

Lesson: Hopping Through Time

Environmental Literacy Question: How have humans affected the Chesapeake Bay and its watershed?

Topic/Essential Questions: What characteristics of the frog help it survive in its habitat and how has human activity changed its habitat and its ability to survive?



Unit/Lesson Sequence: This lesson is one of two lessons in the “surviving human impact” 4th grade module based at Arlington Echo Outdoor Education Center.

Content Standards:

Environmental Literacy Standards

- MSDE 4.0 Populations, Communities and Ecosystems: The student will use physical, chemical, biological, and ecological concepts to analyze and explain the interdependence of humans and organisms in populations, communities, and ecosystems.
- MSDE 5.0 Humans and Natural Resources: The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth’s natural systems and resources.
- MSDE 2.0 Earth/Space Sciences: The students will use scientific skills and processes to explain the chemical and physical interactions (i.e. natural forces and cycles, transfer of energy) of the environment, the Earth, and the universe that occur over time.
- MSDE 3.0 Life Science: The students will use scientific skills and processes to explain the dynamic nature of living things, their interactions, and the results from the interactions that occur over time.

Speaking and Listening Standards:

- CCSS.ELA-Literacy.SL.4.4 Report on a topic or text, tell a story, or recount an experience in an organized manner. Use appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Length of Lesson: 35 minutes

Student Learning Outcome: The student will investigate frog adaptations and take scientific measurements to explain how frogs have adapted to living in our modern freshwater habitats.

Knowledge of the Learner:

- Prerequisite knowledge, skills, and processes: Students will have studied the life cycle and habitats of frogs in their classroom. Students should be able to listen to and follow instructions as given.
- Student needs, interest, and previous learning: These will be identified in the pre-

assessment.

- Conceptual difficulties: Understanding the readings from the meters and taking data in their journals.
- Differentiation: Students are 4th graders with a diversity of backgrounds and skill levels.

Knowledge of Content:

- **For activity leaders:** Provided in the Lesson Plan and Supplements.

- **Vocabulary:**

Runoff	Habitat	Dissolved Oxygen
Temperature	Bio-retention Area	PH
Salinity	Froglet	Tadpole
Bog	Native	Fossil

- **Materials:**

Hopping through Time poster	Nets	Life Cycle Poster
pH meter/pen	Dissolved Oxygen Meter	Salinity Meter
Clip Boards	Easel	Thermometer

Supplements:

- A: Water Quality Testing Instructions
- B: Background: Frogs
- C: Characteristics of Frogs
- D: Life Cycle of a Frog
- E: Wetland types and Classifications
- F: Journal Page
- G: How do Humans Affect..
- H: Inclement Weather lesson
- I: Human Impact Game
- J: Frog Life Cycle Game

Lesson Setup:

At the bog area, make sure all water quality tests are out and ready to use. All of the nets should be accounted for and left in the box until the end of the lesson. The thermometer should be placed in the bog area prior to students' arrival. Posters should be out and accessible for the lesson. Students will be testing for pH, dissolved oxygen, salinity, and temperature. Place meters at designated stations around the bog area. At this time you should become familiar with the testing procedures and all the background information on frogs, Wetland types, and bio-retention areas (see Supplements A-E).

Instructional Delivery

Students will arrive at the main pavilion to meet the activity leader. Move the group to the bog area picnic tables to begin the lesson.

Pre-Assessment/Warm-Up

1. A pre-assessment of students' current knowledge of frog's fossils, adaptations, and habitats. Students have previously researched either frogs or dragonflies in their classrooms. Please set up frog life cycle poster and hand out pictures and descriptions to students. This section should take about 10 minutes.
 - What do you think frogs used to look like? Do they look like this now?
 - *Frogs, used to look like fish with a longer spine and tail. They lived in water a majority of their life over 400 million years ago. (look at fossil 1). These older frogs do not look like this now (show fossil 2). Our frogs today have developed jumping legs and can stay out of water for long periods of time. The reason they do not have tails anymore is because a tail is hard to jump with but is helpful to swim. A longer spine helps you move better in water, but on land it is hard to be on 4 legs with a long spine. So, our frogs today developed jumping legs to go farther and permeable skin to breathe air and lost gills.*
 - Why did they leave the water?
 - *Large bodies of water were getting harder to find so they adapted to live as adults on land and in water.*
 - They are called Amphibians which translates to "double life". Tell me about their life cycle and what in their life cycle might mean its double life (**Supplement D**)?
 - *Go through life cycle on felt board. Discuss that the double life of a frog is that half of their life is spent in water and half is spent on land.*
 - What do frogs need to survive? What are some examples of habitats?
 - *Frogs need water and land. Examples are bogs, freshwater streams, lakes, etc.*

