



Cruisin' for a Bruisin'

Grade Level

8-10

Lesson Length

6 periods x 55 Minutes

STEM Careers

- Food Science

Nebraska Science Standards

- SC12.1.1
- SC12.1.3
- SC12.2.1

Next Generation Science Standards

- **SC.HSP.1 Forces, Interactions, and Motion**

Food Science

These lessons aim to bring the science, skills of inquiry, critical thinking, and problem solving to life through an agricultural context.



Learning Objectives

By the end of the unit, students should be able to:

- Identify the necessary materials and design packaging for a new food product;
- Learn the characteristics of effective packaging; and
- Learn that packaging a product involves science, engineering, technology, and math.

Materials List – (per student team)

- Cruisin' for a Bruisin' lab worksheet
- Packaging materials
- Banana

Preparation

- Print Power Point slides
- Print lab reports, guidelines, and data collection/analysis forms.
- Collect, organize, and prepare materials to be used for the creation of an experiment to test best food packaging materials



Introduction (Interest Approach)

Ask students to identify some of their favorite fruits. Make a list on the board. Point out that these fruits can likely be purchased at your local grocery store. However, were they grown nearby? In some cases, perhaps they were. However, in many cases due to varying climates and growing seasons, we consume fruit (and other foods) that were produced in other areas of our country or even across the world.

Essential Questions

- *How much does packaging affect purchasing decisions?*
- *To what extent can we expect packaging to withstand possible shipping and handling damage?*

Learning Activity 1: Understanding Food Packaging

Show students the Red Blossom California Strawberries website www.rbtrace.com and watch the strawberry packing video clip. Go through the trace back example to see how customers can enter the code on the bottom of their Red Blossom clamshell container to see what farm grew their strawberries, the variety, and date the strawberries were picked.

- This lesson focuses on the science of food packaging and uses fruit as a specific example. Provide several examples of fruit packaging containers for students to examine. Examples include strawberry clam shells, cardboard trays with indentations for holding individual pears or apples, and sacks of oranges. If examples are not available, show the class online examples. Ask students why they think fruit packaging is important. Make a list of ideas on the board.
- Use the background information to help develop the list on the board of who is involved in food packaging, its importance, and possible careers. Effective food packaging is important to farmers because they want their product to look appealing and taste fresh when it gets to consumers. Farmers, however, also need to consider the cost of the packaging. Expensive packaging can reduce profits that farmers need to make from the sale of their products. Product packaging is important to consumers who want to purchase a piece of fruit that smells good, tastes good, is clean, is not bruised or damaged, and has been packaged using safe food handling practices and materials.
- Explain that students will take on the role of food packaging specialists in a challenge to design the best package to ship one piece of fruit. Not only should the package protect the fruit, but it should also be cost efficient and environmentally friendly. For example, a group could place a piece of fruit inside a very large box that is packed with layers and layers of bubble wrap. While this box might prevent the fruit from being damaged, its large size and use of extra materials would be costly to assemble and ship, and would generate a lot of waste.

- Distribute the *Cruisin' for a Bruisin'* lab worksheet. Explain the lesson process and evaluation.
- Organize students into groups. Explain that each individual in the group will design and test their own package prototype. The best package in the group will be selected. The group will then have the opportunity to work together to fine tune the best designed package from their group, which will be presented to the class. The class will then vote on one package to be shipped in the mail with a piece of fruit

Learning Activity 2: Develop the package

1. Instruct groups to begin their design process by researching materials and designs for their fruit package. Packages should be designed to hold one banana. This will keep package material cost and shipping cost uniform
 - The packaging should be suitable for shipping the piece of fruit through the U.S. Postal Service.
 - Examples of websites with packaging materials:
 - [Monte Packaging Company](#)
 - [Hescow](#)
 - [Expedx](#)
 - Explain to the students that they are not to purchase items from the websites, but they should use the websites to gather ideas for types of materials that could be used to package fruit.
2. After researching materials, students should assess the feasibility of several materials and designs that might work for their fruit packages. Each student should sketch their own design ideas on their lab sheet along with a list of materials and dimensions.
3. Each group should brainstorm ideas for their company name and design a decorative label that will go on the fruit. This should be recorded on the lab sheet.
4. As homework, each student will gather their necessary packaging materials. Suggest that students look in their recycling bins at home or at school. You may supply some basic materials, such as tape or cardboard if needed. Examples of packing materials include cardboard, wood shavings, corn packing peanuts, newspaper, tissue paper, cellophane, poster board, foam board, lint, and wool.

Learning Activity 3: Construction

Students will meet in their groups and each student will design and build their own prototype package. Students may use the sample pieces of fruit to establish necessary dimensions for package design, however, package evaluation and testing will be done without fruit inside the package.

