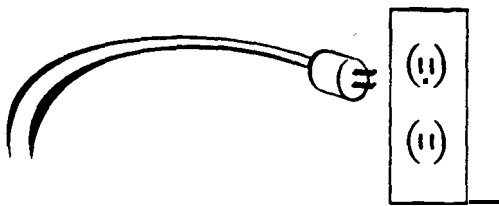


**ACTIVITY FOUR****MUSSEL TO MUSSEL****TIME:** (3) 45-minute lessons**SCIENCE PROCESS SKILL:** Classifying**SCIENCE CONCEPT:** Native and introduced species of mussels must both be recognized.**BENCHMARKS:** Students should:  
Know that a great variety of kinds of living things can be sorted into groups in many ways by using various features to decide which things belong to which group.

Understand that, for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

**OBJECTIVE:** Students will demonstrate the ability to differentiate between native mussels and zebra mussels.**WHAT YOU OUGHT TO KNOW**

Almost 300 different species of native mussels have been identified from streams, rivers, lakes, and ponds of North America. They are important, both economically and ecologically. Zebra mussels compete with native mussels for food, space, oxygen, and other necessities. Some competition may not be bad if the teams are fair; but, because zebra mussels reproduce so quickly, they often will “out compete” the native mussels (and other native organisms as well). Zebra mussels may eliminate native mussels completely from many rivers and lakes. To preserve our native mussels and control or eliminate zebra mussels, we need to be able to tell the good guys ( the native mussels) from the bad guys ( the zebra mussels). Several characteristics can be used to tell different species apart. Several features can be used to tell the difference between native mussels and zebra mussels.



## WHAT'S THE CONNECTION??

### TO LANGUAGE:

Write a constructed definition for each vocabulary word from given materials.

### TO MATHEMATICS:

Find the differences in length of freshwater and zebra mussels.

### TO ART:

Sketch the mussel of their choice. Construct a shell poster.

### TO SOCIAL STUDIES:

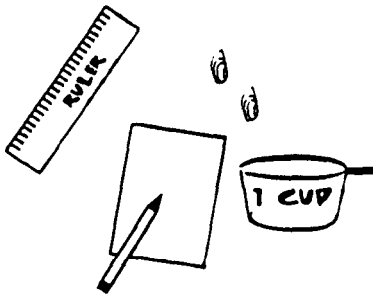
Read about the shell industry along the Mississippi River.



## WORDS OF WISDOM

Classification, diversity, glochidia, life cycle, marsupium, mother of pearl, organic detritus, parasitize, sedentary, sediments, species (native, exotic, and introduced), scientific and common names, shell species (see also glossary on page 7)

## RESOURCES AT THE READY



Collection of mussel shells (4 bags)  
Shell button set (2 buttons per strip)  
Copies of *Mr. Boepple's Shells* story 4.1  
Shell Classification Game 4.2  
(4 game boards in poster tube)  
Freshwater Mussels Life Cycle Chart  
(4 posters in binder's back pocket)  
Zebra Mussel Life Cycles Chart  
(4 posters in binder's back pocket)  
Pamphlets on freshwater and zebra mussels (8)  
Construction paper or cardboard  
Zebra mussel journals and pencil

## TIME TO EXPERIENCE ZEBRA MUSSEL MANIA!!



### DAY 1-3 (THE ENTIRE CLASS)

1. Have the entire class read Mr. Boepple' s story, Story 4.1, and distribute buttons for each group of students to observe. Buttons included in the kit are made from either shells or plastic; you may want to add a few buttons of your own. Buttons on green side of strip are mussel shells; buttons on white side are made of newer plastic materials. Have the students decide which are the shell buttons. In their journals have them write a description of the shell button and the plastic button and how they can tell the difference between the two or between others in the kit.
2. Have the students discuss the story of Mr. Boepple. What were some characteristics they saw in him that made him a good business person? What were some of his characteristics that made him a bad business person? He used mussel shells for buttons. What other uses could be made for shells? Make a list of uses for shells. What changes have been made in modern medicine that would make it almost impossible for Mr. Boepple to die today with a cut foot?
3. Explain that just as they have learned to distinguish the shell button from other buttons, shells can be classified into groups by common appearances or differences. Their next task will be to classify a group of shells by common characteristics and to look at the life cycles of shells.

