

Lesson 2

Pack It Up

v. 1.0.0



Topic(s)

Reduce

Waste Prevention

Duration

Lesson Steps—45-60 minutes over 2 days

Engineering New Packaging—ongoing

Extension Ideas—varies

21st Century Learning Skills

- Collaboration
- Communication
- Creativity
- Critical Thinking

Grade Level

Fourth and Fifth

Materials

Students

1. *Pack it Up* rubric (one per student) **Page 5**
2. *Pack it Up* worksheet (one per group of four students) **Page 6**
3. *Plan Your Packaging* worksheet (one per package redesign team) **Pages 7-10**
4. One or two pictures of packages from home (cut out of magazine or newspaper, original photograph, etc.)
5. Various materials for constructing packaging prototypes

Teachers

1. Examples of contrasting packaged items (e.g., single-serve juice containers and a large juice jug, an over-packaged item/toy, and an item purchased without packaging such as bulk items stored in your own container)

SUMMARY

In this lesson, students will learn how to reduce packaging waste by comparing products that have minimal or excessive packaging. Students will bring in pictures showing examples of packaging, and work in groups to design and engineer a prototype for a new type of product packaging.

CORRELATION WITH STANDARDS

NEXT GENERATION SCIENCE STANDARDS

Fourth Grade

Fifth Grade

Standard and Performance Expectation

4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Disciplinary Core Ideas

ESS3.A Natural Resources: Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

ESS3.C Human Impacts on Earth Systems: Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

COMMON CORE STATE STANDARDS

Fourth Grade

Fifth Grade

Lesson Focus Standards

Writing

W.4.7: Conduct short research projects that build knowledge through investigation of different aspects of a topic.

W.5.7: Conduct short research projects that build knowledge through investigation of different aspects of a topic.

Speaking and Listening

SL.4.4: Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

SL.5.4: Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Supporting Standards

Reading: Literature
RL.4.1, RL.4.2

Reading: Informational Text
RI.4.1

Writing
W.4.2, W.4.4, W.4.8, W.4.9

Reading: Literature
RL.4.1, RL.4.2

Reading: Literature
RL.5.1, RL.5.2, RL.5.6, RL.5.7, RL.5.9

Reading: Informational Text
RI.5.1

Writing
W.5.2, W.5.4, W.5.8, W.5.9

Speaking and Listening
SL.5.5, SL.5.6

Vocabulary

Packaging: A container or wrapping such as paper, plastic, metal, etc., used to protect, transport, display or store a product.

Reduce: To use less “stuff” and produce less waste.

Additional Resources

<http://www.newsela.com> A website containing current news articles at upper elementary and middle school reading levels. Sign-up required.

<http://www.rewordify.com> A website for translating difficult text into easier reading levels.

<http://www.cde.ca.gov/be/st/ss/index.asp> California Department of Education, Content Standards Page

LEARNING OBJECTIVES

Students will...

1. Define “reduce” and describe at least three ways to reduce unnecessary packaging
2. Analyze different types of packaging found at home
3. Design and engineer a prototype of new packaging for a product

TEACHER BACKGROUND

Packaging serves a number of purposes. Paper, steel, glass, aluminum, and plastic are all used to package products. Bottles, jars, bags, and moulded plastic or paper packaging are used to hold or contain a product. Packaging also protects products from damage, prevents theft, makes items easier to transport or display, and often provides important information about the product.

On the other hand, producing packaging consumes large amounts of energy and natural resources—including trees, oil, and various metals and ores. In 2013, Californians disposed of 30.2 million tons of “waste,” and approximately one-third of it was packaging. Ten cents of every dollar spent on a product goes towards the cost of packaging, and reducing the need for packaging can greatly reduce the amount of paper and plastic going to landfills. If we use less, we conserve natural resources, reduce associated greenhouse gas emissions, and save money.

While attempting to minimize the production and use of packaging, we should be careful not to lose sight of its many important functions. Because most of the embodied energy in a product is in the product itself, sacrificing product quality for the sake of more environmentally-friendly packaging may be counterproductive if the product becomes more prone to damage or spoilage.

