

SECTION 3.9 INTRODUCTION

3.9 Plan $1\frac{1}{2}$ class periods* ▶**Plan Your Basketball-Court Solution****Overview**

Students plan a design to solve the *Basketball-Court Challenge*, using the class's recommendations to guide their decisions. As they plan, they sketch their designs and record the reasons for the decisions they make. Then they share their designs with the class and use the feedback they get from the class to revise their plans. Students will build and test their designs in the next section.

Targeted Concepts, Skills, and Nature of Science	Performance Expectations
Scientists often work together and then share their findings. Sharing findings makes new information available and helps scientists refine their ideas and build on others' ideas. When another person's or group's idea is used, credit needs to be given.	Students work with their groups to design solutions to the <i>Basketball-Court Challenge</i> and then share their designs with the class.
Scientists must keep clear, accurate, and descriptive records of what they do so they can share their work with others, consider what they did, why they did it, and what they want to do next.	Students sketch their designs and record the design decisions and the reasons for the decisions.
Erosion is the process of soil and other particles being displaced by water, waves, wind, and gravity.	Students consider the causes of erosion and the possible effects on the basketball-court site as they design their solutions to control erosion.

*A class period is considered to be one 40 to 50 minute class.

Materials

1 per student *Our Design Plan* page

SECTION 3.8 IMPLEMENTATION

$1\frac{1}{2}$ class periods* ►

3.9 Plan

Plan Your Basketball-Court Solution

5 min.

Engage students and provide them with an overview of what they will be doing.

3.9 Plan

Plan Your Basketball-Court Solution

You are about to begin designing and constructing your solution to the *Basketball-Court Challenge*. Your solution can combine as many or as few erosion-control methods as your group feels is necessary. You have learned a lot about how each erosion-control method might work in your situation. You know you have to figure out how to control the water running downhill and the amount of soil and other materials it might carry onto the basketball court.

Using all the knowledge and evidence you gathered throughout this activity, you and your group will create a plan, or blueprint, for your solution. You will present it to your class in a *Plan Briefing*. After that, you will get a chance to build and test a model of your solution and revise your plan.

Design Your Solution

Using everything you have learned, work with your group to design an erosion-control solution for the basketball court. Remember that there are two houses to the sides of the basketball court. The school board says that the two houses and their lots must not be harmed by water or eroding soil from the hill.

Some of the erosion-control approaches you have investigated are good at directing water. Others are good at keeping soil in place. Some are not good at all. Your solution should take what you have learned about erosion and different erosion-control methods. Remember that the school board is more likely to approve a plan supported by evidence and science knowledge than one that is simply a good idea. So as you design your solution, make sure you take into account everything you have been learning.

Using an *Our Design Plan* page, record your design. You will find space for a diagram of your design. You will also find a chart with space for you to list your design decisions and the reasons for each. It has three columns: one for design decisions, one for evidence that led you to make that decision, and one for science knowledge that supports it. You won't have evidence and science for every decision you make, but you need to have one or the other for each.

Project-Based Inquiry Science

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○ Engage

Let students know that they will be planning their design solutions for the basketball court and that they will be able to use multiple erosion control methods in their design.

TEACHER TALK

“You have written many recommendations on the class’s *Project Board* that are supported by your data and the science knowledge you have learned. Do you think your recommendations are ready to be given to the school board? What more do you need to do? What do you think a professional contractor might do before sending off a recommendation for designing the basketball-court site?”

Then let students know that they will be presenting their plans to the class and then will have an opportunity to revise their plans before they actually begin building their design.

△ Guide

Let students know that they will be using everything they have learned. They should use their recommendations from the class to guide their design decisions. Let students know that they should use the class's *Project Board* and the class's criteria and constraints when planning their design. Consider reviewing the criteria of the *Basketball-Court Challenge* with the class before the class begins planning their designs.

Design Your Solution

20 min.

Have groups design solutions to the Basketball-Court Challenge.

TEACHER TALK

“You want to plan a design that will meet all the criteria and constraints for the *Basketball-Court Challenge* and using all you know about erosion and erosion control before you make your final recommendation to the school board. And like we have done previously, you will be sharing your plan with the class and have the opportunity to revise it after hearing everyone's plans. This way you can use others' advice and build on other's ideas.”

