Oyster Beds

Overview

Naturalists and scientists use many skills when trying to understand how animals live and why they behave the way they do. The depth of their understanding is only as keen as the questions they ask and the accuracy of their observation skills. A good naturalist has to have very perceptive senses and a great deal of patience in order to understand the natural world and the creatures that live in it.

Sharing observations with others is very important in the field of science. Adding new information to what we already know about our planet is important for its long-term health. Clear ways of communicating observations are almost as important as the observations themselves. One of the organisms that scientists, food-lovers, and poets have been sharing information about for several thousand years is the oyster!

The construct, design and purpose of this activity is to take a content-rich approach to increasing literacy skills by immersing the students in a compelling hands-on science activity. Content-rich literacy activities are absolutely integral to the hands-on components of science. It is through literacy that thoughts are organized and abstract ideas represented. Science and literacy are both about making connections. Without the organizing abilities of literacy, there could probably be no science.

In Session 1, students are given practice, first in the classroom and then in an outside setting, in using all five of their senses to make observations and to compare their observations with inferences. While outside, students complete a Field Trip Notes student sheet and list their observations and feelings. These words are then transferred to the class word wall.

In Session 2, "The Shell Game," students participate in a Silent Mingle, which gives them the opportunity to share descriptive language about shells with one another and add adjectives to the growing word wall. This activity structure also activates and assesses their prior knowledge about shelled animals. Students then work in cooperative groups and use their five senses to make detailed observations about one half (or **valve**) of an oyster shell.

*Oysters are **bivalves**, as are clams, meaning they have two shells. (See the Background section of this activity for more information.)*

Unbeknownst to the students, the missing halves of their oysters are being closely observed by students in another group. Each student communicates observations about their oyster shell valve with written descriptions (using some of the adjectives from the word wall) and sketches on a card. Shells and completed cards are then shuffled and traded between groups. Each group then makes matches between the cards and shells passed to them from another group.

After a class discussion about what descriptions they found most and least helpful in matching up the cards to shells, they search other groups for the missing half or match to their shell. When they get over the surprise of how the two halves fit together, they sit with their new partner and make new observations about the complete oyster shell. "Oyster Questions" are then displayed to give them practice using the observations they made about oyster shells to make educated guesses about what the living oyster must have looked like and how it made a living. Every answer is accompanied by the question "How do you know?" Students discover that scientists need to make careful observations and communicate them clearly in order to learn about the natural world.

Oyster Beds concludes in Session 3 with students writing collaborative and individual poetry using the word walls filled with new and descriptive vocabulary gleaned from throughout the entire activity. In this session, students discover that poetry offers a way for people to communicate their thoughts and feelings about the special qualities and values of ocean habitats and the animals that live there.

What You Need

For Session 1:

For the class:

- masking tape
- Sense and Observation transparency
- transparency pens
- overhead projector
- Optional: pictures from magazines of people using their five senses

For each student:

- clipboard (or cardboard piece with binder clips)

- ❑ 1 pencil
- ❑ Field Trip Notes student sheet

For each pair of students:
- ❑ 1 pencil
- ❑ 1 Sense and Observation Student Sheet

For each small group of four students:
- ❑ 20–30 5 x 8" index cards or sentence strips cut in half
- ❑ 4 colored markers (various colors)

For Session 2:

For the class:
- ❑ Oyster Questions transparency
- ❑ transparency pens
- ❑ overhead projector
- ❑ 20–30 shells, various (See Getting Ready)
- ❑ 2–3 sheets chart paper (or use the chalk or white board)
- ❑ colored markers (various colors)
- ❑ 3 sets of stickers or colored sticky dots (2 of each kind) (See Getting ready)
- ❑ 10 whole oyster shells which equals 20 halves (you will need more if you have more than 20 students) (See Getting Ready)
- ❑ 10 rubber bands
- ❑ Optional: scale, string, calipers
- ❑ Optional: shell pictures and/or books about shells (See Resources)

For each small group of 5-6 students:
- ❑ 2–3 rulers
- ❑ 5–6 5 x 8" index cards
- ❑ 5–6 pencils
- ❑ one quart size plastic freezer bag containing 5-6 oyster valves (1/2 oyster shell = a valve) (See Getting Ready)

For Session 3:

For each group:
- ❑ 1 sheet 8 1/2 x 11" blank paper
- ❑ 1 pencil

For the class:
- ❑ masking tape
- ❑ 5 x 8" index cards or sentence strips cut in half
- ❑ video images of wetlands (See Getting Ready)
- ❑ books, pictures, or posters about wetlands (See Getting Ready)

Getting Ready

1. Make transparencies of the Sense and Observation student sheet and the Oyster Questions.

2. Field Trip Notes Worksheet
Decide where you will take your students for the schoolyard (or nearby park) observation time using the Field Trip Notes worksheet. Look for a grassy spot so the students can spread out and sit comfortably. An area with a diversity of flora and fauna will give students the opportunity to focus on different aspects of the habitat. If you can't take your students outside to an appropriate area, or if the weather doesn't cooperate, have the students take a virtual field trip. In this case, turn on a video, preferably of the wetlands, and turn the sound down completely. (See the online Resource Database for video titles and ordering information.) You could also have the students look in books, or at pictures or posters.

3. Obtaining an Assortment of Shells
There are many ways to obtain the variety of 20 - 30 shells you will need for the "Silent Mingle" portion of this activity. Rather than buy shells from a shell shop, encourage students to bring in shell collections they might have at home. You will probably be amazed at how many shell collections are languishing in some Aunt, Uncle, Grandparent or neighbors attic. Avoid purchasing shells in shell shops as they are one of the major culprits in decimating many tropical coral reefs. It is better to use shells that are already in collections rather than supporting shell shops by purchasing more. They are however, a great spot to go on a field trip! Create a classroom display of different kinds of shells and have books and pictures of shells available for students to use.

