

## **A PEARL OF AN OYSTER**

**Sandie Nichols**

### **PURPOSE**

Students will understand the basic physiological function of an oyster and its relationship to its environment. (Ecological niche)

### **OBJECTIVES**

**The students will be able to:**

- Make a functional model of a filter feeder
- Use the Internet to find information on oysters
- Make observations
- Create a dichotomous key to distinguish between subtidal and intertidal oysters
- Identify the relationships of oysters to other marine organisms
- Discuss the historical changes to other oyster populations in the southeastern United States

### **GRADE LEVEL**

This lab activity was designed for 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grade students.

### **NATIONAL SCIENCE EDUCATION STANDARDS ALIGNMENT**

#### **K-12: Unifying Concepts and Processes**

Systems, order, and organization

Evidence, models, and explanation

Form and function

#### **Grades 5-8:**

##### **Science as Inquiry:**

Abilities necessary to do scientific inquiry

Understandings about scientific inquiry

##### **Life Science:**

Structure and function in living systems

Regulation and behavior

Populations and ecosystems

Diversity and adaptations of organisms

##### **Science and Technology:**

Understanding about science and technology

##### **Science in Personal and Social Perspectives:**

Populations, resources, and environment

##### **History and the Nature of Science:**

Science as a human endeavor

## MATERIALS LIST

*Students will work in groups of two to four*

### STEP 1:

- KWL chart (what they *know*, what they *want* to know, what they have *learned*)
- Find website: [www.mdsg.umd.edu/oysters/oysfilt.htm](http://www.mdsg.umd.edu/oysters/oysfilt.htm) and scroll down to video (set as favorites to save time)
- Computer with CD ROM and Internet access
- Display screen
- Assortment of sponges, cloth towels, coffee filters, cheesecloth, sand, soil, gauze pads, popcorn packing, cotton, clear plastic cups, clear plastic tubing, clear plastic bags, paper towels, pebbles, marbles, funnels, and muddy water with obvious sediment particles
- Measuring cups
- Bucket to empty the mud
- Small strainers as frames for filter feeders
- Bowls

### STEP 2:

- Computers with Internet
- Treasure Hunt questions
- Appropriate links

### STEP 3:

- Assortment of subtidal oyster shell and intertidal oyster shell
- Rulers
- Calipers
- Scales
- Density blocks
- Bowls of water
- Calculators
- Posters
- Markers and crayons
- Blank transparencies
- Vis-à-vis pens
- Gloves for each student

## SAFETY

In Step 1, students will devise a plan for creating a filter feeder. The plan must be teacher approved to avoid any safety hazards. All testing will be supervised.

In Step 2, students will be using the Internet to answer questions. Supervision is needed to assure that the students visit only approved sites.

In Step 3 of this activity, students will be handling clean oyster shell. **It is important to know if anyone has a shellfish allergy. For some students, this allergy can be life threatening. Even touching the shell could pose problems.**

Students should wear gloves when handling shell to avoid being cut on sharp edges.

## **PREPARATION**

### **STEP 1:**

This activity could take up to three days of regular 45-50 minute class time. Be certain to have enough supplies for each group of two students. If students build the model on the second day, allow them to bring materials from home. (It would be wise to have the students commit to the plan of design to avoid “testing” at home.)

Allow students to develop a rubric for assessment of the activity and stress the important outcome components or use the one included.

### **STEP 2:**

The Internet activity is designed to be completed in one class period. Again, this activity may take two class periods depending on the experience level of students. Be certain to bookmark links to save time for student access. If your school has individual log-ins, have a copy of student passwords available.

### **STEP 3:**

Soak shells with a small amount of bleach mixed with water and set out to dry. If oyster shell is unavailable, contact the South Carolina Oyster Restoration and Enhancement project at <http://www.csc.noaa.gov/scoysters>, or Nancy Hadley at [Hadley@mr.dnr.state.sc.us](mailto:Hadley@mr.dnr.state.sc.us). Explain that you are a teacher and need a small assortment of subtidal and intertidal oyster shell for this activity.

