Agriculture Requires Engineering:

Design an Egg Catcher

How do eggs get from the hens to the grocery store? How can they be collected safely?

Billions of eggs are produced and distributed to grocery stores every year. How do today’s farmers collect hen eggs? By hand? By machine? Using some engineering and design skills, try to build and test an egg catcher. You will need to ask questions, work within constraints and test prototypes as you work.

Do • • •

1. **Gather these materials:** 8 sheets of paper, 50 cm of tape, 1 egg, meter stick, plastic bag to cover the floor, copy of Egg Catcher Observation Log.

2. **Think about the challenge:** Design a free-standing egg catcher using 8 sheets of paper and 50 cm of tape that will safely catch an egg dropped from the height of 1 meter.

3. Use the Observation Log and the design process to ask questions and imagine some solutions.

4. Draw a diagram of your best idea.

5. Create your prototype using only 8 pages of paper and 50 cm of tape. Remember, your design must be free-standing; you cannot hold it or tape it to the floor.

6. Put the egg catcher on top of the plastic bag to avoid messes. Test your design by dropping the egg from a height of one meter. A successful design catches an egg without causing it to break or crack.

7. If successful, try from additional heights. If unsuccessful, throw out the messy egg catcher and damaged egg.

8. Improve your design. Engineers try new designs and test them. Can you produce a better design?
Share
Was your design successful? Describe what happened when you dropped the egg.

Reflect
Go back to the drawing board! What could you do to improve your design?

Generalize
Consider other challenges that poultry farmers face: feeding and housing flocks, cleaning, packaging and transporting eggs. What kinds of problems have agricultural engineers solved?

Apply
Look at other objects around your house. What could you do to improve the design of something?
Engineers design solutions to problems. Agricultural engineers, environmental engineers, mechanical engineers, and many others work on solving the problems that face egg producers. They have invented machinery, improved production systems, and found ways to take care of the environment. Engineers have designed solutions for feeding and housing large numbers of chickens, seeing inside eggs, cleaning, packing, and transporting large numbers of eggs, and designing irrigation and drainage systems related to the environment.

At the heart of engineering is the Engineering Design Process, a highly flexible process used by engineers. Steps in the process include identifying a need, defining the problem, conducting research, analyzing constraints, finding alternative solutions, analyzing possible solutions, constructing a prototype, testing solutions, communicating the solutions, and redesigning. The simplified Engineering Design Process uses five steps: ask, imagine, plan, create, and improve.

Whether it is for a large poultry operation or a small backyard flock of chickens, engineers design solutions for housing, feeding, and keeping the birds safe, as well as collecting and distributing the eggs, and maintaining a clean and healthy environment.

The U.S. produces about 75 billion eggs a year. That’s 280 million birds laying from 250 to 300 eggs each. In modern henhouses, computers control the lighting, which triggers egg laying. Most eggs are laid between 7 and 11 a.m. A hen requires about 24 to 26 hours to produce an egg.

There are 7 to 17 thousand tiny pores on the shell surface. As the egg ages, these tiny holes permit moisture and carbon dioxide to move out and air to move in to form the air cell. The egg can also absorb refrigerator odors through the pores, so always refrigerate eggs in their cartons.

You can have fun dyeing eggs with things from the kitchen by using fruits, vegetables and their peels and juices, herbs and spices and even coffee.

Eggshells also make a good addition to your compost.

**More Challenges**

- Add constraints to the challenge: reduce the amount of tape and/or paper, set a time limit for building the model, catch more than one egg.
- Research problems that poultry farmers face. How has engineering helped to solve some of those problems?
Design Brief

1. **Ask:** What is the need? What is the problem? How can you safely catch an egg after the chicken lays it?

2. **Imagine:** What could be some solutions? The farmer can’t pick up each egg by hand. Imagine some ways those eggs could be caught and collected. Brainstorm a few ideas. List them here.

3. **Plan:** Draw a diagram of one idea for an egg catcher. How can paper be a cushion to safely catch your egg? Do materials testing; use scrap paper and test a few of your ideas. After you test the materials, draw a diagram of your best egg catcher here.

4. **Create:** Build a prototype (model). Use 8 sheets of paper and 50 cm of tape to build an egg catcher that can stand on its own.

   - **Test:** Egg dropped at 1 meter height.  
   - **Test:** Egg dropped at ________ meter height.  
   - **Test:** Egg dropped at ________ meter height.  

   Successful test? Yes ———— No ————

5. **Improve:** How could you improve your design?