Adaptations and Survival:

The Story of the Peppered Moth

Teacher: Rachel Card
Subject Areas: Science/ELA
Grade Level: Fourth
Unit Title: Animal Adaptations
Lesson Title: Adaptations and Survival: The Story of the Peppered Moth (adapted from "Simply Survival", Laura Candler: *Hands-On Science*)

Learning Goals/Outcomes :

As a result of this lesson,

1. Students will develop a basic understanding of the relationship between environment and adaptations of an animal.
2. Students will begin to see the role of adaptations, particularly camouflage, in the viability of a population.
3. Students will be aware of changes in animal populations due to pollution and predation.

Science/ELA Standards: (See Appendix A)

Materials/Resources Needed:

- one moth pattern for each student
- scissors
- crayons or markers
- tape
- two pieces of construction paper, one labeled Eaten and the other labeled Survived
- Power Point Presentation: "The Story of the Peppered Moth"
- student copies of "Virtual Peppered Moth" simulation directions and questions

Introduction (Building Connections to Previous Lessons):

Activate prior knowledge by reviewing what the students have been learning about animal adaptations (physical and behavioral characteristics that help animals survive in their environments). Tell them that they are going to conduct an investigation to discover first-hand how the physical adaptation **camouflage** helps an animal survive. Tell the students that they are going to color a paper moth so that it will blend in with something in the classroom. Explain that in a few minutes they will have to hide their moths by placing them in the chosen places, but the moths will have to remain in plain sight.

Initial Direct Experience with Concept (Hands-On Activity)

Step One: Divide the class into two teams and have them move together. Pass out a moth pattern to each student, and tell the students that they can color their moths secretly with crayons or markers so that no one else in the class is able to see the others moths before they are hidden. When everyone is finished, have them stick a loop of tape on the back of their moths in preparation for the next step.

Step Two: Tell the students that they will play "Moth Hunt", an activity in which some students will hide moths and others will hunt for them. Tell them that they will do the activity two times so that everyone will have a chance to play both parts. Discuss the terms **predator** and **prey** with the class. Tell them that a predator is an animal that hunts another animal for food. They prey is the animal which is hunted and eaten. Name one team as the Predators and the other team as the Prey. Show the students the two pieces of construction paper, Eaten and Survived. Tell the class that the Prey will hide their moths somewhere in the classroom and the Predators will hunt for the hidden moths. All the moths that are found will be taped onto the Eaten rectangle, and the moths that are not found will be taped into the Survived rectangle.

Step Three: Ask the Predators to go into the hall and wait quietly. Allow the Prey to quietly "hide" their moths. Remind them not to place the moths under or behind any objects; all moths must be in plain view.

Step Four: When the prey have returned to their seats, ask the Predators to open their eyes. Give the predators 30 seconds to find as many moths as possible. Predators should gently remove each moth as it is found. When the time is up, have the Predators tape all the moths they found into the rectangle labeled "Eaten".

Step Five: Ask the Prey students to point to the locations of any moth that was not found. Ask the prey to gently remove all of the moths that survived and tape them onto the "Survived" rectangle.

Step Six: Have the students switch roles. The Predators become the new Prey and hide the moths they colored earlier. The Prey become the new predators and have 30 seconds to hunt for moths. Moths which are found are taped into the box labeled "Eaten". Moths which are not found go in the "Survived" box as before.

Discussion (Building Connections to Ideas)

Tell the students to look at the moths that survived and think about where each one was located. Lead a class discussion about the characteristics of those moths. Explain that camouflage helped the moths blend in with their environment, or surroundings. The moths which survived in the classroom probably blended in with some part of the classroom environment.

Applied/Extended Experience (Building Real World Connections)

Objective/Purpose: Tell students that the goal of this presentation is to examine changes in a moth population due to pollution and predation, and observe how species can change over time through adaptations.

Ask the students to sit next to their Reading Partners. Explain to the students that they will be be viewing and listening to a true story about moth survival.

