# Bay Area Scientists in Schools Presentation Plan

**Lesson Name**_ Adapting to Survive: Predators and Prey_____
**Presenter(s)**_____ Integrative Biology Graduate Students
**Grade Level**__ 3rd ___
**Standards Connection(s)**_ LS: Structure of living things help tem grow, survive, and reproduce.
Living change the environment they live in._____

Standards Connection: Life Science
1. Structures of living things help them grow, survive, and reproduce.
2. There are diverse life forms in different environments.
4. When environment changes, living things respond (may be able to survive and reproduce or may die or move to a new environment).
5. Living things can disappear from the Earth, some modern species resemble historic species.

Next Generation Science Standards:

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

| Science & Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| Analyzing and Interpreting Data<br>Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.<br>☐Analyze and interpret data to make sense of phenomena | LS2.C: Ecosystem Dynamics, Functioning, and Resilience<br>☐When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and | Cause and Effect<br>☐Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1),(3-LS4-3)<br><br>Systems and System Models<br>☐A system can be described in terms of its components and their interactions. (3-LS4-4)<br>---------- |

Common Core Standards:

ELA/Literacy:

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Mathematics:

MP.2 Reason abstractly and quantitatively.
MP.5 Use appropriate tools strategically.
3.NBT Number and Operations in Base Ten
3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

FOSS Connections:

Grade 3 Module: Structures of Life

Investigation 3: Meet the Crayfish

**Teaser:** Predator-prey relationships are one of the easiest systems through which we can understand natural selection. There is often an "arms race" between predators and prey, in which each species is continually evolving new mechanisms of outsmarting the other. This can lead to interesting adaptations, like camouflage in prey or specialized eating mechanisms in predators. On top of this, environmental conditions play a big role in natural selection. In this lesson, students will model a predator-prey system in two different environments and examine how different variables (environmental color, prey color, predator type, etc.) are involved in natural selection.

**Objective:** *As a result of your lesson, what will students learn? What will they be able to do?*
Students will learn how camouflage can be an effective mechanism for avoiding predation and how it can evolve, how environment plays a role in natural selection, and how certain predators may be better adapted for catching specific prey species than others. Students will also see how repeating experiments and carefully recording results can allow for reliable and easy analysis.

**Vocabulary/Definitions:**
*3 – 6 important (new) words*

- natural selection
- competition
- camouflage
- adaptation
- predator/prey
- species

**Materials:**
*What will you bring with you?*

dark and light colored beads
plastic forks and spoons
timer
3 black towels
3 white towels
Ziploc bags for collected beads
large print-outs of:
- a cheetah hunting an antelope
- a snake or falcon eating prey
-camouflage example

**Classroom Set-up:** *Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed*
Students should be split into two groups; each of those groups should be split into two groups, students should know which group there in and preferably already be sitting in the groups.

# Classroom Visit

1. **Personal Introduction:** **1 Minutes**
*Who are you? What do you want to share with students and why? How will you connect this with students' interests and experiences?*

Hi, we're biologists from UC Berkeley. Does anyone know what biologists do? We study the living things around us, and today we've come to talk to you about predators and prey.

**Topic Introduction:** **5 Minutes**
*What questions will you ask to learn from students? Big Idea(s), vocabulary, assessing prior knowledge…*

Does anyone know what a predator is (focus on the fact that they eat other animals, prey)? Which of these 2 animals is a predator (show picture of cheetah running after prey, or of a cheetah and a separate one of a prey species)? What about these two (show same picture of cheetah and snake/falcon/other type of predator)? Predators come in all shapes and sizes, and they can catch their prey in different ways. Cheetahs use their teeth and claws, falcons use their feet. There are even some birds that have spoon-shaped bills to catch creatures that live in the water. These animals are different species, or types of predators. Cheetahs might be better at hunting antelope, but snakes/falcons might be better at hunting small rodents, and spoonbills would be best at hunting for small, aquatic things. These are adaptations that these animals have evolved over millions of years. Prey can evolve to escape predators, too. (show pictures of camouflaging animals). These animals use camouflage - another adaptation - to hide from predators.