◇ Get Going

Distribute *Our Design Plan* pages, and emphasize that students should record all of their design decisions and the reasons for them in the chart. Then have groups get started.

△ Guide and Assess

As groups are working on their designs, ask students what ideas they have discussed. Also, ask them how they are using the class's recommendations to guide their decisions. Check to see that the science knowledge and evidence support their idea, asking for clarification if it is not clear. Also, check if students are including opinions and guide them to understand that opinions are not part of evidence or science knowledge.

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Communicate Your Plan

40 min.

Introduce Plan Briefings and lead the class in preparing, giving, and discussing their design plans.

Most of your design decisions will be based on recommendations made by different groups. Each recommendation has evidence and science knowledge associated with it. If you use the *Project Board* as a resource as you design your solution, it should be easy to fill in the *Evidence* and *Science knowledge* columns of the *Our Design Plan* page.

Communicate Your Plan



Plan Briefing

You will present your design plan to your class in a *Plan Briefing*. A *Plan Briefing* is a little like a *Solution Briefing* and a little like an *Investigation Expo*. You will present a plan for a solution. As in an *Investigation Expo*, you will use a poster to organize your presentation.

As in a *Solution Briefing*, a *Plan Briefing* gives you a chance to get advice and suggestions from others. Their advice might help you find a better solution than you could have done by just using the ideas of your group. You will get good advice from people if they understand why you made each of your decisions. The design plan you recorded on your *Our Design Plan* page should help you prepare your poster for this *Plan Briefing*.

Our Design Plan			
Name: _____		Date: _____	
Diagrams	Design decisions	Supports	
		Evidence	Science knowledge

Introducing a Plan Briefing

Preparing a Plan Briefing Poster

A *Plan Briefing* is much like the other presentations you learned to do. In a *Plan Briefing*, you present your design plan. You must present it well enough so your classmates can understand your ideas. They should be able to identify if you have made any mistakes in your reasoning. Then they can provide you with advice before you begin constructing your solution. As a presenter, you will learn the most from a *Plan Briefing* if

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△ Guide

When students finished their design plans, introduce the class to *Plan Briefings*. These are similar to *Investigation Expos*, but in *Plan Briefings*, groups present details of their design plans.

TEACHER TALK

“Before you build your basketball-court solution, you’re going to share your plans with the rest of the class. This way, your classmates may see things you missed in your plans, or you might realize as you’re explaining something that it won’t work. Then you can fix your plans before you build your basketball-court solution. To show your plans to the class, you’re going to make a *Plan-Briefing* poster.”



you can be specific about your design plans and about why you made your design decisions. You will probably want to draw pictures, maybe providing several views. You want everyone to know why you expect your design to achieve the challenge.

The following guidelines will help you as you decide what to present on your poster:

- Your poster should have a detailed drawing with at least one view of your design. You might consider drawing multiple views so the audience can see your design from different angles. It is important that the audience can picture what you are planning to build.
- Parts of the design and any special features should all be labeled. The labels should describe how and why you made each of your design decisions. Show the explanations and recommendations that support your decisions. Convincing others that your design choices are quality ones will convince them that you are making informed decisions backed by scientific evidence.
- Make sure to give credit to groups or students who ran the investigations that you used in your design or who gave you ideas that helped your design.
- If another group provided an explanation or evidence that you are using, you should credit them with their assistance in developing your design.

Participating in a *Plan Briefing*

A *Plan Briefing* is similar to an *Investigation Expo* and a *Solution Briefing*. However, this time you will be presenting your design plan. As in other presentation activities, groups will take turns making presentations. After each presentation, the presenting group will take comments and answer questions from the class.

When presenting, be very specific about your design plan and what evidence helped you make your design decisions.

Your presentation should answer the following questions:

- What are the important features of the design?
- What criterion of the challenge will it achieve? What makes your plan the right way to achieve that criterion?
- Are there any problems you foresee with this design?
- What do you predict will happen when you test your design?

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Project-Based Inquiry Science

Tell students that they will make posters with detailed drawings of their plans—with all parts labeled—and that the class will discuss what criteria the features of the design achieve, what is expected to happen, and any possible problems. Emphasize that *Plan Briefings* should be specific and contain the reasoning behind design choices. They should also give credit where the results of an experiment or a group's recommendations are used. Students can use the guide on pages 105 through 107 as they prepare for and participate in *Plan Briefings*.

