SCIENTIFIC AMERICAN FRONTIERS
TEACHING GUIDE

www.pbs.org/saf/1201

Pet Tech

Activity 3: Grades 5-8
Animal Training

In Entertaining Parrots, you observed that a parrot could distinguish between several different colors and vocalize the name associated with a specific color. But isn't it common knowledge that animals other than humans are colorblind? Is this parrot special or can other animals also distinguish between colors? Since you can't ask an animal if it detects colors, you'll need to acquire this knowledge in another way. A well-designed set of experiments might answer the question "Can my pet distinguish colors?"

OBJECTIVE

This activity page will offer:

- An introduction to animal training
- An opportunity to explore color perception
- A computer experience in creating specific color characteristics

MATERIALS

- Pet dog
- Dog treats (for rewards)
- Opaque plastic bowls
- Tape
- Heavy stock paper
- Access to a computer (with basic paint program) Note
- Color Printer

***TEACHER NOTE**: Be sure students know that they must have adult supervision throughout this training session. A form signed by both the student's guardian and the dog owner must be submitted and approved by you prior to any physical interactions with the dog.

Part 1- Shades of Gray
PROCEDURE

1. Open a palette from any color paint program.
2. Observe how easily the colors are distinguished from each other.
3. View your palette with a monochrome (shades of gray) display
4. What happens to the colors? Can you still tell most apart?
5. In order to insure that the dog is distinguishing colors (and not shades of gray), you'll need to create special colors that have the same "gray value". It may take you some time to get this critical mix, but don't give up. Work with these three target colors: blue, red, and violet. Vary the hue, saturation, and brightness to create this test palette. When you finally have a selection of these colors that appear as identical shades of gray, you are ready to proceed.

TEACHER NOTE: You may want to assist students with this portion of the activity. Here are the slider values for three different colors (red, blue, and purple) that appear identical when seen in grayscale. The values are for using either the RGB sliders or the HSB sliders in the application Adobe Photoshop

Using RGB sliders:

Red	red = 223	green = 0	blue = 40
Blue	red = 0	green = 101	blue = 223
Purple	red = 191	green = 0	blue = 191

Using HSB sliders:

Red	H = 349	S = 100	B = 87
Blue	H = 213	S = 100	B = 87
Purple	H = 300	S = 100	B = 75

Part 2- Selecting A Difference
PROCEDURE

1. Fill each of the plastic bowls with snacks, then empty. This will distribute a food smell among the three bowls.
2. Invert the three bowls and place them on the floor in a side-by-side arrangement.
3. Print out a small square of one of your colors (2" by 2"). Cut out two additional scraps of white paper that are the same size. Turn the bowls over and use tape to attach one scrap to the bottom of each bowl, white on two, and the color on one.
4. Place a small amount of food beneath the "color" target bowl.
5. Have your dog examine the three inverted bowls. Let the animal select one bowl to overturn. If no selection has been made, expose the food

treat in the color bowl. If the dog overturns the wrong bowl, set it back up and try again. Be sure to praise the dog if it overturns the correct bowl.

6. Repeat this action several times in a ten-minute session. Randomize the placement of the target bowl, but always keep the treat beneath the colored square.
   NOTE: To increase training efficiency, have multiple sessions and limit the time of each session to ten minutes.
7. Record your observations.

PART 3- The Test

1. Reassemble your test setup. This time replace the two white squares with the two other colors you created.
2. Choose a target color.
3. Allow your dog to select once again from these three bowls. Reward a correct selection, then repeat the exercise randomizing the placement of the target bowl but using the same target color. If necessary, display where the treat has been kept. Remember to spread out these training sessions and limit them to about ten minutes at a time.
4. Record your observations.

ANALYZE YOUR OBSERVATIONS

Was your dog able to distinguish the colored target from the white squares of paper? How could you tell? How many trials did it take your dog to "connect" that food was beneath the colored target? Was your dog able to distinguish between the three different colors (that have the same gray appearance)? How many trials did this type of training take? Do you think that your pet was able to distinguish color, or simply shades of gray?

TESTING OTHER PETS

Does you or a friend own another pet, like a cat or a bird? How might you modify this experiment to test these animals for color-blindness? Write up your ideas and test them out, with the permission of your teacher and the pet owner.

ZOO CONNECTION

Contact a local zoo or aquarium. Speak with an animal trainer and learn more about his or her skills, career and responsibilities. Find out what types of animals are easiest to train. What sort of structure and frequency do they have to their training periods? Are there "special" strategies for training zoo animals that can be applied to house pets?

WEB CONNECTION

Color Blindness
http://www.dai-sho.com/colorblindness/index.html
color blindness in humans information page

The Straight Dope
http://www.straightdope.com/classics/a2_004.html
article on color perception in dogs and cats

Dog Training
http://www.faqs.org/faqs/dogs-faq/training/
a huge FAQ list on dog training that is applicable to other animals as well

The activities in this guide were contributed by Michael DiSpezio, a Massachusetts-based science writer and author of "Critical Thinking Puzzles" and "Awesome Experiments in Light & Sound" (Sterling Publishing Co., NY).

Academic Advisors for this Guide:
Corrine Lowen, Science Department, Wayland Public Schools, Wayland, MA
Suzanne Panico, Science Department, Fenway High School, Boston, MA
Anne E. Jones, Science Department, Wayland Middle School, Wayland, MA