### TEACHER DIVIDES THE CLASS INTO TWO GROUPS

GROUP 1  
classifies the shells

GROUP 2  
looks at the life cycle

The groups will switch activities each day so both groups will have the opportunity to do each activity.

## CLASSIFYING THE SHELLS (DONE BY GROUP 1)

1. Each group should take a shell set and shell classification guide. Have each group sort the shells into groups that look alike. They will notice that the shells have numbers. The number will be used later in sorting the shells and to help learn their names. Have them write, in the zebra mussel journal, descriptions of each shell. Encourage them to use a ruler. Discuss how their shell groups were formed-by size, by color, by shape, by shell type, etc. Accept all answers in this discussion.
2. Explain that most shell keys are developed around a binary (two division) key. They are now going to classify the shells using Record Sheet 4.2, Mussel to Mussel Shell Classification Game.
3. Show students the procedure for developing the key. First have them place all the shells in one group. Place shells in the big rectangle on Record Sheet 4.2. Then, make up a good question, where the answer is either yes or no, that will divide the shells into two groups. (One questions could be: Are they snail-like?) Write the question on the line in the first big rectangle. Physically divide the shells into those two groups. Place the shells or write the numbers of the shells whose answer is yes in that rectangle; and the letters whose answer is no in that rectangle. Have the students pretend that the lines are a path on which the shells are carried to the next rectangle. Keep dividing the shells by asking new questions that can be answered by either a yes or a no until the bottom of the board has been reached.
4. When finished, have each group share their classification. Discuss how the groups vary, or are the same? Why were decisions made about the grouping? You may want to make a big classification diagram on a poster board or lay the shells flat on a piece of butcher paper.
5. Hand the groups the picture guide to Freshwater *Mussels of the Upper Mississippi River*. From your list, have them find the name of a shell, then look up information in the shell guide. Copy information from that shell guide along with names of other students researching that shell.

## LIFE CYCLES (DONE BY GROUP 2)

1. Give the students a piece of construction paper or cardboard and a shell. Have them make a list of the important information about that shell. Print it carefully. When both groups have finished the classification activity, place the shells from one set on the completed descriptions of that shell. Place the shell and information page in a display area for other classes to observe.
2. Explain to the students that internal or reproductive methods also are used by experts to classify mussels. Students should understand how freshwater mussels are classified differently from zebra mussels and many other mussels by their reproductive method. That characteristic is one reason why zebra mussels have spread so easily, with exploding populations that cause population declines in freshwater mussels.
3. Have the students collect the life cycle posters and Observation Sheet 4.6.
4. Using the life cycle charts for both native and zebra mussels, have each working group read, discuss, and record the similarities and differences of both groups of organisms. They should make notes in their zebra mussel journals and transfer the final information to Observation Sheet 4.6.
5. Have each group share their observations with the class. As they do so, make a large list on the board. With discussion, prepare a list of characteristics that will compare and contrast the two organisms. Have the students copy that information into their zebra mussel journal. They will need that information later.
6. Have each student draw in the journal the life cycle of the freshwater mussel and life cycle of the zebra mussel, and label the drawings fully.
7. Have everyone complete the Mussel Multiplication section of *All About Mussels* found in the front pocket, or use this later as part of the Post-test.

## WHAT DID YOU LEARN??

You should be able to observe the students interact in groups as they classify the shells and compare and contrast freshwater mussels with zebra mussels. Each student should have the required information and drawing in the journal. Questions can be asked about the life cycle, and each group should be able to distinguish between the life cycles of native mussels and zebra mussels.

## WAIT, THERE'S MORE . . .

- The students can bring in other shells or mussels (including freshwater and saltwater species) to add to your collection. Are they freshwater or marine species? Have them find the names of each from shell books.
- Did you discover that 13 shells were found in the shell collection? Shell 13 is unlucky because this mussel can no longer be found alive in the Illinois River. The other shells, however, can still be found at locations along the river where they once were abundant. Can the students develop some explanations for the disappearance of that species? Find out which mussels in your region are endangered.
- Do a venn diagram comparing and contrasting zebra mussels and other freshwater mussels.

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