How People Learn

Presented by Galia Bar-Sever

May 22, 2018 @DTEI, UCI

Goals for this workshop

By the end of this workshop I hope you will:

1) Have a greater understanding of the biological processing of learning

2) Have concrete ideas of strategies to support student learning you can implement in your classes

Roadmap

1) Misconceptions about the brain
2) How the brain learns
3) What kind of classroom practices are taking advantage of how the brain learns
4) Tools to implement in classes based on neuroscientific principles

Introduce yourself

Name

Department

Level

What you hope to get out of this workshop

Ice Breaker! - Human Scavenger Hunt (10 min)

Find someone who:

1) Adopted a pet
2) Has tried surfing
3) Has more than 2 siblings
4) Doesn’t like chocolate
5) Has seen every Marvel movie
6) Has a birthday this month
7) Doesn’t own a car
8) Is from the same city as you
9) Is wearing green
10) Can whistle

Energizer! - Biggest Fan

Pair off and play Rock, Paper, Scissors (R beats S, P beats R, S beats P)

Whoever loses becomes the winners biggest fan, and cheers them on ebulliently as they fight another winner/fan pair.

Whoever wins that round gets all their opponents followers.

Eventually two players face off, each with half the class at their backs cheering them on.

[NB: this energizer is INSANE in a large class! Try it!]

Neuromyths

Neuromyths

Neuromyths


Left
Right


10%?


Visual
Auditory
Reading & Writing
Kinesthetic

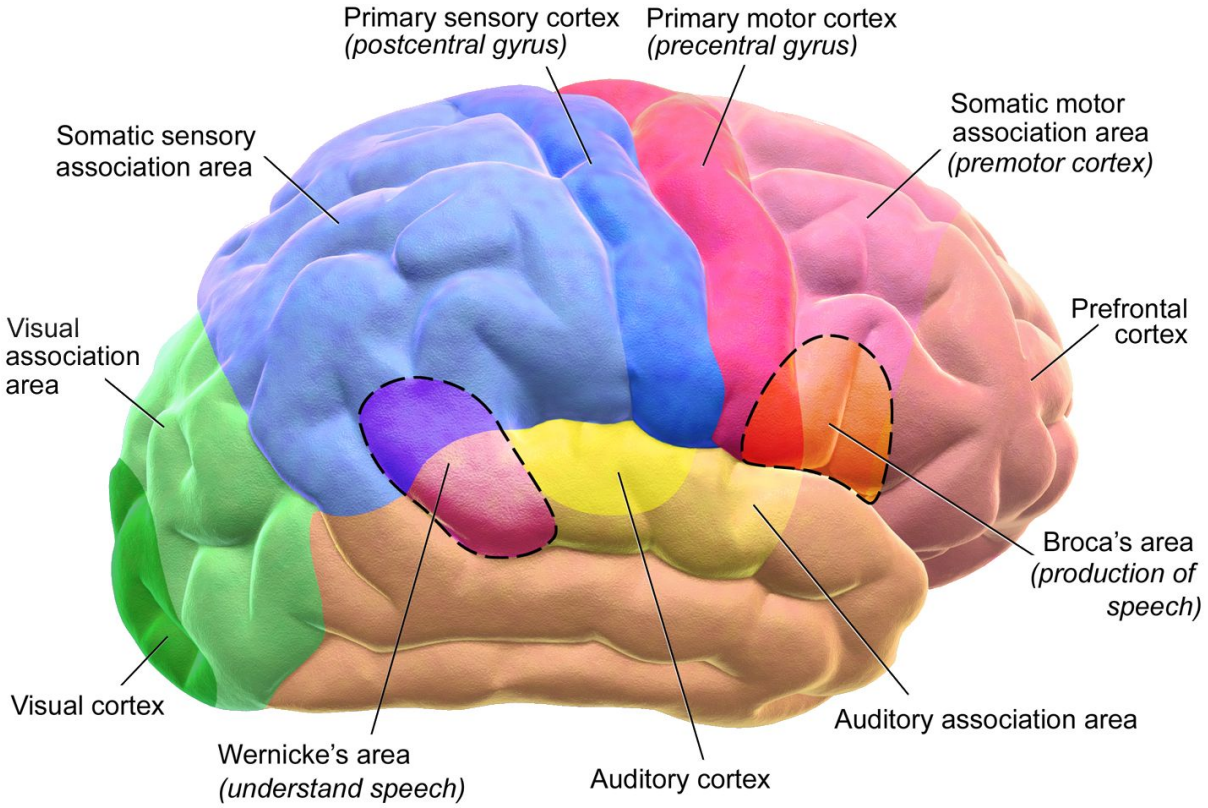
Bad neuroscience and education

Misconceptions about the brain and education are rampant.