Procedures:

2. Pull out the Hopping through Time Poster (**see Supplement F**) and explain to the students that today we are going to be frogs looking for a new habitat. To find a new habitat we are going to test one right next to us, the bio-retention area. Take some time to go over what a bio-retention area is, the poster, including sharing how to use any meters needed for water quality testing (**Supplement A**). Activity leader and chaperone will assist with testing as needed. This should only take about 5 minutes.
3. Have students form groups of two or three. In those groups, each student will be given a clipboard, writing utensil, and their journal to record the data.
4. Students will perform all testing with their groups around the bog area as well as the visual assessment. This should only take about 10 minutes.

Assessment:

5. After the testing and bog examination, students will move back to the picnic table and discuss the water testing results and describe their pictures they drew for their visual assessment (**Supplement F**). Journals will be used for their final project at school for Quarter 1, so writing down these testing results are important. Ask students questions such as:
 - Was this Habitat Healthy? Why or Why Not?
 - *Yes, it was healthy based on the tests... or no, it was not healthy based on the tests...*
 - As a frog, would you want to live in this habitat? Why or why not?
 - *There is plenty of food. Great place for tadpoles to survive, etc.*
 - Answer this question in their journal: "How have frogs adapted in order to survive in this type of habitat?"
 - *They have adapted to low oxygen areas, they have webbed feet to swim, they can breathe under water, etc.*
 - Discuss how human activity affects (**Supplement G**):
 - Salinity
 - pH
 - temperature
 - dissolved oxygen
 - food sources

These types of questions can help students to draw conclusions about what they have learned and observed.

6. Once the students have completed the Journal page, they can use nets to try and find tadpoles and insect larvae in the small rectangle bio-retention area near field hall. Proper instruction will be given on the handling of frogs, tadpoles, and eggs by the instructor to the students. "Frog Stages" poster (**Supplement D**) may be used in conjunction with this activity. Once the activity is over, please collect all nets and place them back in the box until the next group's time. This should only take about 5 or so minutes.
7. If time permits, play inclement weather Pollution game or frog life cycle game (**see Supplements I-J**) or they can play the games and color in the supplemental pages of their journals.

Module Debrief:

After all groups have rotated through the Dragonfly and Frog lessons, they will meet back at the main pavilion to have a large group debrief. This will be led by an Arlington Echo staff member. This is an opportunity for students to recall what they have learned over the course of both activities. Students should be prepared to give their informed opinions on what makes a healthy habitat for a frog or a dragonfly and how humans affect their habitat.

Notes for Clean Up

Please clean, organize, and return the lesson materials to their proper locations at the end of each day of instruction. Remember to inform the Arlington Echo staff if you need assistance or

if any materials are damaged or destroyed. Materials for this lesson will be kept in the bee room in Field Hall.

Notes for morning set up (overnight trips):

Remember to set up your materials prior to the mornings activities. If you do not spend the night, please check in with the AE staff assigned to the model and be at your teaching location by 8:45 a.m.

Notes for Inclement Weather:

Arlington Echo encourages keeping our outdoor activities outdoors—even in the event of rain. In the case of severe weather (thunder, severe cold, etc.), the alternative location for this activity will be in Field Hall. Arlington Echo staff will direct you on the lesson modifications. The alternate activity is to be done in the bee room. Students will play a game about frogs and continue with the Hopping through Time poster from above, based on the outdoor bog. See Inclement Weather Lesson **(Supplement H-J)**.