SURVIVAL OF THE FITTEST

GRADE LEVEL: 6 - 12

TIME REQUIRED: One class session

SETTING: Classroom or outdoors

GOAL: The students will create a graph depicting protective coloration as an element of survival.

OUTCOMES: At the end of the lesson the students will:
- define protective coloration and
- demonstrate the relationship of coloration and environment to survival.

KERA GOALS: Meets KERA goals 1.3, 1.4, 1.7, 1.8, 1.9, 1.10, 1.11, 2.1, 2.2, 2.4, 2.6, 2.8, 2.11, 2.13, 3.3, 3.7, 4.2, 4.4, 4.6, 5.1, 5.2, 5.3, 5.4, 6.2, 6.3

BACKGROUND INFORMATION

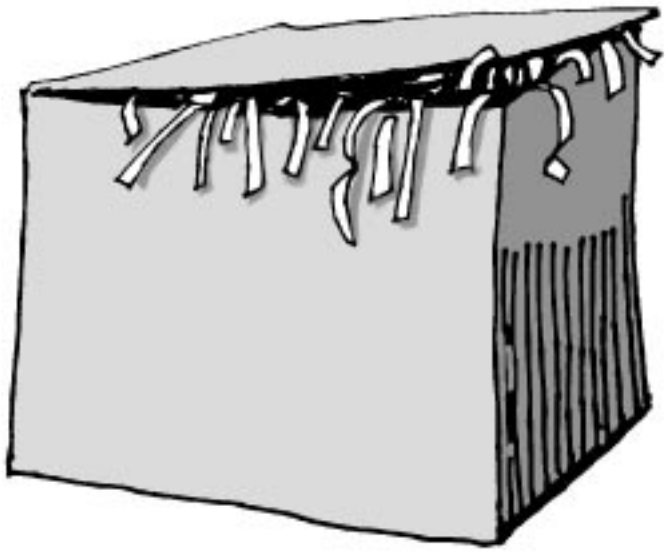
Since the beginning of time, thousands of plants and animals have evolved, lived, and become extinct. Our ecosystem is dynamic and ever changing. Fire, flood, drought, earthquakes, or changes in the climate may alter the environment. As the system changes, organisms are forced to change in order to survive. Those that are best suited to the environment survive. Evolution is a process by which populations change over time. Individuals unable to deal with the environmental stresses die, while others able to cope with the stresses survive. This is the process of natural selection. Each distinct environment (desert, pond, mountain top, or cave) supports a more or less distinct population. Plants and animals within each of these environments exist because they have adapted to their specific environmental conditions. Those unable to cope with the environment become extinct.

Organisms interact with each other constantly. Many of their contacts result in an energy flow through the ecosystem. There are three basic types of interactions within a community: predation, symbiosis and competition.

Predation may be defined as the behavior of capturing and feeding on another organism. The two components of predation are the predator and the prey. The predator is the organism that feeds on another living organism, and the prey is the organism that is eaten. Animal coloration has arisen through natural selection in response to the predator-prey relationship. Protective coloration allows the prey to resemble some object in its environment, thus providing potential escape from predation.

Symbiosis occurs when two very different organisms live together and each receives what it needs to survive from the other. Lichens are an example. Lichens are formed from algae and a fungus living together. The alga is green and produces food for the fungus through the process of photosynthesis. The fungus provides a thread base that protects the algae from receiving too much ultra-violet light and from drying out.

There is great **competition** within any community for both food and shelter. No two species in any community can occupy exactly the same niche and therefore even closely related species will differ slightly in their survival requirements. The swallow and house martin are good examples. Both these birds capture their insect food on the wing, but the martins tend to fly slightly higher than the swallows and direct competition is avoided.