Studies suggest about 50% of teachers hold faulty information about the way brains work, and it makes its way into educational policy (Dekker et al. 2012)

In this next part of the talk, we're going to take a tour and look at how the brain works when we learn

An educator's guide to the brain



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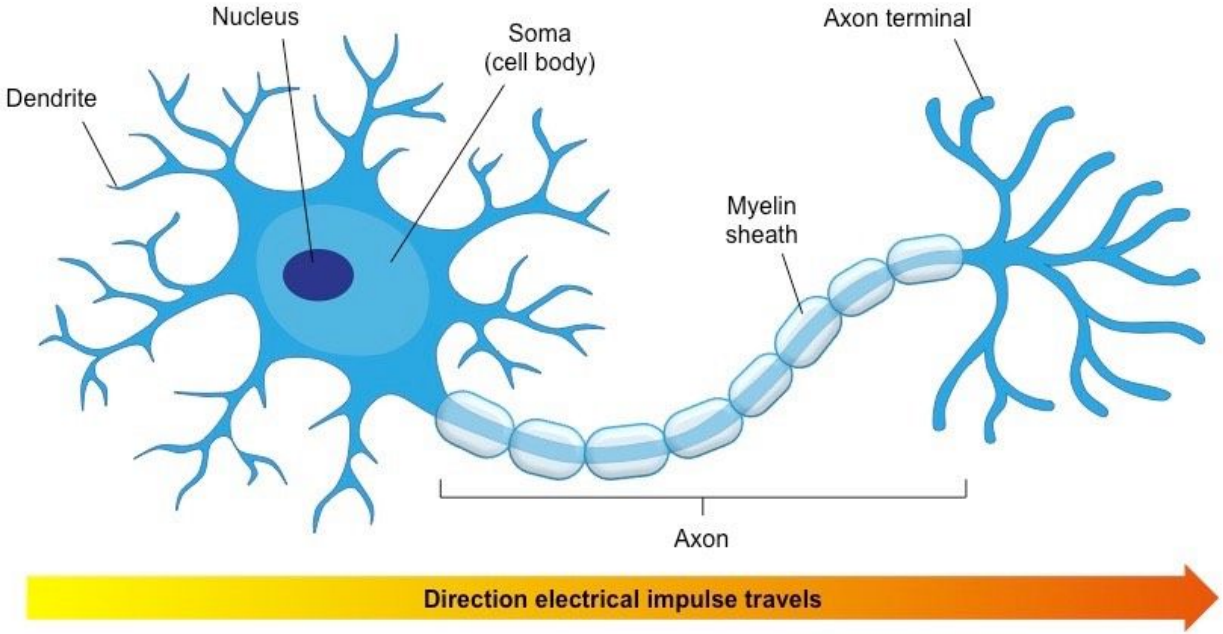

-Dendrites receive signal from other neurons or the outside world (sensory stimuli)