## **INCLUDING ALL STUDENTS**

- Student groups create their own design of a filter feeder using familiar objects to address the tactile learners.
- Students make a visual aid in the form of a poster or concept map to reflect visual modalities.
- Students present their findings orally to accommodate the auditory learners.
- Based on the students’ questions, this could lead to volunteer opportunities and career exploration.
- Cultural aspects of Native Americans and the first Thanksgiving could be expanded.
- Awareness of the diverse cultures that depend on oyster populations for subsistence could be expanded based on the cultural diversity of the students.
- The “Oyster Song” used as a wrap-up activity addresses auditory learners.

## **QUESTIONS TO ASK ALONG THE WAY**

1. What is a hypothesis?
2. Why should you test your filter more than once?
3. What is the purpose of a model?
4. What are some extraneous variables that affect the function of your model of a filter feeder?
5. Why do you think the oyster is a filter feeder?

6. What clues lead you to believe that oysters live where they do?
7. Are scientists' hypotheses always correct?
8. What is measurable data and why is it necessary?
9. What is the difference between subtidal and intertidal oysters?
10. Why do you think subtidal and intertidal oysters grow differently?
11. What is the difference between qualitative and quantitative data?

## **PROCEDURE**

### **STEP 1:**

(See materials list)

*Students will make a functional model of a filter feeder.*

Show the class the video clip and begin a KWL chart to be displayed throughout the unit. Begin filling in what the students already know about oysters. Restrict the statements to cover two pages at most. Fill in what the students would like to know after the unit. Do not restrict questions to those that can be answered through research.

Cooperatively assign students in groups of two to four. Random grouping allows better diversity. Give groups the assignment.

- 1. Your group must create and build a model of a filter feeder.
- 2. The filter must attempt to visually clean 2 cups of muddy water after being fed. (Hypothesis: Our feeder will filter sediment from 2 cups of muddy water and the water will appear clear.) (Class may wish to develop a scale of clarity.)

Students will devise plans for their filter feeders and get teacher approval before creating the model. If activity exceeds class time, students may bring items from home as long as the plan is approved prior to the end of the class period. Students may wish to draw diagrams of their filters for reference. Teacher may take digital pictures to help students remember the model or for students to use on their poster for Step 3.

Students will build their approved models and test. Be certain to stir the muddy water before applying it to the filter for each group. Have students save a cup of the filtered liquid to use as a comparison for the second testing of the revised feeder. Students will revise their feeders and retest. Be certain that groups are able to justify their predictions for revisions to their feeders.

When all groups have tested their feeders, revisit the KWL chart and discuss conclusions. Grades are based on the attempt made not the actual success of the filter. Explain that due to time constraints, feeders will only be tested once.

Groups will share their ideas and revisions with the class. Allow students to draw conclusions and make inferences about the filtering process. Reinforce the idea of a model and its purpose. Avoid misconceptions that may include that oysters are cleaning and instead of eating. Direct students to compare their two samples of filtered liquid and determine which one would be more beneficial to the oyster.

### **STEP 2:**

(See materials list)

*Students will use the Internet to find information on oysters.*

Regroup the students in pairs. Create a Treasure Hunt list of questions based on the KWL chart of things the students want to know or use the attached Treasure Hunt. Ten to twelve questions are adequate for this portion of the lesson. Be certain to include questions about habitat, growth and development, adaptations, form and function, and diversity of oysters.

Students will work in pairs on approved sites on the Internet to answer the questions for the Treasure Hunt. Students should have prior experience on the Internet, logging in, and browsing before attempting this assignment. Supervision is necessary while students access the approved sites.

Appropriate sites:

**“South Carolina Oyster Restoration and Enhancement”** (<http://www.csc.noaa.gov>)  
<http://www.csc.noaa.gov/acebasin/specgal/oyster.htm>

**“Department of Natural Resources”** (<http://www.dnrstate.sc.us>)  
<http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html>

**“Ladywildlife”** (<http://www.ladywildlife.com>)  
<http://ladywildlife.com/animal/oyster.html>

**“Maryland Sea Grant”** (<http://www.mdsg.umd.edu>)  
<http://www.mdsg.umd.edu/oysters/oysfilt.htm>

Revisit the KWL chart and fill in or make adjustments to the W portion of the chart.

STEP 3:

(See materials list)

*Students will make quantifiable observations and create a dichotomous key to distinguish between subtidal and intertidal oyster shell.*

Review and demonstrate principles of a dichotomous key using nails/screws, markers/pencils, or shoes/sneakers.