4. Obtaining Oyster Shells
Obtaining oyster shells is half the fun of this activity - especially if you like barbecued oysters! For this activity you will need 10 whole oysters for a class of twenty students [the equivalent of 1/2 (or one side) of an oyster shell for each student.] It is imperative that you have both sides of the oyster for this activity. Buy live, whole oysters at your seafood market (they will order them for you if the store doesn't usually carry them.) Cook them on a BBQ until they just open, add a little BBQ sauce or butter and they are delicious. If you don't want to eat the oysters, you can steam them open in a pot with a small amount of liquid. Wash the shells thoroughly and separate them carefully at

the hinge. Take care to not break them. Set them out to dry for several days in the sun. When they are completely dry, wrap a rubber band around the shell to keep the matching valves together. Some oyster bars or restaurants will save both sides of the oysters for you if you ask them–otherwise, as they are shucking them, the shells quickly become separated from their match.

5. Wetland Visuals
Obtain visuals about the wetlands. A video is ideal as a focal point for the virtual field trip, but a slide show, books, pictures and posters will also work well. Try to use a different video or show a different piece of it than you used in the Build a Wetland activity. (See the online Resource Database for titles and ordering information.)

6. Key Concepts
Write out the Key Concepts on sentence strips or chart paper using colored markers and large bold letters.

> **Scientists need to make careful observations and communicate them clearly in order to learn about the natural world.**
>
> **Poetry offers a way for people to communicate their thoughts and feelings about the special qualities and values of the ocean and ocean habitats.**

7. Setting Up for the Shell Game (for a class of 20):

1. Lay out four quart size freezer bags and place identical stickers on two of them (or write the same letter on two of them with an indelible marker.) Repeat with the other two bags so that you have two sets of twin bags, e.g. two bags with the letter A (A1 and A2) and two bags with the letter B (B1 and B2) or two sets of bags with matching stickers.

2. For the two A bags, take one of the whole oyster shells (made up of two valves), remove the rubber band, and place one valve in A1 and the other valve in A2 so that you are separating the matched valves. Repeat this four more times so that you end up with two bags of five shells each. Try to alternate placing the flat and cup-shaped valves into the bags so that there is a mixture of shapes and sizes in each bag.

Now repeat for the two B bags. You will now have four bags of five shells each. The valves in A1 have their match in the A2 bag and the valves in B1 have their match in the B2 bag.

3. If you have more that 20 students, simply add oyster shells; one whole oyster shell for every two students. It's OK if you have one extra shell in a group, but be sure to alert the students to it. If possible, try to use an even number of groups.

Since matching pairs are critical to the success of the activity, try to buy the oysters live and then shuck them yourself without breaking either half of the shell. BBQ is the way to go!

(Into the Activity)

Session 1: How Do We Observe?

Our Five Senses

1. Elicit from students what are our five senses (seeing, hearing, touching, smelling and tasting). Tell them that it is by using our senses that we **observe** the world around us.

Depending on the prior knowledge of your students, you may want to spend more or less time describing the five senses. Magazine clippings, chalkboard sketches or overhead projector drawings of each of the five senses are especially helpful for ELL students.

2. Tell the students that they will now have the opportunity to practice using their five senses to make observations. They will work with a partner and together find two different ways to use each of their senses to make observations of the classroom. Give them an example of an observation and the sense that was used.

Some examples of senses and classroom observations include: look at how the desks are arranged or how the books are organized; touch the textures of the walls or other surfaces; smell the chalk dust or a classroom plant; taste the water in the drinking fountain; listen to the noises coming from the playground or the next classroom.

3. Distribute one Sense and Observation student sheet to each pair of students. Show them how to complete the sheet, especially spending time on the Tell Us What You

Think About It... column. Tell them that this third column is for them to write down their thoughts and feelings about the observations they make.

For example, if they tasted a piece of candy, they might write down for their observation that it tasted sweet. What they thought about that piece of candy (good, bad, yummy or yucky) is their individual opinion or feeling.

4. Give them about 5–10 minutes to wander quietly about the room with their partner as they take notes on their student worksheet.

5. Have partners join together to form a foursome. Give them some time to share their examples of each kind of observation and what they thought about it.

6. Show the transparency of the Sense and Observation student sheet and ask for volunteers to help fill in the blanks. Write down some of their observations and feelings for each of the senses. Point out the difference between the observations and the feelings about the observations. Tell them that feelings and personal opinions are called **inferences**.

Inferences are not based on one of the five senses, but instead could be called a personal opinion. For example, some people will think a flower smells wonderful, while other people will think that same flower is stinky. What is the observation that was based on their sense of smell? The flower has an odor.

7. Ask the students if they think observations are better than inferences? Encourage discussion about this topic, but leave them with the idea that observations are really **not** any better than inferences. They each have a very important role to play in human understanding and communication. Imagine a poem, a play, a novel or a conversation with a friend that didn't include inferences. No opinions or feelings expressed? How boring! But science **is** based on observations made with the senses that you can measure and quantify.

For centuries the languages of science have been Latin and Greek. Whenever a new plant or animal is discovered it is given a Latin or Greek name as well as a common name. This has been a way to make sure that everyone, no matter where they are, are speaking about the same organisms.