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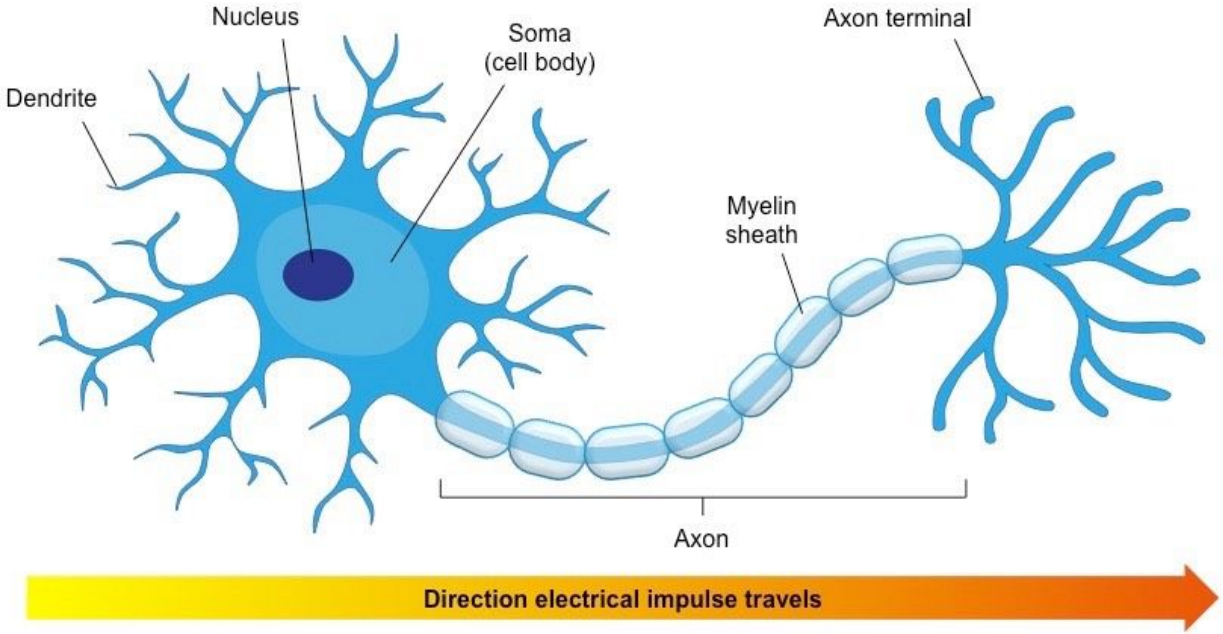

-Dendrites receive signal from other neurons or the outside world (sensory stimuli)

-Electrical signal flows down axon and ends in the axon terminals

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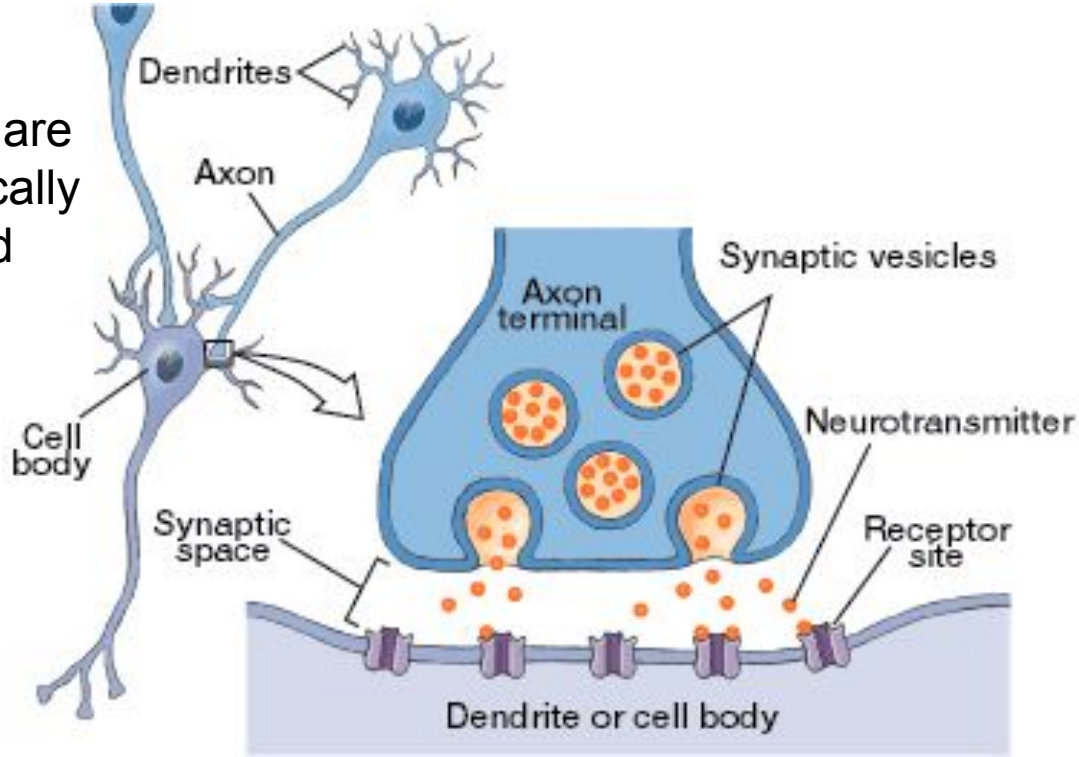
-Neurons are not physically connected together.



