Factors that Attract Hummingbirds

Grade Level: Elementary, Middle School, High School
Ecological Concepts: **Behavior**, **Preferences**, **Competition**
Arizona Science Standards: Science as Inquiry; Life Science

Materials:

1) Cane sugar
2) Water
3) Hummingbird feeders
4) Bowl, spoon and heat source for mixing sugar and water
5) Measuring cups
6) Writing/drawing materials
7) Colored Paper

BACKGROUND
Hummingbirds and many insects feed on the nectar (sugar fluid) of flowers. This nectar provides food for the animal and the actions of the insect or bird often pollinate the flower. Pollination is the transfer of pollen from one flower to another flower of the same species. The pollen is the male genetic material of a plant needed to fertilize the ovules (eggs) of the flower in order to produce seeds. Flowers come in many sizes, shapes, colors and levels of sugar in their nectar. Hummingbirds usually feed on a flower one bird at a time. Male birds are particularly territorial about "their" flowers. Even at a large artificial feeder only one male hummingbird will feed at a time. Females can usually feed along with males or other females.

GUIDED INQUIRY
Observation/Exploration Period: Observe hummingbirds in the habitat. Some behaviors to look for are where the hummingbirds go, what flowers or feeders they go to, how long they feed at a flower or feeder, and where and how long they rest.

Group Discussion and Question Period: What causes a hummingbird to be attracted to a flower? Do hummingbirds prefer some flowers to others? What flowers do they go to? What are the colors, sizes and shapes of those flowers? How much time do they spend at each flower?

Important aspects of guided inquiry are encouraging students to generate multiple hypotheses, and letting students make decisions about what data are important and create their own data sheets. Keeping these ideas in mind, the sample in the box below illustrates how ONE OF MANY possible investigations around this topic might develop.

Sample Hypothesis: We need to set up a fair test of what attracts hummingbirds to certain flowers. To do that, we want to test one characteristic, or factor, at a time. A single factor would be one like color. Our hypothesis might be, "Hummingbirds are more attracted to red flowers than blue flowers because they can see red better." Or, "As the color red increases, hummingbirds are more attracted to the flower/feeder."

Sample Experiment Design: We set up feeders of different colors to test which color, if any, the birds prefer to eat from. The color of the feeder is the **independent variable**. Several feeding stations need to be set up to be as exactly alike as possible, except for the one factor being tested, color. This way the experiment is **controlled** as much as possible. Set up a minimum of two feeders of each color being tested so that there is **replication** of the **experimental units**. Fill each feeder with the same amount and concentration of sugar water. (Use 1/4 cup sugar to 1 cup hot water. Stir to dissolve the sugar, then let cool.) Wrap and tape colored paper around the feeder. (Do not use food coloring in the water— it could harm the birds.) Hang all the feeders at the same height above the ground, in the same general area, but

at least 3 meters apart. All should be in either the sun or the shade to be consistent. Hang all the feeders at the same time, and then move away to some place comfortable, but within easy view of the feeders. Let the feeders sit for five to ten minutes before recording data so the hummingbirds in the area have time to find the new feeders. Groups of two-three students can watch individual feeders and record data.

Sample Prediction: More hummingbirds will visit feeders that are red than any other color.

Record Results: Record the number of visits to the feeder within a pre-determined time period such as fifteen minutes. You could also do multiple observation periods over several days. Use tally marks to keep track of the number of visits. The data recorded (number of visits to the feeder) is the **dependent variable**.

Sample Analysis of Data and Presentation: At the end of the allotted time period, group all the data on a large sheet or board. Calculate the **average number** of visits to each feeder color. An average is the number of visits to all feeders of one color divided by the number of feeders of that color. Example: ten visits to the two blue feeders would be an average of five visits. Make a **bar graph** with the average number on the vertical axis and the feeder color on the horizontal axis.

Discussion: Was your hypothesis supported? If yes, go on to test other hypotheses. If not, why not? What did happen? Why? This is a great opportunity to revise your hypothesis and do another test.

MORE:
(1) Elementary:
(a) Other possible factors to test are flower shape and sugar concentration. Keep in mind that in nature multiple factors are often not separate, but work together. To discover this, however, we first test each factor separately. For the sugar concentration test make solutions that are 1/8 cup sugar to 1 cup water and 1/2 cup sugar to 1 cup water, as well as the normal concentration of 1/4 cup to 1 cup water. These are 1/2 normal and 2 times normal concentration.
(b) Observing two species of plants with the same color flower but different shapes can test preference for flower shape. Another way would be to buy or make flowers to put on hummingbird feeders that are of the same color but two different shapes (tubular versus flat and round).

(2) Middle School:
(a) Find the **mean**, **median**, **mode** and **range** of the data.
(b) Record how many times two or more hummingbirds attempt to use the same feeder at the same time, and if both birds feed or only one. This will be an indicator of **competition** for the food resource. If possible, determine the sex and species of the birds.
(c) Use stopwatches to record how long each bird stays at a feeder. Or record length of visits as short, medium and long.

(3) High School:
(a) Calculate the **variance** and **standard deviation** of the averaged data.