Communicating Observations: In the Classroom

1. Tell the students that in the last activity we made and shared some observations about the classroom. How did we share or communicate? We wrote in words and then discussed them out loud. Ask the students what are some other ways they can think of to communicate with someone else. Some examples include: (talking, writing,) drawing, poetry or songs, pantomime, tracing, etc.

2. Have students again work with a buddy for this next activity. Tell them that they need to communicate to their partner, using as much detail as possible, what they had for lunch or breakfast that day. **They can use any form of communication, except they cannot talk.**

3. Give students a few minutes to communicate with each other, then ask whether or not they were able to clearly understand what their partner was trying to *tell* them. What did their partner do that helped them to understand? Make a list on the board of those things that helped them to catch the details.

Observing and Communicating: Outside

1. Tell students they will be going outside to practice their observation and communication skills as if they were going on a field trip. And just like a field trip, they will be on the Buddy system. Distribute a pencil, a writing surface, and the Field Trip Notes student sheet to each student. Review the student sheet and answer any questions they might have about the assignment before going outside.

Student Sheet

SENSE	OBSERVATION	TELL US WHAT YOU THINK ABOUT IT...
Taste		
Taste		
Smell		
Smell		
See		
See		
Hear		
Hear		
Touch		
Touch		

2. Tell them that when they get outside, they can choose their own "magic spot" within the boundaries you set. For the first five minutes of their observations, they are not allowed to speak or communicate with each other in any way. This is their opportunity to use all of their senses, take notes on their individual observations and feelings and to let any "wildlife" become accustomed to their presence. Their job is to answer the questions on their Field Trip Notes sheet, including making and communicating as many observations and using as many of their five senses, as possible. They can use the last five minutes to communicate and share their observations with their buddy.

3. Take the students outside, preferably to a grassy area with trees and plants. Remember to set your boundaries. Have the students spread out so that they have some space between one another. Give the students about 10 - 15 minutes to make and communicate their observations.

If you don't have the opportunity to actually go outside, you could simulate this "field trip" right in your classroom. Have students make and communicate observations as they watch organisms in an aquarium, or on a video (with the sound turned off completely) or while pouring over marine science posters, magazines, photos, or books.

4. Back in the classroom have the students share their observations with another buddy pair. They should help each other decide which are observations they perceived and recorded with their senses, and which are thoughts or feelings.

Remind them about the difference between expressing our feelings about something and actually observing something through our senses. If someone wrote about how they thought a tree was pretty or that they liked how the sky looked, those were thoughts or feelings. If they wrote that the tree was dark green with small pink flowers on it and that the sky had large puffy white clouds in it, those were observations.

Field Trip Notes

1. Sit quietly and write down 20 single words that describe your **observations** or **feelings**.

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. Watch one cloud, plant, insect, bird or some other animal carefully for five minutes. Write down anything interesting you notice about it (shape, color, how it moves, etc.). Write down four of your **observations**. Use complete sentences.

_____
_____
_____
_____

3. Make a detailed drawing of something you observed while sitting in your magic spot. Label your drawing. **Use the back of this sheet**

4. Describe some of your feelings while sitting in your magic spot.

5. What was the coolest or most interesting thing your buddy observed on the field trip.

5. Have the students share some of their observations with the entire class as you record them on chart paper. Then distribute word strips or 5 x 8" index cards and colored markers to each group of four students. Have them write down in large bold letters, the single words they recorded on their Field Trip Notes. Tell them to write only one word per card and to write each word only once.

6. If you have time now, tape the words up to create a word wall and have the students help you to sort them based on many different characteristics. Some possible sorts include: by the senses used, multisyllabic words, combined words, adjectives, words within words, words with blends, feelings, observations, etc.

7. Tell the class that they will see these words again, both on the word wall and as part of a poetry writing activity.

(Through the Activity)

Session 2: The Shell Game

Silent Mingle

> *A Silent Mingle is an activity structure designed to determine what is already known about a topic as well as giving the students the opportunity to discover new insights as they investigate the topic in a new way. This structure has the students using language in meaningful ways in a series of orchestrated conversations with changing partners.*

1. Distribute a shell to each student. Tell them their classroom has now become a shell museum. They are about to do an activity called a Silent Mingle which means they will be slowly walking around the room (that's the mingle part) without talking (the silent part) as if they were in a very quiet museum. As they pass by their classmates, they can smile and make eye contact, and most importantly show them the shell they are holding. When you say Pair-Up, they should stop and partner up with one or two student(s) nearest them. You will then give them a question to discuss with their partner(s).

2. Have the students stand up, hold their shell and walk silently around the room, looking at their classmates and the shells they are holding.

3. Say "Pair Up" and when everyone has found one or two partners, ask the first discussion question from the list

below. Give the partners (or groups of three) a chance to discuss it and then ask for volunteers to tell the class what their partner(s) said. Record their answers on chart paper or the board. Repeat #2 and #3 until all the questions have been discussed and recorded.

The answers to these questions will become words for the word wall and poetry exercise in Session 3. If you write the words on chart paper, you can then cut apart the paper into individual words and save time by not having to write the words again on sentence strips or 5 x 8 cards.

- Tell your partner(s) all the descriptive words you can think of to describe your shell.

- What are all the categories that we could put these descriptive words into? [texture, color, shape, design, pattern]

- Use descriptive words from as many categories as possible to describe to your partner(s) the prettiest or most interesting shell you've ever seen.

- What types of animals do you think have shells?

- What do you think animals use their shells for?

- What would you like to know about shells and the animals that make them?

4. Have students sit down with their last partner(s) and one or two other silent mingle groups near to them to create a new cooperative group of 5 - 6 students.

