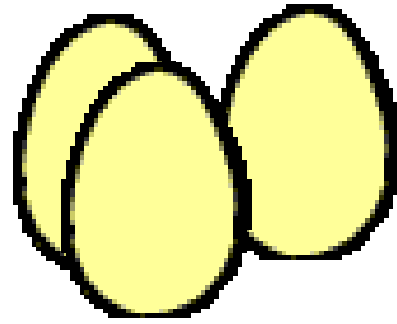




Engineer: Egg Drop



Time: 45 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	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions (for science) and defining problems (for engineering)	PS2: Motion and stability: Forces and interactions	2. Cause and effect: Mechanism and explanation
3. Planning and carrying out investigations	ETS1: Engineering design	6. Structure and function
6. Constructing explanations (for science) and designing solutions (for engineering)		

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

When you drop an egg, it gains speed and energy as it falls. With no protection, the egg hits the ground fast and hard at one small point on its shell. Whack! The egg smashes. When you protect the egg by packaging it in water or something else two things happen. First, the material around the egg decreases the speed at which the egg hits the ground. Second, the cushioning material

The Science of Eggshells (*continued*)

spreads out the impact from just one point on the eggshell to a larger area of the shell's surface. This reduces the force of the egg's impact with the ground. There is less damage to the egg with the watery cushion than to the egg that is dropped without a cushion. Whether the egg breaks and how hard it splats if it does depends on the amount of energy that your padding system absorbs. Egg Shells look solid, but each one contains up to 17,000 microscopic holes.

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

Materials List

- | | |
|---------------------|--|
| 1 large garbage bag | Re-sealable plastic bags (gallon size) |
| Pitcher of water | Other cushioning supplies: sand, tissue paper, bubble wrap, cornflakes |
| Eggs | |

Discuss ...What do the students know about eggs? Have they ever cooked or made anything using eggs? What are some unique properties of eggs?

Predict ...What do the students think will happen when the egg comes in contact with the floor? Will this reaction be the same or different if the egg is surrounded by something else?

Experience “What to Do”

1. Spread the garbage bag on the ground. This is your landing site—the place where the eggs will land.
2. Half fill one of the plastic bags with water.
3. Place an egg in the bag with the water and seal it completely.
4. Place the other egg in the empty bag, and seal it completely.
5. Take one bag in each hand. Then hold both egg-filled bags at shoulder height above the garbage bag. Release them at the same time.
6. After the bags hit the ground, open both bags and examine the eggs. What do you see?
7. Repeat the experiment trying out other materials. What happens if you use different amounts of water? What about dropping the egg on different surfaces? What is you drop the egg from different heights? Change the variables and see what you can discover!

Share ...Ask students to describe what they observed happening after each drop.

Reflect ...**Analyze and interpret the data and results. Discuss among the group.** What other questions do you have now that you have conducted this experiment? Will other types of cushion protect the egg better? (Jell-O, tissue paper, bubble wrap, cornflakes)

Generalize ...**to real world examples. Construct explanations.** Which type of cushioning created the most protection? Why?

Apply ...**outside the classroom or club meeting.** The same principles that you applied to protecting the egg are applied by engineers who design other types of protective equipment—from car bumpers and air bags to bubble wrap and bike helmets. Today, helmets are made with a layer of foam to help absorb an impact. Scientists and students have recently conducted experiments that show gel layer may be more effective. What else can we learn from an egg?

Additional Egg Experiments

The Egg Crusher: http://www.youtube.com/watch?v=oPdyp_L11I4

The Incredible Egg: http://www.youtube.com/watch?v=oPdyp_L11I4

Naked Egg: <http://www.exploratorium.edu/cooking/eggs/activity-naked.html>

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Agriculture Sciences & Natural Resources, Family & Community Health, 4-H Youth, Forestry & Natural Resources, and Extension Sea Grant programs. Oregon State University Extension Service offers its programs and materials equally to all people.