

A photograph of Julius Yego, a Kenyan athlete, celebrating a victory. He is wearing a red athletic singlet with a white Nike logo and the word "KENYA" in white letters. He is holding the Kenyan flag (black, white, and red stripes) above his head with both arms. He has a joyful expression, smiling broadly. The background is a plain, light-colored wall.

Rethinking Active Learning—In Person and Online

Barbara Oakley, PhD, PE
Distinguished Professor of
Engineering
Oakland University
Rochester, Michigan

Julius Yego

Photo by Erik van Leeuwen



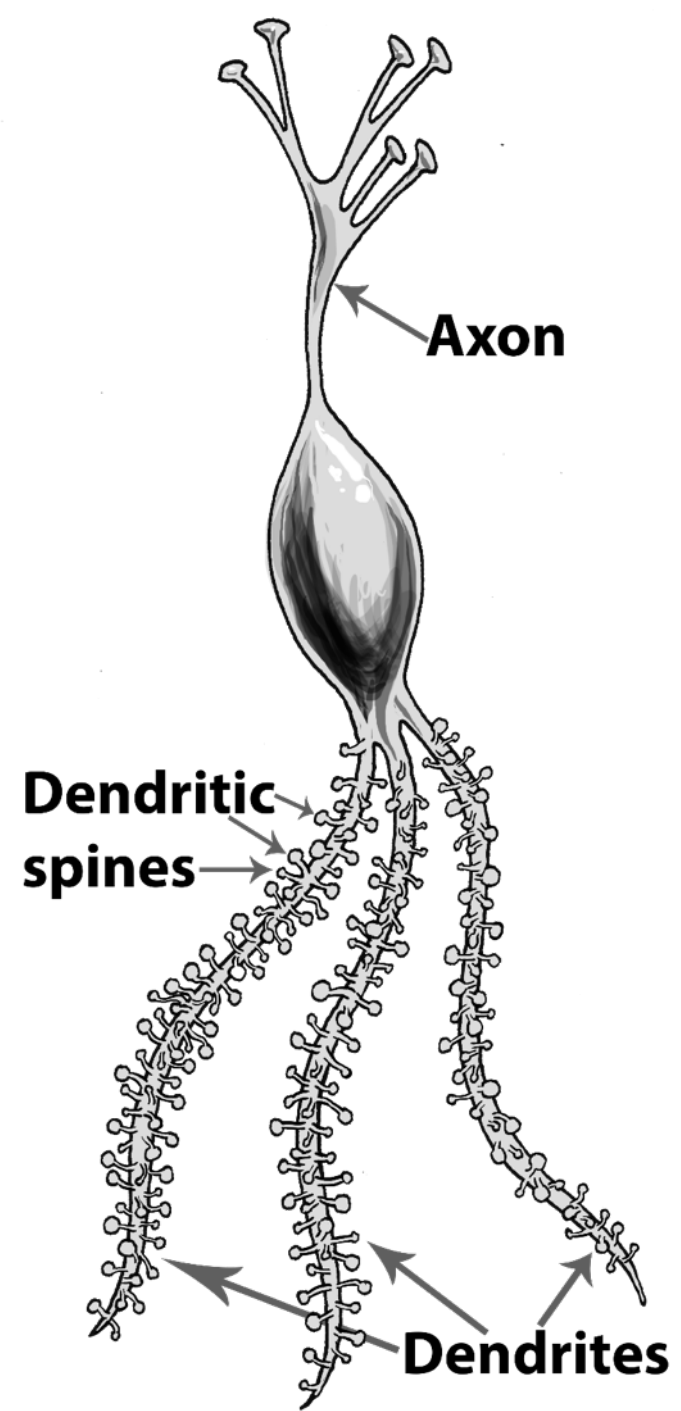
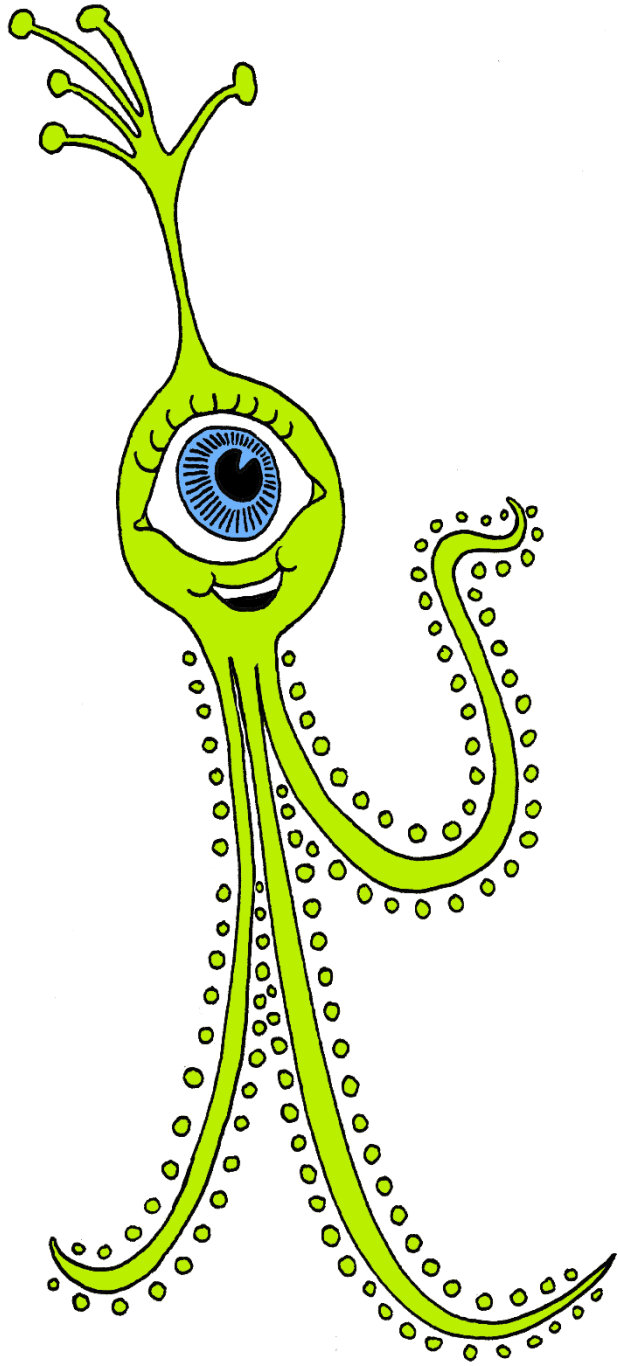