(Through the Activity)

Observing Shells

Tell students (with a smile) that you think they will find this next part of the activity very easy, but that with every subsequent part it will get more and more difficult. Ask them if they think they are up to it.

1. Remind students that they will be using some of their observation skills that they used in Session 1 activities; e.g. seeing, hearing, tasting, smelling, touching.

2. Review the methods for communicating these observations; e.g. telling about it, writing about it, drawing a picture, tracing an item, composing a song or a poem, etc.

3. Have students work in groups of 5-6 with all the groups the same size, if possible. If you have an odd number of students, you will have an extra shell in one group. Give each group a bag that contains one side (valve) of an oyster shell for each student. [Remember that you placed the other half or match of the oyster shells in another groups' bag labeled with the same number or sticker - but don't tell the students yet.]

4. Ask each student to take an oyster shell (it is actually 1/2 an oyster shell) from the bag and examine it for 2 or 3 minutes. Have students return their shells to the bag. Have one student gently mix up the shells in the bag and then gently dump them back out on the table.

Sidebar: Use your own judgment, but you may need to warn the students to not mark on the shells in any way - it spoils some of the fun and definitely defeats the purpose of honing observation and communication skills.

5. Ask students to pick out the shell they had previously examined as quickly as possible.

How is Your Shell Different?

Tell the students that you think they will find the next part of the activity a little more difficult...

1. When students have relocated their shells, give them an index card. Ask them to examine their shells once again, but this time tell them to communicate 4-5 observations on the index card. Remind them that their written or drawn communications need to be clear enough that someone else can understand them. **They shouldn't write their names on the cards.** If you have an odd number of students in one of the groups, just tell the students that they have an extra shell without a card or make a card for it yourself and add it to the pile.

2. Show them the other resources around the room that they can use to make or quantify their observations. Possibilities include rulers, scales, string for measuring the girth, or calipers.

3. When students have finished their observations, (a time limit of 5 or 10 minutes should be sufficient), have them place the shells back in the bag. Have students stack their

cards next to the bag. Keep the cards and shells from one group together, but don't put the cards in the bag.

Using Observations as Clues

Tell the students that this next part of the activity will be even more difficult...

1. Switch cards and shells with the group that has the same sticker or letter on their bag. [Remember, students don't know it, but you have placed the match to their shell in another similarly marked bag so that you can keep track of which groups should get together for the upcoming "Match Game."]

2. Have a student randomly distribute the cards among their group. Ask students to first examine the card and then try to locate the shell it describes. Students can work together or as a group, but everyone has to agree that each card is correctly matched to a shell for a group to be finished.

3. Once every group has matched up the cards and shells, ask them what information helped them to easily and without any doubts make a match. [Students almost always say it was a tracing that was most helpful; other helpful information included really specific and quantifying observations, i.e. there are three barnacles on the pointed end or it is 8 cm long and 5 cm wide, etc.]

4. Now ask them what didn't help them to make a match. They will usually say that feelings or inferences aren't very helpful for matching cards and shells. [i.e. it is yucky, looks like a raccoon or my foot, or it stinks]

Very general observations that are true for almost all oyster shells are also not very useful. [i.e. white and smooth on the inside, greenish and rough on the outside.] Remind students that the very general observations are **not bad** observations and **are** based on one of the five senses, but they are too general to be helpful in this case and for these purposes.

The Match Game

Tell students that now comes the really hard part...the most difficult part of all. Somewhere in the room is the other half or match of "their" oyster shell and they need to find it.

1. Direct one group to join the group with their matching shells. Tell the students which groups should work together to find matches. Before you direct them to start, tell them that **immediately** upon finding their match, they are to sit with their new partner. They can sit anywhere, but they must sit quickly. That way people who are still looking for matches can get together.

2. Tell them that once they find their match and sit down, they are to work together with their partner to make a list of questions (at least three) on the back of their 5 x 8 card, that they now have about oysters and their life history.

3. Tell them to stand up, take one shell from their table group (it doesn't have to be their original shell) and "find their match!" If the groups are uneven in size, one student may need to find the match to two shells. Be sure there are no shells left on the tables, otherwise someone won't find their match. Walk around the room, helping to facilitate match-making.

If students have difficulty in matching oyster shells, it is usually because they expect the two halves of one shell to look identical to each other - like a clam. Many students are very surprised to discover that one side is flat and the other side rounded and they fit intricately together like a soup bowl with a tight-fitting lid.

4. After all matches have been made, and student partners have had time to list at least three new observations they have about oysters, have them join with two other pairs to form a new cooperative group.

5. Have the students wrap a rubber band around the matched shells so that you don't have to search for the matches again later.

Oyster Questions

1. Lead a class debrief using the Oyster Questions transparency. Display the Oyster Questions transparency, covering all but the first question. Tell them that this exercise is to have them practice using the observations they made about oyster shells to make educated guesses about what the living oyster must have looked like and how it made a living.

2. Record students questions and ideas they have right on the transparency. Display only one question at a time, and before any answers are given, encourage cooperative groups to discuss it and try to come to a consensus on their ideas. Call on a different cooperative group to share their ideas for each question.

As you take the students through the questions, build on their knowledge base step by step and help them to come up with their own hypotheses based on evidence. [See the Teacher's Sheet of the Oyster Questions for suggested answers and hints.]

3. After all the questions have been discussed, distribute a sheet of paper to each group and have them choose a recorder to list all the new words that came up when talking about oysters and their wetland habitat.

4. Have each group share their words with the class as you record them on 5 x 8 cards or 1/2 sentence strips. List words only once and then add them to the word wall.

