Internet of Things (IoT) at UCF

UNIVERSITY OF CENTRAL FLORIDA

UCF RET Site: Collaborative Multidisciplinary Engineering Design Experiences for Teachers

#2000360 Anatomy and Physiology

Tracy Ebert

2000360 Anatomy and Physiology

7/18/18

RET Site: CoMET Lesson/Unit Plan

Course(s): Anatomy and Physiology
Grade Level: 11th and 12th
Suggested Length of Lesson: 4 days

Materials/Technology Needed

- Model of the brain
- 2 models of vertebral column
- Batteries
- Copper wire
- Light bulb
- Motor?
- Model of foot?

Where this Fits

- When teaching students about the physiology of nerve conduction and the characteristics of nervous tissue.

Lesson Objective(s)/Learning Goal(s)

- Explain how sensory signals and motor commands are relayed through the spinal cord and spinal nerves.
- Locate and identify the spinal nerves and nerve plexuses

Standard(s)/Benchmark(s) Addressed

SC.912.L.14.11 - Characteristics of tissue (nervous)
SC.912.L.14.21 - Anatomy, histology, and physiology of the central and peripheral nervous systems and name the major divisions of the nervous system
SC.912.L.14.22 - Physiology of nerve conduction, including generator potential, action potential, and the synapse
SC.912.L.14.25 - Major parts of a cross section through the spinal cord

Evidence of Learning (Assessment Plan)

- There will be a pre-activity question about spinal cord injuries
- Questions to answer during the simulation
- Post simulation questions about how to treat spinal cord injuries

Instructional Strategies

- Modeling
- Cooperative Learning
- Inquiry Based Learning
- Closed Reading
- Lecture
- Guest speaker
- Formative Assessment

Description of Lesson Activity/Experiences

Day 1:

1. Students will be introduced to the circuit model. There will be a closed circuit as well as a severed circuit. On the hand out they will have to explain the difference between the two and what observation they make about the severed circuit
2. The students will watch the video and answer some guiding questions on the worksheet https://www.youtube.com/watch?v=sZD_2mtKPrE
3. Students will then be asked, on the worksheet, to relate what they observed with the circuit to what they learned in the video.

Day 2:

1. Lecture on the spinal cord and how nerves transmit signals

Day 3:

1. Closed reading of the article: **Nanomaterials for Spinal Cord Injury Recovery**
2. Guided questions, will be asked, to help them understand the carbon nanotubes and their possible use in spinal cord injuries.
3. Students will then work with a partner to research possible experimental treatments that are now being used with spinal cord injuries. They will have to compare and contrast the two and then explain the benefits as well as the shortfalls of each.

Day 4:

Guest speaker who is paralyzed from the waist down speak about her injury and what life is like for her now

Day 5:

1. Guest speaker from UCF, College of Sports Medicine, to show the students how to backboard and also rehab someone with a spinal cord injury

Day 6:

1. The students will answer a few post activity questions which will consist of 2 or 3 questions from each of the activities. In addition, they will have to write a 5 sentence summary of their learning.

List of Recommended Assessment(s) and Steps

- The students will complete a worksheet while completing the circuit activity and watching the video. Some of this will assess pre-knowledge and some will be assessing what they are learning during the process
- There will be a post assessment that will consist of about 10 questions and a summary of their learning

Materials/Resources Used

- Circuits – wires, D batteries, alligator clips, and small light bulbs
- 3D printed vertebrae (if I can get them made or purchased)
- Models of brains to simulate connection of the spinal cord nerves to the brain

You can create multiple lesson plans if you are developing a unit.

Important Vocabulary

Term and Definition
Axon- portion of a nerve cell that conducts nerve impulses away from the cell body. **Central Nervous System**- portion of the Nervous System consisting of the brain and spinal cord. **Nerve** - a bundle of nerve fibers located outside of the Central Nervous System. **Neurons**- cells in the Nervous System that are specialized to initiate and conduct electrical signals throughout the body. **Neurotransmitters**- chemicals stored at the ends of axons. Responsible for signal transmission across a synapse. **Spinal Cord**- the nerve cord housed within the vertebral column. Runs from the base of the brain to the lower spine. **Synapse**- the link between neurons which includes the presynaptic membrane, the synaptic cleft, and the post synaptic membrane. **Vertebrae**- bones that make up the spinal column. **Glial Cells**- non-neural cells in the Central Nervous System that help regulate the extracellular environment.

Troubleshooting Tips

Because of the guest speakers that will be coming into the class it would be very easy for the students to lose sight of what they are supposed to be learning. That is why the actual goals of the learning will be done over the first 3 days of the lesson and assessed as they are doing the activities. The guest speakers will really only be meaningful if they have met the learning expectations. If they have not then it will be difficult for them to participate in the back boarding exercise or to understand what happened to the speaker who is paralyzed.

Other Helpful Information

The closed reading is going to allow the students to apply the information that they learned when doing the circuit activity. From that activity they will learn that until we “close the circuit” the spinal cord is no longer functional. The close reading will allow them to explore using the CNT to not only be used as a temporary “bridge” but also to be “doped” with chemicals/hormones that might stimulate growth of new cells in an effort to regenerate the damaged area.

Attachments

List here any lesson or activity attachments not included within this document, such as the following:

- PowerPoints for lecture
- Activity/Video questionnaire
- Post assessment “quiz’

Remember to send these as separate files along with your unit/lesson plan.

References

Rodolfo Amezcua1, Gina Vimbela2 and David A Stout (2017). Nanomaterials for Spinal Cord Injury Recovery. iMedPub Journals, 3, 1:3. Doi: 10.21767/2471-8173.10003

Acknowledgements

Authors

Tracy Ebert and Zachary Morgan

Supporting Program

RET Site: COMET Program, College of Engineering and Computer Science, University of Central Florida. This content was developed under National Science Foundation grant #EEC-1611019.

Contact information

Tracy Ebert: tracy.ebert@ocps.net