Unit 10
Neurobiology

Description

Neurons are wired together in a complicated network and connect to other neurons via synapses. Day-to-day changes in synapses can lead to a higher rate of response to a given level of neurotransmitter at a particular synapse; these changes are partly responsible for memory and learning. Neurotransmitters, such as dopamine, that function in the reward pathway underlie behaviors essential for survival, and also are responsible for behavioral problems associated with addictive drugs.

Menu of Unit Activities

Note: All activities, handouts, solutions, and tips can be found in the Appendix of this guide.

Activity 1: Connections (15 minutes + 30 minutes of video)

A discussion around a diagram of neurobiology terms that have conceptual connections.

Activity 2: Penny for Your Thoughts (10 minutes)

Recalling details of an everyday object as a way to stimulate thought on what makes something forgettable or memorable.

Activity 3: Action Potentials (60 minutes)

A demonstration of how ions change the membrane potential of neurons, using small objects to represent ions, and boxes with openings to represent neurons with ion channels.

Activity 4: Sex, Drugs, and Neurobiology (25 minutes)

Readings from the Neurobiology online text on drugs and the nervous system, with discussion questions.

Activity 5: Fountain of Youth (10 minutes)

A discussion on the development of neurons in adults and the role of environmental stimulus in neurogenesis.

Before the Session

Facilitator: Copy and assemble the following activity materials. (See the Activities section in the Appendix of this guide for master copies of transparencies and handouts, plus Tips and Suggested Answers.)

Activity 1: Connections requires:

- One copy of the Diagram of Terms per person (master copy provided)

Activity 2: Penny for Your Thoughts requires:

- One set of the Parts of a Penny per two people (master copy provided; to make a set, cut on the dotted lines after copying)
- One penny per two people (as the answer key)

Activity 3: Action Potentials requires:

- One copy of the Instructions per four people (master copy provided)
- One copy of the Neurobiology online text chapter per four people (available online at http://www.learner.org/channel/courses/biology)
- One copy of the Discussion Questions per person (master copy provided)
- One set of 100 small, colored objects per four people. (The objects can be balls, chocolate-covered candies, jellybeans, coins, or gumdrops. Each set should have 30 blue, 49 red, and 21 green objects.)
- One box for every four people. The boxes should be open at the top to allow visualization and manipulation of the colored objects. Make two panels in the sides of each box that can be opened and closed, and are sufficiently large that they permit the addition and removal of the objects. For Exercise 2, have at least three boxes.
- One piece of graph paper per person
- Tips and Suggested Answers

Activity 4: Sex, Drugs, and Neurobiology requires:

- One copy of the Neurobiology Online Text Chapter Excerpts per person (master copy provided)
- One copy of the Discussion Questions per person (master copy provided)

Activity 5: Fountain of Youth requires:

- One copy of the Discussion Questions per person

Facilitator: Make sure that the room has these supplies:

- pens or pencils and paper
- overhead projector and markers
- VCR and TV
- black/white board with chalk or markers

Session Activities and Video

Activity 1a: Connections—Pre-Video Activity (10 minutes)

- Read the Setup.
- Arrange into pairs.
- Have each person take a handout with the Diagram of Terms.
- Spend 10 minutes in pairs, making and explaining as many connections between the terms as possible.

Facilitator: Emphasize that not all the terms will be familiar. This is just a warm-up exercise to begin thinking about neurobiology.

Video, Part 1 (7 minutes)

- Watch the first part of the Neurobiology video.

Facilitator: Start timing the Neurobiology video at the Annenberg/CPB logo and watch for about 7 minutes. Stop the video just after the host says, "One area of study that forges ahead as scientists understand more about how neuronal connections change is the study of learning and memory."

Activity 2: Penny for Your Thoughts (10 minutes)

- Read the Setup.
- Arrange into pairs.
- Have each pair take a set of the Parts of a Penny.
- Spend 10 minutes in pairs, making the diagram and discussing why the details of everyday objects are—or are not—familiar, and what makes an object or an event memorable.
- Check finished diagrams against a real penny.
- Variation: Do the activity before beginning to watch the video.

Video, Part 2 (23 minutes)

- Finish watching the Neurobiology video.

Activity 1b: Connections—Post-Video Discussion (5 minutes)

- As a group, go over the Connections Diagram of Terms. See if anyone picked up new connections to make after watching the video.

Session Activities and Video, cont'd.

Activity 3: Action Potentials (60 minutes)

- Read the Setup.
- Arrange into teams of four. Within each team, designate one person as scorekeeper, one as gatekeeper, and two as ball handlers.
- Have each team take a copy of the Instructions, the Neurobiology online text, one set of colored objects, and one box.
- Have each person take a copy of the Discussion Questions and a piece of graph paper.
- Spend 20–30 minutes in teams doing Exercise 1 and discussing the Discussion Question.
- Set up the boxes and colored objects to do Exercise 2 as a group.
- Spend 20–30 minutes doing Exercise 2 and discussing the Discussion Questions.

Activity 4: Sex, Drugs, and Neurobiology (25 minutes)

- Read the Setup.
- Arrange into teams of three.
- Have each person take a copy of the Neurobiology online text excerpt and a copy of the Discussion Questions.
- Spend 5–10 minutes reading Section 1 of the text excerpt, then discuss the first set of questions in teams of three.
- Spend 5 minutes reading Section 2 of the text excerpt, then discuss the second set of questions in teams of three.
- Review some of the questions and points that were the most controversial in the small team discussions as a group.

Activity 4: Fountain of Youth (10 minutes)

- Read the Setup.
- Have each person take a copy of the Discussion Questions.
- Discuss the questions as a group.

Summary (5 minutes)

- If time permits, as a group or in pairs, define the major ideas or "take home" lessons of this unit and its applications.