Students will need to be familiar with making a dichotomous key and concept mapping.

Regroup the students in pairs. Do not use the prior groups from Step 1 or Step 2. Give each group an assortment of subtidal and intertidal oyster shell. **Be aware of any student with a shellfish allergy.** Any student with a shellfish allergy will **not** handle the shell **even with gloves.**

Students will make observations of the shells using scales, calipers, density, and appropriate classroom materials. All data must be quantifiable and recorded in a data table created by students. Students will create a dichotomous key using the information learned in previous activities. Students will create a poster or a transparency to share with their classmates. The evaluation will be based on a rubric and placed in their portfolios. Revisit the KWL chart and fill in the L portion of the chart based on the information gathered and developed throughout the activities. All questions may not be answered.

Teach wrap-up Oyster Song, written by Sandie Nichols

### **SUGGESTIONS FOR ASSESSMENT**

- An authentic assessment of terms and concepts could be given at the end of this unit.
- A rubric for Step 1 could be developed by students and used as an assessment for this lesson.
- A fill-in-the-blank concept map could be used as an assessment tool.
- A short essay summary of the learning could be given as a test.
- The rubric for Step 3 could be used as an assessment for this unit.
- The Treasure Hunt could be used as an assessment.

### **WHERE TO GO FROM HERE**

- Create a food web based on oysters and their habitat
- Use samples of water from ponds, creeks, tap, and bottled water to test for water quality, salinity, oxygen levels and make comparisons
- Measure shell samples and find the mean, median and mode of the samples and graph the results
- Create a problem solving activity based on a hypothetical situation where a non-native species was accidentally introduced
- Create a wanted poster of a non-native species accidentally introduced into the oyster reef
- View the video, Common Ground: Saving the Chesapeake's Oysters, Silverwood Films, Inc. 1999. Have students make proposals for assisting the bay with restoring the oyster population
- Join as volunteers for the SCORE program and “adopt” a reef, help with water quality monitoring
- Help out as a volunteer during a Beach Sweep to clean the beaches
- Create a plan for the preservation or recovery of the oysters to be presented to the state DNR
- Create an educational brochure for the preservation or recovery of oysters

### **REFERENCES AND RESOURCES**

“South Carolina Oyster Restoration and Enhancement” (<http://www.csc.noaa.gov>)  
<http://www.csc.noaa.gov/scoysters>

“Department of Natural Resources” (<http://www.dnr.state.sc.us>)  
<http://dnr.state.sc.us/marine/pub/seascience/oyster.html>

“Maryland Sea Grant” (<http://www.mdsg.umd.edu>)  
<http://www.mdsg.umd.edu/oysters/anatlab/lab.htm>

“Chesapeake Bay Foundation” (<http://www.savethebay.cbf.org>)  
<http://www.savethebay.cbf.org>

**“Ladywildlife”** (<http://www.ladywildlife.com>)  
<http://ladywildlife.com/animal/oyster.html>

**“Maryland Sea Grant”** (<http://www.mdsg.umd.org>)  
<http://www.mdsg.umd.edu/oysters/oysfilt.htm>

## **STATE SCIENCE EDUCATION STANDARDS ADDRESSED**

Step 1: South Carolina State Standards:

- IA1a1: Observe patterns of objects and events
- IA1a2: Distinguish between qualitative and quantitative observations
- IA2a: Recognize potential hazards within a scientific investigation and practice appropriate safety procedures
- IA2b: Pose questions and problems to be investigated
- IA5a: Review and summarize data to show cause-effect relationships in experiments
- IA7a: Use drawings and written and oral expression to communicate information
- IB4b: Suggest improvements and try proposed modifications to the design

Step 2: South Carolina State Standards:

- IA1a1: Observe patterns of objects and events
- IA1a2: Distinguish between qualitative and quantitative observations
- IA4b: Construct and/or use models to carry out/ support scientific investigations
- IA7d: Create and/or use scientific models to communicate information
- IB3b: Organize materials, devise a plan and work collaboratively where appropriate

Step 3: South Carolina State Standards:

- IA1a1: Observe patterns of objects and events
- IA1a2: Distinguish between qualitative and quantitative observations
- IA1b2: Use scientific and dichotomous keys for classification
- IA4b: Construct and/or use models to carry out/ support scientific investigations
- IA7a: Use drawings and written and oral expression to communicate information
- IA7b: Create drawings, diagrams, charts, tables and graphs to communicate data
- IA7d: Create and/or use scientific models to communicate information