Student Sheet

Oyster Questions

1. What three new observations can you make about the oyster now that you can see both sides (called valves) of its shell.

2. What questions do you have about oysters and their life history?

3. If oysters grow about 1" a year, how old was it when it was harvested? What is the size of the largest and smallest oyster in your group? What is the average size? How could we figure out the average size of all the oysters in the room?

4. What other animals might be related to oysters? Why do you think so?

5. Which side of the oyster do you think was up when it was living out in nature - the rounded side or the flat side? What's your reason?

6. What sort of habitat did this animal live in and how do you know?

7. What other animals do you think live with oysters? How do you know?

8. Did the oyster move? If so or if not, how do you know?

9. What did it eat? How do you know or how could you find out?

10. What adaptations or special features do oysters have for catching prey and avoiding predators? How do you know?

11. So now what side do you think was up - the flat or rounded valve? What is your reason?

12. What other questions do you still have about oysters?

Teacher Sheet

Oyster Questions

1. What three new observations can you make about the oyster now that you can see both sides (called valves) of its shell.

Answers will vary, but here are some common observations:
the valves fit together very tightly, like a puzzle; one side is rounded and the other flat; there may be organisms growing on the shells; there is a black spot on the inside of both sides of the shell - (where the muscles attached); there appears to be a hinge

2. What questions do you have about oysters and their life history? Answers will vary

3. If oysters grow about 1" a year, how old was it when it was harvested? What is the size of the largest and smallest oyster in your group? What is the average size? How could we figure out the average size of all the oysters in the room?

Answers will vary. Often the shells appear to be about 3 years old, which is about how long they grow before they are harvested–depending on the species you are working with.

4. What other animals might be related to oysters? Why do you think so? Mussels, clams, cockles, and scallops are related- they all have a shell made up of two sides or valves. These are bivalve mollusks. Mollusk means soft body. Other mollusks include snails, abalones, and limpets which have only one shell - but they do have a shell. It is harder to realize that octopus and squid are also mollusks which have lost their shell. The outside part of the octopus and squid is called the mantle and similarly it is the mantle that lines the inside of the oyster shell and actually makes the shell. Octopus and squid have the soft, unsegmented body of mollusks without the shell to protect it.

5. Which side of the oyster do you think was up when it was living out in nature - the rounded side or the flat side? What's your reason?

Don't tell the students the answer to which side was up - even if some of them guess it, they won't know for sure and the rest of the questions are giving them bits of information, little by little to help them figure it out for themselves.

6. What sort of habitat did this animal live in and how do you know? It lives in the wetlands. It is difficult to tell where an oyster might live, however, you can guess that it most likely lives between the tides, sometimes covered by water and sometimes exposed. You can tell this because it appears to have been attached to something hard, it can close up very tightly to protect against predators, and it can keep a reserve of water in the cup-shaped bowl to help it stay wet and cool until the tide returns. You might also be able to tell where it lives by what sort of organisms are growing on its shell.

7. What other animals do you think live with oysters? How do you know? List some of the other animals that live in wetlands. You can tell some of the animals that lived with it by looking at what was growing on the oyster shell.

8. Did the oyster move? If so or if not, how do you know? Oysters attach themselves with a very permanent glue to something hard when they are very tiny. Because they can't move once they are attached, it is imperative that they pick a good spot to begin with. How do they know a good spot? A good clue would be to attach to other oyster shells. If the original oysters were able to grow there, it is more likely that the youngsters will also make it. Once oysters attach, they can't move from their spot, but they do open and close their shell by a combination of the hinge and the muscles so that they can filter water for food and oxygen.

9. What did it eat? How do you know or how could you find out? Once the students hear that the oysters filter water for food, they realize that the food must be very tiny. If they have heard about plankton, they will usually guess that they must be eating something like that. They actually eat phytoplankton (plant plankton) and if you were to open their gut, it would appear to be green.

10. What adaptations or special features do oysters have for catching prey and avoiding predators? How do you know? It appears that the shells fit together very tightly and a predator might have a difficult time getting into the shell. The muscles which held the shells together appear to be rather large if the muscle scars are any indication. Some students will have experience in trying to open up a living oyster - it is extremely difficult - the muscle must be cut as most people couldn't actually pry it open. In order to obtain their food, they open up their shell at high tide and water can flow in bringing food and oxygen. The gills set up a pumping motion to pump the water in.

11. So now what side do you think was up - the flat or rounded valve? What is your reason? The flat side was up. The cup-shaped lower valve comes in handy at low tide as a kind of "soup bowl," holding water in reserve to keep the oyster from drying out while waiting for the tide to return once again. The shape of the shell also helps it when obtaining food and oxygen, since it is the less heavy and less cumbersome flat side which is lifted up to let in the water. (Sometimes it appears that the rounded side couldn't have been down because it is covered by barnacles - this brings up the whole issue that many of these oysters are from oyster farms. Oyster farms grow oysters on ropes hung down into the water, so there might not be an up and down for some of them.)

12. What other questions do you still have about oysters? Answers will vary.

Session 3: Poets in the Classroom

Science is not the only way to discover and communicate new insights. Poetry can also help us express what we know and value about the ocean and can be very effective in capturing the essential quality of an ocean habitat such as the wetland. This next activity helps students to develop visual images of the wetland habitat in order to add descriptive, concept and organism words to the ever-expanding wetland word wall. These words will then be used as the basis for the students own poetry compositions.

Of course the best way for students to develop visual images of the wetland would be to take them on an actual field trip to the real wetlands!

