

Problem: Ada's playground is too hot to sit on.

Students solve the problem: Students investigate the problem; research existing solutions; and design, build, and test model shade devices.

How they solve the problem:

Lesson 1: What's the Problem?

Students construct initial explanations about why the playground is hot and discuss how they should approach solving the problem.

Phenomenon: The playground surface is too hot to sit on.

Students figure out: To better understand the problem, students figure out that a playground surface is warmed by sunlight shining on it.

How they figure it out:

Lesson 2: Warmer or Colder?

Students ask questions about the hot playground. They evaluate three ways to determine whether one part of a playground surface is warmer or cooler than another: visual inspection, touch, and using a thermometer.

Lesson 3: Feeling Hot! Hot! Hot!

Students use a model to investigate and compare the effects of lamplight and shaded lamplight on the temperature of a surface. They explain that the unblocked light warms the surface more than the blocked light, and extend their results to explain that sunlight warms Ada's playground surface.

Lesson 4: The Shade's the Thing

Students begin to design solutions to the problem. They decide what their devices need to do. They use a text to research and compare existing sunshade solutions to see what shapes are common to stable shade structures.

Lesson 5: Picking Parts

Students refine their solution design ideas after exploring the properties of potential building materials.

Lesson 6: Design a Shade

Students build prototype sunshade models, test their stability and ability to cast shade, and redesign them as needed based on their preliminary testing.

Lesson 7: Are You Keeping It Cool?

Students test their model shades to determine whether they work as intended. They compare all the structures built by their classmates and look for common designs, materials, and shapes.

Design Challenge

Problem: Ada gets hot while moving around in sunlight.

Students solve the problem: Students ask questions to help define the problem; research existing solutions; and design, build, and compare portable shade devices.

How they solve the problem:

Lesson 8: Carrying the Shade Part 1

Students hear about a new problem and reflect back on how they solved the playground problem. They compare their process to a story about engineers designing a shade plan for a zoo exhibit. They begin to define the problem of Ada getting hot in sunlight.

Lesson 9: Carrying the Shade Part 2

Students ask questions about Ada's situation and compare it to their previous investigations, so they can define the problem. They research existing solutions and brainstorm ways to use the available materials to design a portable shade device.

Lesson 10: Carrying the Shade Part 3

Students build their portable shade devices, test to see if their device can be used while crossing the room, and compare the shapes and stability of all the designs.