



Fossil Recovery Team

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Target Grade: 3rd Grade

Time Required: 45 minutes (can be extended for more trials)

Standards:

Next Generation Science Standard(s):

- 3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

Common Core ELA Standard(s):

- CCSS.ELA-LITERACY.SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Georgia Social Studies Standard(s):

- SS3E3 Give examples of interdependence and trade and explain the benefits of voluntary exchange.
 - a. Describe the interdependence of consumers and producers.
 - b. Describe how goods and services are allocated by price in the marketplace.
- SS3E4 Explain the concept of opportunity cost as it relates to making a saving or spending choice.

Common Core Mathematics Standard(s):

- CCSS.MATH.CONTENT.3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Lesson Objectives:

Students will:

- create an affordable package to safely transport a fossil from the dig site to the lab.
- experience opportunity cost as it relates to how price drives the market.
- make observations and take journal notes to record results of package trials.
- collaborate and cooperate with small groups of peers to solve a problem.

**Central Focus:**

How can we safely and affordably ship artifacts from excavation sites to labs and museums? After reading *Days of Digging*, by Holly Cefrey, students will create a model of a package that could be used to ship their fossil or artifact to a lab or a museum. The models will be tested to ensure the fossil will arrive dry and unbroken. After experiencing the effects of an 8 ft. drop and 20 seconds under water, students will use their results to improve on the packaging during further trials.

Key words: engineering design process, fossils, team work, groups, dinosaurs, brainstorm, test, revise, improve, redesign

Background Information:

Archaeology is the study of human activity through digging for and recovering artifacts (objects made in the past by humans) and architecture. Archaeologists analyze these man-made items to gain knowledge about the history of humans, society, advancements, and culture.

In contrast, paleontology is the study of life through the analysis of fossils preserved in rocks. Fossils, including animals, plants, and microbes, can provide a great deal of information about the origin of life and the evolution of organisms throughout time. Recent fossil discoveries have been able to provide palaeontologists with invaluable information about the flora and fauna of the past through DNA samples, preserved organ and skin tissues, and even entirely preserved animals and plants.

The transportation of fragile artifacts and fossils has to be carefully planned. Artifacts and fossils must be carefully packaged in order to prevent the items from being damaged. Changes in weather and moisture from humidity are some of the largest problems for fossils. Fossils and artifacts must be kept in climate controlled areas, as to not allow breakdown of the specimen that can occur in colder and warmer temperatures. Additionally, many items in transit need extra space to ensure that the artifact or fossil does not contact any other pieces. Often, fossils and historical artifacts require packaging that prevents movement, even inside the container. This often involves the use of packing foam, insulation, and shock-isolation to prevent damage.

Materials

- Picture Book – *Days of Digging*, by Holly Cefrey or any other book with a story about digging artifacts or fossils
- SmartBoard - To display book, directions, or data charts
- ELMO - Document Camera - To display book, directions, or data charts
- Fossil/Artifact Models – These need to be uniform in size, easily breakable, and soluble, Pringles Chips are a good choice, but fossils could also be made from Plaster of Paris
- Package Planning Guide – 1 per group



- Package Budget Sheet – 1 per group
- Scissors – 1 per group
- Plastic Cup - 1 per group (to be used as a guide for the maximum package size. Make sure to choose a cup that will fit the fossil size your students will be using.)
- Tape with dispenser
- Ruler
- 4x6 rectangles of various paper types, wax paper, foam packaging sheets, or any other materials on hand to use as materials to package fossils
- Small tub, at least 6 inches deep to be used to sink the package
- Water
- Paper towels
- Timer

Instruction

Advance Preparation:

- Have heterogeneous group assignments ready.
- Print Package Planning Sheet and Package Materials Order Form – 1 copy per group.
- Fill small tub with water and place it on a table where the trial will take place. Put paper towels nearby.
- Place packaging materials where all groups can easily access them. Make sure to have the price of materials marked (you may precut materials with prices of \$5, \$10, or \$15 written on a card next to each item). Make sure to have the tape with dispenser and a ruler to measure it. (Charge \$5 for 12 inches of tape.) Prices could be adjusted to meet the level of your students.