## **PEDAGOGY USED**

Broad Teaching Strategies:

- Active learning/discovery learning
- Cooperative learning
- Critical analysis/critical thinking
- Hands-on learning
- Inquiry-based learning
- Student-centered instruction
- Self-directed instruction

Use of Instructional Technology

- Computer-assisted learning
- Other instructional technology use

Additional Teaching Strategies

- Class/group discussion
- Data analysis, collection, interpretation
- Demonstrations
- Hypothesis testing
- Laboratory equipment
- Learning cycles
- Problem-based learning

Authentic & Alternative Assessment

- Portfolios

RUBRIC FOR STEP 3 OF **A PEARL OF AN OYSTER**

1 POINT FOR EACH ITEM.

- \_\_\_\_\_ 1. Presentation
- \_\_\_\_\_ 2. Content
- \_\_\_\_\_ 3. General to specific information
- \_\_\_\_\_ 4. New vocabulary usage
- \_\_\_\_\_ 5. Smooth transitions
- \_\_\_\_\_ 6. Spelling
- \_\_\_\_\_ 7. Creativity
- \_\_\_\_\_ 8. Neatness
- \_\_\_\_\_ 9. Clear conclusion
- \_\_\_\_\_ 10. Equal participation of group members

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\_\_\_\_\_ = **Total grade for group #** \_\_\_\_\_

**Names:** \_\_\_\_\_  
\_\_\_\_\_

**Treasure Hunt for “A Pearl of an Oyster”**

NAMES \_\_\_\_\_

Group# \_\_\_\_\_

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This Treasure Hunt will help your group find answers to questions using pre-selected web sites. Your group will need to look at the information on the sites and consider how accurate the information is at the site.

*QUESTION 1. What is an oyster?*

WEBSITES	SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.htm">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.htm</a>
Who created this website?		
Why did they create it?		
How accurate do you think the info is?		
When was this site last updated?		

*Question #2. What is the habitat of an oyster?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #3: What competitors do oysters have?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #4: What predators do oysters have?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #5: What do oysters eat? How do oysters eat?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #6: How do oysters reproduce?*

SITE #1:	SITE #2:
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<a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	<a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #7: What changes have occurred in the oyster population over the last century?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #8: What adaptations do you think have occurred in oysters over the years?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #9: What naturally occurring population controls exist?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

*Question #10: How and why has the human population changed the geographic range of oysters?*

SITE #1: <a href="http://www.csc.noaa.gov/acebasin/specgal/oyster.htm">http://www.csc.noaa.gov/acebasin/specgal/oyster.htm</a>	SITE #2: <a href="http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html">http://www.dnr.state.sc.us/marine/pub/seascience/oyster.html</a>

Assessment for Step 1: **Building a filter feeder**

1 point for each question

1. \_\_\_\_\_ cooperation of group members

2. \_\_\_\_\_ equal participation

3. \_\_\_\_\_ creativity

4. \_\_\_\_\_ on task

5. \_\_\_\_\_ logical method

6. \_\_\_\_\_ appropriate revision

7. \_\_\_\_\_ organization

8. \_\_\_\_\_ materials list

9. \_\_\_\_\_ procedure/ method

10. \_\_\_\_\_ conclusion

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\_\_\_\_\_ =TOTAL GRADE FOR GROUP # \_\_\_\_\_

### **WRAP-UP**

**THE OYSTER SONG, Written by Sandie Nichols**  
(To the tune of "This Old Man")

Oysters are  
Filter feeders  
Mollusks, bivalves, spawn in summer  
Gills gather phytoplankton, waiting for the tide  
Clusters in brackish water abide

Oysters need  
A solid substrate  
Old oyster cultch is really great  
Creates habitat for many species  
Barnacle, mussel, sponge  
Oysters settle as spat on grunge

Oysters expel  
Pseudofeces  
Change gender many times during life  
They grow new layers like  
Rings of a tree  
They can't move to run or flee

Predators are  
Crabs, starfish  
Subtidal, intertidal are two types  
With hair-like cilia  
Separate food from silt  
That is how new habitats are built