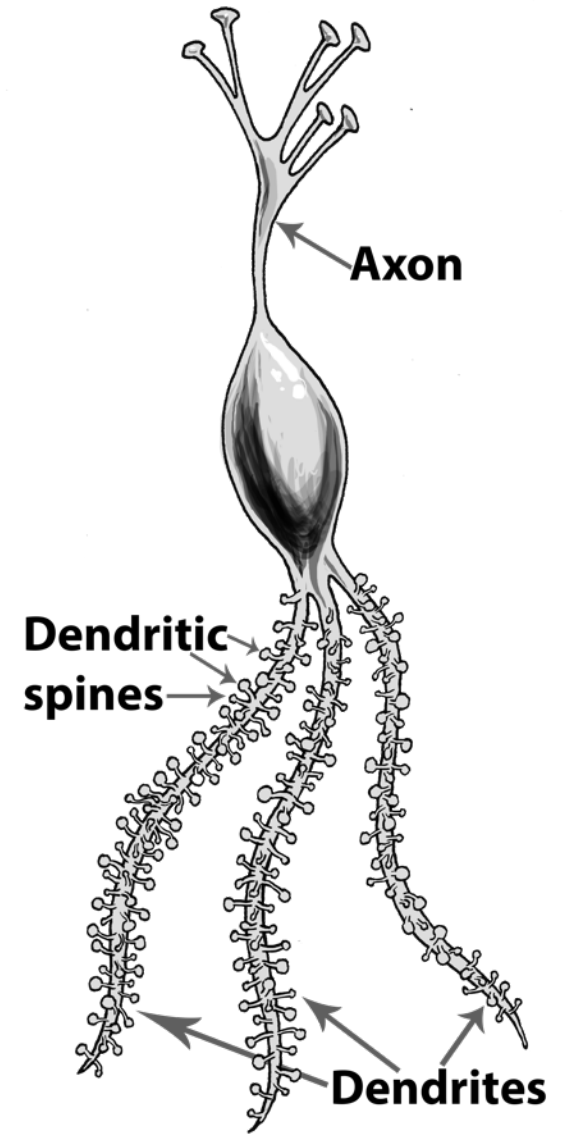
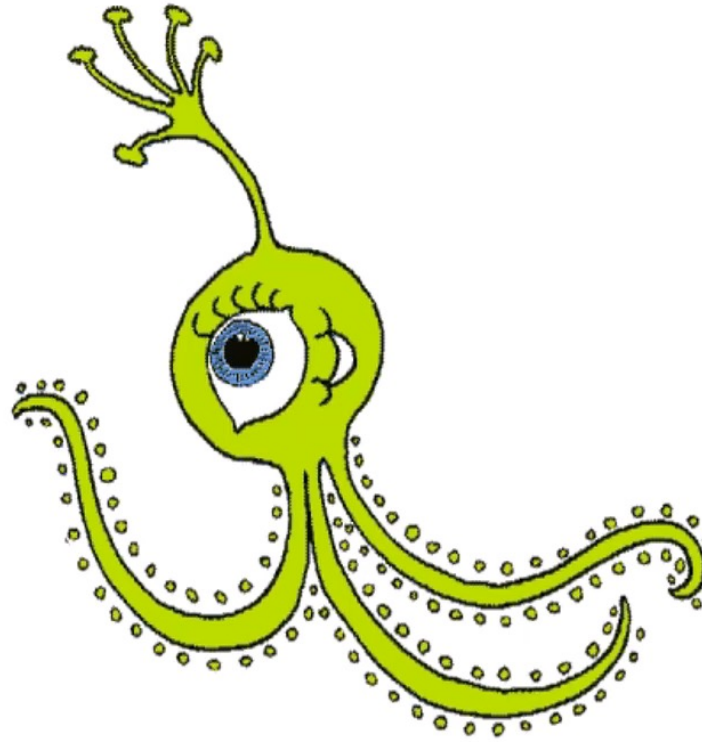
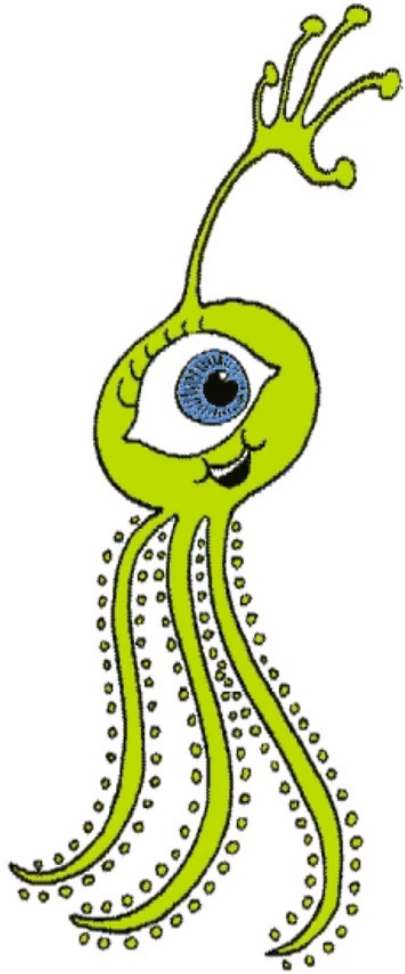
Philip Oakley