Virtual Wetland Field trip

1. Tell students they are now going to go on another Virtual Field Trip to the habitat where oysters live - the Wetlands. Have students sit in small groups as they watch a video (**turn the sound down completely**) with images of wetlands.

2. Have one student in the group act as the recorder and write at least ten words that come to mind as the students watch and quietly discuss the video.

3. Have each group share their words as you record them on word cards for the word wall.

If you don't have a wetland video available, you can do a Relay Talk as follows using pictures of the wetlands:
Have the class sit as threesomes with one of them acting as a recorder for the other two. Hold up pictures of the wetlands, ocean, shells, oysters, sky etc. one by one and have each pair of students brainstorm as many words as they can think of to describe each picture. The third student in the group takes notes as quickly as possible to record what the other two are saying. Transfer these words to word cards to add to the word wall.

Composing Poetry

There are many different techniques for helping students to feel comfortable writing poetry. The following activities have been used with much success to help students write poems expressing aesthetic and emotional aspects of ocean habitats such as the wetlands. Poetry can also be used as a means to assess students' content knowledge of a topic, concept or habitat.

Decide which of the following techniques you would like to use with your students. Depending on your students' experience with writing poetry, you will probably only be able to try about two of these techniques within one class period. Even if you have never written any poetry yourself, you will be amazed at what your students will compose given just a little structure and the descriptive language to express their thoughts and feelings .

Word Cards Poetry

1. Pull down all of the word cards from your word wall or take only a subset of interesting words that you or the students choose. Shuffle the cards so the descriptive shell words, Field Trip Notes words, oyster words, and the images of wetlands words are all mixed up together.

This technique is truly amazing at helping even the most reticent student to compose poetry. Being given a set number of words, and words not of your own choosing, takes away the burden of being embarrassed to use descriptive language or needing the poem to be esteemed as great or deep by others. After all, the student didn't choose the words so they can't be made fun of and the poem only has to make sense to the individual who wrote it. This technique is courtesy of John Oliver Simon, a wonderful poet at large and part of the Poets in the Schools program in Oakland, California.

2. Give each student a random set of five of the word cards and tell them they will use these cards to write a poem. The poem can be as simple as stringing the five words together in any way that makes sense to the individual student. They can slightly modify or add words according to the following rules:

- only add words like and, an, a, the, and but, etc.;
- change the tense or make a word plural;
- use a word multiple times;
- if they are really having trouble putting the words together, they can raise their hand and ask for as few as one or as many as five new cards.

3. Randomly select five of the words yourself and give the students an example of how to put them together to compose a poem that makes sense to YOU. Tell the students that their poem doesn't have to make sense to anyone else, but they should be able to tell the class what it means to them.

Cinquain

1. Explain that a cinquain is a five line poem of uneven line length, with the lines not necessarily rhyming. Ask students to think of something in the marine environment you're studying --an animal like the oyster, a habitat like a mudflat or wetland, a beautiful shell—one thing.

2. Have students write each line of the cinquain as you give instructions for the poem.

Line 1: One word: the name of the thing you see in your mind.

Line 2: Two action words (--ing words): what is the thing doing?

Line 3: Three describing words: What shape or size is it? What color, texture? What does it smell or feel like?

Line 4: Four words that express a feeling: How does your plant or animal feel? Or how do you feel about your plant or animal or habitat?

Line 5: One word: a synonym or another word for the subject of the poem.

Example:
Ocean!
Roaring, crashing
Huge, enormous, frothy
Raging in a storm
Awesome!

Haiku

1. Explain to the students that a haiku is a traditional Japanese short poem developed over 500 years ago! They appear to be simple, but yet they can evoke strong images and feelings. Writing a haiku helps the writer look more carefully at the environment.

2. Haikus are three lines long, with a total of 15-20 syllables (traditionally 17 in Japanese style.) The poem should capture a sense of the habitat or animal or a moment in nature in a minimum number of words. Share the following examples with your students either before or after they attempt to compose their own.

Examples:
The sea in the dusk
is green, and the sky is green
as a field of rice.
--Basho

Whale!
down and down it plunges
its huge tail soaring higher and higher
--Buson

3. Now have students compose their own haikus. Have the students sit quietly with pictures or photo images of wetlands or other ocean habitats and follow your instructions for writing the three lines. As you give the instruction, refer to one of the examples so they have a model. Tell them the number of words in each line is just a guide. What is important is that they capture the essence of their thoughts with a minimum number of words.

Line 1: Your first impression of the scene in 4 - 5 words or less

Line 2 Look more closely for some detail in the scene and describe it in 4-5 words.

Line 3: Now look at the two lines and see how they are connected and write 4-7 words describing that connection.

Limericks

1. Explain that limericks are silly poems of five lines that follow a specific formula of rhythm and rhyming. They often begin, "There once was a..." and tell a story about something funny that happened.

2. Have students choose a subject for their poem - - a person or an animal is the easiest. Lines 1, 2, and 5 have three accented syllables; lines 3 and 4 have two accented syllables in a triplet meter. This is best explained by example, having the students tap out the rhythm with their fingers or hands, or say it out loud with la-la-las.

Examples:

There once was a crab from the sea
Who climbed to the shore on his knee
He wobbled and crawled
Got sad and them bawled
For he'd left his sweetheart for a flea.

There once was an oyster named Coop
Who lived on a rock in the goop
He opened his shell
Upon hearing a bell
For he thought it was plankton cup-a-soup

Collaborative Poems

1. Make one long poem about the oyster or the wetlands (or whatever the students composed their poetry about) by

stringing all their poems together in a logical order. The poems could be word card poetry, haikus or cinquains.