Learning Activity 4: Salesmanship

1. Each student will present their prototype package to the group and the group will evaluate the prototype for craftsmanship, aesthetics, and use of materials using the packaging rubric.
2. Each student will then subject their package prototype to a durability test for tearing and crushing. Following the test, students will report back to their groups.
3. The package design with the best durability will then be used to complete the lab.

Learning Activity 5: The Final Product

The group will develop one final package for their fruit based on improving the design of the package that received the highest score from the rubric. The group must keep track of materials cost, package dimensions, shipping cost, and logistics

Learning Activity 6: The Drop

1. Groups will present their package design, cost of materials, and cost of shipping to the class.
2. Groups will one at a time drop their package containing the food item from a designated height in the room. Students will record damage to the packaging as well as any damage that occurred to the food item.



Reflection

Using the prompts below to facilitate reflection, allow each student to respond in writing to the prompts and then facilitate a whole class discussion.

- 1) What packaging concepts held up the best during the dropping portion of our lab?
- 2) What effect on consumer purchasing decisions do you think packaging has on a product?



Apply

Given what you have learned about packaging, develop a drawing of a package design for a “hamdog” which is a cheeseburger only in a hotdog form. This product is frozen and will be prepared in a microwave.

References:

Engineering K-PhD Program, Pratt School of Engineering, Duke University

https://www.teachengineering.org/lessons/view/duk_foodpackage_music_less

Cruisin' for a Bruisin' Experiment Guidelines

Objective: Using basic principles of marketing and packaging, design a package to protect your given food item.

Guidelines:

1. Students will need to determine what materials will be used for packaging.
2. Students will need to specify size, and shape of their developed package.
3. Each student in the group will use the provided lab report to document their findings.

Procedures:

1. Using the internet research materials typically used in packaging of food products. Some suggested resources include...

- Monte Packaging Company www.montepkg.com
- Hesco www.hesco-fl.com
- Expedx www.xpedx.com/packaging-solutions

2. Create a list of packaging materials needed to develop your package. Complete the chart in your packet labeled "packaging materials chart".
3. Determine the size and shape of your container, complete the questions in the lab packet for this step.
4. Sketch your design in the space provided.
5. Using the packaging material collected develop your package. Remember that larger packages cost more for the company and increase the retail price of your product.
6. Once package is complete, share package design with your group. Test packages and decide which design will represent your group.
7. Work together as a group to perfect your package before the "big drop".
8. Complete the "big drop"
9. Observe and record damage to package and to the selected food item.
10. Complete the lab analysis questions based on your findings.

Cruisin' for a Bruisin'

Situation:

A local startup company is focused on providing healthy, fresh, local food to consumers in the area. They plan to ship fresh fruits to consumer's front doors in hopes of increasing the amount of fruit consumed during all times of the year. You have recently been hired to design packaging for their fresh bananas.

Your Task:

Develop a package that can be used to protect fresh bananas during all times of the year, keep in mind that costs need to stay as low as possible and that transportation is when damage is most likely to occur.

Packaging Material Chart

Material	Cost

Package Construction:

Determine the size and shape of the package needed to contain your fruit.

Measure the width, or diameter, and height of your piece of fruit and include units.

Diameter = _____ $\frac{1}{2}$ diameter = _____ radius

Height = _____

What is the volume of your piece of fruit? Volume of a sphere = $(\frac{4}{3})\pi r^3$

Volume = _____

Based on this information, the package needs to be at least _____ tall and _____ wide and hold a volume of _____ (Leave some extra space for padding materials.)

You may wish to wrap your fruit. Calculate the surface area of your fruit to determine the amount of wrapping you will need. Surface area of a sphere = $4\pi r^2$

Surface area of fruit = _____

Package Construction:

Sketch your design in the space provided.



Durability Test:

Record the results of the “big drop” and assess the quality of your package.

1. What damage was sustained by the packaging?

2. What damage was sustained by the banana?

3. Based on your groups findings would this design be sufficient for the food delivery service to use? Why?

Name:

Lab Report

Please complete the following report during the design and implementation of your experiment.

Research Problem

- Describe what you are investigating and justify why you are investigating the problem.

Hypothesis

- Formulate one or more hypotheses for your experiment.

Procedures

- Create the steps you will follow for your experiment.

Data Collection

- Describe the data that you will collect during your experiment.
- Provide graphs, tables, charts, and raw data as necessary.

Results

- Explain your results.

Conclusion

- Based on your data:
 - What can you conclude?
 - Were your hypotheses supported?
 - Were there limitations to your experiment?
 - What are new research questions that derived from this study?