

Egg-Laying Box

Task: Students will work in small groups to design and create an egg-laying box that rolls eggs away from the hens' area into a collection area.

Getting Started

Build Content Knowledge

If you wish to provide students with background knowledge about laying eggs, inclined planes, and absorbing forces, reproduce and distribute pages 10 and 11. Then have students read and discuss the science concept and the visual literacy graphics on those pages.

Introduce the Challenge

Reproduce and distribute the STEM Challenge on page 12. Then have students read the challenge and the testable goals. Discuss the materials with the students and decide on a plan for gathering the materials.

Next, have students research ramps and materials that affect friction and absorb shock. Have them use the STEM Planner on page 8 to think about how science, technology, engineering, and math are used to create an egg-laying box. Finally, have students independently brainstorm and draw their ideas on page 12.

Completing the Challenge

Assign students to small groups.

Optional: Model the Design Process

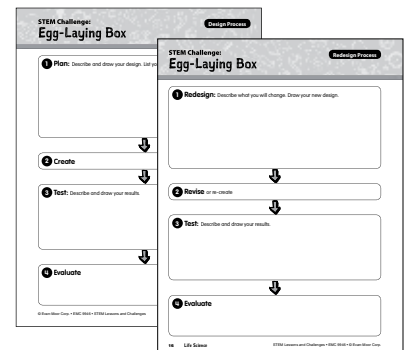
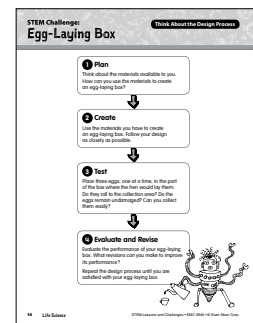
You may wish to reproduce and distribute page 14 to students. This resource is intended to help students think about how to approach each step in the design process.

Design Process Worksheets

Reproduce and distribute the STEM design process worksheets to students. Provide support when needed to help students describe and evaluate their plans.

After the Challenge

Have students share their design processes, compare their egg-laying boxes, and brainstorm ideas for improvements.



The Hen That Laid the Rolling Egg

Scrambled, hard-boiled, or baked into a cake—most eggs that we eat come from chickens. Eggshells are hard enough to keep the protein-packed yolk and fluffy white contained inside but easy enough to break into a frying pan or a mixing bowl—or onto the floor, if the raw egg rolls off the counter.

Young hens usually lay an egg each day during spring, summer, and fall, as long as there are at least 12 hours of daylight. They lay eggs less often with less light and will stop during winter. While hens rarely build a nest for their eggs, they do sit on the eggs as soon as they think they've laid enough. Good luck collecting them out from under a mother hen at that point—their beaks and **talons**, or toenails, become sharp weapons.

The easiest way to collect the eggs is to have the eggs roll away from the chickens to someplace you can reach them without disturbing the birds in their pens or cages. Just like water flowing downstream or a sled sliding down a snowy hill, eggs are easily pulled by gravity down an **inclined plane**, or ramp. Once an egg is in motion, it will stay in motion unless another force acts on it. **Friction** on the ramp's surface is one possible force. If the ramp is smooth, the egg will **accelerate**, or get faster, as it travels downward. If it has a rough surface, friction will slow it down, possibly making the egg come to a stop. Another factor affecting the egg's speed is the **angle** at which the ramp is set. The steeper it is, the faster the egg will roll. If it is too shallow, the egg might not roll all the way down.

Assuming the egg reaches the bottom of the ramp, something there will stop it. If the **impact**, or strike, of the egg with that something is too hard, it could break the shell. However, if the material the egg hits can absorb the shock of the impact, it won't break—until you scramble it in a pan.

