

## CLASSROOM ACTIVITY

# Tapping In: The Promise of Brain-Computer Interface

For decades, neuroscientists have sought to use electronics to communicate with the brain. Computing and surgical technique have now become sophisticated enough to implant devices directly into neural tissue. In this feature, researchers at Albany Medical Center and the Wadsworth Center at the New York State Department of Health reveal a world where mind and machine merge. Their cutting-edge devices translate brain signals into action, helping people with ALS and other disabilities regain the ability to communicate.

## CLASS DISCUSSION

### Establish Prior Knowledge

Call on students to share what they know about how the brain works. If necessary, direct students to this website to learn more: [http://www.amnh.org/exhibitions/brain/brain\\_intro.php](http://www.amnh.org/exhibitions/brain/brain_intro.php)

Review that the brain is an electrical organ and brain cells communicate through electrochemical signals. Point out that scientists are using computers to identify when the brain's electrical frequencies occur, in what area of the brain, and during what function. This brain computer interface (BCI) is helping scientists begin to understand the brain's electrical language. Explain that in the video they are about to see, scientists use brain computer interface to help severely disabled people communicate.

### Exploration

Have students read the synopsis and watch the video. Use the following questions to guide a class discussion.

- How does the EEG (Electroencephalogram) brain computer interface (BCI) work?  
*(Answer: A person wears an electrode cap with 8 electrodes that touch the scalp. These electrodes measure brain waves. The computer monitor shows an array of letters, numbers, and functions that flash. The system looks at the brain's response to those flashes. When a letter, number, or function flashes that the person wants, the brain responds with a brain wave that the computer identifies.)*
- What are some of the drawbacks of the EEG brain computer interface?  
*(Answer: When the signals are recorded from the scalp there are head movements, eye movements, non-brain noise and other interferences which needs to be filtered out.)*
- Electrocorticography or ECoG is another brain computer interface. How is ECoG different from EEG?  
*(Answer: It is a more advanced BCI that picks up brain waves with electrodes or a recording device that is implanted directly on the surface of the brain.)*
- What does the ECoG BCI allow researchers to do?  
*(Answer: It allows them to differentiate behaviors, such as moving a hand, by looking at where the activity changes in the brain. The activity shows up on the monitor in the form of a red dot. The more active the area of the brain, the bigger the dot. The ECoG system also records activity when the patient simply imagines the word. In reverse, the system can also analyze a brain activity to decipher what the patient is thinking.)*

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# Tapping In (cont'd)

### Wrap-Up

Use the following questions to wrap up your discussion:

- What are the pros of BCIs?  
*(Answers will vary but should include the idea that these programs will help people with disabilities to communicate and will allow them to live fuller lives.)*
- What might be some ethical issues connected to BCIs?  
*(Answers will vary. The technology could be used for various unethical purposes, such as spying or mind control.)*