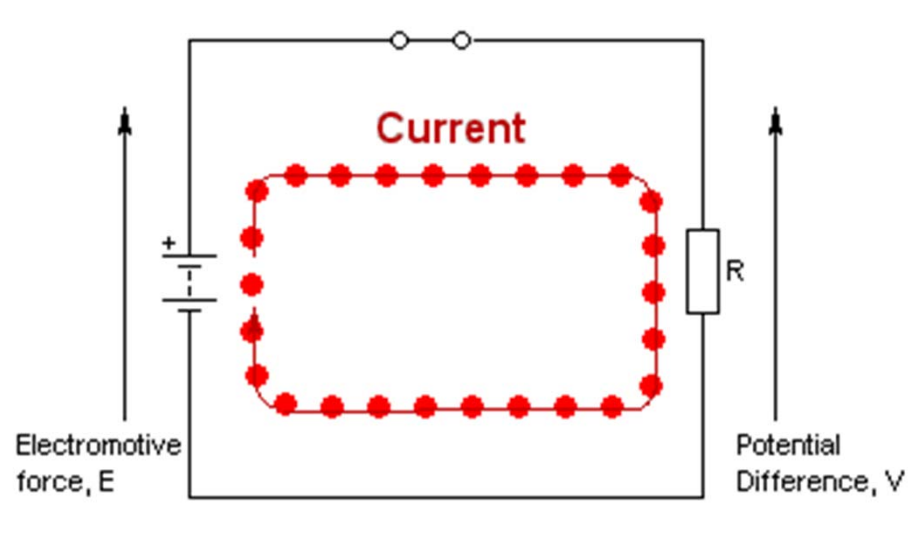


Ericsson, Karl Anders. *Development of Professional Expertise*. NY: Cambridge University Press, 2009.

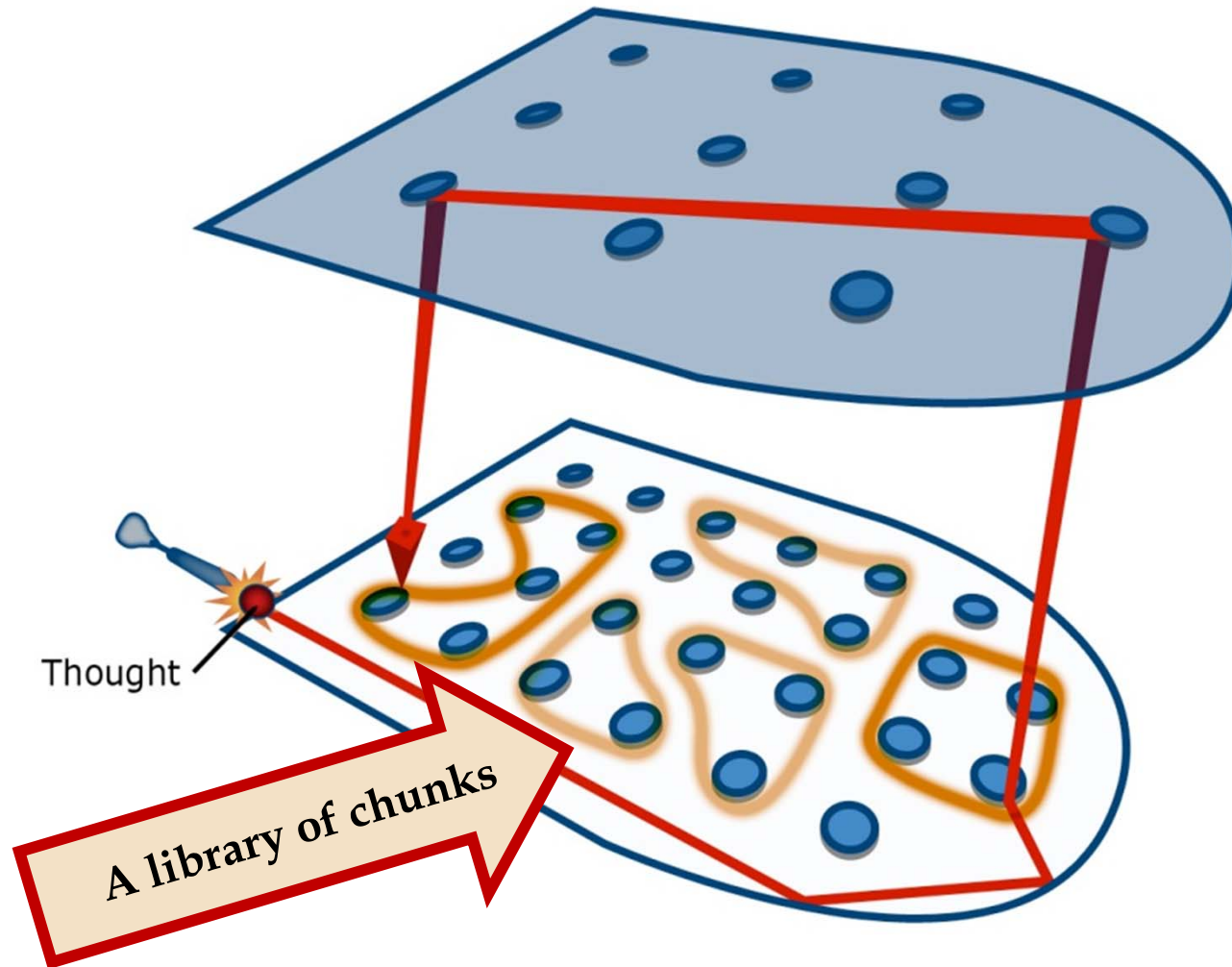


Explain so a 10-year-old can understand

- Use metaphors and analogies.



Diffuse thinking



Focused thinking

Queen - Radio GaGa - Live Aid : Wembley London 1985 youtube:ihowell67



Summing it up

- **Alternate focused attention with diffuse relaxation**
- **Use the Pomodoro to tackle procrastination**
- **Problems are like songs – *practice makes permanent!***
- **Sleep is critical to learning.**
- **Techniques that help students learn most efficiently**
 - Recall
 - Self-testing
 - Interleaving and spaced repetition
 - Metaphor and analogy
- **Avoid illusions of learning**
 - Highlighting
 - Passive rereading
 - Glancing at solutions and thinking you can solve a problem
 - Repeatedly solving the same type of problem
 - Multitasking during learning
 - Last minute cramming

Paradoxes of learning

- Illusions of teaching
 - Occur when you only grasp one side of the paradox
- The importance of *NOT* focusing
 - Persistence
 - Procrastination
- Understanding is *NOT* enough.
 - Chunking
 - Recall

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References

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