Biologists often use models/simulations to understand and explain what happens in nature. Today we're going to do an experiment to see whether or not camouflage is really an effective adaptation for survival, and to see whether certain predators are better adapted to certain environments and prey types. We're going to pretend to be two species of predators and we're going to pretend that these dark and light colored beads are our delicious prey. One type of predator is going to use their fingers to catch beads, and the other type is going to use a spoon/fork. They're both going to compete for the same food - the beads. Who do you think will be the better bean hunter? What should we name our predator species? (Allow class to pick species names). We're going to split in two now and half of us will work on the dark plot and half on the light plot

**2. Learning Experience(s): 35 Minutes**

*What will you do, what will kids do? Demonstrations, hands-on activities, images, games, discussion, writing, measuring… Describe in order, including instructions to kids.*

1. Assign about 5-6 students per towel. Give some a spoon, some a fork and let some use their fingers.

2. Show class the beads. Ask: which will be easier to see on the plot (explain camouflage)?; which prey species do we expect to catch more of?; which predator species will have an easier time catching these tiny prey?

3. Explain to group that we're going to play several rounds of this game and that everyone will get a chance to play. Tell them for each round, we'll play until one predator species has "won" and there are none left of the other species. We'll keep score of which predator species wins each round.

| First Game: | WHICH PREDATOR WON? | Second Game: | WHICH PREDATOR WON? |
|---|---|---|---|
| Round 1 | | Round 1 | |
| Round 2 | | Round 2 | |
| Round 3 | | Round 3 | |
| Round 4 | | Round 4 | |

4. Show students the initial prey population (100 beads, half black, half white, in a clear container). Scatter initial prey population.

5. Tell students that they will now be competing for beads and that they'll have 20 seconds to collect beads and the goal is to collect as many as possible. Less than 10 beads means they must leave (leave the plot); 10 or more, survival

6. After 20 seconds, stop. Count # beads collected for each student and determine who survives/dies. Keep each species' collected beads in a separate bag. Repeat this process until one species dies off completely.

7. After one species dies off, mark the winner on the scoreboard. Collect beads that remain on the plot and store in a different bag, labeled "uncaptured beads." Compare the caught with the

leftover container and ask students which prey color we caught more of, and which we caught less of (which survived best).

8. Repeat the game but switch what tool the students get to use. After all have gone ask them which predator was a better competitor, and which prey was better at hiding from the predators (surviving)? Ask them why that type of prey had an easier time hiding (should refer to background plot color).

**3. Wrap-up: Sharing Experiences** **10 Minutes**

*Putting the pieces together – how will students share learning, interpret experience, build vocabulary?*

Have the two halves of the class present their results to each other. Ask the class as a whole which predator species was a better competitor (which one won) and why? Ask why different prey colors survived better on different backgrounds? Show picture of different animals camouflaging to demonstrate.

Define and discuss natural selection with the whole class. Explain that one prey species and one predator species had an advantage, depending on the environment. Explain that the advantage depended on the environmental conditions. Explain that the species who had a better advantage also

**4. Connections & Close:** **5 Minutes**

*What else might kids relate this to from their real-life experience? How can they learn more? Thanks and good-bye! Clean-up.*

What did you learn today? (we'll bring index cards for kids to write down 3 things they learned, then do questions afterwards)

**Total 56 Minutes**

# Follow-up – After Presentation

*Suggest students write a letter explaining "How we learned about* ***camouflage and natural selection…****"*

**Natural Selection** – **Peppered Moth Activity (pg. 5)** from Bioscience for the Future
http://www.bbsrc.ac.uk/web/FILES/Resources/darwin-2009-activities.pdf#page=5

**Reading Connections:**

- Where Else in the Wild? By David M. Schwartz and Yael Schy – This volume is ideal for introducing a unit on survival strategies or for extended discovery at a classroom station. The adaptations of both predators and prey are included, so the book can also be used for lessons in food webs, habitats, and life cycles.
http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=19794

- Why Are Animals Blue? By Melissa Stewart – The books in the *Rainbow of Animals* series use vibrant colors and fun facts to take readers through the world to explain how color helps creatures survive. Each volume provides a beautiful introduction to animal adaptations using a concept to which children can relate.
http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=19119

**Five Fingers of Evolution** (TED-Ed video by Paul Anderson and Alan Foreman)
http://ed.ted.com/lessons/five-fingers-of-evolution