

LESSON PLAN 18

Title: Quadrat Count

Content Area Subjects:

- Career and Educational Development, Science, Health and Physical Education, History, ELA, Math, Social Studies

Grade level(s): Grades 3-12+ (The Instructor could adapt portions of this lesson for lower grades; the computer exercise at the end may require older students to be partnered with younger students, depending on the skills of the group)

Standard(s):

Maine Learning Results

- Career and Educational Development. Interpersonal Skills (A3.pre-k to diploma.a,c)
- ELA. Informational texts (A3.3.c); (A3.3.e); (A3.6.e); A3.9-diploma.b); Research (C1.3-5.a,c,d)(C1.6-8.g); (C1.9-diploma.a,c); Listening (E1.3-diploma.c); (E1. 9-diploma.a); Speaking (E2.3-8.d); (E2. 9-diploma.a)
- Health and Physical Education. Cooperative Skills (I1.pre-k to diploma.a-d); Responsible Behavior (I2.pre-k to diploma)
- Math. Data (B1.4-8.a,b); (B1.9-diploma); Measurement and Approximation (B1.4-diploma.a,b); (B1.9-diploma.a,b,c); (B2.3-6); (B2.7.1a, 1b); (B2.8-diploma.3)
- Science. Scientific Inquiry and Technological Design (B1.3-diploma.a); (B1.3-diploma.b); (B1.3-diploma.c); (B1.3-diploma.d; (C1.3-diploma.a)
- Social Studies. Taking Action Using Social Studies Knowledge and skills (A3.3-diploma)

Common Core:

- ELA. (V.3-12.6); (SL.3-12.1c); (SL.3-5.1); (L.3.5b);(L.3.5b)
- Science and Technology. (R.6-12.4); (R.7-12.4)

STEM Skills

Brief Description: The students will take a field trip to the Rocky Shore to learn how to use a quadrat for counting holdfasts and determining the age of a seaweed,

Ascophyllum nodosum, in this lesson on taking marine samples. If time allows, this lesson can be combined with Lesson 20, and the other plants and animals found in the quadrat can be counted and identified as well.

Adaptations for different age level/abilities:

The Instructor could adapt portions of this lesson for lower grades, but they may need help if the substrate is dense. For the computer portion at the end, teachers could partner students of varying ability levels or skill levels)

Objectives/Goals: After completing this lesson, the students will be able to:

- demonstrate a knowledge of the use of a quadrat to take samples of a particular species
- use math skills to calculate percentages and averages
- cooperate with a partner and a group for a common goal
- observe several species in their natural environment

Time needed: 1 ½ hour or one class period or in the field;

1 hour or one class period in the classroom

The lesson can be adjusted to the available time; this lesson needs to be done at low tide so students can get to the mid and low intertidal. Depending on the abilities of the group, taking samples and counts can be made as realistic as the Instructor wishes. An entire area could be completed or an illustration of the practice could be accomplished.

Keywords:

holdfast, quadrat, seaweed *Ascophyllum nodosum* (knotted wrack), taking samples

Materials Needed:

30 cm by 30 cm quadrats (pieces of pvc pipe, twine to make a grid, and 90 ° pvc elbows are used to make quadrats; Plastic toy hula hoops can be substituted if a formula for the area of a hoop is substituted.) Arrangements may be made with Dr. Brian Beal to borrow quadrats from DEI.

small notebooks or charts to use in the field to write down data (waterproof, if possible)

pens/pencils

some *Ascophyllum nodosum* to show the students prior to leaving the classroom

pictures of taking samples using quadrats

math worksheet on samples and determining average age and formulas for space (used in science day camp)

boots and play clothes

computers with internet connection (other resources could be substituted)

Procedure:

Introduction:

The Instructor will say, "Today we are going to have the opportunity to use a quadrat to take samples in a marine habitat." Show them the quadrat and let them see the pictures that illustrate students using quadrats.

In the field trip portion of our work, we have two purposes:

1. To count the seaweed plants by determining the number of holdfasts of *Ascophyllum nodosum* that we find in a particular habitat at the low, mid, and high tide level
2. To determine the age of the *Ascophyllum nodosum* plants we find in each quadrat by starting with the holdfast attached to the rock and counting one year for each node up until the counter reaches the tallest part of the plant.

We will ask our hypotheses as questions to be answered after the count:

1. Are there more holdfasts on average at the upper tide versus the lower tide height?
2. Are *Ascophyllum nodosum* plants on average older at one tidal height versus another?

Prior to leaving for the field trip, there are a few points to explain to the students. If possible, the Instructor can demonstrate how to count the seaweed if a sample can be obtained. The Instructor can also demonstrate how the students will obtain the quadrat samples by placing/tossing the quadrat at various points in the designated area to be sampled.

The Instructor needs to caution the students about the slippery rocks that they might encounter and try to pick a way through the habitat that is as safe as possible.

CARE SHOULD BE TAKEN TO LEAVE ALL HOLDFASTS ATTACHED TO ROCKS AS A CONSERVATION MEASURE. SEAWEED WILL CONTINUE TO GROW

EVEN IF IT IS PRUNED IN SOME MANNER. There are regulations governing how close seaweed can be clipped.

(See <http://www.seagrass.umaine.edu/publications/outreach>)

The Instructor will show the students how to record their data, by referring to a worksheet and explaining what the students are to write down. (This exercise will work well with a group of 2 to 4 with the members of the group making sure that data is entered correctly before leaving the quadrat site.)

If obtaining a piece of seaweed is not possible beforehand, then the Instructor can demonstrate how to identify and count the holdfasts and count the nodes that signify years of age once the group has arrived in the area.

Key Questions

What is a quadrat?

How is a quadrat used to take samples of marine plants/animals?

What precautions must the people follow to take samples and make sure their data is accurate?

How can we recognize *Ascophyllum nodosum*?

What does a holdfast look like? What is its purpose?

Why should good stewardship practices be followed while taking samples?

Main Activity

The Instructor and students will travel to the field area and take samples as directed. If the time in the field is to be extended, Lesson 20 can be incorporated into this lesson, and the students can find and identify other marine plants and animals that they find.

Conclusion

Upon return to the classroom, the Instructor will show how the individual student or small group data can be compiled into one set of data to describe the samples of an area. Using the worksheet and working together, data will be calculated, checked, and entered into the main worksheet.

The Instructor should explain how to work the math formulas OR ALLOW THE STUDENTS TO DO THIS TOGETHER IF IT IS A REVIEW OF MATH SKILLS ALREADY LEARNED IN THE PAST.

Assessment/Follow-up/Enrichment Activities:

The Instructor could lead a discussion about taking marine samples and how the data are used to understand and help preserve natural and commercial resources.

Seaweed is currently being harvested in Downeast Maine. The discussion could center on the use of the age count of *Ascophyllum nodosum* prior to and after a harvest season to check the health and growth of the plant in a particular area. The students could use their computers and a website such as <http://www.seagrant.umaine.edu/publications/outreach> and www.seaweed.ie to find out more about seaweeds and uses for seaweed in their area and the world.