Axon

Dendritic
spines

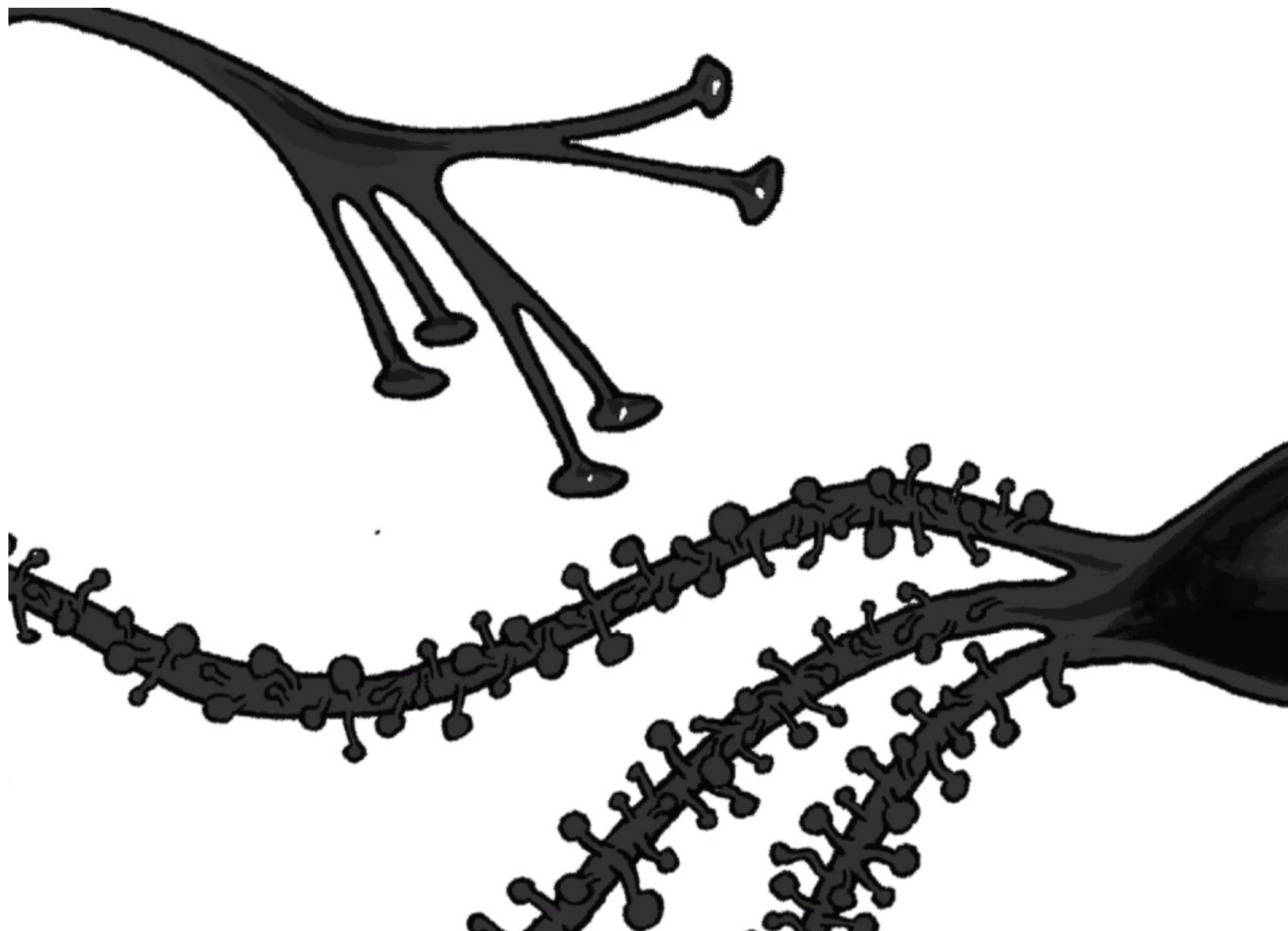




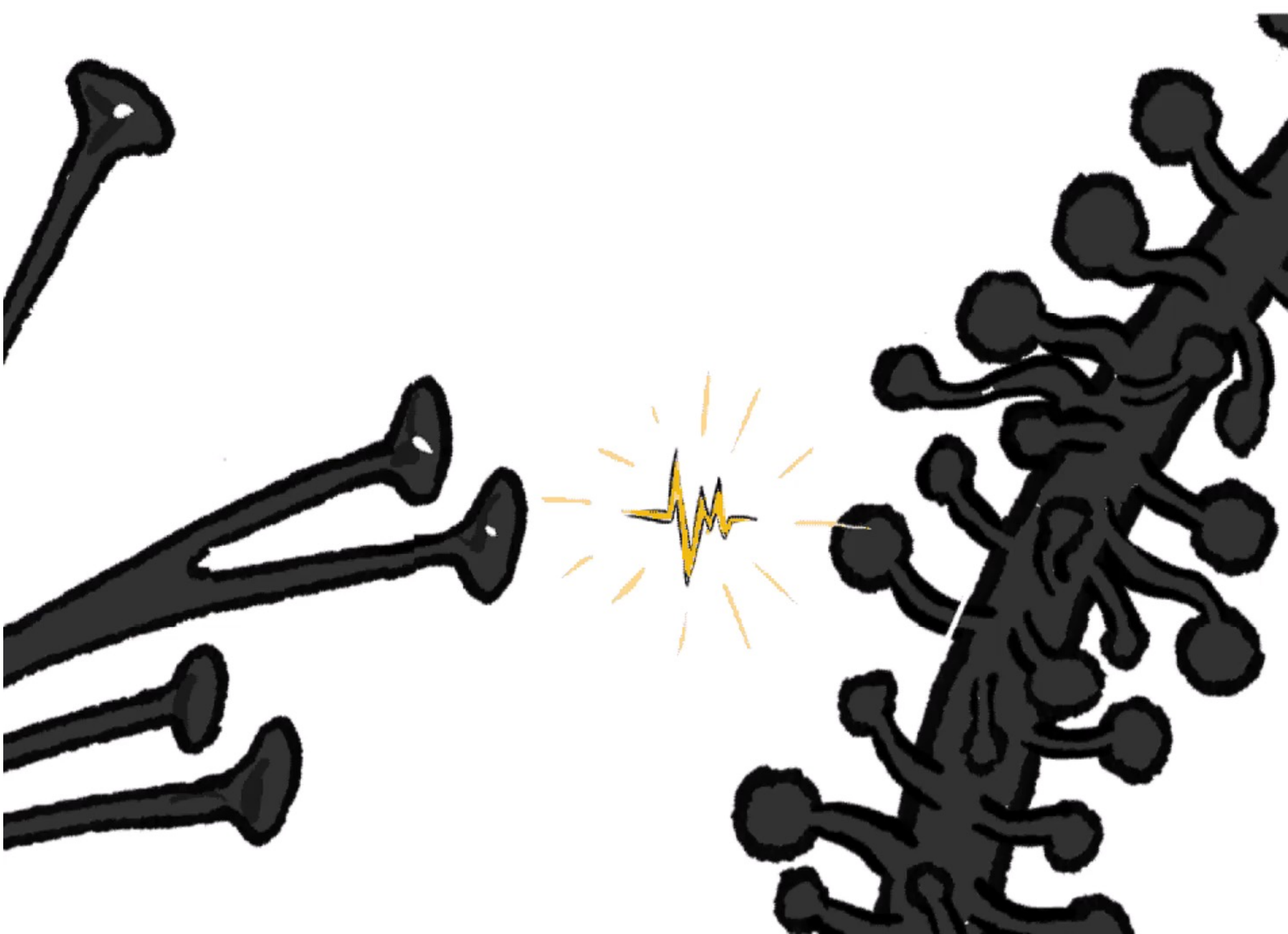


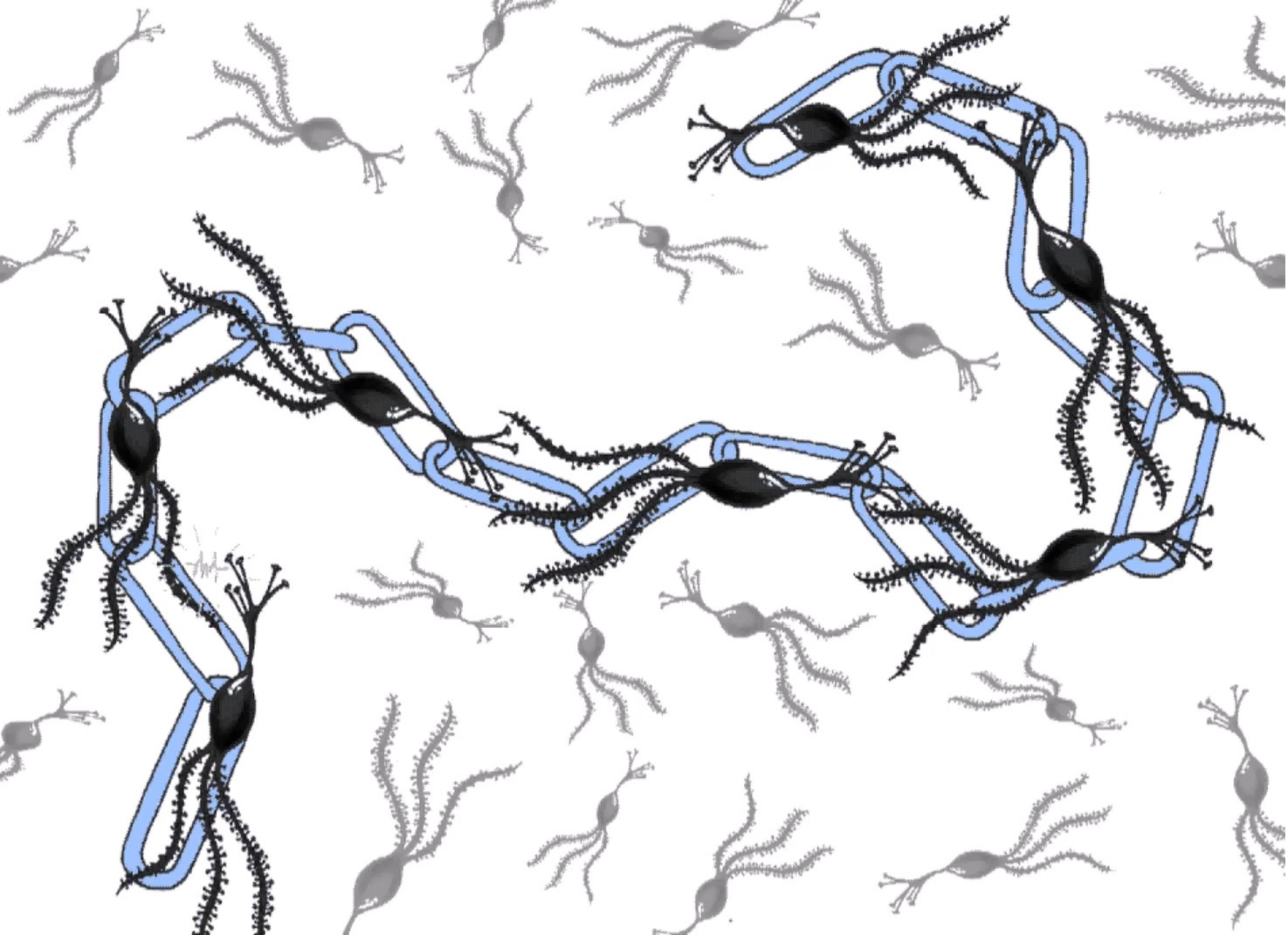
Neurons
send
signals

Neurons create sets of links when you learn something.



