Lesson Plan Title
Aquatic Ecology

Name (last, first): Larson, Don

Scientific Theme(s):
C-2: develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms; and

C-3 develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

Life Science
*Changes in Life Forms over Time
*Natural History and Biodiversity
*Ecological Interactions

Grade Level(s):
* 6-8
* 9-12

Lesson Duration: 2 lessons. 50 minutes for each

Overview
Aquatic ecosystems are integral parts of Alaska. Numerous animals directly or indirectly rely on complex food webs in ponds, streams, and lakes for energy. Salmon, bears, ducks, and many other important food sources for humans rely on the tiny aquatic invertebrates and the fish that eat them. In this lesson students will explore the different types of aquatic invertebrates and unique adaptations that these invertebrates have for survival. Students will gain an understanding and appreciation of the diversity of aquatic invertebrates and their adaptations.

Objectives
Students will identify at least four different aquatic invertebrates
Students will describe physical characteristics or behaviors of at least one invertebrate
Students will describe the function of a body part based on its form
Students will discuss invertebrate diversity in a pond
Grade Level Expectations (GLEs) Addressed
[6] SC2.1 using a dichotomous key to classify animals and plants into groups using external or internal features
[6] SC3.2 organizing a food web using familiar plants and Animals
[8] SC2.1 placing vertebrates into correct classes of taxonomy based on external, observable features
[9] SC2.1 describing and comparing the characteristics of phyla/divisions from each kingdom
[10] SC3.2 exploring ecological relationships (e.g., competition, niche, feeding relationships, symbiosis) (L)

Required Background
Instructors should be familiar with proper dip net use. Students should understand insect life cycles. Students should understand food webs and food chains.

Vocabulary
Invertebrate
Mollusca
Nymph
Larvae
Helminth
Odonata
Damselfly
Dragonfly
Diptera (fly)
Adaptation
Mayfly (Ephemeroptera)
Beetle (Coleopteran)
True bug (Hemiptera)

Materials
Field equipment
Paper for observations
Dipnets
Trays for sorting insects
Containers for insects
Forceps
Waders (if available)
One 5 gallon bucket with lid
Classroom materials
Large tub container
Stereoscopes
Forceps
Petri dishes
Coloring pencils
Paper
Document camera (if available)
Computers/Laptops

Activity Preparation and Procedure
Preparation:
1. Acquire all materials
2. Find a suitable pond or small lake where students can sample around aquatic vegetation without getting too wet

Activity
DAY 1
1. Give a brief presentation about the importance of insects in the environment. Describe how aquatic invertebrates are a valuable food source for human foods like fish. Further, aquatic insects are an indicator of an ecosystems health.
2. Explain to students that in this pond are numerous tiny animals involved in large, complex food webs. The animals in this pond are very unique and have special adaptations to hunt or avoid predators. We will spend today collecting as many animals as we can.
3. At the pond, students will be filling out an observation sheet. Students will create a sketch of the pond and one invertebrate they collect in the pond. Students will then make two observations about each drawing. This is to be completed at the site.
4. Instruct students in proper dip-netting techniques. Demonstrate to students the sweeping motion they should make. Instruct students to not collect too much vegetation with each pass.
5. Show students how to invert a net into a tray to sort for insects. Adding water to the tray makes invertebrates easier to find.
6. After the demonstration have students divide into groups of two or three.
7. Have students collect 1 dip-net, 1 tray, 2 observation sheets, 1 pair of forceps, 1 container
8. While students are collecting and sorting fill a five gallon bucket with pond water and vegetation that can be used tomorrow in class.
9. Assist students with collecting activities.
10. If time permits discuss with students what they observed. Ask students how many different invertebrates they collected and what role different invertebrates play in the ecosystem.
11. Have students label all containers with their name and partner’s name, period, and location.
12. Have students wash out nets and trays.

DAY 2
Preparation:
1. Place contents from five gallon bucket into large container and let settle for a few hours.
2. Set out color pencils and sketch paper for students.

Activity
1. Remind students of yesterday’s field trip.
2. Instruct students today that they will be looking closer at the invertebrates with their partner.
3. Each group should have one stereoscope. Take time to demonstrate proper treatment and handling of equipment.

4. Show students website:

5. Explain to students that this is a dichotomous key and assist students in identifying at least one organism.

6. Require students to identify at least four invertebrates.

7. Students will produce three sketches today. Two drawings of invertebrates with their proper identification and one close up drawing of some alien or odd looking body part from an identified invertebrate. Demonstrate to students how large images should be. Each sketch should cover at least half a page.

8. For the body part sketch, have students write one sentence on the function of the part.

9. Let students collect their containers, forceps, trays, Petri dishes, and stereoscope.

10. Assist students when necessary with microscopy work.

**Assessment**
For the assessment, have students share their drawings with another group and discuss the variation in body types and function. Students should compare and contrast their drawings. Once done, gather as a group and further discuss the body type variations and possible functions.

As part of the class discussion have students discuss how many different animals are present based on their identification.

**Complementary Activities and Extension Ideas**

Have students create a hypothesis for how they would determine the function of the body part.

Have students sort invertebrates by predators and prey.

**References**
<table>
<thead>
<tr>
<th>Drawing of the pond</th>
<th>Picture of one invertebrate I thought was interesting</th>
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<tbody>
<tr>
<td>Two observations of the pond</td>
<td>Two observations about animals in the pond</td>
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