Lesson Topic: The Body's Information Processing System

Objective:
Students will be able to:

1. Describe the body's information processing system.
2. Describe simple reflexes.
3. Identify a stimulus, response, and the sensory organ involved in a given scenario.

Time Required: 85 minutes

Materials Needed:

- Teacher computer with internet access
- Projector/Smartboard
- 1 computer/laptop/iPad per student with internet access
- The Body's Information Processing System handout (attached)
- 5 or more grades of sandpaper samples (available at hardware stores, Walmart, etc)
- Baggies

Teacher Preparation:

- Assign a Legends of Learning Instructional Quick Play playlist for the day(s) you will be teaching the lesson.
    - Instructional - Middle School - The Body's Information Processing System
- Assign a Legends of Learning Content Review Quick Play playlist for the day(s) you will be teaching the lesson.
    - Content Review - Middle School - The Body's Information Processing System
- Make copies of The Body's Information Processing System handout (1 per student)
- Gather samples of sandpaper, making sure the grade is written on the back of the sample. Cut the samples into smaller squares (3"x3" is good), so that each pair of students has one set. Organize the sets into baggies.

Engage (15 minutes):

1. Tell students that they are going to test their sense of touch.
2. Divide students into pairs.
3. Hand out a baggie of sandpaper to each pair.
4. One student (student 1) should lay out the pieces of sandpaper on the desk, making sure the other student (student 2) can't see the grade written on the back of the sandpaper.
5. Student 2 should feel the pieces of sandpaper and order them from smoothest to roughest.
6. The students can now check their "answers" by comparing their order to the grade written on the back (the higher the number (grade), the smoother the sandpaper).
7. Have students mix up the samples and switch roles, so that the other student can try arranged the samples of sandpaper in order of smoothest to roughest.
8. Ask students "What made you arrange the samples in the order that you did?"
    a. They felt different. Some were rougher and some were smoother.
9. Ask students, "How do you think you knew they felt different?"

a. Our nerves sent signals to our brain to tell our brain that they felt different. (note: students may not know the correct answer yet; this is a simple explanation they will probably be able to come up with for now).

Explore (30 minutes):

1. Have your students sign in to Legends of Learning. Instruct students to complete the Instructional playlist.
2. As students complete the assigned game, students should fill out the The Body's Information Processing System Handout.
3. Assist students as needed during game play, pause playlist if you need to address content or questions to the entire class.

Explain (20 minutes):

1. Review answers to The Body's Information Processing System by writing answers on the board or through a verbal discussion.
2. Relate student knowledge to demonstration at the beginning of class.
    a. What sense did you use to arrange the different grades of sandpaper? (touch)
    b. What was the stimulus? (sandpaper)
    c. What was the response? (feeling different sensations, textures, etc)
    d. What kind of cell detects the stimuli then transmitted the signals to your brain to be processed? (sensory neurons)
    e. How were you able to tell the difference between the different textures by touching them? (positive and negative signals either increased or decreased the response to the stimuli depending on how rough or smooth the sandpaper was).

Elaborate (10 minutes):

1. Tell students that sometimes when an organism is in immediate danger and needs to react quickly to avoid harm, signals do not go to the brain. Instead, our body reacts through reflexes as soon as signals reach the spinal cord. We react before we even know what is happening!
2. Show this video (2:34) that explains simple reflexes.
3. Ask students to list some other reflexes they can think of. Some possible answers might include:
    a. Blinking when something is being thrown towards your eyes
    b. Coughing
    c. Jumping when startled

Evaluate (10 minutes):

1. Have your students sign in to Legends of Learning. Instruct students to complete the Content Review playlist.
2. Analyze student results to determine what concepts need to be a focus for reteaching.

Additional Lesson Strategies:

- To use Legends for additional instruction, create a custom playlist with an instructional game and pre and post assessment.

- To use Legends for a quick formative assessment, create a 5-question assessment in a playlist.
- To use Legends for a student-directed experience, create a targeted freeplay playlist.
- Encourage students to play on their own at home in Legends of Learning: Awakening for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.

The Body's Information Processing System

1. Define stimulus and give an example.

2. Why is it important for organisms to respond to stimuli in their environment?

3. Animals use their sense organs to detect external stimuli. What are the 5 sense organs?

4. What body system drives an organism's response to stimuli?

5. Give an example of a reflex.

6. How does the nervous system help maintain homeostasis of an organism?

7. What kind of cell detects stimuli then transmits signals to your brain to be processed?

8. What kind of cell carries new signals to the muscles so your body reacts to the stimuli?

9. A signal that increases the strength of the response to a stimulus is called a _____ response. A signal that decreases the strength of the response to a stimulus is called a _____ response.

The Body's Information Processing System

Teacher Key

1. Define stimulus and give an example.
    a. A stimulus is a thing or event that causes an organism to react. Some examples include light, temperature, or a perceived threat (like a bear chasing you).
2. Why is it important for organisms to respond to stimuli in their environment?
    a. To keep the safe from threats and/or help them to maintain homeostasis.
3. Animals use their sense organs to detect external stimuli. What are the 5 sense organs?
    a. Eyes, ears, skin, tongue, nose
4. What body system drives an organism's response to stimuli?
    a. The nervous system
5. Give an example of a reflex.
    a. Pulling your hand away from a hot stove without even thinking about it (it is an automatic response to a dangerous stimulus).
6. How does the nervous system help maintain homeostasis of an organism?
    a. The nervous system detects internal stimuli and responds appropriately. For example, if you get too hot, you will start to sweat to help you cool off.
7. What kind of cell detects stimuli then transmits signals to your brain to be processed?
    a. Sensory neurons
8. What kind of cell carries new signals to the muscles so your body reacts to the stimuli?
    a. Motor neurons
9. A signal that increases the strength of the response to a stimulus is called a **positive** response. A signal that decreases the strength of the response to a stimulus is called a **negative** response.