Connections
strengthen
with practice

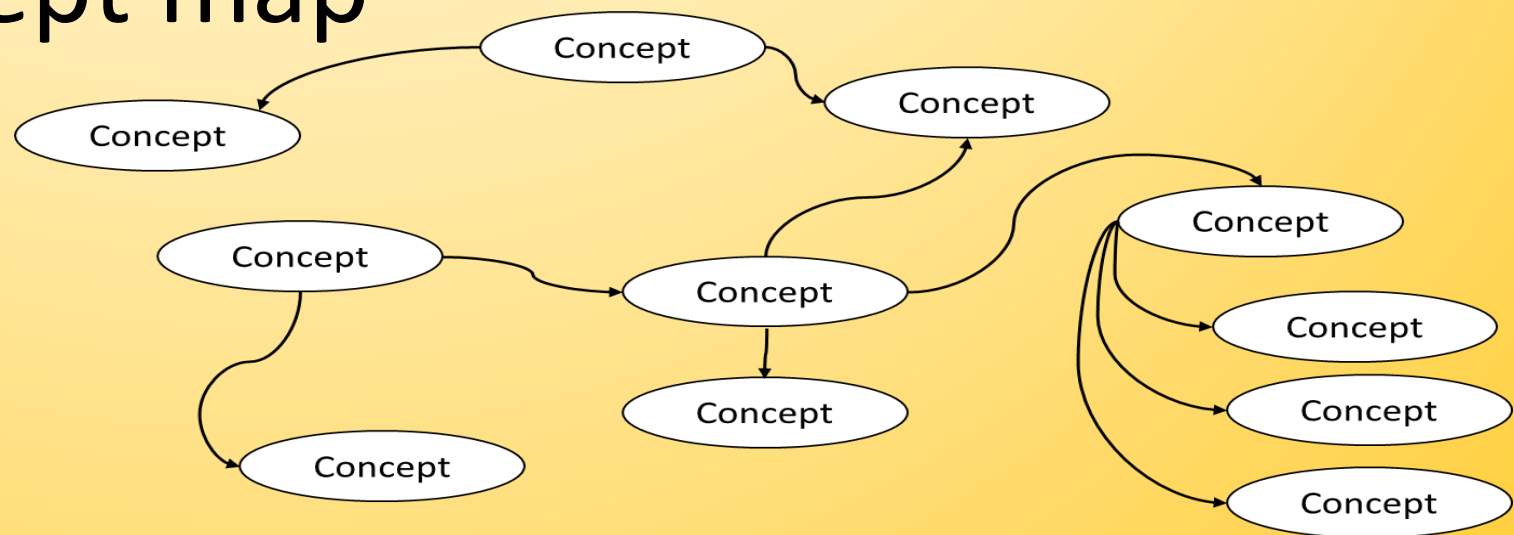




These are like
sets of links
in a chain.

What is the most powerful technique to help you learn most efficiently?

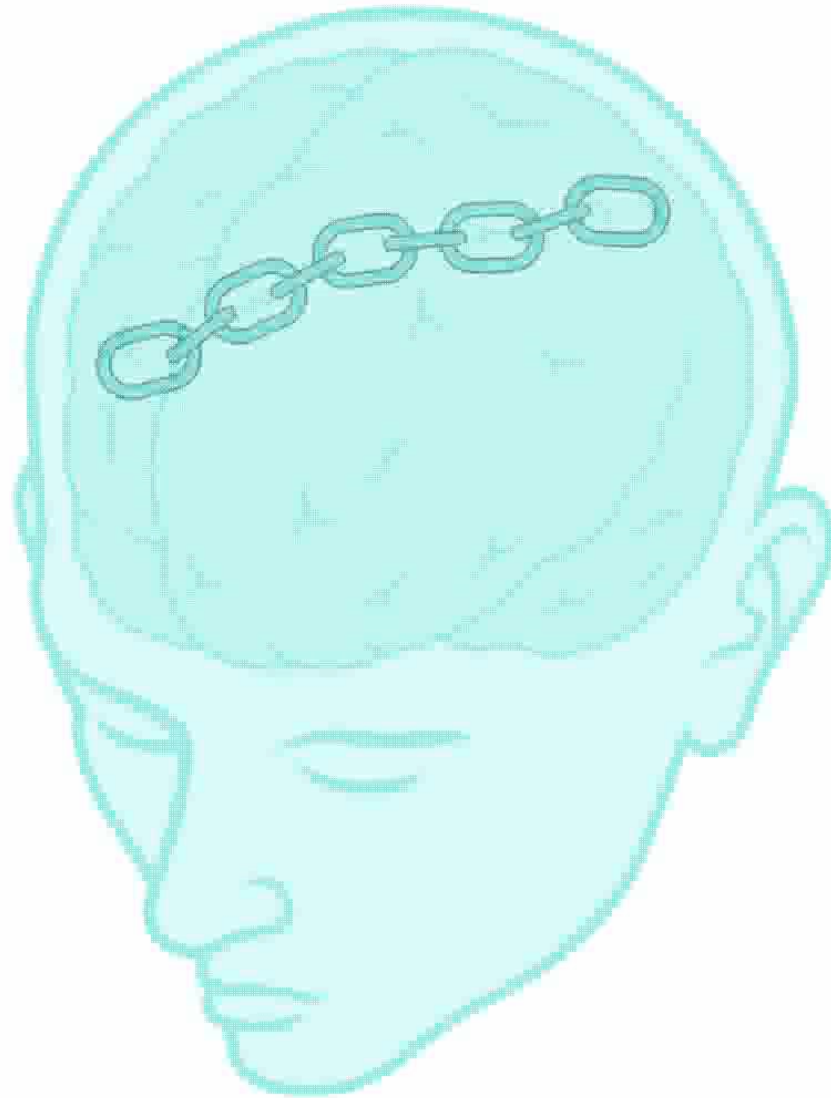
- Reread
- Highlight or underline
- Retrieval practice (“recall”)
- Create a concept map