Lesson Introduction: 10 – 30 min.

- Read aloud *Days of Digging*, by Holly Cefrey. (This part of the lesson time depends on whether this is the first reading and whether any text discussion will take place during this reading.)
- Discuss how fossils are moved to labs and then museums.



Whole Group: 5 min.

- Give directions for the building challenge. Students are to build a package that will protect the artifact or fossil from breaking while being shipped to the lab or museum. The least expensive package that protects the fossil, maximum cost of \$50, will receive the contract from the digging company.
- Break into groups of 3-4 students and give each group a cup, a pair of scissors, one chip (fossil), the Planning Sheet, and the Package Materials Order Form.

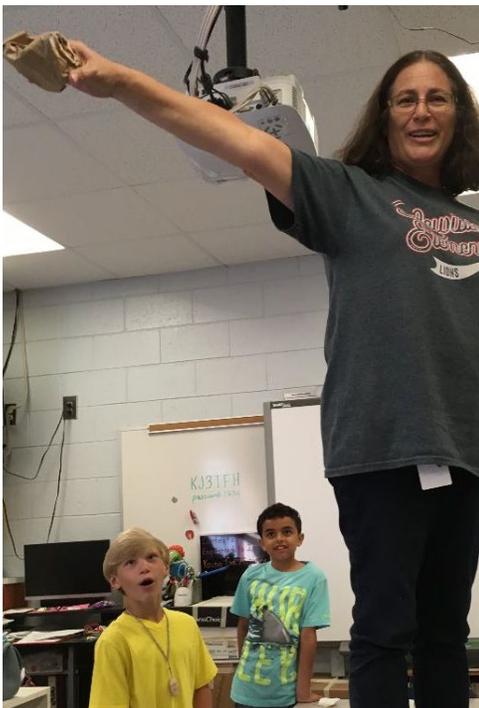


Small Group: 15 min. Remind students to work quickly, otherwise much time could be lost here.

- Students work together to design the packaging.
- Once they have decided what materials they want to try, a representative will bring the completed order form and collect the supplies. Groups may make more than one trip to get supplies, but all supplies must be added to the budget.
- When they have finished their package, they should total the cost.

Whole Group: 10min.

- One representative from each group will bring their final package to the teacher who will stand on a table and make the drop at shoulder height, approximately 8 feet.





- Two representatives from each group will complete the underwater trial. One student will place the package into a small tub with about 6 inches of water and gently push in under with their open palm. As soon as their hand is under water, the other student will start the timer and time for 20 seconds.



- When the timer goes off the package will be removed and carefully opened to check the condition of the artifact.
- The group recorder will complete the observation chart to indicate what happened. The group will give input as to why their design worked or didn't work.

Small Group: 5 min.

- Students write or draw their results, then write about what they are wondering after the first trial.





Extension:

- Allow students to participate in multiple trials, as time allows. Students should write or draw their results after each trial.

Differentiation

Approaching Level:

ELL: Provide an example of what a package might look like. Demonstrate the drop test and the underwater test in advance so that they can visualize what they are expected to create. Provide a word bank or sentence stems as needed for the observation chart.

Fine motor difficulties: Provide assistance with cutting and taping if needed.

Beyond Level Extension:

Students can research current shipping methods and costs, then recreate the activity using different materials or add additional criteria for subsequent trials.

Assessment

Formative Assessments:

Teacher observation of collaborative teams, shipping trials, and completed Package Shipping Guides.

Assessment Differentiation:

Students dictate or draw their ideas, results, and “wonderings.”

Summative Assessment:

Students will write a paragraph explaining which package company they might award a contract to, based on what solution worked best. They will also write at least one idea to demonstrate how they might reduce the cost or improve on the best packaging presented.



Package Planning Guide



Team Name: _____

Team Members: _____

- Your budget is \$50.
- You may use up to two fossils (chips) during your product development. Any additional chips needed will be at a cost of \$1 each.
- The shipping package, with the fossil/artifact inside, must fit into the cup provided. It will need to survive an 8 ft. drop and 20 seconds under water.
- The winning package will be awarded the contract with the dig company.

Draw or write your ideas here.

Draw or write your results here.

Write your wonderings here.