Like the 4Rs hierarchy in general, the best way to reduce packaging waste is to use less packaging in the first place. Many food items can be purchased in bulk by filling a reusable container at the store, saving packaging and money. When bulk purchasing is not an option, purchasing products with minimal packaging can reduce packaging waste (e.g., purchasing large containers not single-serve packages). Packaging can often be reused as well. For example, many spices come in glass jars that can be refilled from a bulk bin of the same spice for a fraction of the cost. We can also avoid purchasing items that come in types of packaging that are currently difficult to recycle for technical and economic reasons, such as Styrofoam, plastic wrappers, and packaging made from multiple types of materials.

LESSON STEPS: DAY 1

Activating Prior Knowledge

4. Review the 4Rs hierarchy with students one of several ways, such as: asking students to write down the 4Rs in order on an individual white board; calling out one of the 4Rs and asking students to respond by holding up the number of fingers that corresponds to its rank in the hierarchy; having students hold up four fingers and say each word chorally as they point to a finger (i.e., “First—reduce. Second—reuse. Third—recycle. Fourth—rot.”); or, reviewing gestures, hand motions, or key words taught in the previous lesson. (*Reduce* = Use Less. *Reuse* = Use it Again. *Recycle* = Turn it into something new. *Rot* = Decompose)

5. Inform the students that they will be learning more about the top of the 4Rs hierarchy. Students will collaborate with a partner to define *reduce*. Provide a sentence frame to scaffold as necessary (e.g., “To reduce means to _____. One way to reduce is by _____.”) Define *reduce* as lowering the amount of waste generated, or using “less stuff.”
6. Ask the students what they know about packaging. Ask them to share examples of something they buy that comes in a package. Chart these examples.

Building Background

7. Describe how packaging protects products, conveys important information about the product, and prevents theft. For example, a CD case protects the CD from being broken, provides a place to display information about the product, and allows a place for manufacturers to insert anti-theft devices.
8. Show the students contrasting packaged items, e.g., a single-serve juice container and a large juice jug. Ask the students what is left over from the single-serve juice pack after the juice has been consumed (the juice packaging, the plastic straw, and the plastic wrapper on the straw).
9. Ask the students what would be left over if they used reusable cups for everyone to get juice from a large juice jug. Producing one large juice jug requires fewer resources than producing dozens of small juice packages and straws. Show other examples of excessive packaging that you brought to class, along with a contrasting item purchased without traditional packaging, such as an item bought in bulk and stored in one’s own container (e.g., “boil-in-a-bag” rice and a glass container of brown rice). Discuss the differences.
10. Ask students to share examples of packaged items they might find at home. For example, in the kitchen they might find cereal, snack food, chips, and ice cream. Other items may include gum wrappers, shoe boxes, containers for toys, etc. Add students’ ideas to the earlier chart.
11. Have students estimate how many of these items come in unnecessary or excessive packaging. Students can discuss their estimates with a partner. Provide students with a sentence frame to scaffold as necessary. For example, “Of the items on the chart, I counted ___ that come in excessive, or too much, packaging. For example, my family bought _____ (toilet paper/chips) and it was packaged with _____ (plastic around each roll/just a few chips in each small bag, with all the bags inside a large box wrapped in plastic).”
12. Assign students to bring to class two pictures of items they think have minimal or excessive packaging for the next day’s in-class work. They can cut the pictures out of a magazine or newspaper, find or take a photograph, or even draw something, but the picture should clearly show the packaging. Students can also bring an actual packaged item, as long as the item wasn’t purchased for this assignment.

LESSON STEPS: DAY 2

Check for Understanding

13. Have students place all items or pictures brought from home—those with minimal packaging and those with excessive packaging—into a large bin or pile.
14. As a class, sort the items and pictures into two categories—minimal packaging or excessive packaging. Ask questions to ensure students’ understanding of the differences between the items you have presented to them:
 - Why do you think this item should be categorized as having excessive packaging?
 - Which parts of the packaging are unnecessary?
 - What similar items have you seen or purchased that have less packaging?
 - What materials does the packaging seem to be made from?
 - What other materials could the manufacturer have used?
 - Why do you think this item should be categorized as having minimal packaging?
 - What similar items have you seen or purchased that have more excessive packaging?
15. Discuss with students that there are other ways to reduce besides purchasing items with minimal packaging. Ask some of the following questions to stimulate discussion:
 - If you write on both sides of paper, how does this reduce waste?
 - If you buy one big bottle of detergent instead of three small ones, how does this reduce waste?
 - If you use a reusable lunch box or bag instead of paper, how does this reduce waste?
 - If you use dishes instead of paper plates, how does this reduce waste?
 - If you use a reusable mug instead of a paper or plastic cup, how does this reduce waste?
 - If you say, “No thanks, I don’t need a bag,” when you buy something that doesn’t require a bag, how does this reduce waste?