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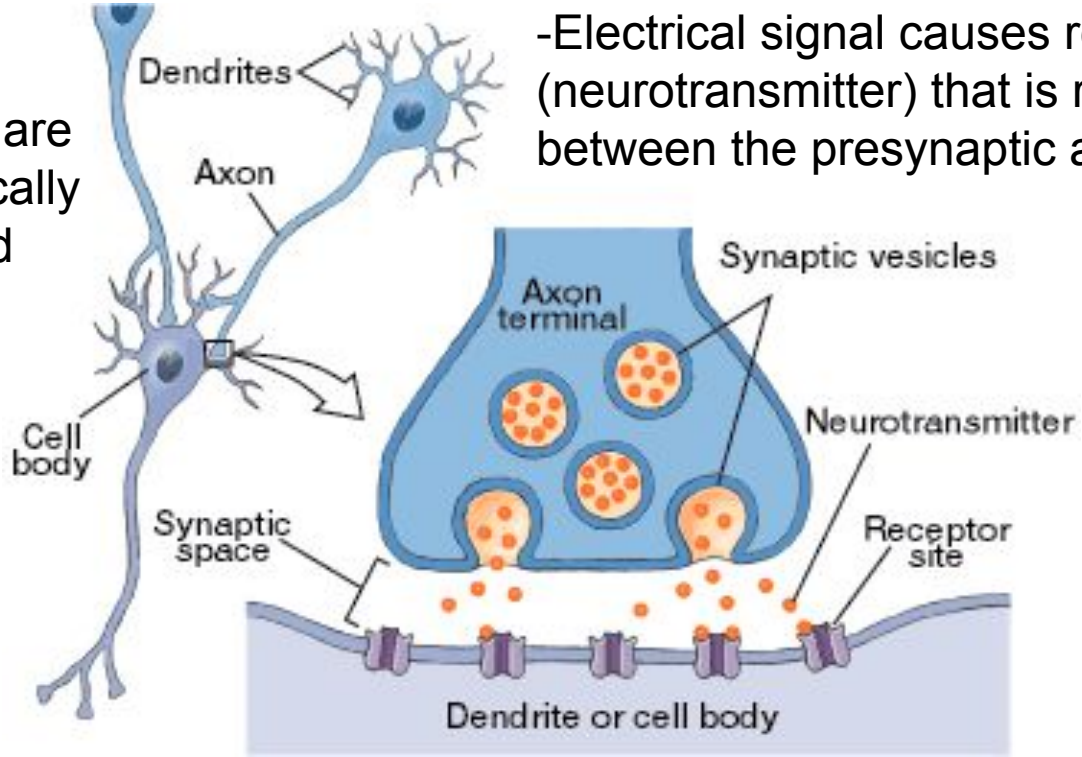

