



Engineer: Egg Crusher



Time: 50 Minutes

Skill Level: Elementary (age 9-11), Middle School (age 12-14)

Background

What is Science Inquiry?

Children are natural scientists. From a very early age they explore the world, ask questions and seek answers. This journey of exploration and discovery is Science Inquiry. Science Inquiry helps young people understand their environment, solve problems and gain knowledge about scientific ideas and processes.

Next Generation Science Standards (NGSS)

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
3. Planning and carrying out investigations
6. Constructing explanations (for science) and designing solutions (for engineering)

Disciplinary Core Ideas

- PS2:** Motion and stability: Forces and interactions
- ETS1:** Engineering design

Crosscutting Concepts

2. Cause and effect: Mechanism and explanation
6. Structure and function

Objective

In this activity students will use the engineering cycle to design and test the sturdiness of an egg shell under various stresses.

Intro to Engineers

Engineering begins with a problem, need or desire that suggests an engineering problem needs to be solved. Engineering makes use of models to test possible solutions to problems. A simple engineering design cycle consists of six steps: (1) State the Problem, (2) Generate Ideas, (3) Select a Solution, (4) Build the Item, (5) Evaluate, (6) Present results.

The Science of Eggshells

While eggshells may seem thin and fragile, they are actually quite strong. The structure and composition of an eggshell serves to not only protect a growing embryo, but also provide nutrients (e.g., calcium) and regulates gas and water exchange.

Watch the Video: <http://oregon.4h.oregonstate.edu/science-engineering-and-technology>

Materials List:

- Boards for constructing the egg crusher
- Duct tape
- Masking tape
- Bathroom scale
- Set of weights
- Padding materials (bubble wrap, newspaper, paper towels, etc.)
- Wet wipes
- Garbage bags

Preparations:

Prepare a test site for the egg crusher. Cover the ground or surface with a large plastic garbage bag to help contain the mess.

Discuss ...What do students know about chicken eggs? Some may have backyard hens. Use the information on the video to discuss chicken egg design. Explain the engineering cycle. Discuss what can be varied in the experiment: type of padding, amount of weight. Select a design challenge that the groups agree upon for the first egg test. Examples include:

- Are brown eggs stronger than white eggs?
- Are hard boiled eggs stronger than raw eggs?
- Do fresh eggs change the results?
- In which direction should the egg be placed in the crusher to hold the most weight?
- Does air temperature make a difference?

Predict ...Generate Ideas. Select a Solution.

Experience “What to Do”- What is the plan for the investigation?

Have students construct an egg crusher from the materials provided. Run the test. Evaluate the results. Continue to ask and answer questions. When testing is complete, have students clean the boards and weights thoroughly with wet wipes. Discard any padding material that cannot be reused.

Share ...Guide students to share questions about their egg crusher results and encourage them to think about ways to answer their questions. Recording data is an important part of sharing.

Reflect ...Analyze and interpret the data and results. Discuss among the group.

Analyze the results to address the original design challenge. Were students able to answer the question?

Generalize ...to real world examples. Construct explanations.

Ask the students to identify other structures that have a shape similar to an egg. Where in nature or in the built environment would you find structures similar to the egg?

Apply ...outside the classroom or club meeting. What position do chickens place their eggs when they are in the nest? Could you use the shape of the egg to build a house? What would be some other benefits of an egg-shaped house?

Developed by Patrick Willis, Washington Co. 4-H Agent, patrick.willis@oregonstate.edu, for the Oregon 4-H Science Inquiry Video Series

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