2. Have students help decide which poems naturally follow each other. Then have the class read the whole poem out loud together or have each student read aloud their contribution to the collaborative poem in the order decided by the class.

3. Finally, you might want to host a poetry reading session in your class of each student's favorite poem and invite parents and other classes to attend.

4. Hold up the key concepts for this activity and have one or more students read them aloud. Post it near your word walls and poetry.

Scientists need to make careful observations and communicate them clearly in order to learn about the natural world.

Poetry offers a way for people to communicate their thoughts and feelings about the special qualities and values of the ocean and ocean habitats.

The box below has examples of poetry which can come from a list of 20 words as expressed by 1st graders. These students sat for five minutes in front of a tank at an aquarium while parents wrote down the students observations and feelings. You can have this same experience in many different settings - including the schoolyard. The main thing is to get the students to slow down so that they can observe the world around them. These poems were written by Rita Davies class at Oxford School in Berkeley, California

Amazonian Fishes
by Samantha, Makaela, Zeana, Erin, Danita, and Suzanna

Large orange and the way
he swims at top and
middle
moves slow,
likes to look at us.
Sparkly yellow
Amazonian fishes--
Arapaima, Arawana
looks sad, hungry
wants to make friends
fins like feather scales
like corn

The Roundabout
by Kyle, Leib, and Paris

Mouth open, tail broken,
shiny, smooth stingray.
Yellowfin tuna
fish,
tail bent over,
acrobatic diving,
ready to swim.
Dizzy blue,
turquoise
purple, black
drive by,
excited
and curious.

Untitled
by Evan, Saharath, DJ, Noel, and Amanda

Bat ray
bottom feeder
fins, gills,
alligator fish
flashlight--
feels like being in the dark,
up and down
pretty.
They look sad
like plastic fish,
dead.
Long nose
alligator legs on fish,
fish making a hole
uses tail to swim--not "wings"
looks like pillows.

Untitled
by Matthew, Julian, and Owen

Big yellow rock
catfish
ears of corn
Darth Vader fish,
Black stripe
starfish, leopard shark
horn shark,
camouflage,
bright,
ugly fins and tails
great whites.

(Beyond the Activity)

Going Further

Famous Sea Poems

Read aloud to the students some of the famous poems about the sea by ancient and modern poets such as Robinson Jeffers, Pablo Neruda, Anne Morrow Lindberg, Gerard Manley Hopkins or others. Try to memorize a stanza or verse of a sea poem and practice reciting it out loud or read the longer poems to the students during a quiet period. Have students reflect on the feelings expressed in the poem in a short letter or drawing to the author. List some of the words from the famous sea poems and help the students to discover if any of their brainstormed words were used by the famous poets.

Student Poetry

- Display the haiku and cinquain poems written by the students by hanging them on wooden dowels to make them look like Japanese scrolls.
- Create a class poetry book and have all the authors autograph copies at a "booksigning" party.

The Real Thing

Bring in live oysters from a seafood market or even a bottle of shucked oysters for your students to investigate what the living organism looks like. Place the live oysters in a bucket of seawater or buy Instant Ocean from an aquarium store to make seawater and watch the oyster open and close. Be sure to check out the muscles and gills.

Library or Internet Research

- Have students investigate pearls, how they are made, natural, cultivated or synthetic, freshwater or ocean, pink, white or black. What is the difference between all of these types? Where do black and pink pearls come from? Do all mollusks have the capability of growing pearls?

- What are "introduced organisms" and what is their effect on the wetland or other habitats? How do organisms get from one place where they are common to another place where they are not naturally found? Who are the introduced organisms in your area? Are they a problem or not? If so, what are people doing about it?

- Why is it OK to eat mollusks, like oysters, during some times of the year, but not at others? When is it OK? What is paralytic shellfish poisoning?

Literature Connections

• John Gay, the 18th-century British poet wrote on the subject of oysters:

> The man had sure a palate covered o'
> With brass and steel, that on the rocky shore
> First broke the oozy oyster's pearly coat,
> And risked the living morsel down his throat.

Write this poem on the board and ask students to discuss what the author was trying to convey. Did he communicate well? Which lines are scientific observations and which are feelings? Have students take each line from this poem and illustrate it. Put the words and illustrations together to form a book.

• Have students read the Lewis Carroll poem, "The Walrus and the Carpenter" and act it out for the class.

Field Activities

Arrange a field trip to a wetland area. Ponds, creeks, rivers, lakes, sloughs, watershed areas, all work well for this purpose. Use the Field Trip Notes handout or have each student create a field journal prior to the trip (plain paper stapled together and a small pencil is sufficient). Give students the opportunity to use their newly honed observation skills in a natural setting. Have students spend 5-10 minutes quietly observing their surroundings and making journal entries using words and sketches.

Oyster Beds Home Activities

KEEPING A JOURNAL

• Ask your parents to tell you about their first memory of visiting the ocean or some other special place where they had a favorite experience. Who did they go with, what do they remember about the smells, sounds, feel or look of the place? What are their feelings about it? Encourage them to include all of their senses in their memories with as many descriptive words as possible. Record their remembrances in a journal.

FAMILY POETRY WRITING

Teach your family how to write a cinquain, haiku or limerick. Have everyone write at least one and then have a poetry reading session after dinner. What

subjects did they choose to write about? If it is OK with your family, write down all their poems and bring them to class to share.

SHELL COLLECTIONS

Ask your relatives, neighbors and friends if you could look at their shell collections and maybe borrow them to bring into school. Where did the collections come from? Are they old or new collections? Are there any stories connected to any of the shells in the collections? Make up a story about how a particular shell found its way from the ocean to the collection.

