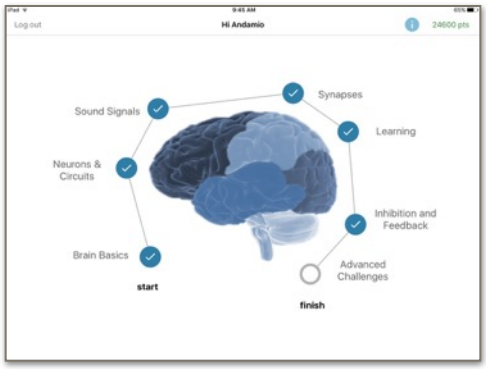
Andamio Games

iNeuron Challenge Summary

May 2016

Below is a summary of the challenges and concepts included in iNeuron. Themes are underlined, challenges are italicized, and the concepts covered in the challenges are listed.

Brain Basics



Lesson: ***Welcome to Your Brain***
- Choose your role; brain basics

Circuit: ***Connect the Neurons***
- Circuit building game basics

Circuit: ***Break the Circuit***
- More circuit building game basics

Neurons & Circuits

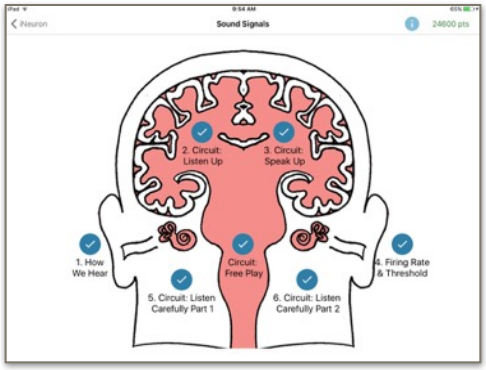
Lesson: ***Neurons & Nerves***
- Nervous System Basics
- Neurons and Cells
- Types of Neurons (motor, inter-, sensory)
- Anatomy of a Neuron (dendrites, axon, axon terminal, cell body)
- Neuronal Circuit Basics (including information flow)

Circuit: ***Flex Biceps***
- Build a motor circuit to make the biceps muscle contract.

Circuit: ***Feel the Sensation***
- Build a sensory circuit to send touch information to the brain.

Circuit: ***Free Play***

Sound Signals



Lesson: ***How We Hear***
- Auditory Processing
- Parts of the Ear
- Types of Sensory Neurons

Circuit: ***Listen Up***
- Using graphs to measure firing rates.

Circuit: ***Speak Up***
- Build a motor circuit to flex the muscles around the mouth and speak.

Lesson: ***Firing Rate & Thresholds***
- Action potential
- Firing rate
- Firing period
- Thresholds
- Anatomy of a Neuron (review)

(continued)

Circuit: ***Listen Carefully, Part 1***

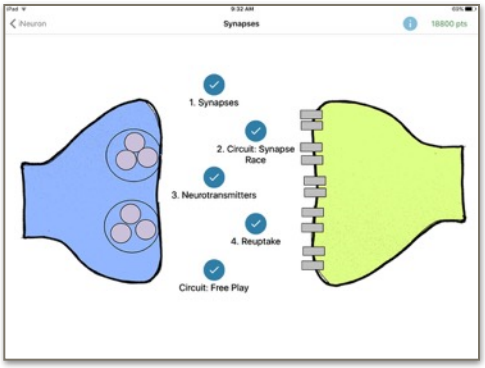
- Build an auditory circuit and increase firing rate.

Circuit: ***Listen Carefully, Part 2***

- Make an auditory circuit with multiple sensory neurons.

Circuit: ***Free Play***

Synapses



Lesson: ***Synapses***

- Neurotransmitters
- Receptors
- Reuptake

Circuit: ***Synapse Race***

- Make multiple synapses.

Circuit: ***Neurotransmitters***

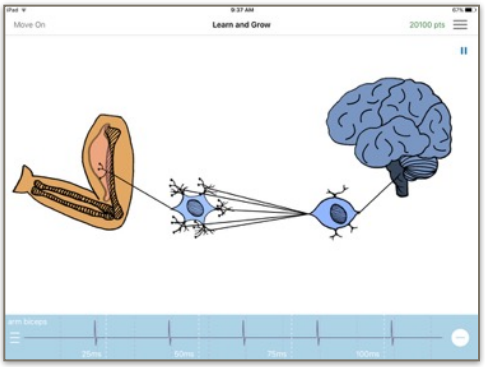
- Move neurotransmitters across the gap of the synapse.

Circuit: ***Reuptake***

- Move neurotransmitters back from dendrite to axon terminal.

Circuit: ***Free Play***

Learning



Lesson: ***Learning***

- Synaptic plasticity
- How learning changes a synapse

Circuit: ***Synapses Change***

- Comparing synapses before and after practice.

Circuit: ***Learn & Grow***

- Create multiple synapses between interneuron and motor neuron.

Inhibition and Feedback

Circuit: ***A New Sensation***

Build a sensory circuit to bring information from the biceps to the brain.

Circuit: ***Speed Up***

Build a positive feedback loop.

Circuit: ***Freeze***

- Use an inhibitory neuron to stop the biceps from flexing.

Circuit: ***Slow Down***

- Build a negative feedback loop.

Circuit: ***Free Play***

Advanced Challenges

Circuit: ***Take Control***

- Alternately flex and relax biceps and triceps.

Lesson: ***Brain Anatomy***

Circuit: ***Free Play***

Circuit: ***Group Challenges***

- Multi-player versions of all the circuit building challenges (also available throughout the game). The goals are the same as for the individual versions, but each member of the group controls one or more separate components of the circuit.

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Here's how one Minnesota AP Psychology Teacher mapped iNeuron to the neuroscience Standards for High School Psychology Curricula (APA):

Standards:

IIA-1.1 Identify the neuron as the basis for neural communication.
IIA-1.2 Describe how information is transmitted and integrated in the nervous system.
IIA-1.3 Analyze how the process of neurotransmission can be modified by heredity and environment.
IIA-2.1 Classify the major divisions and subdivisions of the nervous system.
IIA-2.2 Differentiate the functions of the various subdivisions of the nervous system.
IIA-3.1 Identify the structure and function of the major regions of the brain.
IIA-3.2 Recognize that specific functions are centered in specific lobes of the cerebral cortex.
IIA-3.3 Describe lateralization of brain functions
IIA-5.1 Describe how the endocrine glands are linked to the nervous system.

What our Learning Targets look like:

I can identify the parts of the neuron.
I can explain the electrical/chemical process of neurotransmission.
I can understand the different ways the brain uses motor and sensory neurons.

These are our Essential Learning Outcomes:

I. Brain

A. I can identify and explain the functions of a neuron.
B. I can explain the process of neurotransmission.
C. I can identify the divisions of the nervous system.
D. I can identify the functions of the endocrine system.
E. I can identify the lower and cerebral cortex brain structures and their functions.
F. I can explain the functions of the left and right hemispheres.
G. I can differentiate the scientific ways the brain is studied.