Professional Development Situation: Activity Guide

Skill Focus: Preparing STEM Learning Opportunities, Managing Groups During STEM, Encouraging Collaborative STEM Work, Modeling Engineering Practices

Time Required: 60 minutes

EGG DROP

In this activity, youth use the engineering design process to design and build a package that will keep an egg from breaking.

Learning Objectives

- Youth will be able to collaborate to develop a packaging design to safely hold an egg as it is dropped from a height.
- Youth will be able to use their resources wisely to complete a challenge.
- Youth will be able to identify a packaging engineer's job duties.

Key Terms

Package Engineering: design package for any given product based on the manufacturing and distributing process.

Materials

- Each Group:
  - Cardboard
  - Cotton
  - Fabric
  - Foam
  - Packing peanuts/bubble wrap
  - Towels
  - Straw
- Entire Class:
  - Uncooked eggs

- Tarp
- Tape
- Glue

Advanced Preparation

- Review the activity and practice it on your own, if possible.
  - *Italics words are what you can say to youth.*
- Gather all the materials needed.
- Familiarize yourself with educational pathways to become a packaging engineer and what they do as part of their job.

Activity Instructions

Introduction (5 minutes)

- Introduce youth to the lesson by asking the following questions:
  - *When you go to the store to buy a food item like milk or something like toilet paper or a cell phone, does it just come on its own or does it come in some sort of packaging or container?*
  - *What is the purpose of the packaging? What would happen if you didn't have the packaging?*
  - *Who designs that packaging? The product designer? Actually, it's the Packaging Engineer.*
- Explain to the youth that they will be taking on the role of a packaging engineer. A packaging engineer designs packages and/or containers for things like food, clothing, electronics, and toys. They work with product designers and look at costs when designing their packaging.
- Introduce the challenge to youth:
  - *"A local farmer requests your expertise as packaging engineers to help with transporting eggs from the farm to the store. As packaging engineers, your challenge is to design a container to transport the eggs safely without breaking."*
- Youth will work in groups to design a package for holding a single egg that can be dropped from a specific height without allowing the egg to break.
- Review the Engineering Design Process and emphasize to youth that they will be following all the steps in the process to create their package/container.
- Lead a discussion using the following prompting questions to help youth make connections to prior knowledge related to the challenge and to make predictions about what they think will happen.

- If your challenge is to prevent an egg from breaking, let's think about what causes an egg to break. What are the different ways to break an egg? How and why do those methods break the shell?
- How do people package or transport fragile items, such as eggs, in order to keep them from breaking?

Brainstorming and Design (5 minutes)

- Give youth 5-10 minutes to brainstorm and sketch a design for their container. As they are working, ask them open-ended questions about their design.
  - *How does your design work?*
  - *Why did you decided to build your design that way?*
  - *What materials are you planning to use? Why did you choose those materials?*

Build (20 minutes)

- Give youth 30 minutes to build their packaging. As they are working, ask them open-ended questions about their container.
  - *Describe the different parts of your packaging and their purposes?*
  - *What do you think will affect the results of each test?*

Test and Present (10 minutes)

- Once each team is done building their design, have youth brainstorm 2-3 tests to determine how effective their packaging is. The entire group will decide how each group will measure and record the results of each test.
- Ask each group to come up to the front of the class and describe the elements of their design before putting their packaging through the test.
- Test the packaging using the tests the group developed.
- After each group tests their design, ask them to share with the entire group what about their design allowed it to be successful or unsuccessful at keeping the egg from breaking.

Redesign (10 minutes)

- Based on the results of the testing phase, allow youth to redesign aspects of their package. Emphasize that they should use knowledge gained from observing how their own package and the other groups' package designs performed during the testing phase.

- Once they have completed their redesign, youth will test their new packaging to see how it compares.

Reflection and Discussion

Questions (8 minutes)

- Follow up the activity with a think-pair-share about the design process. For each question, give youth 30 seconds to think about the answer on their own, 2 minutes to discuss in pairs, and then have pairs share out their answers with the large group. This will give all youth the opportunity to voice their thoughts about the activity. These times are suggested guidelines. Please adjust them based on your students' needs and the nature of the question you are asking them to reflect on. Some possible discussion questions include:
    - *Which design worked the best? Why do you think this design was the best?*
    - *What elements from other groups' packages could be combined to improve your packaging design?*
    - *What other materials would have helped your design?*
    - *In real life, eggs are not sold individually. How would you design packaging for a half a dozen or a dozen eggs?*

Connections (2 minutes)

Discuss the career connection of the activity to the group.

- *In today's activity, you played the role of packaging engineers. Packaging engineers balance a variety of criteria when considering how to package a product, including the attractiveness of the packaging material, how well the packaging protects the product, and cost effectiveness of the packaging material. Packaging engineers come from a variety of backgrounds, including material sciences and industrial engineering.*