Ask them to listen and watch carefully to find out how animals can change, or adapt, to their environment. Then, read "The Story of the Peppered Moths" while showing it on a Power Point Presentation. At the ends of slide 3 and slide 6, pause after reading the questions. Have the students think about their own answers, then discuss with their reading partners. Finally, call on students to share their ideas with the class.

Closure

Discuss the following questions with the students:

How did adaptations play a role in the survival of light and dark peppered moths in their environment before and after the environment was polluted?

How did the moth population change as a result of the changes in the environment?

Tell the students that they will be doing a peppered moth simulation activity in the computer lab the next day to examine firsthand how camouflage affects moth survival.

Performance Task (Day Two)

Virtual Peppered Moth simulation activity and questions

Appendix A

Science (Michigan Grade Level Content Expectations)

L.EV.04.21 Identify individual differences (color, leg length, size, wing size, leaf shape) in organisms of the same kind.

L.EV.04.22 Identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction.

L.EC.04.11 Identify organisms as part of a food chain or food web.

L.EC.04.21 explain how environmental changes can produce a change in the food web.

S.IP.04.13 Plan and conduct simple and fair investigations to compare and contrast the needs of plant and animal requirements and their relationships.

S.RS.04.19 Describe how people such as Charles Darwin, Rachel Carson, Luther Burbank, George Washington Carver, Ibn Al-Baitar, Charles Turner and others have contributed to science throughout history and across cultures.

English Language Arts (Common Core Standards)

RL.4.1. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.4.2. Determine the main idea of a text and explain how it is supported by key details; summarize the text.

RI.4.3. Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4. Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

W.4.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

W.4.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

SL.4.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Virtual Peppered Moths

1. Please go to the following website and click on the "Bird's Eye View" icon. Then, click on the arrow twice, until you are prompted to "Choose a forest for your experiment".

   http://www.techapps.net/interactives/pepperMoths.swf

2. Click on the top left button with the bird and a light-colored moth.

3. Before beginning to eat moths, note the proportion of light and dark moth populations:

   Lichen covered forest beginning moth populations, 50% dark moth, 50% light moth.

4. Begin playing! Eat moths by clicking the mouse until one minute passes, and the "Change in your Forest" data appears.

5. Now write the new proportion of light and dark moth population:

   Lichen covered forest ending moth populations, _____% dark moth, _____% light moth.

   These numbers will be written at the bottom of your screen.

6. Click the bird/moth button at the bottom of the screen, and then click on the arrow twice.

7. Now click on the top right button with the bird and a dark-colored moth.

8. Before beginning to eat moths, note the proportion of light and dark moth populations:

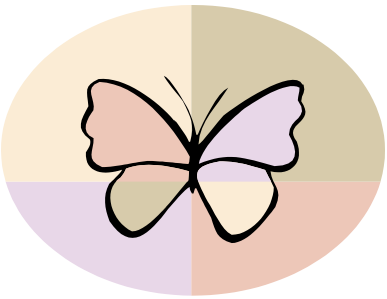
   Dark, soot-covered forest beginning moth populations, 50% dark moth, 50% light moth.

9. Eat moths by clicking the mouse until one minute passes, and the "Change in your Forest" data appears.

10. Now write the new proportion of light and dark moth population:

    Dark, soot-covered forest ending moth populations, _____% dark moth, _____% light moth.

    These numbers will be written at the bottom of your screen.



Peppered Moth Reflections

1. **Which color moth did you eat more in the lichen-covered forest, light or dark? Why?**

_____

_____

_____

_____

_____

2. **Which color moth did you eat more in the dark, soot-covered forest? Why?**

_____

_____

_____

_____

_____

3. **Why were there more light gray moths before the Industrial Revolution in England?**

_____

_____

_____

_____

_____

4. **How did the factories change the moths' environment?**

5. **Why were there more black moths after many factories were built?**

6. **Why are more light gray speckled moths surviving now?**