STEM Challenge: Egg-Laying Box

Three children are sliding down a sand dune, a snowy hill, and a wooden slide. Who will slide most easily? Who will move most quickly? Who will land most safely?



sand dune

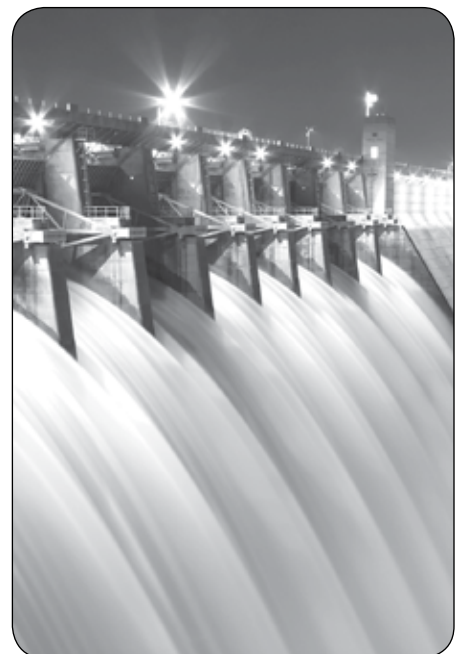


snowy hill



wooden slide

We can use gravity to move something without touching it. A homeowner uses a rain gutter and gravity to collect water. After getting a roller coaster to the top of a hill, the operator uses gravity and momentum to power the rest of the ride. A hydroelectric plant uses falling water to move a turbine that causes a generator to produce electricity.



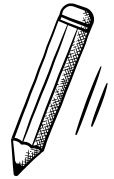
Egg-Laying Box

Challenge: Design and create an egg-laying box that rolls eggs away from where a hen would lay them into a collection area.

Testable goals: Three raw eggs roll into the collection area at least 1 foot (30 centimeters) from the hen's area. The eggs do not break or crack and are easy to collect.

Research: Look at pictures of egg-laying boxes. Notice how the boxes are constructed. Think about how science, technology, engineering, and math are used to create an egg-laying box.

Brainstorm: Draw one or more design ideas for an egg-laying box. There are many different ways to complete this challenge. Be creative!



A large, empty rectangular area with rounded corners, defined by a dashed border. This area is intended for students to draw their design ideas for an egg-laying box.

STEM Challenge: Egg-Laying Box

Suggested Materials List

Items for each group

shoe box

scissors

Items for the whole class

cereal boxes

glue

foam sheets

pencil

felt

carpet scraps

towels

plastic, canvas, or wire mesh

plastic bags

rubber bands

zip ties

string

strong tape

Items for testing

a dozen raw eggs

toy chicken (optional)

1 Plan

Think about the materials available to you. How can you use the materials to create an egg-laying box?



2 Create

Use the materials you have to create an egg-laying box. Follow your design as closely as possible.



3 Test

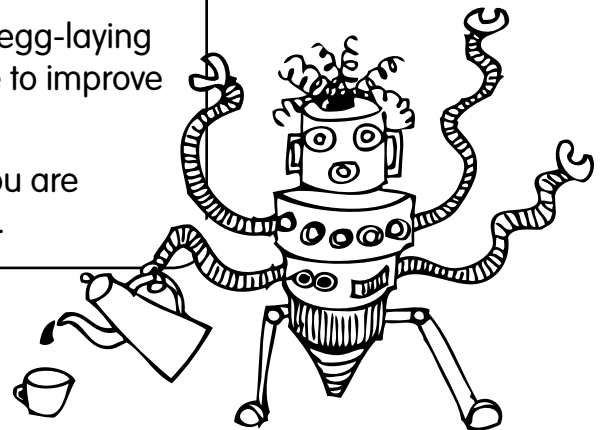
Place three eggs, one at a time, in the part of the box where the hen would lay them. Do they roll to the collection area? Do the eggs remain undamaged? Can you collect them easily?



4 Evaluate and Revise

Evaluate the performance of your egg-laying box. What revisions can you make to improve its performance?

Repeat the design process until you are satisfied with your egg-laying box.



1 Plan: Describe and draw your design. List your materials.



2 Create



3 Test: Describe and draw your results.



4 Evaluate

1 Redesign: Describe what you will change. Draw your new design.



2 Revise or re-create



3 Test: Describe and draw your results.



4 Evaluate