Retrieval Practice



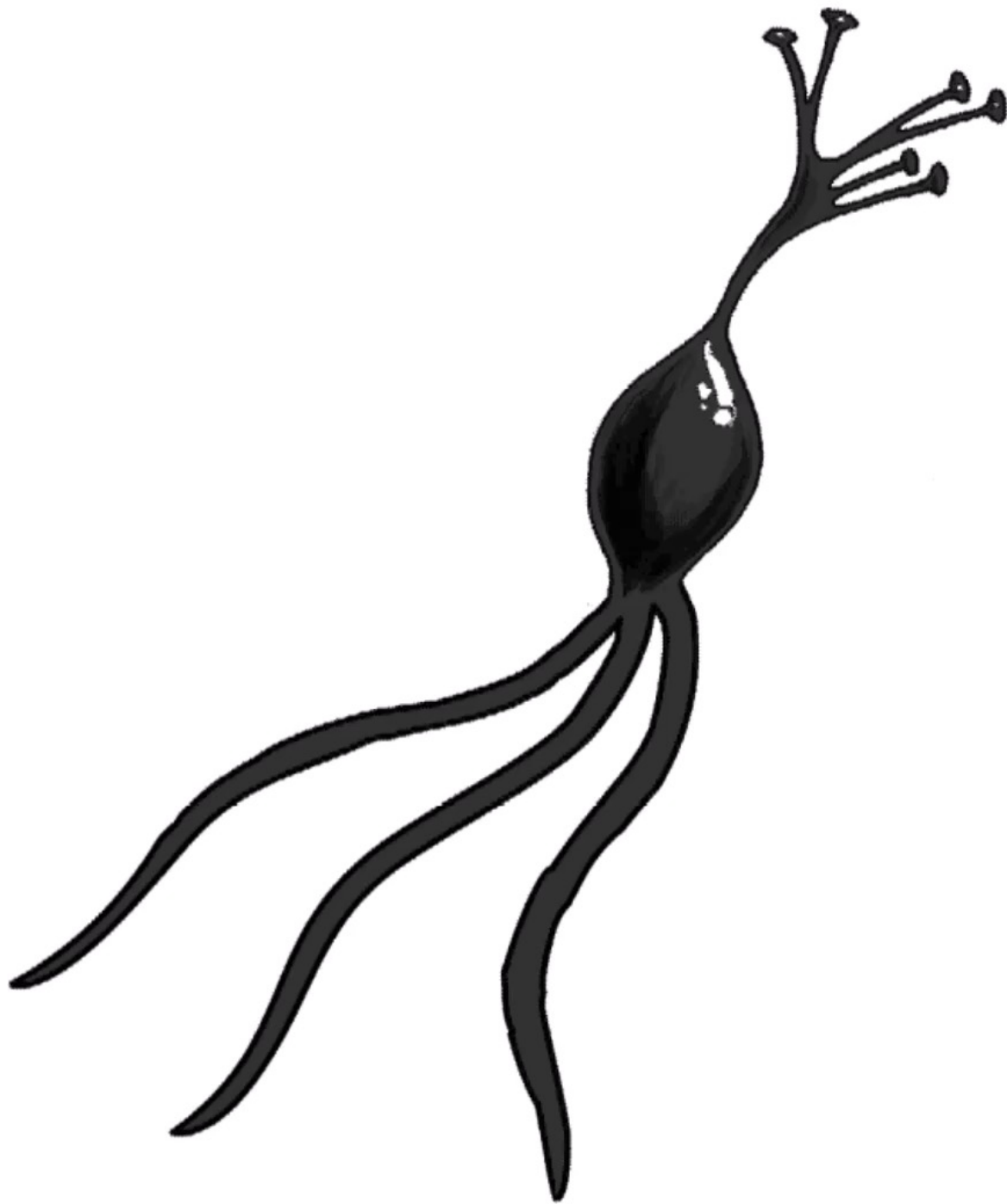
Retrieval Practice



← **Initial learning**

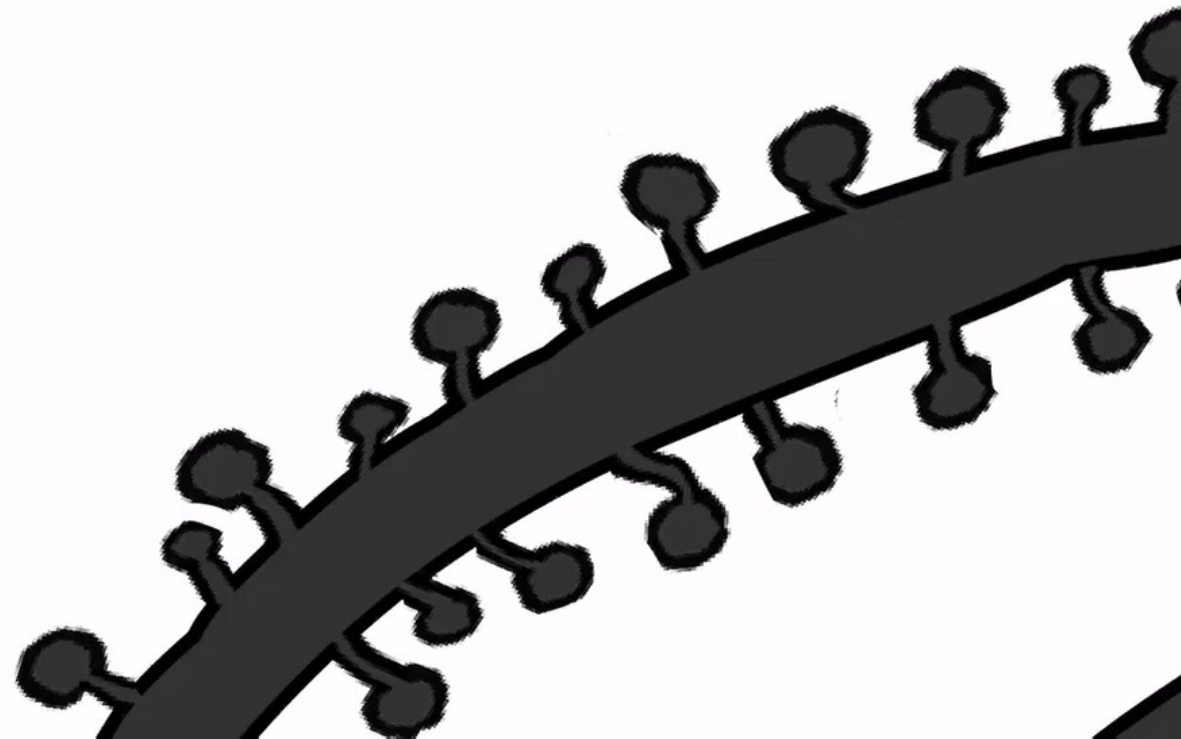






Active learning
(with sleep in
between!)

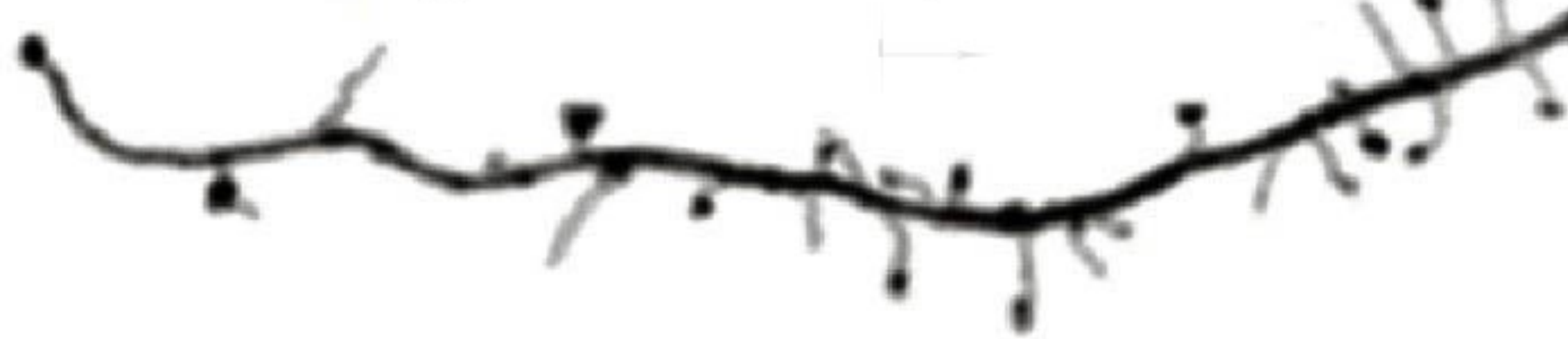
Active learning
(with sleep in
between!)



Before learning and before sleep



Before learning and before sleep



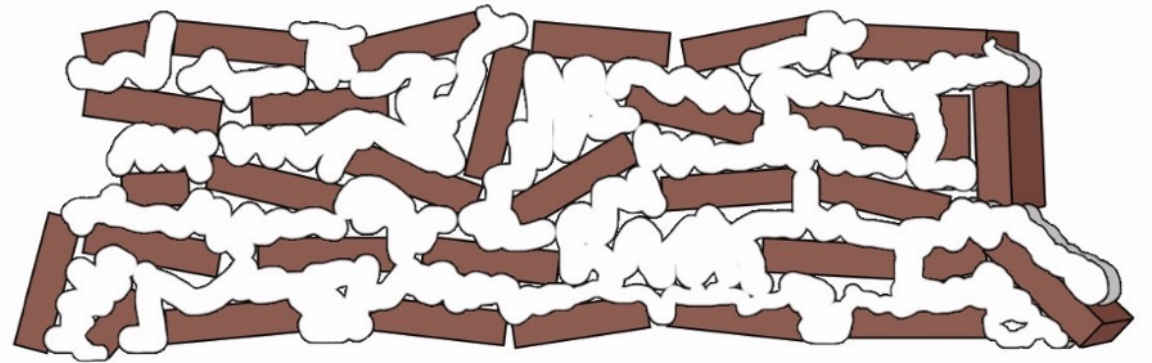
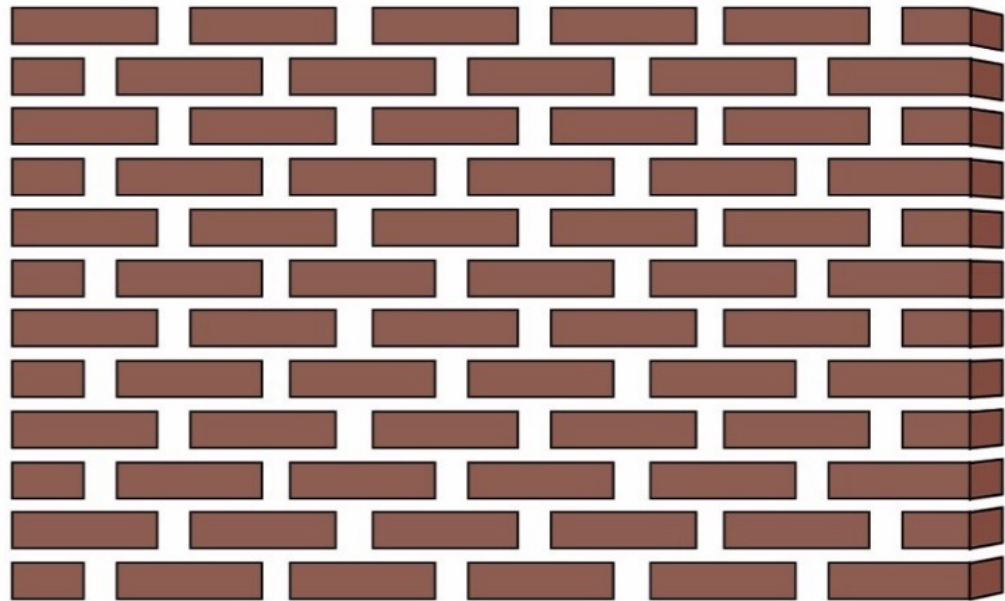
After learning and after sleep



