

## 3.1 Understand the Challenge

### *Thinking About Erosion*

You are going to begin by identifying the criteria and constraints of this challenge. You will then walk around your school, looking for examples of erosion. Understanding what erosion is and what causes it will be important for addressing the challenge. For now, think about erosion as movement of soil or other ground material from one place to another.

#### **Identify Criteria and Constraints**

It is always a good idea, before beginning to address a challenge, to make sure you understand the challenge. One way to do that is to identify the criteria and constraints. Remember that criteria are what you need to accomplish, and constraints are limitations on your solution. For the *Basketball-Court Challenge*, your criteria are what you need your erosion-control method to be able to do. The constraints on your solution are what you have to keep in mind and be careful about as you work on a solution. Review the letter that you received from the school superintendent, and record the criteria and constraints you identify. Then, as a class, list and discuss the criteria and constraints for this challenge.

Once you are aware of the criteria and constraints for your design challenge, you can decide which ideas are worth spending more time on and which ones are not.

#### **The Basketball-Court Challenge**

Criteria	Constraints
The solution will keep mud and dirt from sliding down the hill onto the basketball court	

## The Erosion Walk

You will be taking a walk around your school and looking for examples of erosion. Look for things you might not usually notice. These might include a pile of pebbles on the side of the road or small gullies formed by a recent rainfall. You do not have to go very far to find examples of erosion.

Erosion-Walk Observation		3.1.1
Name: _____		Date: _____
Location: _____ Description: _____ Cause: _____	Location: _____ Description: _____ Cause: _____	
Location: _____ Description: _____ Cause: _____	Location: _____ Description: _____ Cause: _____	
Based on your walk, make a list of the places you think erosion is most likely to occur.		
Based on your walk, make a list of causes of erosion.		

Working with a partner, identify at least five examples of erosion. Also identify at least two examples of places where erosion should have happened but did not. Try to find examples that other students have not noticed.

It helps to notice small details. Look for clues, such as dirt that looks different than other dirt around it or rocks piled together. It is important to remember that the effects of erosion can be small or large. Erosion may cover only a few inches of ground, or you might see large areas where soil is washed away. Look carefully as you walk around.

You should also look for places where erosion should have happened but did not. For those places, try to identify what prevented the erosion. If you have any questions about how erosion happens or does not happen, be sure to record them so you will remember.

### Recording Your Observations

Record your examples on *Erosion-Walk Observation* pages. You will be able to fit four observations on each page, so each pair of students will have room to record eight examples. For each example, make a sketch of the eroded area. If you can see where the eroded material came from, your sketch should also include the path the material traveled and what was formed when it was deposited. Record the location of your example, and describe it in words. Try to figure out what caused the erosion, and record that as well. You may need to look closely at the area around where you found the example of erosion to figure out how it happened. For your examples of where erosion did not happen, figure out and record what

prevented the erosion. Record enough so that you will be able to share your observations with others. You and your partner may agree or disagree. If you disagree, write enough so that you remember what you disagreed about.

You will need a hard surface to write on as you complete your *Erosion-Walk Observation* page, so take a book or workbook with you to lean on. If you have a camera, bring that too. You should also have a pencil and your *Erosion-Walk Observation* page.

## Conference

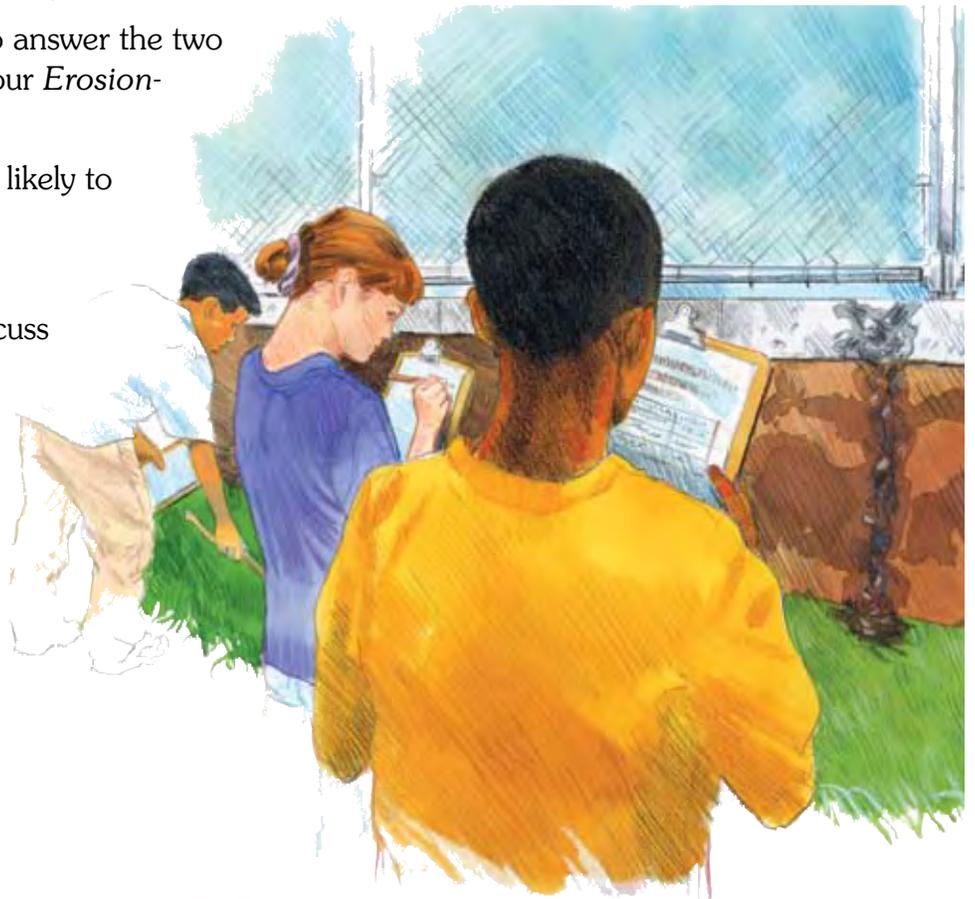
After you return from the erosion walk, share your observations and ideas with your group about what caused your examples of erosion. Make sure everybody has a chance to share. As a group, select two examples of erosion, and make your best guess about how each happened. For example, you may have found a small ditch carved out in a flat area. You might think that the wind slowly carried particles of dirt away from the area. Your guess may not be correct, but do your best based on what you know so far.