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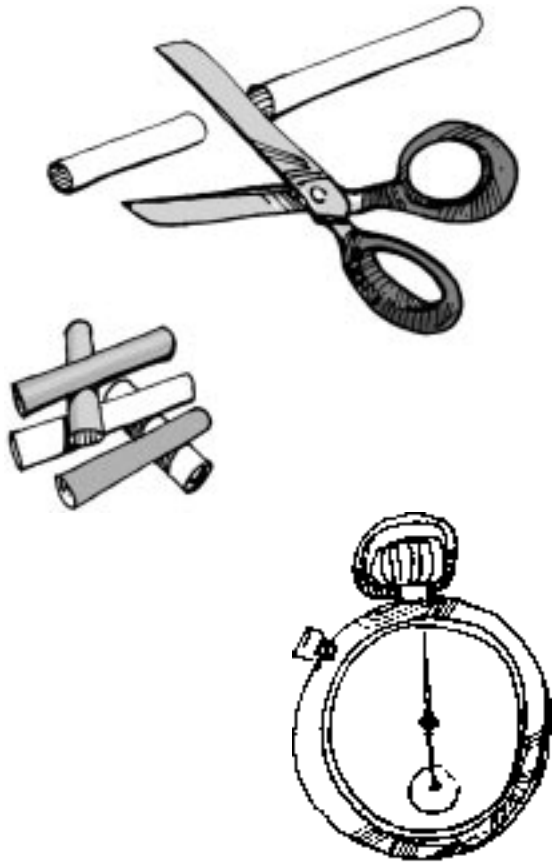
MATERIALS NEEDED

- One box with a hinged lid for each pair of students
- Stopwatch or watch with second hand
- White tissue paper cut into ¼-inch strips
- Drinking straws in 5 colors, cut into 2-inch lengths
- Graph paper
- Pencil



PROCEDURE

1. Cut white tissue paper in ¼-inch widths. Fill a hinged box with the cut paper, making a "bed" of tissue paper. You will need one box for each pair of students.
2. Cut drinking straws into 2-inch lengths. You will need 8 pieces each of five different colors. One of the colors must be white. These straws represent five different species living in a habitat. Mix these straws into the bed of tissue paper.
3. Divide students into teams of two. Give one student in each team a habitat box and a stopwatch or a watch with a second hand. This student will open the box and keep time for three seconds. At the end of the three-second interval the box lid will be rapidly closed.
4. The second student will pick one straw at a time from the box during the three-seconds that the lid is open.
5. At the end of the three-second round the students will reverse roles.
6. The activity will continue for ten rounds.
7. At the end of the ten rounds the students will tabulate the results by adding up the number of straws of each color they have collected.
8. Have each team produce three bar graphs. Have each **student** create a bar graph that shows the number of each color straw he or she "captured" during the 10 rounds of play. Instruct the students to combine their results and produce a bar graph that reflects the total of each color captured by the **team.**
9. Create a graph that reflects the combined results from the class as a whole. Compare your graphs.
10. The following questions are to be addressed:
    - Which color straw was most frequently selected?
    - Why was that color selected?
    - Which color was least represented on the chart? Why?

- What is the correlation of survival to the environment?

EXTENSION:

1. Read and discuss the peppered moth experiment conducted in England in 1950. H.B.D. Kettlewell (*Scientific American,* March 1959, page 48) details this experiment in "Darwin's Missing Evidence". How do the results of this experiment compare to the above straw activity?
2. Conduct a second camouflage activity which looks at the blending ability of a species. To conduct this experiment you will need 10 sheets of newspaper, 5 sheets of white construction paper, 5 sheets of black construction paper, scissors, and a large container. Directions:

- You will need to produce five habitat areas. Each habitat area will require one open sheet of newspaper and a total of 192 rectangles that measure 1"x 1 ½ " each cut from black paper, white paper and newsprint. Cut 64 rectangles out of the white construction paper. Cut 64 rectangles out of the black construction paper. Cut 64 rectangles out of the second sheet of newspaper.
- Place all the cut papers in a container and shake to mix thoroughly.
- Dump the mixed papers onto the open sheet of newspaper, being certain that the pieces are scattered across the top surface of the newspaper. You have now prepared a classroom habitat. Prepare five of these habitats and space them around the outer edge of the classroom or down the length of a hallway.
- Have the students line up. At your signal, have them walk quickly past each classroom habitat and quickly "capture" one paper creature from each habitat area.
- Instruct the students to compute their results. How many of each type paper animal were captured? How many of each type paper animal survived? Graph the survival rate of the different animals.
- Which coloration offered the best protection? Why? How could a change in pollution (more soot covering the habitat, for example) affect the numbers and kind of animals in the population? How would this same population be affected if a "Clean Air" regulation was enacted and enforced? Predict the new results. Test your predictions by placing your populations (cut rectangles) on a solid black habitat surface or on a solid white habitat surface.