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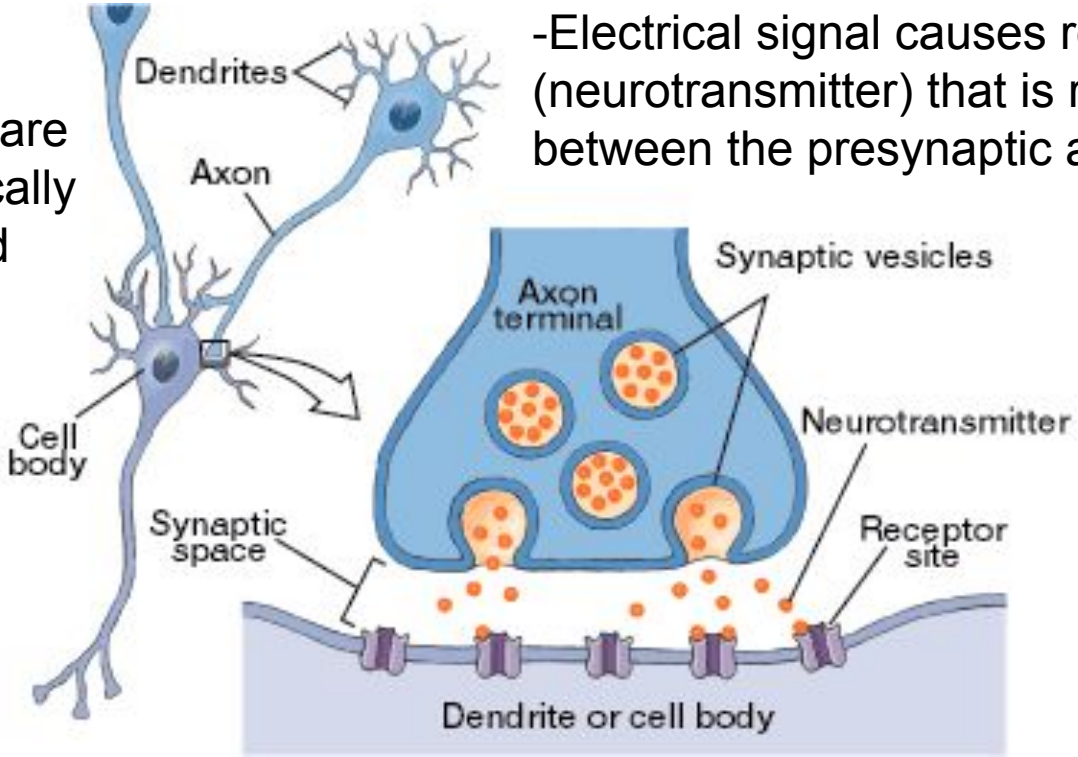

-Electrical signal causes release of chemical signal (neurotransmitter) that is released into the gap between the presynaptic and postsynaptic neuron

-The neurotransmitter is specific to the identity of the presynaptic neuron, and causes different reactions in the postsynaptic neuron

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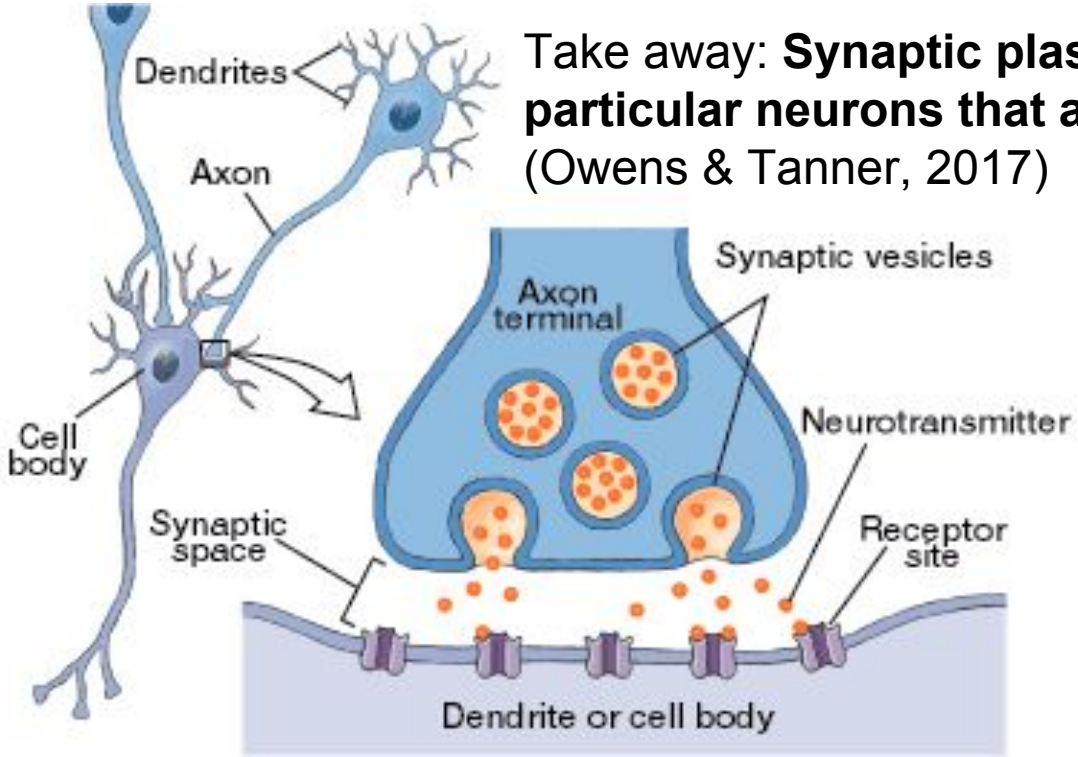

