THE SPINAL CORD

Student Pages

Produced by Regenerative Medicine Partnership for Education
Duquesne University
Director John A. Pollock • pollock@duq.edu
Art Director Joana Ricou • jiricou@gmail.com

Principal funding from Science Education Partnership Awards
National Center for Research Resources
National Institutes of Health

Designers Brianne Miller, Molly Bugaile
Hello! My name is Dr. Allevable and welcome to my lab! Make yourself comfortable and explore a little before beginning your work as my guest assistant. Oh, didn’t Regenerobot tell you? He seems to be forgetting things lately… I’ll have to fix his memory card again.

Well anyway, today you will be helping me gather some very important information about the spinal cord! The information you collect will help me with my Regenerative Medicine Project.

Before you begin your research, I have to fill you in on some important information about the spinal cord, so please pay attention.

Believe it or not, the spinal cord is made of the same material as the brain. They are both made of neurons! Together they make up the Central Nervous System.

The spinal cord connects the brain to the rest of the body and takes sensations from the body to the brain. Synapses are very important in the spinal cord because they are the point of contact between two neurons. They allow information, like sensations, to be passed between cells. Together, the spinal cord and synapses help you know the floor is cold when you touch it.

The neurons and their synapses in the spinal cord let you know the floor is cold when you touch it.

**Task**

As I told you at your arrival to my lab, you will be my guest research assistant. Your job today is to help me gather information about regenerative medicine. Your assignment is to research the spinal cord, since I heard you are becoming quite an expert! To gather your information, you will be using the Spinal Cord Module on my lab website.

Make sure you read all of the information on the website! It will be useful to you if I need to further discuss the spinal cord with you. At the end of this activity, you will show your lab supervisor and fellow researchers (your teacher and classmates as we sometimes like to call them) exactly what you have learned about the spinal cord in the human body. Remember to have fun and be prepared!
**Process**

You will use the internet to explore the fascinating spinal cord. Please follow the directions on the following pages of your *Reading Guide* to finish your research. After you complete each step of your task list, you will start the given assignment in class.

**Evaluation**

Once you have gained the necessary background information, you and your partner will showcase what you have learned about the spinal cord and regenerative medicine in whatever form you chose! This can include a poster about advances in regenerative medicine, a brochure about medical care for injured spinal cords, or even a flip book detailing what happens when a spinal cord is injured. Once you and your partner decide on a product, please share this idea with your teacher so he or she may record it. Remember, the project types listed are simply ideas! You can create whatever you want, but be sure to check with your teacher for specific content he or she would like to see. Share your finalized projects with your classmates to compare and contrast information you found in my lab.

**Conclusion**

Please follow the directions provided on the following pages. If you have any questions, remember to quietly raise your hand and your teacher will be around to help. Also, take a minute to think about proper computer lab behavior you have learned. If you are unsure, feel free to ask your teacher again!
Reading Guide

Part 1:
(Please check off when complete)

◊ Go to the following website: http://www.sepa.duq.edu
◊ Click “Visit the Lab!”
◊ Give the lab a chance to load
◊ Click on “Spinal Cord Module”

1. Write T or F to mark the following statements true or false. If it is false, change the statement so it is true.
   ___ The spinal cord is soft like jelly.
   ______________________________________________________
   ___ The spinal cord is as big around as your pinkie.
   ______________________________________________________
   ___ The spinal cord is made of cells called neurons.
   ______________________________________________________
   ___ Only the brain is a part of the central nervous system.
   ______________________________________________________
   ___ Messages from your brain are carried through your nerves.
   ______________________________________________________

2. What are the longest cells in the human body?
   ______________________________________________________

◊ Read the Introduction page that pops up and complete the following Part 2:

◊ Click the black NORMAL FUNCTION tab at the bottom of the Spinal Cord Module screen
◊ Read this section and answer the following questions:

1. What is the function of the axons on the neuron cells?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
Part 3:

◊ Click the black SYNAPSES tab at the bottom of the Spinal Cord Module screen
◊ Read this section, click to watch “How Synapses Work,” and answer the following questions:

1. Why is it important for neuron cells to have many appendages?

____________________________________________________________
____________________________________________________________
____________________________________________________________
____________________________________________________________

2. Arrange the following sentences by writing the correct number on the line (1-7) to explain how synapses work.
   
   ____ The chemical message is released from neuron #1.
   ____ The electrical signal moves along the cell’s axon until it reaches its endpoint, a synapse.
   ____ The neuron creates an electrical signal to represent that information.
   ____ The chemical message spreads across the gap between cells to neuron #2.
   ____ A neuron receives an important piece of information.
   ____ When enough synapses are active, the signal threshold is reached and the electrical signal passes along the cell’s axon to its end.
   ____ The chemical message binds to special receptor proteins on neuron #2.
   ____ Receptor proteins on neuron #2 are activated and cause the cell to begin creating an electrical signal again.
   ____ The electrical signal is then changed into a chemical message at the synapse.

2. What is the total length of all these cells in the body?
Part 4:

1. Each of the boxes below include two statements that are related as cause and effect. Mark the following sentences in each set with a “C” if it is a cause or an “E” if it is an effect.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>The axons swell.</td>
<td>Axons shed their protective coating.</td>
</tr>
<tr>
<td>Blood supply is cut off from the spinal cord.</td>
<td>The spinal cord swells.</td>
</tr>
<tr>
<td>The message is interrupted between synapses.</td>
<td>A scar forms.</td>
</tr>
<tr>
<td>Neurons die and break open.</td>
<td>Damaged cells leak and cause swelling.</td>
</tr>
</tbody>
</table>

2. Complete the following analogy:

   A fallen telephone pole is like a(n)_________________________neuron cell.

   Why is this analogy true?

   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________

Wow! You are done already? Well take a look at the next page for other fun sites to discover more about the spinal cord!
More Websites!

◊ Neuroscience for Kids:
http://faculty.washington.edu/chudler/spinal.html
- Explore more about the spinal cord! Look at cool diagrams, listen to
audio links to hear spinal cord vocabulary, and play online activities like a
“Spinal Cord Match-Up Puzzle” and a “Spinal Cord Puzzle.”

◊ Neuroscience Coloring Pages:
http://faculty.washington.edu/chudler/colorbook.html
- Click on any of the links on this page to print out a full-page picture to
color. Try labeling the picture once it is colored with your new knowledge
of the spinal cord.

Evaluation Choices

Now that you have had a chance to complete your research in my lab,
why don’t you show your supervisor and colleagues (your teacher and
classmates) what you know! Create a visual presentation with both images
and writing that depicts at least 6 things you learned about the spinal cord
and regenerative medicine. Remember to cite your sources! Some possible
ideas include:

◊ An informative poster about new medical advances associated with
  Regenerative Medicine and the spinal cord
◊ A brochure about medical care for injured spinal cords
◊ A flip book detailing the processes that occur when a spinal cord is
  injured
◊ Have another idea? Please see your teacher before you start.