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Teacher's Corner Lesson Plans

Helping Teachers and Students Make the Most of their Outdoor Classroom

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Who Eats What and Where?*†

Pamela Miller

Grade level: 4

Provincial curriculum links: Ontario

Subject: Life Systems

Keywords: food chain, transect

Description

Students answer the question "Which plants have the greatest amount of animals feeding on them-the plants on the edge of a garden, or the plants in the centre of the garden?" by surveying plant damage along a transect.

Curriculum Framework

Topic: Life Systems

Strand: Habitat and Communities

Specific Lesson Goals:

- Identify, through observation, various factors that affect plants and animals in a specific habitat
- Classify organisms according to their role in a food chain (e.g., producer, consumer);
- Demonstrate an understanding of a food chain as a system in which energy from the sun is transferred eventually to animals, construct food chains of different plant and animal species, and classify animals as omnivore, carnivore, and herbivore;
- Describe structural adaptations of plants and animals that demonstrate a response of the living things to their environment

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* This exercise is adapted from *Teaching in the Outdoor Classroom,* Evergreen/TDSB Summer Institute, 2007, 82 pages.

† Submitted by: Pamela Miller

- Classify plants and animals that they have observed in local habitats according to similarities and differences (e.g., in shape, location).
- Plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions;
- Communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts
- Describe ways in which humans can affect the natural world

Preparation

Preparation Time:

- 30 minutes
    - 10 min setting up markers
    - 20 min preparing and gathering equipment

Length of lesson:

- 155 minutes
    - 20 min Introduction
    - 10 min Writing Research Proposal
    - 15 min Demonstrating and preparing transects
    - 30 min Sampling plant damage and recording data
    - 5 min Class Data Compilation
    - 10 min Discussion of Results, Inferences, Conclusions.

    - 10 min Introduction to Data Drawings
    - 30 min Making drawings and captions:
    - 10 min Sharing and group conclusions
    - 20 min Journaling conclusions

Resources required:

- Ckass data sheets
- Markers
- Per research team:
    - Research Proposal Sheet
    - white sheet, approximately 1mx1m
    - meter stick

- Signs of animals eating Resource Sheet
- measuring tape at least 5m long
- 5m long transect rope or string with marks at 0.5m, 1m, 1.5m and 2.0m and 2.5m or alternately if site is smaller than 5 m, after site is measured, mark transect string at 1 tenth, 2, tenths, three tenths, and 4 tenths and half of total length.
- stakes for anchoring transect
- data sheets, pencils and clip boards

Procedure

1. ***Introduction:***
    a. Share thoughts about what animals live on the schoolyard and what they eat to survive. Create food chains that may exist on their schoolyard. Talk about why knowing what animals eat is important. Discuss whether people can harm or protect the food resources animals need to survive. Can some animals harm the food resources people need to survive?
    b. Invite students to record questions about what animals eat on a class chart. You might want to add some questions such as:
        i. Do most animals eat just one thing or many different things?
        ii. Does more than one kind of animal eat the same thing?
        iii. Do animals eat in one place or many different places?
    c. Brainstorm ideas of how to figure out where animals are eating on the school yard. What evidence will give them clues about animals feeding habitats. How could they gather the evidence?
    d. Complete as a class a Research Proposal worksheet
    e. Introduce and demonstrate a transect method of collecting data.
2. ***Locating and running transects***
    a. Locate the starting point for your transects randomly.
    b. Each transect should start approx. at the edge of the study area(0 to 10 cm in), and then will run in a straight line up to 5 m as perpendicular to the study area edge as possible.
    c. Run the 5m transect rope or string from a stake at the starting point into or across the study area. If the study area is smaller than 5 m, please mark your transect into tenths from one-tenth to one-half. You will be sampling at the .5m- (one tenth of total length) 1m-(two tenths),1.5m-(three tenths), 2m-(four tenths) and 2.5 m-(half-way point), along the transect.

3. ***Collecting data at each sampling point***

   a. Think of each point as the center of a "plus" sign. The transect line is one part and an imaginary line through the sampling point at right angles to the tape is the other. This identifies four "quadrants" for sampling. You can lay the meter stick perpendicular across the transect line to help you visualize the quadrants.

   b. Find the plant closest to the sampling point in each of the five quadrants. For each plant you sample during this study, collect the following evidence:

      i. Observe the plant. Count total numbers of any visiting animals, e.g. insects such as butterflies, wasps, bees, and birds.

      ii. Lay a white cloth down on the ground directly beneath the plant. Shake the plant gently but firmly for a predetermined amount of time or with a predetermined number of shakes. Keep this consistent with each plant you sample.

      iii. Immediately examine the insects that fall onto the sheet. Your goal is to count as many animals as possible. Check the plant for any animals that did not fall off. Record your results on the data sheet.

      iv. Examine each of the leaves and stems on the plant. Count the different ways the plant has been eaten: -chewed, rolled, galled, mined, frothed, gnawed, bored or skeletonized. Use *Signs of Animals Eating Plants* as your Resource. Record your results on the data sheet.

      v. Determine a descriptor of the overall plant that has been eaten to the following percentages: Record your results on the data sheet.