Take away: **Synaptic plasticity is specific to the particular neurons that are active together.** (Owens & Tanner, 2017)

What happens when we learn?

-Basic architecture of the brain is set up in childhood

-Individual neurons can change their signaling and synaptic connections throughout a person's life

-This is referred to as brain **plasticity**.

-The formation of new neurons (neurogenesis) is rare, and brand new neurons are only ~0.004% of all of your neurons at a given time (Spalding et al. 2013)

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-Frequently used connections between neurons are enhanced the most

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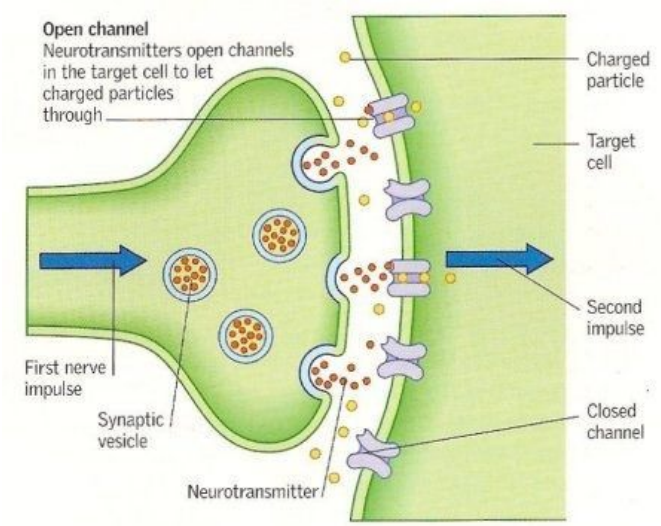

