

Butterfly Camouflage

Introduction

Introduce natural selection using this exciting, hands-on activity about camouflage. Students will explore how natural selection equips organisms for survival in their environment and why certain traits emerge in populations.

Concepts

- Camouflage
- Adaptation
- Natural selection



Background

Natural selection is a process in which individuals with inherited characteristics that are well-suited to their environment are capable of leaving more offspring on average than other individuals without such characteristics. Charles Darwin (1809–1882) developed this theory based on two major observations. He first recognized that more offspring are produced than can survive or that the environment can support. The other observation was that members of the same species have slight variations that are inherited and passed from generation to generation. When individuals that function best in their environment leave more offspring, a higher proportion of individuals with the advantageous characteristics will emerge over time. These inherited characteristics are called *adaptations*. Adaptations improve an organism's ability to survive and reproduce in a particular environment.

An example of an adaptation that is easily understood is *camouflage*. Camouflage, or *cryptic coloration*, is basically background matching—making a visible organism indiscernible from the surrounding habitat. However, this tactical deception only works in the natural environment of the organism. Various types of cryptic coloration exist among Earth's inhabitants. Examples include concealing coloration, disruptive coloration or self-decoration. *Concealing coloration* is the most common, where the organism resembles its surroundings in coloration, form or movement. An example would be the earth-tone colors of a white-tailed deer or the swaying walking pattern of a walking leaf insect. *Disruptive coloration* allows the organism to disguise its identity or location so that predators misidentify what they are seeing. For example, a zebra has a black and white stripe pattern. This pattern makes it extremely difficult for a predator to stalk one zebra, as the patterns of the herd blend together. Another example is the eye spot on some butterfly wings. The eye spot can be misinterpreted as an eye of a larger animal like an owl or can misdirect the predator to attack a less vulnerable body part, providing the prey with an opportunity to escape. *Self-decoration* is the act of hiding and concealing body features. Organisms, like the dresser crab, decorate themselves to match the background. The dresser crab obtains pieces of coral or sponge and affixes them onto hooked hairs that cover its body. This allows the dresser crab to blend into the seafloor and be overlooked by a predator.

Materials

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| Butterfly template | Scissors |
| Colored paper or construction paper | Tape |
| Colored pencils, crayons or markers | |

Safety Precautions

This classroom activity is considered nonhazardous. Follow all classroom safety guidelines. Students need to exercise caution walking with and using scissors.

Procedure

Activity A.

1. Prepare a minimum of 100 butterflies for students to “hunt” by using a die cutting machine or tracing and cutting out the provided template. Use many different colors of construction paper or wrapping paper to ensure some butterflies will be camouflaged while others will not.
2. Using tape, affix the butterflies around your classroom. Do not hide them, but rather place them out in the open.
3. Have students meet you in another room, like the science laboratory, for the explanation of the activity. Alternately, students could be kept in the hallway for the explanation if another room is not available.
4. Explain to students that they are predators going “hunting.” When they are allowed in the environment, they will have an allotted amount of time to “feast”—or pull down butterflies. Allow enough time for students to gather several butterflies, about 20–30 seconds. Emphasize safety—students are not allowed to run, climb objects to reach butterflies, push each other or steal each other’s butterflies.
5. Once time is called, have students tally their results (color of butterfly and number caught) in a chart.
6. Have students take a minute or two to look for remaining butterflies and give an explanation for why they were not found.
7. Discuss with students how the activity demonstrates natural selection through camouflage.
8. Have students return the butterflies back into the environment for the next class period. Express that some butterflies should be obvious while others should blend in and that butterflies are not to be hidden.

Activity B.

1. Photocopy three butterflies from the template for each student.
2. Students are now in control of natural selection. Students should color the butterflies with markers, colored pencils or crayons so they are camouflaged in the “habitat” of their choice. Students can be as creative as they want. Reinforce the idea that there are multiple habitats within an environment. For example, the environment is the classroom while a habitat is a poster.
3. After designing the butterflies, students need to label the back of the butterflies with their name and class period and then cut them out.
4. For the “hunt,” have the prior class period affix their butterflies in the habitat using tape. The following class will then hunt for the butterflies that were not created during their class period. Allow as many hunting rounds as desired. Two or three hunting rounds should be enough for students to remove most butterflies.
5. Remove the surviving butterflies each class period to showcase the “fittest” butterflies from each period.
6. Discuss with students the types of camouflage utilized and trends of natural selection.

NGSS Alignment

This laboratory activity relates to the following Next Generation Science Standards (2013):

Disciplinary Core Ideas: Middle School

MS-LS1 From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

LS2.A: Interdependent Relationships in Ecosystems

Disciplinary Core Ideas: High School

HS-LS1 From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

LS2.A: Interdependent Relationships in Ecosystems

Science and Engineering Practices

Developing and using models

Analyzing and interpreting data

Constructing explanations and designing solutions

Crosscutting Concepts

Cause and effect

Structure and function

Tips

- A greater amount of butterflies created for *Activity A* allows for extra hunting rounds or a longer hunting time ensuring obvious butterflies are consumed while camouflaged butterflies are not or less likely to be.
- In *Activity A* or *B*, several rounds may be performed to ensure that well-camouflaged butterflies tend to survive while more noticeable butterflies do not.
- Prizes could be awarded for the “fittest” butterflies from each class period.
- Extensions to this activity could include:
 - For *Activity A*, have students analyze the data by graphing the captured butterflies round by round and predict changes to the butterfly population over time. Have students infer which adaptation (variation) will be selected for by natural selection.
 - For *Activity A*, students could be eliminated after a “hunting” round if they do not “eat” enough butterflies. The remaining students could be responsible for adding more butterflies to the habitat, representing reproduction of surviving butterflies. For example, any butterflies not removed would have another butterfly of the same color added to the population. General trends should emerge for the fittest butterfly coloration.
 - For *Activity B*, challenge students to utilize other forms of camouflage besides concealing coloration. They could also practice classification by grouping butterflies according to camouflage categories. Students can determine which type of cryptic camouflage was most successful for survival.
- Butterflies for *Activity A* may be laminated for more durability.
- Other types of camouflage include countershading, warning coloration and motion dazzle, but these types do not pertain to this activity. Students could research animals that utilize these types of camouflage and the advantage of these adaptations.
- Flinn offers several kits that relate to adaptations and natural selection. *Fish Fitness—Flinn STEM Design Challenge™* (Catalog No. FB2129) and *Beaks—Flinn STEM Design Challenge™* (Catalog No. FB2130) both incorporate STEM and are aligned to NGSS. *Natural Selection* (Catalog No. FB1989) is a simulation of the classic peppered moth natural selection study.

Discussion Questions

The discussion after completing *Activity A* should be basic and focus on which butterflies were easily caught and which butterflies survived to reproduce. This would lead into a discussion about what trends or patterns would emerge after several generations (rounds of “hunting”). Include in this discussion how an organism’s structure enables survival and predict what might occur if the butterfly’s habitat was disturbed or damaged. For example, if a meadow became a shopping center or burns due to a fire.

For *Activity B*, focus the discussion on the type of camouflage employed by the most successful butterflies in the classroom environment and challenge students to ascertain other adaptations of butterflies allowing survival.

Materials for *Butterfly Camouflage* are available from Flinn Scientific, Inc.

Catalog No.	Description
AP5394	Scissors, Student
AP6400	Prismacolor Art Pencils, 24-Color Set
FB2129	Fish Fitness—Flinn STEM Design Challenge™
FB2130	Beaks—Flinn STEM Design Challenge™
FB1989	Natural Selection

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.