☐ None:	0%
☐ Little:	1%-19%
☐ Some:	20-40%
☐ Half:	41-60%
☐ Lots:	61%-80%
☐ Most or all:	81%-100%

   c. Repeat this procedure for each plant at each of the 5 sampling points along the transect. If time is limited reduce sampling points to three: 0.5m-(one-tenth), 1.5m-(three tenths), 2.5m (one-half).

   d. Review demonstration with the students, (e.g., What did you see me do? What did I do first, second, etc.) Review the data collection form.

   e. Assign an area of the schoolyard to each research team.

   f. Gather as a class and compile data on the class data sheet.

4. ***Interpreting Data***

    a. Have the students combine the class data into simple, stylized drawings and then write captions that explain the relationship of the data depicted in the drawings. Record numbers of animal visitors, amount eaten, and preferred eating methods.

    b. Using the student sheet as a guide, do the first sample point drawing and captions as a class. Divide the remaining sample points between the research teams and let them do the drawings and captions on their own. Post the class drawings and captions.

    c. Have the students post and compare their drawings, and captions with each other. Lead the class to recognize and describe patterns in their data and answer the question "Which plants have the greatest amount of animals feeding on them? The plants on the edge of a garden, or the plants in the centre of the garden?" Develop a group conclusion regarding the size of a plant community and the amount of animal feeding.

Discussion and Questions

Habitat edges are receiving a lot of attention these days, in large part because human activity has created so many edges and small patches where there used to be larger expanses of contiguous habitat. Some species require conditions found only in the interior of an intact community and small patches of habitat are not large enough for these species to escape the "edge" effect. Consider the difference between wolves and coyotes. Coyotes have adapted well to the urban edges whereas wolves have not.

- Invite discussion and journaling with the students around the following:
    - What did your research team notice? Were you surprised by anything you found out?
    - What additional questions came up during the experiment?
    - Do plants have more than one type of damage? Do different animals eat different parts of plants?
    - Are some animals eating the animals that are eating the plants?
    - On which part of plants do camouflaged insects feed?
    - Based on the compiled class data, ask students to conclude, "Which plants have the greatest amount of animals feeding on them-the plants on the edge of a garden, or the plants in the centre of the garden?" What could be the reason for our findings?

- Which plant community has more edge space as compared with internal space, a small community or a large community? Which size of plant community will have the greatest amount of animals feeding on the plants according to our results? How might different sizes of plant communities affect the needs of animals, plants and humans?
- Are there other factors influencing which plants are being eaten, e.g. structural adaptations of plants to repel insects? What additional questions could be investigated?

Student Assessment and Evaluation

Brainstorm with the students expected standards for the following processes and products to create class generated rubrics, checklists, rating scales and standards for anecdotal feedback.

Research Submissions:	Look for understanding of concepts, details in methods and materials, connections made in predictions.
Field Work *(Process)*:	Anecdotal or Checklist: Observe on-task behaviours, responsibility re: following procedures, equipment, living organisms, teamwork.
Field Work *(Product)*:	Data Collection Worksheets. Look for completion, accuracy
Data drawings and captions:	Accuracy, ability to communicate and portray data through words and pictures
Conclusions: (Discussions and Journal Entries)	Ability to connect and formulate patterns in data. Extends conclusions beyond specific site example.

Enrichment and Extension Activities

- Make food chains and webs for the study site organisms
- Research one of the animals or plants on the study site to find how it fits into the school yard food web. If possible, keep a animal for a short period of time to watch its eating behaviours or observe it on location.
- Design and conduct scientific investigations regarding food preferences for small invertebrates.

Educator Notes

This can be taught by itself and further developed through the extension activities or linked with the literacy lesson “Who Has Been There?” and art lesson “Drawing on Leaves” (Available from Teacher’s Corner)

References/Resources

Eco Inquiry, Kathleen Hogan, Institute of Ecosystem Studies, Kendall/Hunt Publishing Co. Dubuque, Iowa 1994 ISBN 0-8403-9584-1

SYEFEST Activity: Beat Sampling: www.ecostudies.org/syefest/ap1res8.htm,

SYEFEST Activity: Tree Transects: www.ecostudies.org/syefest/ap1res3.htm

Institute of Ecosystem Studies, Millbrook, New York, Contributor: Alan Berkowitz