Then select an example of a place where erosion did not happen. Try to come to an agreement about why it did not occur.

When you are finished, try to answer the two questions at the bottom of your *Erosion-Walk Observation* page.

- Where is erosion most likely to happen?
- What causes erosion?

In the time you have left, discuss which of your answers you are sure about and which you are less sure about. Discuss what you think you still need to learn to fully understand your observations.



## Create the Project Board

When you work over a long period of time on a project, it is important to keep track of what you have accomplished and what you still need to do. Throughout *PBIS*, you will be using a *Project Board* to do that. A *Project Board* gives you a place to organize your ideas, what you need to investigate, and what you are learning. Reading the box, *Introducing the Project Board*, will give you a better idea of what a *Project Board* is and what you will use it for.

**Project Board:**  
a space for the class to keep track of progress while working on a project.

To get started on this *Project Board*, identify the important science question you need to answer. To design erosion-control measures for a basketball court, you need to understand the answer to these questions: What causes erosion and how can it be controlled? Write these questions on your *Project Board*. Your challenge is to design an erosion-control plan to manage erosion around the proposed basketball court. Add the challenge to the top of your class *Project Board*: *How can erosion around the proposed basketball court be controlled?*

The erosion walk was meant to help you recognize what you understand about erosion. It also helped you think about what you do not understand well enough. These are the things you will record in the first two columns of the *Project Board*.

What causes erosion and how can it be controlled? How can erosion around the proposed basketball court be controlled?				
What do we think we know?	What do we need to investigate?	What are we learning?	What is our evidence?	What does it mean for the challenge or question?

**Be a Scientist****Introducing the *Project Board***

When you work on a project, it is useful to keep track of your progress and what you still need to do. You will use a ***Project Board*** to do that. It gives you a place to keep track of your scientific understanding as you make your way through a Unit. It is designed to help your class organize its questions, investigations, results, and conclusions. The *Project Board* will also help you to decide what you are going to do next. During classroom discussions, you will record the class's ideas on a class *Project Board*. At the same time, you will keep track of what has been discussed on your own *Project Board* page.

The *Project Board* has space for answering five guiding questions:

- What do we think we know?
- What do we need to investigate?
- What are we learning?
- What is our evidence?
- What does it mean for the challenge or question?

Each time you use the *Project Board*, you will record as much as you can in each column. As you work through a Unit, you will return over and over again to the *Project Board*. You will add more information and revise what you have recorded. Everything you write in the columns will be based on what you know or what you have learned. In addition to text, you will sometimes want to put pictures or data on the board.

***What Do We Think Know?***

In the first column of the *Project Board*, you will record what you think you know. As you just experienced, some things you think you know are not true. Some things are not completely accurate. It is important to record those things anyway for two reasons:

- When you look at the board later, you will be able to see how much you have learned.
- Discussion with the class about what you think you know will help you figure out what you need to investigate.

### **What Do We Need to Investigate?**

In this column, you will record what you need to learn more about. During your group conference, you probably came up with questions about how to explain some of your observations. You might also have figured out some things you are confused about. And you might have found that you and others in your group disagreed about some things. This second column is designed to help you keep track of things that are confusing. Record what you do not understand well yet and what you disagree about. These are the things you will need to investigate. They will be important for achieving your challenge (designing a method to control erosion).

Sometimes you are unsure about something but do not know how to word it as a question. One of the things your class will do together around the *Project Board* is to turn what you are curious about into questions you can investigate.

Later in this Unit, you will return to the *Project Board*. For now, work as a class and begin filling in the first two columns.



### **What's the Point?**

You observed examples of erosion in your schoolyard or nearby neighborhood. Some may have been small and hard to notice and others may have been large and quite visible. They were caused by different forces in nature, such as running water, wind, and gravity.

You started a *Project Board* to help you keep track of what you understand. You also added some questions and ideas you need to investigate further. The *Project Board* is a space to help the class work together to understand and solve problems. Using it will help you have good science discussions as you work on a project.

Now that you have identified the questions you need to answer, you know what you need to do next. You need to investigate to find the answers to some of those questions.