FAMILY MYTHS

Ask your family to help you write a myth or fable about how the oyster got its shell. Most myths are actually based at least partly on fact so teach your family what you know about oysters.

FAMILY FIELD TRIPS

• Ask your parents to take you to visit a jeweler that specializes in pearls. Ask the jeweler to talk to you about how and where the pearls they carry are cultivated. Where in the world does the jeweler get most of the pearls? Find the places on a map. Do pearls seem to be more or less popular now than they used to be? Do your relatives have any pearls? What kind? Do they have a story associated with them? Who gave the pearls to them and how long have they had them? Write and illustrate an imaginary story about how the pearl came to be in your family, starting with the sand grain entering the oyster. Be sure to use many descriptive words and some real facts you learned about oysters. Read your story to your family and then bring it in to share with your classmates.

• Visit an "oyster farm" to see how oysters are cultivated for food. If you can't actually visit the farm, take a virtual field trip on the internet and find out all you can about them. Share your discoveries with your classmates.

• Plan a trip with your family to a local seafood market (Asian markets are great) to see all the different kinds of mollusks they sell. Talk to the seafood manager to find out where the mollusks came from and how they are kept alive or fresh. What types of mollusks are the most popular? Do many people buy fresh oysters? Ask your parents if you can buy some to have a BBQ. Did you like them? Did your family like them? If you buy 10 or so, do the Oyster Bed activity with your family and invite the neighbors for an after dinner game.

BACKGROUND

Oysters belongs to the group of **invertebrates** (animals without backbones) called **mollusks** (from the Latin word Mollusca, meaning soft-bodied.) Most mollusks have hard shells and a soft unsegmented body, but the octopus and the squid are two notable exceptions. There are five major classes within the mollusk group. Oysters are one of the **bivalve** mollusks (an animal with two shells and a hinge) along with clams, mussels, and scallops. Octopus and squid are **cephalopod** mollusks (meaning head-foot)

Oysters begin their lives as part of the microscopic **plankton** world. As tiny larvae, they drift in the water for several weeks until they are ready to settle and attach to rocks or other oyster shells in a mudflat. Once they settle and attach they are called **"spat."**

The young oysters have a shell made up of two halves, similar to a clam. Each half of the shell is called a **valve**, hence the name **bivalve.** The shell serves throughout the oyster's life to protect the soft body within. On the inner surface of each valve is a soft layer called the **mantle**. The mantle surrounds the animal and actually takes calcium from the water to create the shell. It is also the mantle that will put a smooth coat around any irritating sand grains that get caught inside the oyster between the body and the shell; creating a **pearl** in the process.

The two valves of the shell are held together by a hinge, and like a door hinge, is the pivot where the shell opens and shuts. A set of muscles connected from one side of the oyster to the other acts as the oyster's security system. Working together, the muscles and hinge control the opening and closing of the shells. The black mark on the inside of most oyster shells is the muscle scar where the muscles were attached. A cement-like substance, secreted from near the hinge, attaches the oyster for life to whatever it initially clings to after settling out as a spat.

Oyster shells are not symmetrical, like a clam or scallop shell. One half is flattened and fits like a snug lid into the bottom, cup-shaped shell. This cupped shell is well designed for the sedentary, "between the tides" lifestyle of the oyster. At high tide the oyster is covered with water and it is at this time that the oyster can open up its shell and filter the water for food and oxygen. At low tide, the oyster is left high and dry. During the low tide, the oyster closes its shell tightly to protect itself against predators. The cup-shaped lower valve comes in handy at low tide as a kind of "soup bowl," holding water in reserve to keep the oyster from drying out while waiting for the tide to return once again. The shape of the shell also helps it when obtaining food and oxygen, since it is the

less heavy and less cumbersome flat side, which is opened to let in the water.

Oysters have gills and a respiratory system for absorbing oxygen and releasing carbon dioxide. They have a heart, a liver, and a kidney, as well as a digestive system complete with a stomach and intestines. These animals are **filter feeders**. Their gills, in addition to helping them breathe, help them to eat by straining tiny floating plants called **phytoplankton** out of the water.

We know from shell mounds left by many cultures in Europe, North America and Asia that oysters have been widely harvested by humans since prehistoric times. They have been cultivated or farmed for several thousand years, first by the Romans, as early as 97 BC., and continuously by many cultures since that time. Native American people of the Pacific Northwest used oysters and clams as a food staple and their shells as currency.

The history of oysters and the San Francisco Bay is a rich one. From the early to the mid-1800s, hundreds of thousands of pounds of oysters were taken from the wetland waters of California. By the turn of the century the oyster stocks were nearly depleted, leading to the virtual disappearance of the little native species (*Ostrea lurida*). With the completion of the transcontinental railroad in 1869, the transportation of live East Coast or American oysters (*Crassostrea virginica*) was made possible. Unfortunately, along with the imported oyster stocks came a great number of other animals that did not belong in the San Francisco Bay. The Bay has never fully recovered from this introduction of non-native or "introduced" species of clams, worms and barnacles.

By the early 1900's it was clear that the American oyster was not able to successfully reproduce in our West Coast bays and estuaries. The oyster industry was nearly dead until the early 20's when Japanese or Pacific oysters (*Crassostrea gigas*) were introduced to the Pacific Northwest. The Pacific oyster has been very successful and once again the oyster industry is a thriving business. Today, the health of our wetland habitats where these important animals make their homes is threatened by pollution, dredging and filling for our many uses. Only 5% of the historical wetland marshes of the San Francisco Bay remain today. We need to preserve and protect wetland habitats so that oysters and other animals have homes in the future.