2 μm
Images courtesy Guang Yang, NYU Langone

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						



It takes time



Weight lifter Sultan Rakhmanov, RIA Novosti

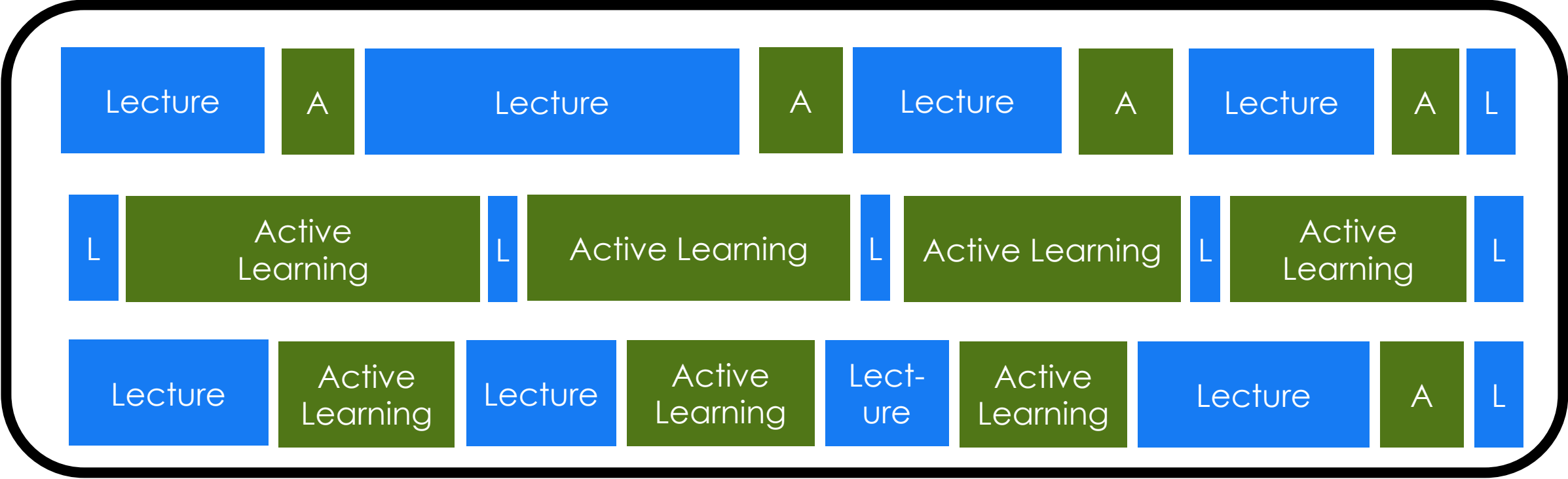


Photo by Erik van Leeuwen

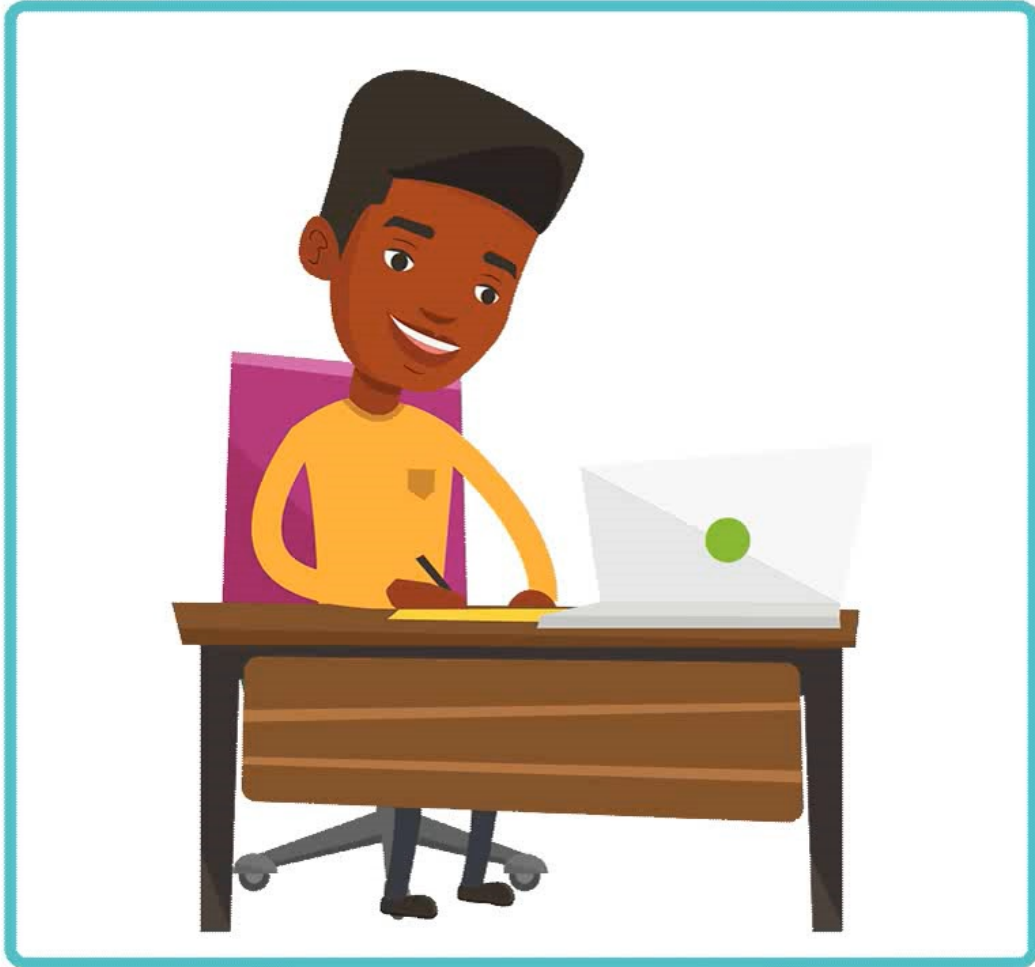
Julius Yego

Lecture

Active Learning



Direct instruction



Lecture

Active Learning

Lecture

Active Learning

Lecture

Active Learning

Lecture

Active Learning

Lecture

Active Learning

Lecture

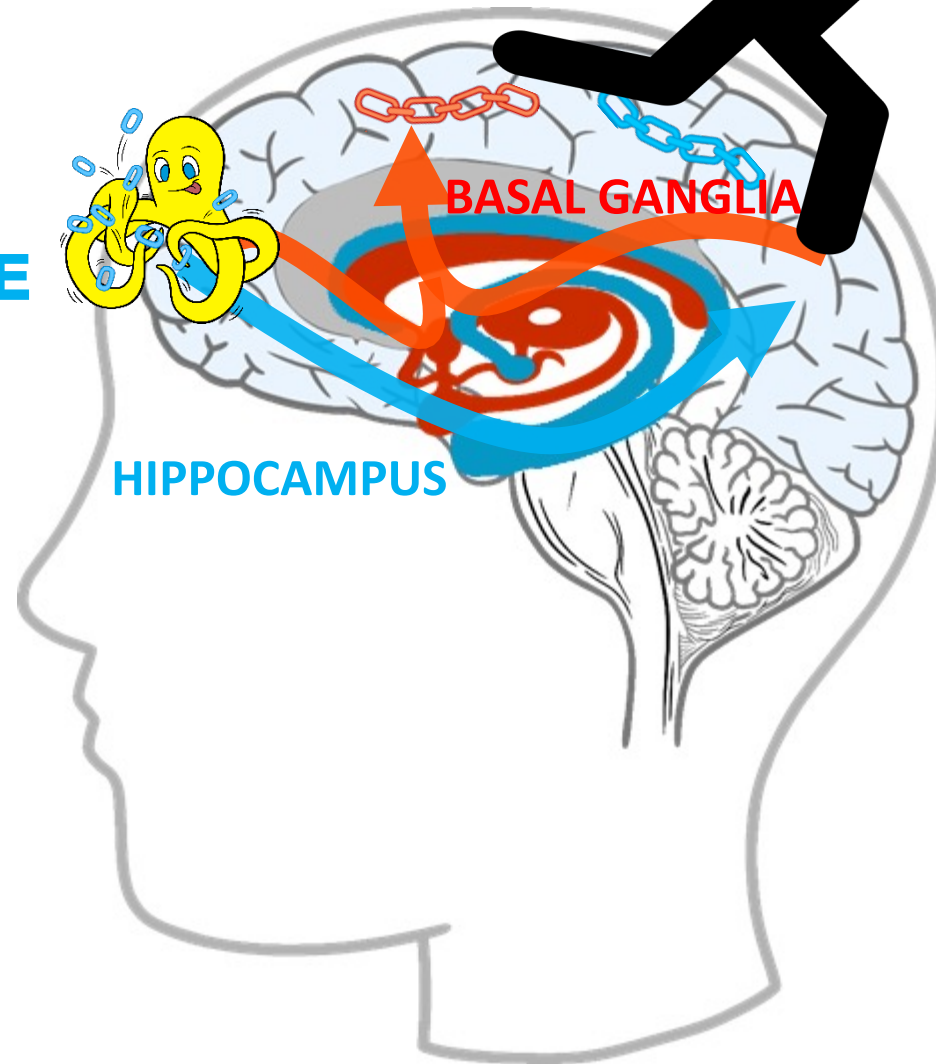
Active Learning

Lecture

Active Learning

Lecture

DECLARATIVE