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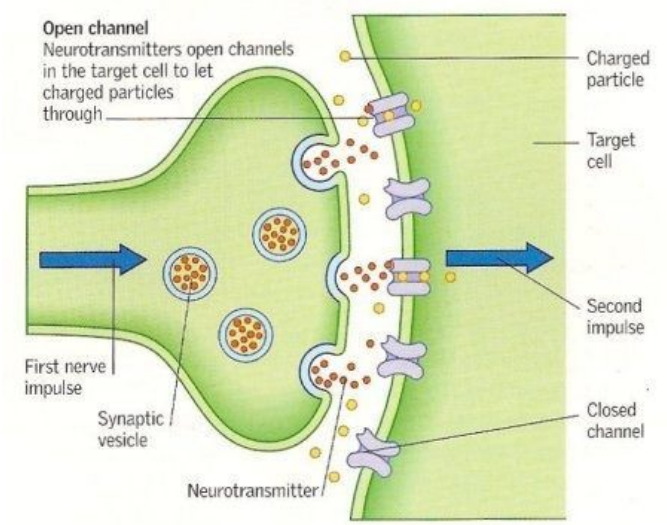
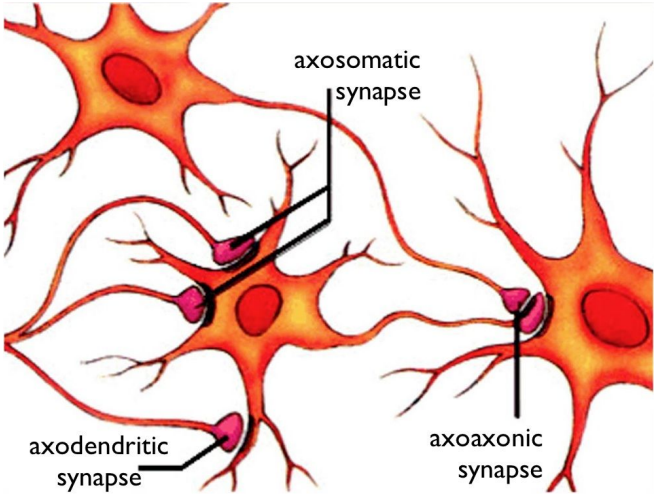
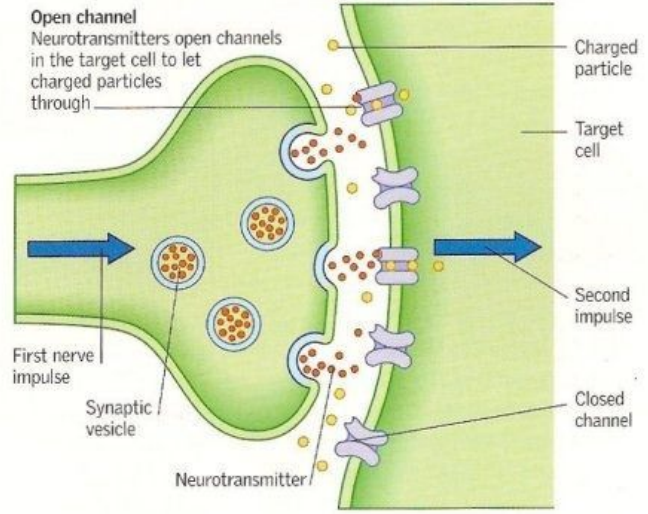
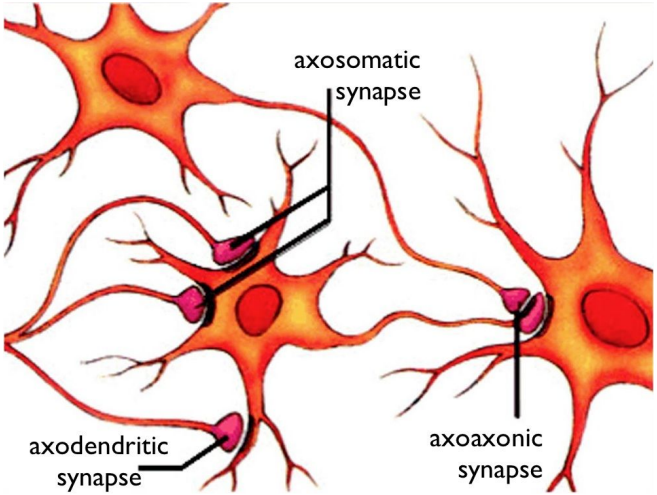




If coactivation happens repeatedly, these new synapses can last for a long time.





Shatz, C. (1992), The Developing Brain. Scientific American, Vol. 267, No. 3.

Factors in formation and retrieval in memories

Synaptic plasticity can be affected by neurotransmitters

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Acetylcholine (ACh): involved with situations of novelty or surprise

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Take away: **‘Neuroscientists would predict that when our students are motivated and attentive in our class, their brains are releasing dopamine and ACh, priming them for plasticity and learning.’** (Owens & Tanner, 2017)

Factors in formation and retrieval in memories

The dark side of neurotransmitters: **CORTISOL**

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Mild elevations in cortisol can increase performance on memory tests, high elevations inhibit memory formation and retrieval.

Take away: **'Neuroscientists would likely predict that high levels of stress in students in classrooms would be an impediment to learning, and removing some stressors could facilitate it.'** (Owens & Tanner, 2017)

What neurotransmitter is associated with reward?

Google wants your questions

You may have noticed google is trying to get your attention. Please take a moment to go to the link at the top of the slides and ask me a question.

This can be a useful tool in classes with particularly shy students

Energizer! - Collaborative Face Drawing

Get a piece of paper and a pen or pencil.