Students will collaborate with a partner to answer questions orally using a sentence frame to support academic language development. (For example, “When I _____, this reduces waste by _____.”)

Activities

16. Display the lesson rubric, and review the expectations for this lesson.
17. Show a copy of the *Pack it Up* group worksheet and model how to complete it. Then, place students in groups of four, and give each group a copy of the *Pack It Up* worksheet. You can assign one student to be the recorder, or allow students to develop their own plan for completing the assignment.
18. Redistribute pictures and packages to the students who brought them. In groups, students will share the pictures and packages they brought in and collaborate to complete the worksheet, identifying ways to reduce or eliminate the packaging of each item when possible. (For example, toys are usually sold in unnecessary packaging. Cereal can often be bought in bulk or large boxes. Soup can be made at home from fresh vegetables, water and seasoning. Lunch food can be placed in reusable plastic containers. Bananas and apples don’t need to be put into plastic bags before they are purchased.)
19. Individually, in pairs, or as a group of four, students will target one item for package redesign. Package redesign teams will sketch a design, construct a prototype, and create a presentation designed to convince the product manufacturer to use the new packaging design (a print brochure, a three to five minute pre-recorded video presentation, or a live-action presentation).
20. Provide teams in-class time to research and design improved packaging for their product, construct a prototype, and brainstorm, plan, and rehearse an effective presentation to the manufacturer, using the *Plan Your Packaging* worksheet. Presentations (print, prerecorded video, or live-action) should convey the purpose behind the packaging redesign, inform the audience of the materials used and the resources conserved, and explain why the redesigned packaging will appeal to their target audience.

21. Teams will present designs, prototypes, and/or manufacturer presentations to the class, using visuals and multimedia components. Presentations should include relevant facts and evidence to support findings. After each team is finished, discuss the following questions with the class:

- In what ways did the new design reduce the amount of packaging used?
- In what ways were the new materials or design more effective for conservation and waste prevention?
- What was the main message of the presentation to the manufacturer?
- What was the most convincing or effective part of the team’s presentation?

Closure

22. Write the word *reduce* on the board. Ask the students to collaborate with a partner to develop a definition for *reduce*, and to discuss why *reduce* is at the top of the hierarchy. Provide a sentence frame to support oral language as needed. (For example, “Reduce means _____. Reduce is at the top of the hierarchy because _____.”) (By generating less waste in the first place, we are conserving natural resources, e.g., trees used for paper packages, petroleum used for plastic, etc.)

Extension Ideas

- Read *Wump World* by Bill Peet, *The Lorax* by Dr. Seuss, or any work of literature from the suggested book list. Students will determine the theme of the chosen story (should relate to the 4Rs—specifically *Reduce*), and look for evidence from the text to support the theme. Discuss how the author uses characters, setting, plot, and illustrations to convey a specific message or point of view.
- Provide students with three types of packaging choices for a product, e.g., orange juice in a one-gallon plastic jug, half-gallon paper carton, and a six-pack of individual containers. Students will write an informative/explanatory essay detailing which packaging has the least amount of waste, and is therefore the best choice for the consumer. Details should be supported with facts and evidence from informational text, either researched or provided to student.

REFERENCES

¹ California Department of Resources Recycling and Recovery (CalRecycle). *California’s 2013 Per Capita Disposal Rate*. 12 June 2014. Web. Accessed 26 Nov. 2014. <<http://www.calrecycle.ca.gov/lqcentral/goalmeasure/disposalrate/MostRecent/default.htm>>.

Alameda County Waste Management Authority and Recycling Board. *Doing the 4Rs – A Classroom Activity Guide to Teach Reduce, Reuse, Recycle and Rot*. 2010. Web. Access ed 18 November 2014. <<http://www.stopwaste.org/recycling/schools/curriculum-and-videos>>.