HIPPOCAMPUS

BASAL GANGLIA

PROCEDURAL




DECLARATIVE

- You're mostly conscious of it
- Develops through explicit instruction
- You can explain it.
- Involves sequential tasks.
- Fast to learn, slow to use.
- Flexible



PROCEDURAL

- You're not conscious of it
- Develops through *practice*
- You can't explain it (or not easily)
- Involves complex patterns
- Slow to learn, fast to use
- Inflexible 



DECLARATIVE



PROCEDURAL

RETRIEVAL PRACTICE

SPACED REPETITION

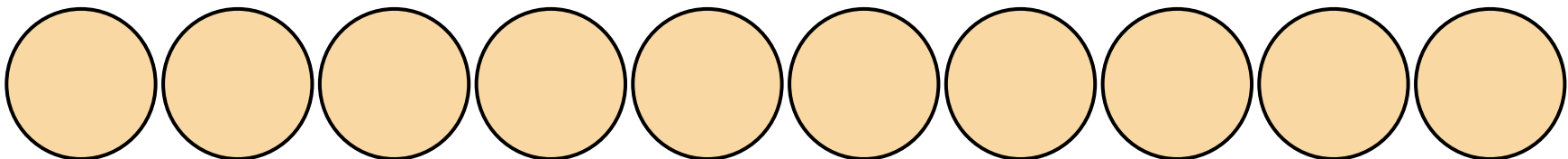
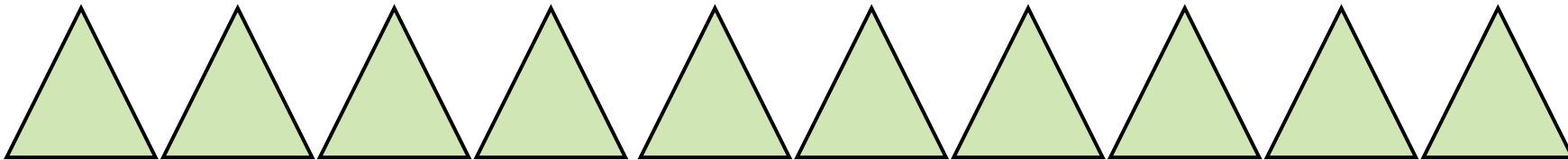
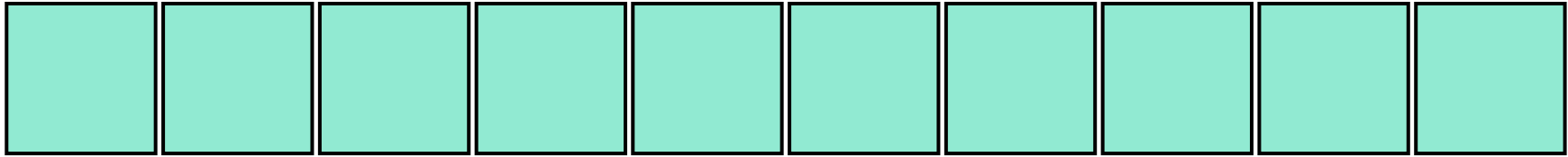