Write your name at the bottom of the page.

Start walking around. When the timer dings, find a partner and exchange papers

Draw the feature I say until the timer dings again (start with eyes).

Repeat (x5)

Admire your completed portrait.

But why icebreakers?

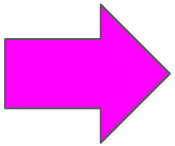
‘...implementation of icebreakers and re-energizers in the classroom might well contribute to improved student participation, increased student persistence, and ultimately enhanced student learning.’ (Chlup & Collins, 2010)

- ✓ promote classroom community
- ✓ good classroom community beneficial to learning
- ✓ easy to implement

Implementing neuroscience

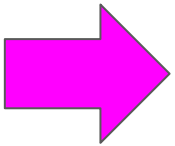
Neuroscientific principle:

Synaptic plasticity is specific to the particular neurons that are active together. (Owens & Tanner, 2017)



Educational principle:

Active forms of studying improve test performance over passive forms.



Teaching technique:

Frequent, active homework

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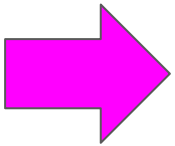

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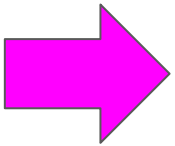

Teaching technique:

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Why do you think this might be effective?

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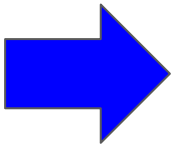
Dopamine and ACh, released during states of motivation and attention, boost synaptic plasticity. (Owens & Tanner, 2017)



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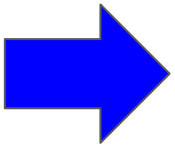
Motivation and attention increase learning.



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Problem-based learning

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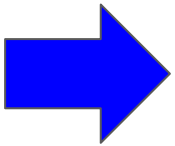

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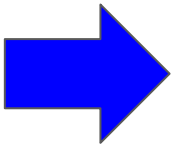

Teaching technique:

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Why do you think this might be effective?

Active learning

Active learning, or any learning that engages students in the learning process, has been shown to improve student attitudes and performance over traditional methods of instruction (lecture heavy, passive learning)

Implementing active learning techniques that can increase the attention, motivation, and critical thinking processes can range from the simple (iClickers) to complex (JigSaw)

One simple activity that can be easily implemented is called **Think-Pair-Share**

What is a think-pair-share?

What happens during a think-pair-share?

1) A (hopefully) interesting question is posed — grabbing students' attention and enhancing neuroplasticity
2) As students are writing and discussion the questions with their peers, they are practicing problem-solving and thinking skills necessary for gaining expertise, forming wider connections between the semantic information
3) Low-stakes, reducing stress and the amount of plasticity-inhibiting cortisol

Think pair share

Please take a moment and reflect on ways you already utilize these neuroscientific principles and ways you can implement them in your classes .

Then, pair up with a neighbor and share your ideas.

After, share in your group and find if there are any commonalities in ideas.

Record your idea here!

Questions?

Sign up for ‘Languages of the World’ (Ling 1) **Summer Session 1**!

meets MWF 1-2:50

Are you interested in how people communicate? Do you want to explore the amazing diversity of languages the world has to offer? *Languages of the World* will take a deep dive into the world’s languages. The class will make use of readings, videos, and in class discussions to find out what in our languages connects us and makes us unique.

Fulfills University Requirement VIII (International/Global Issues)

Slides will be available on my website

http://sites.uci.edu/gbarsever/

Resources

https://www.icebreakers.ws/classroom-icebreakers

http://www.funretrospectives.com/category/energizer/

https://www.cultofpedagogy.com/

https://quickdraw.withgoogle.com/#

https://www.polleverywhere.com/

https://www.peardeck.com/

https://kahoot.com/

www.nap.edu/catalog.php?record_id=9853

Resources

https://www.hastac.org/blogs/cathy-davidson/2017/11/15/active-learning-kit-rationale-methods-models-research-bibliography

https://www.facultyfocus.com/

http://www.educationalneuroscience.org.uk/resources/neuromyth-or-neurofact/