



8th Grade: Natural “Hooplection”

Course description: Variability among insects is the key to understanding how natural selection allows them to survive, reproduce, and adapt by passing on advantageous traits to their offspring. We will discuss the different ways in which adaptations allow insects to live efficiently in their environments. Students will conduct an interactive lab over the course of this unit through which they will perceive the means of adaptations through natural selection. In this unit, students will be making hypotheses and collecting data to then analyze and support their hypothesis on why insect adaptations increase the rate of successful reproductions across generations.

Day 1: Insects are highly adapted for survival in their environments and it is all thanks to natural selection. Students will begin to conceptualize how natural selection plays a role in forming insect adaptations by observing them up close and personal.

Demonstration: Live insects from both terrestrial and aquatic ecosystems will be presented to students. After observing live insects, students will have the opportunity to view bugs preserved in resin to meticulously study the features each insect has adapted. By utilizing a Venn diagram students will compare and contrast distinct adaptations in different species.

Day 2: Behavioral adaptations such as thanatosis, the ability to play dead when startled, are critical to the proliferation of a species. Students will begin a three-day lab unit in which they will have to think like an insect in order to survive. An experiment will be conducted in which students have to attempt to throw a ball through a hoop from varying distances for students to observe how behavioral traits are passed to the next generation.

Demonstration: Each student will be ascribed a number that correlates with a hoop. All the hoops will be placed in different locations relative to the starting point. We will clarify to students that the distances they stand away from the hoop are representative of behavioral changes. Students closer to their hoop will be more likely to make their shot which will allow them to survive the first generation and move on to create offspring. Those at a farther distance will be at a disadvantage and less likely to make their shot, those who miss their shot will not be able to breed because their traits were not favorable. If students were unable to breed (make their shot in the first generation), they will become the offspring for the next generation and be stationed at one of the closer hoops. Throughout this experiment, we will be collecting data to conceptualize and support the survival of insects across generations.

Day 3: Not only do insects adapt behaviors to survive their environment they also develop physical traits like mimicry, camouflage, flight, hardened exoskeletons, and more! The adaptation of physical traits is vital to an insect's survival. By adjusting the hoop lab from the day before students will further explore concepts of physiological adaptations and their effects on the rate of reproduction in a species.

Demonstration: Now that students can articulate how behavioral traits are passed down through generations, they will revisit the “hoop lab” conducted on the day prior, to distinguish the contrast between a behavioral and physiological adaptation. The sizes of the hoop will be

varied, foregoing distance parameters from the previous day. As generations progress, students that are tossing their balls in the larger hoops will have a greater advantage and be able to survive to pass on offspring, whereas those throwing the ball in smaller hoops will face greater difficulty, preventing them from surviving and reproducing. We will again record and analyze data to support our findings.

Day 4: Insects like the Madagascar hissing cockroaches are well adapted for consumption in their adult stage but when it comes to dispersal, a key factor in an insect's life and reproduction, they lack wings that would permit them to efficiently disperse their eggs. If the Madagascar hissing cockroaches had wings, however, they would be counterproductive to their role as detritivores in their environment. Applying the knowledge students have acquired over the course of this unit, students will realize that while some traits may be advantageous for one scenario, they may not be for another. As students are now experts on how physical and behavioral adaptations affect the rate of successful reproduction, students will combine these parameters to discern how adapted insects interact with complex ecosystems.

Demonstration: On the last day of this lab unit, students will be given varying-sized balls, maintaining the differing hoop sizes and reintroducing the distance parameters from the first day, in order to develop their understanding of the complex ways insects interact with their environment.