EXPLANATION

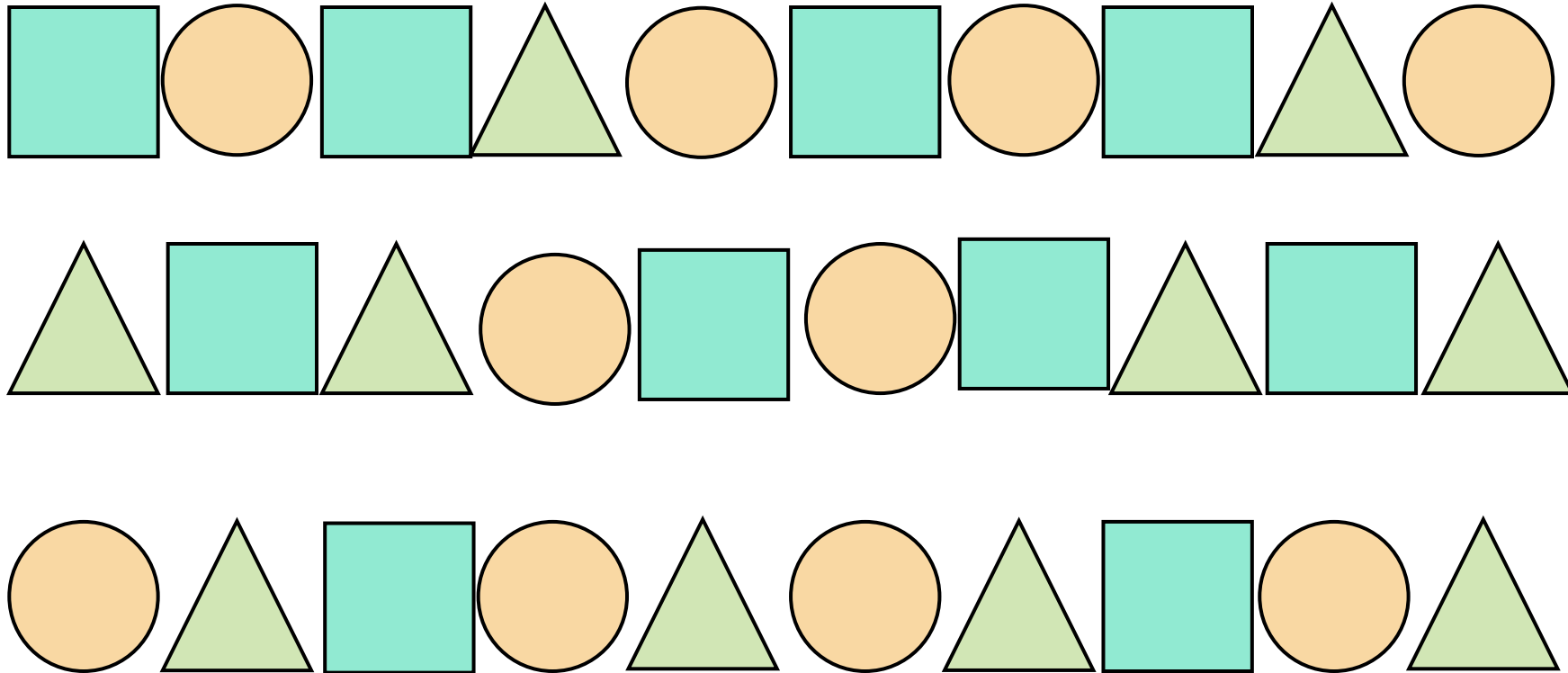
VARIED PRACTICE

INTERLEAVING

Blocking



INTERLEAVING



Interleaving

Plain Assignment

Topic 7 problem 4

Topic 7 problem 9

Topic 7 problem 15

Topic 7 problem 17

Topic 7 problem 22

Interleaved Assignment

Topic 7 problem 4

Topic 4 problem 8

Topic 7 problem 9

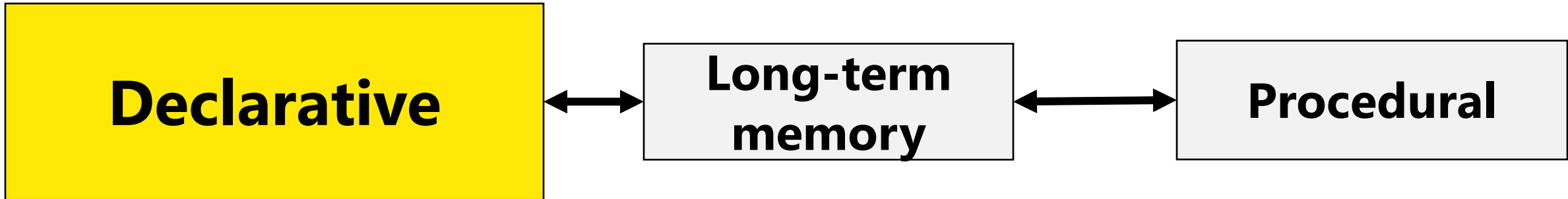
Topic 6 problem 26

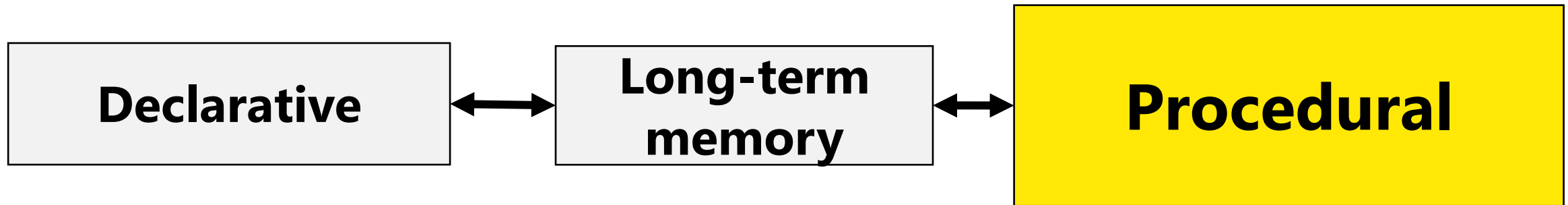
Topic 7 problem 15

Topic 5 problem 18

Topic 7 problem 17









DRILL



KILL



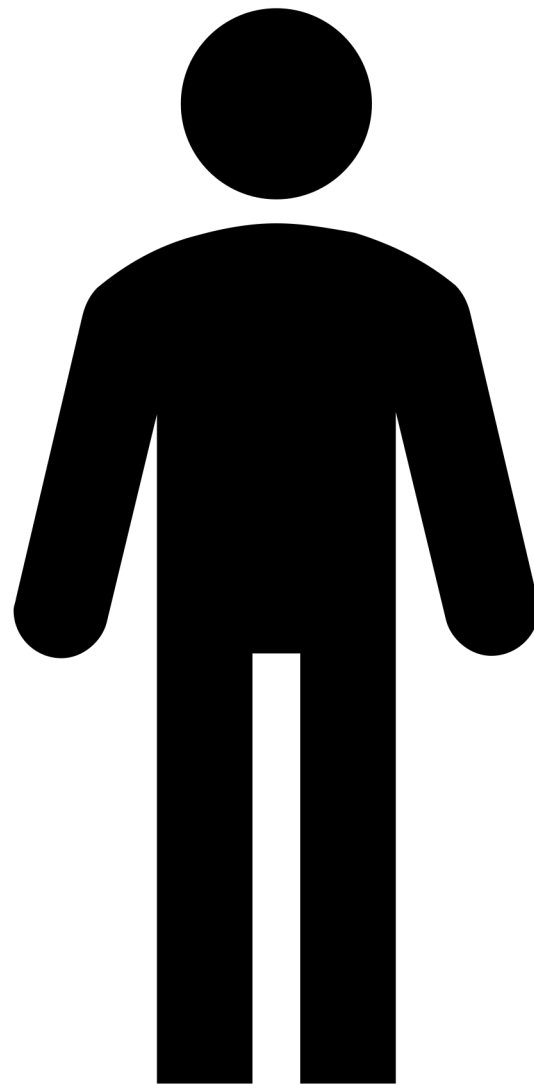
Why Learning Via Video is so Valuable



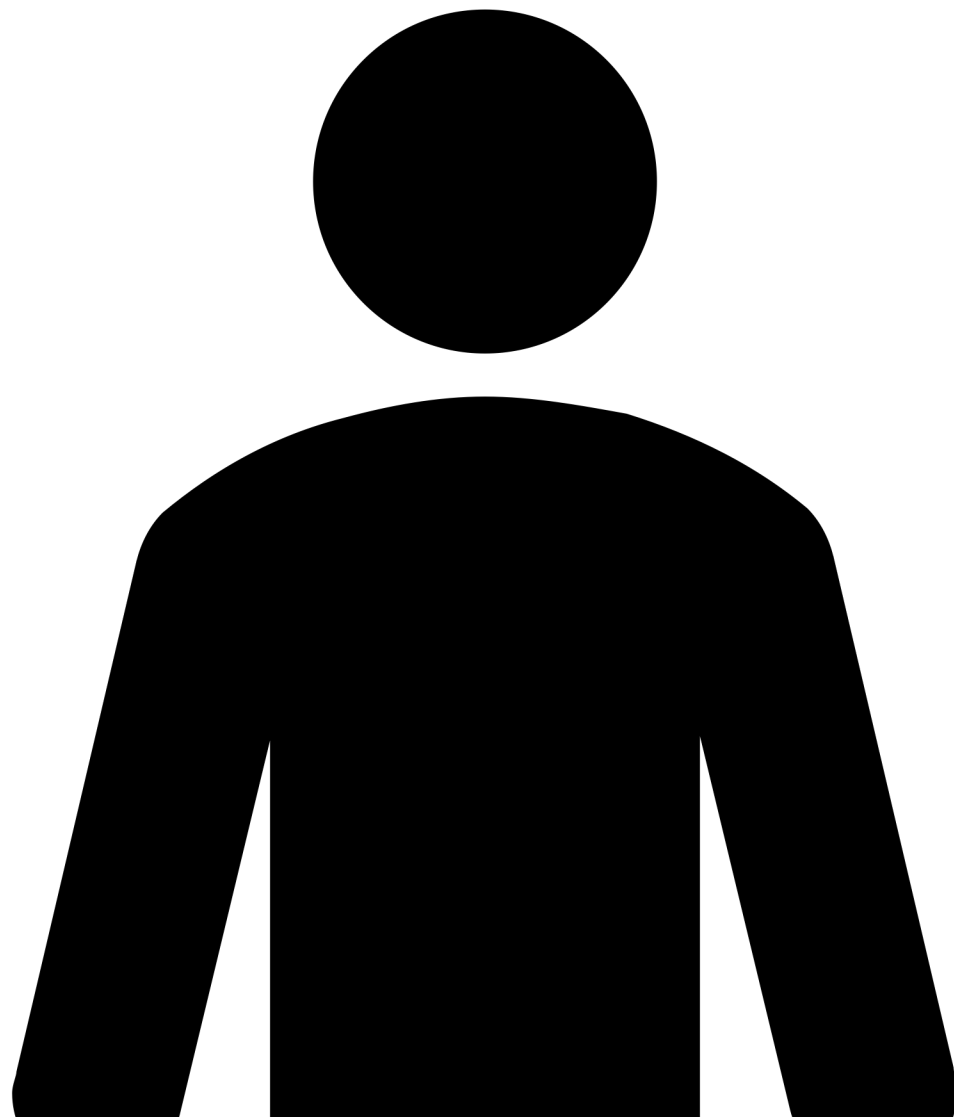
Attention



The value of looming motion



The value of looming motion



Engaging Your Students

- Students in online courses look first at the videos.
- But we want them to *engage*.

“Zero-ith” Rule of Making Engaging Online Courses

Make a BAD video





**But you didn't give
us time to practice
all you taught!**



Photo by Erik van Leeuwen

Julius Yego