City of Napa, County of Napa, and Napa Recycling & Waste Services. *Reduce, Reuse, Recycle Guide for Napa County*. 2016. Web. 19 July 2016. <<http://schools.naparecycles.org/wp-content/uploads/2016/09/Napa-Recycle-Guide-2016.pdf>>.

Pack It Up

Rubric

A rubric is a scoring tool that helps you understand how your work will be evaluated. This rubric is provided to show you the expectations for your performance and engagement during the lesson based on specific tasks.

Name _____ Date _____

Task	4	3	2	1
Plan Your Packaging Worksheet (Individual)	Notes are detailed, complete, and neat. Responses to focus questions are thorough and correct.	Notes are mostly detailed, complete, and neat. Responses to focus questions are correct, though may lack some detail.	Notes lack detail or are difficult to read. Some responses to focus questions are incorrect.	Notes are incomplete.
Redesigned Packaging Prototype (Individual or group)	New packaging is realistic; it fits the appropriate dimensions of the product. Prototype is neatly constructed; design is original and reduces waste.	Most aspects of new packaging are realistic; it fits the appropriate dimensions of the product. Prototype is constructed; design is somewhat original and reduces waste.	New packaging has realistic elements; it approaches the appropriate dimensions of the product. Neatness, originality, and function of prototype could be improved.	New packaging is unrealistic and/or does not match the dimensions of the product. Prototype is either incomplete or does not reduce waste.
Presentation	Presentation is professional, well paced, clear, and focused. Presenters understand their task, packaging, and audience. Facts and details are used to support claims.	Presentation is mostly professional, well paced, clear, and focused. Presenters mostly understand their task, packaging, and audience. Facts and details are sometimes used to support claims.	Presentation has elements that are professional and clear. Presenters do not seem to completely understand their task, packaging, and/or audience. Few facts and details are used to support claims.	Presentation is not focused or clear. Presenters may have misunderstood their task, packaging, and/or audience. Facts and details are not used to support claims.

Pack It Up

Pack It Up

Directions: Observe the items that group members brought from home, and answer the questions below for each item.

Name _____ Date _____

Name of Item	Does this item come in unnecessary packaging?	If yes, how would you REDUCE this item's packaging?
1.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5.	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Pack It Up

Plan Your Packaging — Part One

Congratulations! Your team has been hired as engineers to redesign the bulky, excessive packaging of a product. The company who makes this product wants the new packaging to be as minimal as possible. You should also consider designing packaging made of materials that are not harmful to the environment, and might even save the company money. Be prepared to present your design to the company executives (aka your classmates). Follow the directions below to get started.

Name _____ Date _____

Analyze the Current Packaging

Answer the questions below about the current packaging on your product.

1. What is the product?

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2. How is the product packaged? Describe the materials it's made from, how it looks, and how much packaging there is.

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3. Which parts of the packaging do you think should be kept the same, if any?

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.....

4. Which parts of the packaging seem excessive or unnecessary (i.e., "too much")?

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.....

5. Sketch how the package currently looks.

[Large dotted-line box for sketching the current package appearance]

Pack It Up

Design & Research New Packaging — Part Two

Name _____ Date _____

2. Research to determine if your design will work.

Reference (book, website, etc)	Important facts or details	My Conclusion How will this information impact your design?
1.		
2.		
3.		
4.		
5.		

Design & Research New Packaging — Part Three

Construct a Prototype

A prototype is a preliminary or first model of something. The purpose of a prototype is to test the product, get feedback, and use the information to redesign and improve the outcome. In this case, you will create a prototype of the newly designed, reduced packaging for your product.

Pack It Up

Design & Research New Packaging — Part Four

Name _____ Date _____

Present Your Design and Prototype

Now that your team’s sketch, research, and prototype are complete, plan a presentation for the company’s executives (e.g., if you are redesigning an orange juice container, you are presenting to the people in charge of the orange juice company.) Your presentation should convince the company why your redesigned packaging is a good choice for their company. Be sure to include multimedia and visual elements in your presentation.

Design & Research New Packaging — Part Five

Reflection

Answer these questions when the process is complete.

1. In what ways did the new design reduce the amount of packaging used?

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2. In what ways were the new materials used more effective for conservation and waste prevention?

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3. What do you believe was the most convincing part of your team’s presentation?

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4. What would you do differently next time? (packaging design or presentation)

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