SN IN HIGH SCHOOLS

November 12, 2016
Spider Hearing and Robot Senses

Activities

ACTIVITY 1: WHAT IS THIS ANIMAL TELLING ME?

Class time: Approximately 30 to 60 minutes

Purpose: Practice observing animal behavior

Notes to the teacher: This activity begins by using dogs as an example but can be completed using any animal that is available and familiar to students.

Materials:

- Internet access or a printout of a dog behavior chart (for example, this "Dog to English translation chart" from Dogs for Defense or this Canid Ethogram from Texas A&M University)
- Internet access to *Science News for Students* or a printout of the article "Fair play" found at www.sciencenewsforstudents.org/article/fair-play
- Video of dog behavior (there are numerous available on YouTube or create your own)

Directions:

1. Ask students to think about how animals, including insects and spiders, can't use words to communicate. And yet we can know something about their state by observing specific behaviors.

2. Ask students what they might be able to learn from an animal based on observations of that animal's behavior (accept all reasonable answers). Discuss how animals, including bees, communicate with each other as well as with predators and prey. In 1973, Karl von Frisch shared the Nobel Prize in physiology or medicine for his work in understanding how honeybees communicate. Students might be interested in researching his work and that of others who study animal communication.

3. Give students a guide to dog behavior and discuss. Then watch a video of dogs interacting with a human and use the guide to decipher what that human could infer from the dog's behavior.

   a. Discuss students' findings. What was easy or difficult to decipher? Did everyone see the same behaviors and interpret them in the same way? What would reduce variability in observations and/or interpretations?

   b. This could lead to a discussion on why scientists often record videos of animal behavior and how those videos are used for analysis. Such a discussion could also bring up questions of whether video can distort the animal's original behavior by reducing the visual field, for example.

4. Extension: Have students read, "Fair play" and discuss the following questions:

   a. What do dogs learn from playing?

   b. Why are videos used by scientists to better understand dog play? How does new technology help

scientists do this kind of study?

c. How does play help animals and people explore the limits of socially appropriate behavior?

d. What aspects of the environment could affect play?

ACTIVITY 2: YOU ARE THE ANIMAL BIOLOGIST

Class time: Approximately two, 60-minute class sessions plus possible time outside of class

Optional Materials:

- A motion-activated camera such as this one available on ebay for around $15

Directions:

1. Students should work in pairs to develop a behavioral study. Educators should define the type of study and approach based on what is most appropriate for their classroom. Consider whether students should choose a pet at home or an insect in the classroom to observe. Decide what parameters you should place on the nature or scope of their research. (Possible animals to consider include ants, bean beetles, fruit flies, pill bugs, etc.)
2. Have students select a stimulus (making a loud sound, knocking on a closed door, turning on a light, for example). They will present the stimulus to the animal to study how the animal responds. Make sure the chosen stimulus will not physically harm the animal.
3. Students will plan their experiment with the help of Blackline Master 4. Ask them questions to guide their design process:
   a. What is your hypothesis?
   b. What are your variables?
   c. How will you administer the stimuli?
   d. How many individual animals will you test? All of the same species? Same sex?
   e. How will you perform your test?
   f. How will you collect your and record your data?
   g. How will you be sure you, as the researcher, aren't influencing the animal's behavior?
4. Give students time to collect their data and bring it back to class. Have students share their data and discuss the most appropriate type of statistical analysis. This could be very simple (mean, median, mode) or could be more robust (ANOVA, T-test) based on students' math backgrounds. What questions come from looking at the data? How might these questions be answered if the study was continued?
5. Scientists share their findings. Some scientists write scholarly papers. Others speak about their findings at community meetings or participate in the creation of public service announcements. Ask groups to determine the best way to communicate their findings to an interested audience.

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Activity: You are the Animal Biologist

Part 1 Directions: Use the prompts below to help you plan and execute your experiment.

1. What animal do you want to observe?

2. Define the stimulus you will use for your test.

3. Develop a hypothesis based on what you are trying to determine.

4. Define your experimental variables. Are there any potential confounding variables that you should design your experiment to avoid?

5. How will you administer the stimuli?

6. What data will you collect? How will you organize it? Create a data table to organize your data collection.

7. What statistical test are you planning to use based on the data you hope to collect?

8. How many different animals do you plan to observe? Does the statistical test you are hoping to use require a certain number of samples?

9. Write your procedure for performing your experiment. Be as detailed and specific as possible.

Part 2 Directions: Now, use the prompts below to analyze your data.

1. Based on your chosen statistical test, what story does your data tell about your animal's behavior? Explain.

2. Did you prove or disprove your hypothesis?

3. Decide on a way to visually display your data and results? Make sure you label your visual and provide keys for any necessary information.

4. What sources of error do you believe existed in your experiment? Would there be a way to remove the potential error in a future experiment? Explain.

5. As you examine your data, what new questions arise? How could you test those new questions?