

## Lesson Plan

### BCI Jeopardy

**Book:** *Brain-Computer Interfaces*

**Series:** Science for the Future

**Level:** Voyager

### Objective

To help students demonstrate understanding of key concepts and terms from a text about brain-computer interfaces.

### Supplies

- *Brain-Computer Interfaces* book
- Whiteboard
- Whiteboard markers

### Before the Activity

Have students read the *Brain-Computer Interfaces* book. Draw the following chart on the whiteboard:

Brain Activity	Device Design	Senses and Signals	Device Types	Treating Disease	Brain Parts
100	100	100	100	100	100
200	200	200	200	200	200
300	300	300	300	300	300
400	400	400	400	400	400
500	500	500	500	500	500

### Activity

*Brain-Computer Interfaces* describes the various kinds of BCI devices, the tasks they do, and the parts of the body they interact with. To review these terms and details, have students play a game of Jeopardy. Divide students into three or four teams. On each team's turn, its members can choose a category and number from the chart on the whiteboard. You will read the corresponding clue out loud. Team members have 30 seconds to decide on an answer. They should format this answer as a question. For example, suppose the clue said, "A thin, bendable sheet or skin." The correct answer would be "What is a membrane?"

Students can use the book to find or confirm their team's answer. If students guess correctly, add points to the team's score on the whiteboard. Then erase that box, and let the next team choose a clue. Use the following list of clues:

## Brain Activity

- 100: Cells that connect together end to end and send messages using chemicals and electricity. (What are neurons?)
- 200: Signals that appear in the brain shortly after a person notices something of interest. (What are P3 signals?)
- 300: Brain signals that show up when someone moves or thinks about moving. (What are sensorimotor rhythms?)
- 400: A test that shows the levels of activity in different parts of a person's brain. (What is an electroencephalogram, or EEG?)
- 500: Signals relating to the process used by living things to produce or break down energy. (What are metabolic signals?)

## Device Design

- 100: A connection between a human brain and a device inside or outside the body. (What is a brain-computer interface, or BCI?)
- 200: Devices that are placed inside the body using surgery. (What are implants?)
- 300: The part of a BCI that makes the signals clearer. (What is an amplifier?)
- 400: The part of a BCI that turns electrical signals into digital signals that a computer can read. (What is a converter?)
- 500: Devices through which electrical signals enter or leave an area. (What are electrodes?)

## Senses and Signals

- 100: The system, made up of the brain and spinal cord, that tells the body how to respond to the outside world and to conditions within the body. (What is the central nervous system?)
- 200: The nerve that sends information from the eye to the brain. (What is the optic nerve?)
- 300: The nerve that carries signals from the ear to the brain, where they are interpreted as sounds. (What is the auditory nerve?)
- 400: Organs in the body that produce chemicals used by other parts of the body. (What are glands?)
- 500: The layers of cells at the back of the eye that sense light and send signals to the brain. (What is the retina?)

## Device Types

- 100: A robotic suit that can move a person's limbs. (What is an exoskeleton?)
- 200: A machine that turns text into sounds that imitate human speech. (What is a speech synthesizer?)
- 300: A type of BCI that helps people with hearing loss detect sounds. (What are cochlear implants?)

- 400: A type of BCI that uses electrodes placed deep in the brain. (What is deep brain stimulation, or DBS?)
- 500: A tiny device that can be placed directly into a patient's blood vessel without surgery. (What is a stentrode?)

### Treating Disease

- 100: A condition where people are conscious but cannot speak or move their muscles. (What is locked-in syndrome, or LIS?)
- 200: Periods of abnormal electrical activity in the brain and the symptoms they cause. (What are seizures?)
- 300: A disease that causes shaking movements called tremors. (What is Parkinson's disease?)
- 400: A study where people volunteer to test a medical treatment to see if it will be safe and effective. (What is a human trial?)
- 500: A disease that attacks nerve cells in the spinal cord and brain and weakens muscles. (What is ALS, or Lou Gehrig's disease?)

### Brain Parts

- 100: The part of the brain that controls basic functions, such as breathing and heartbeat. (What is the brain stem?)
- 200: The part of the brain that helps with movement and balance. (What is the cerebellum?)
- 300: The part of the brain that is responsible for more complex thinking. (What is the cerebrum?)
- 400: The membrane that covers and protects the brain. (What is the dura matter?)
- 500: An area connected to parts of the brain that affect emotion, memory, sleep, and more. (What is Brodmann area 25, or BA25?)

### Evaluation

The team with the most points at the end of the activity wins. If you need a tiebreaker, use one of the following clues:

- A word that means "Having to do with artificial body parts." (What is *prosthetic*?)
- A word that means "Using mechanical parts and electronic devices to help perform tasks." (What is *bionic*?)

### Standards

This lesson may be used to address the Common Core State Standards' reading standards for informational texts, grade 7 (RI 7.4).