**Are you in control?**

**Topic: Motor Control of your body**

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**Grades:** K-5 adaptable

**Vocabulary words:** reflexes, body/movement control, movement

**Materials:** weights (2.5-10lbs), buckles for weight release, knee hammers

**Time needed: 10-15 min**

Introduction (2 min):

Neuroscientists and neuroscience

**Summary:** This lesson is a basic introduction to neuroscience that can be adapted for any elementary school class. Students learn that anyone can be a scientist, what neuroscience is, major regions and functions of the brain, how brains are similar and different depending on necessity of different animals, and that the building blocks of brains are neurons- in all animals. The lesson should emphasize interactive discussion about neuroscience and about animals’ brains.

Classes with an advanced understanding of neuroscience should skip introductions to neuroscience, but typically still enjoy comparing animal brains with advanced discussion, and making pipe cleaner neurons which can also incorporate advanced discussion.

This lesson is an excellent as a first-visit to a class, to be followed by a more specialized lesson.

**Prerequisites for Students:** None. Helpful if students understand the concept of cells.

**Learning Goals:**

* Dispel myths about scientists
* Introduce neuroscience as the study of the brain
* Think critically about different needs of different animals
* Learn that neurons are the building block of the brain

**Background for instructor:**

* Everyone can be a scientist, not just old men with crazy white hair. Think about myths about being a scientist that the children may have heard.
* We wear special clothes (Personal Protective Equipment) when in the lab; think about why we need to wear these as scientists, in clinical, basic, and animal labs. PPE protects us and protects our subjects (patients, animals, cells, etc)
* Refresh basic knowledge of parts of a brain and their functions (slides provided). Think about why some brain regions might look different in different animals to discuss with students.
* Refresh basic knowledge of parts of a neuron (slides provided)
* Time spent on each section may be modified to suit each class; experience has shown that students like and tend to spend most time in the 3 activities

**Set-up:** Setup a projector and computer for the slides, have PPE and pipe cleaners ready to distribute

**Lesson Outline:** Introduce yourselves and start by asking the students what they know about scientists and what types of scientists there are. Ask what a scientist looks like, and when they describe “mad scientists” from cartoons and media, discuss that you are scientists, and that they are all scientists, too.

Ask them to raise their hands if they’ve ever fixed a toy, or help a parent cook dinner, and explain that those are forms of science, too. Everyone should have their hand raised.

Ask them, “Who wants to dress up like a scientist?!” Have one volunteer come up to put on full disposable PPE (booties, gown, face mask, hair net, gloves; they often ask about safety goggles but we do not have any to give away). Have other students guess what parts of the outfit the volunteer will need, before they out them on; sometimes students who guess correctly can also wear that particular item. Discuss why we need each item in the lab: to protect ourselves from what we are working with, but also to protect our subjects (cells, animals, patients) from our germs.

Ask if anyone knows what a neuroscientist is, and explain that you are in fact a neuroscientist. Discuss why the brain is interesting and important to all animals, from ants on up. Discuss parts of the brain and their functions (younger classes, less specific anatomy: the front of the brain controls decision making, the part of your brain that understands vision is actually in the back) – point to each part of your head and have them point on their own heads. Cerebellum is a good region to specifically name and discuss.

Play the animal brain guessing game using the slides, and reveal the animal after they have correctly guessed it. Hand out the animal brain specimens for appropriate groups so they can see them in person. Discuss similarities and differences among animal brains. Have them guess why. Have them come up with hypotheses about what the brain of an animal not pictured or passed around would look like and why. They often like to discuss imaginary or extinct animals (unicorns, dinosaurs). Size is an obvious difference in animal brains, but guide them to thinking about the size of specific parts of the brain, or about the “bumps and folds” in the brain. Great example: fish, dolphins, and sharks have disproportionately large cerebelli. We learned that the cerebellum controls movement and coordination. Why might a fish need a bigger cerebellum? Because they navigate in 3-dimensions, while humans and other land animals navigate in only 2-dimensions.

Transition by saying animal brains might look very different and do different things, but they are all made of the same tiny building blocks: neurons. Discuss parts of a neuron (cell body, axon, dendrites), and that neurons help all the different brain regions talk to each other like telephone poles and wires.

Pass out 3 different colored pipe cleaners to each student (with help of teacher) and have them build their own neurons. Leave picture of neuron on the screen, but encourage creativity. Go around to each table to help students and talk to them about their neurons. At the end of class, gather all students together to put their neurons together in one giant class “brain” - this is a good photo op for the teacher.

**Wrap-up, final thoughts**: There is a lot that is introduced here, but reinforce the idea that the brain of every animal is made of neurons that communicate with each other to control everything an animal does. Every animal is different, so every animal brain is slightly different, and as neuroscientists we can study that.