Get Going

Distribute posters for the *Plan Briefing*, give students a time frame (about 20 minutes), and get them started making their posters.

META NOTE

Assess students' skills in sharing ideas, asking questions, and responding to peers. Look for whether students base their reasoning about design choices on what they have learned about how different erosion-controls work in models of the basketball-court site.

META NOTE

Keep track of revisions groups should make when they revise their plans so that you may check for them later.

◆ Evaluate

As groups work on their *Plan Briefing* posters, look at groups' posters to see if their drawings are clear and if there is enough detail that the class will be able to discuss what criteria the plan will achieve and possible problems.

◇ Get Going

Lead the class in presenting and discussing each group's design plan.

When groups have finished their posters, have each group present their design plan to the class.

△ Guide

Tell the class that as each group presents, the class should ask probing questions and politely point out errors and misconceptions. Emphasize that students should look for how the features of the design will achieve the criteria of the *Basketball-Court Challenge* and look for any problems that might come up. Model the participation you expect by asking questions of the presenting group when anything isn't clear. Emphasize that the presenting group can ask the class for advice too.

After each presentation, you may need to ask a question or two to begin the discussion. Then ask a student to ask a question. These questions should be about how features of the design will achieve criteria of the *Basketball-Court Challenge*, what will probably happen when the design is implemented, and any problems that the group presenting may not have thought about. If the discussion stalls or loses focus, you can ask students whether all of the questions on page 106 have been answered. Make sure the presenters respond to the student who asks the questions.

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3.9 Plan

- Is there anything you need help with?

As a listener, you will provide the best help if you ask probing questions about the things you do not understand. Be respectful when you point out errors and misconceptions in the reasoning of others. These kinds of conversations will also allow listeners to learn.

For each presentation, if you do not think you understand the answers to the questions on the previous page, make sure to question your classmates. When you ask them to clarify what they are telling you, you can learn more. They can learn, too, by trying to be more precise.



Revise Your Plan

You may have received some good advice from classmates about how to make your design plan better. If so, spend some time with your group doing that. Revise your *Our Design Plan* pages to match your revised plan. Add any evidence and science knowledge that supports your design decisions.

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DIGGING IN

Revise Your Plan

10 min.

Have groups revise their plans.

What's the Point?

5 min.

Discuss the importance of justifying your ideas with evidence and how this is a good practice when sharing ideas and opinions with others, as well as convincing yourself of what choice to make when making a decision. Then discuss the benefit of discussing ideas with others to help you refine your ideas.

META NOTE

Groups will have another opportunity to revise their designs, in the next section.

Get Going

Now that groups have presented their designs and received feedback from the class, they can use the feedback to revise their plans. Give students a time frame and have them revise their plans. Emphasize that they need to record their new plans and justify their revisions.

Assess

As groups are revising their plans, check to see what revisions groups are making. They should be using the feedback they got from the class.

Assessment Options

Targeted Concepts, Skills, and Nature of Science	How do I know if students got it?
<p>Scientists often work together and then share their findings. Sharing findings makes new information available and helps scientists refine their ideas and build on others' ideas. When another person's or group's idea is used, credit needs to be given.</p>	<p>ASK: What are some ways you can discover flaws in your design before you begin building?</p> <p>LISTEN: Students should include discussion with peers among their responses.</p>
<p>Scientists must keep clear, accurate, and descriptive records of what they do so they can share their work with others, consider what they did, why they did it, and what they want to do next.</p>	<p>ASK: How did you learn from hearing the reasons for other groups' decisions?</p> <p>LISTEN: Students should have learned which design choices were more effective than others and why.</p>
<p>Erosion is the process of soil and other particles being displaced by water, waves, wind, and gravity.</p>	<p>ASK: What kinds of erosion does your solution address?</p> <p>LISTEN: Solutions should address erosion that is likely to be found at the site of the basketball court—most likely, heavy rain.</p>

Teacher Reflection Questions

- What types of problems did groups learn about during their *Plan Briefings*?
- How did you model the kinds of questions and comments you expect from students during presentations? What ideas do you have to encourage appropriate discussion among students?
- How was managing the *Plan Briefings* different from managing recommendation and explanation presentations? Is there anything you would do differently next time?