# Fairfax Collegiate
# 2026 Summer Program
# Neuroscience Course Syllabus
# Rising Grades 7-9

## Course Description

*Investigate how your brain works.*

Model the brain and neurons, explore EEG patterns, test reaction times, measure muscles' electrical signals, and dissect a sheep brain.

Learn about brain anatomy, neuron structure, action potentials, nerve fibers, brainwaves, sensory systems, and neurodegenerative diseases.

Students participate in hands-on experiments that connect biology, psychology, and physiology. With collaborative activities and engaging discussions, students build confidence as they explore the science of the nervous system.

Families receive photos and videos capturing students' lab activities, models, and final presentations. Students leave with a stronger understanding of neuroscience, increased scientific confidence, and a deeper curiosity about the brain and the mind.

---

## Learning Objectives

| | |
|---|---|
| **Course Goals** | **Understanding of Neuroscience:** Students gain a better understanding of the field of Neuroscience and how it relates to Biology, Psychology, Physiology, and Chemistry.<br>**Research in Neuroscience:** Students learn how to conduct research in Neuroscience through a series of lab experiments.<br>**Neuroscience in Today's World:** Students learn how to relate Neuroscience to today's world through investigating topics like neurodegenerative diseases and animal ethics. |
| **Course Topics** | **Brain Anatomy:** Students learn about the different lobes and areas of the brain.<br>**Neurons:** Students learn about the structure and function of neurons.<br>**Action Potentials:** Students investigate how neurons work by learning about action potentials, saltatory conduction, and synapses. |



*revised 2026-02-01*

| | |
|---|---|
| | **Nerve Fibers:** Students learn about the different types of nerve fibers in the Central Nervous System and the Peripheral Nervous System.<br>**Brainwaves:** Students learn about brainwaves, brainwave patterns, and the research techniques used to measure and record them.<br>**Sensory Systems:** Students learn about the different sensory systems by conducting a lab experiment devoted to sensory illusions.<br>**Brain Controlled Movements:** Students learn about how the brain controls movements by conducting a series of cockroach experiments.<br>**Neurodegenerative Diseases:** Students explore specific neurodegenerative diseases and learn about their similarities and differences. |

---

## Course Schedule

| | |
|---|---|
| **Class Meeting 1** | **Introduction & Icebreakers:** Students gain an understanding of what is to be expected from them in class. They will review the syllabus and any additional classroom rules.<br>**Discussion: What Is Neuroscience?:** Students learn about the field of neuroscience and basic brain anatomy.<br>**Activity: Modeling the Brain:** Students gain an introduction to the gross structures of the brain and their major functions by constructing a model of the brain out of play-dough.<br>**Activity: Brain Hat:** Students construct a "brain hat" to further their understanding of brain anatomy. |
| **Class Meeting 2** | **Discussion: Synapses:** Students learn about synapses.<br>**Activity: Rope Neuron:** Students gain an understanding about how neurons transmit messages and the difference between electric and chemical signals.<br>**Activity: Message Transmission:** Students reinforce what they have learned about electrochemical message transmission by modeling a chain of neurons.<br>**Activity: Neuron Worksheet:** Students work in groups to further develop their understanding of neuron structure and function.<br>**Discussion: Neurons:** Students learn about neuron morphology and function.<br>**Activity: Modeling a Neuron:** Students use what they have learned to create a model of a neuron.<br>**Discussion: Saltatory Conduction:** Students learn about saltatory conduction.<br>**Activity: Saltatory Conduction:** Students model a single neuron transmitting an electrical signal to gain an understanding about saltatory conduction. |

| | |
|---|---|
| **Class Meeting 3** | **Discussion: Glial Cells and Nerve Fibers:** Students learn about the importance of glial cells and the different types of nerve fibers.<br>**Activity: Reaction Times:** Students gain an understanding about transmission speed of signals.<br>**Discussion: CNS and PNS:** Students gain an understanding of the CNS and PNS.<br>**Video: Model Organisms:** Students watch a video to introduce the topic of model organisms.<br>**Discussion: Animal Ethics:** Students discuss the ethical implications of the use of animals in neuroscience.<br>**Activity: Animal Ethics Debate:** Students further their knowledge on animal ethics by participating in a debate. |
| **Class Meeting 4** | **Experiment Measuring Action Potential of the Hands:** Students work in groups of 2-4 to measure the action potential of their hands using the Muscle SpikerBox Pro.<br>**Activity: Gelatin Brain Mold:** Students construct gelatin models of the brain to further investigate brain anatomy.<br>**Final Group Projects:** Students gain understanding of neurodegenerative diseases by participating in a group project. |
| **Class Meeting 5** | **Sheep Brain Dissection:** Students learn about in-depth neural anatomy through participating in a lab dissection.<br>**Discussion: Sheep Brain Dissection Post-lab:** Students review the dissection lab in order to answer any questions that they might have. |
| **Class Meeting 6** | **Discussion: EEG and Brainwave Patterns:** Students learn about brainwaves and their patterns.<br>**Activity: Brainwave Controlled Helicopter:** Students further their understanding of brainwaves by using them to 'control' a helicopter.<br>**Activity: Mindset Headset:** Students explore their own brainwaves and the control they have over their own mind.<br>**Discussion: Sleep:** Students learn about sleep and sleep brainwave patterns. |
| **Class Meeting 7** | **Lab: Confusing the Senses:** Students learn about the different senses by completing a lab. |
| **Class Meeting 8** | **Discussion: Brain Controlled Movements:** Students learn about brain controlled movements and a simple reflex neuronal circuit.<br>**Activity: Neuroimaging:** Students learn about the different imaging modalities used in neuroscience. Students learn about different diagnostic tools used in neurology and neuroscience. |
| **Class** | **Final Group Projects:** Students gain understanding of neurodegenerative diseases by participating |

| | |
|---|---|
| **Meeting 9** | in a group project. |
| **Class Meeting 10** | **Final Group Project Presentations:** Students further their understanding of neurodegenerative diseases.<br>**Review Game:** Students play a review game to summarize what they have learned in the course. |