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Lesson 10: Packaging, Then and Now

Description: An investigation into how packaging has changed with the introduction of plastic and how it's affecting the environment.





Upon completion
of this lesson
students will be
able to:

**Explain
how and why
packing material
has changed.**

Concepts:

1. Packaging is involved in many aspects of our lives.
2. The majority of modern packaging is made of plastic.
3. Modern packaging affects the environment differently than packaging materials that were used in the past.
4. We have the ability to reduce the amount of packaging in our lives depending on the choices we make.

Outcomes:

Upon completion of this lesson students will be able to:

1. Define packaging.
2. Explain how and why packing material has changed.
3. Describe how packaging affects the environment.
4. Provide examples of ways that we can reduce, reuse, and refuse plastic packaging.

Outline:

- I. Set up (5 min.)
 - II. Introduction (10 min.)
 - a. Learner Level Assessment
 - b. Behavior Guidelines
 - III. Pack It Up, Pack It In (30 min.)
 - a. What is Packaging?
 - b. The Plastic Packaging Evolution
 - c. Packaging in the World's Oceans
 - IV. Conclusion and Review (5 min.)
 - V. Follow-up Activities
 - a. Ocean Animals Affected by Plastic Debris
 - b. Life Before Plastic
 - c. Innovative Alternatives
 - VI. Additional Resources
 - a. Sources
 - b. Vocabulary
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We have the ability to reduce the amount of packaging in our lives depending on the choices we make.

I. Set up (5 min.)

This lesson requires a screen and projector to show visuals to the class. Ensure that images provided in this lesson can be projected and magnified. Students also need pencils and paper for brainstorming activities.

II. Introduction (10 min.)

a. Learner Level Assessment

This lesson begins with two one minute writing prompts.

1st prompt, ask students to write on this prompt sixty seconds:

"Imagine that your family has a farm and the year is 1880. Every day, your job is to milk the cows and distribute the milk to the neighboring town. You have 20 customers who all receive the same amount of milk daily. How will you distribute the milk and ensure each customer receives the right amount?"

Before discussing the invention of the milk bottle, take a few answers from students or have them discuss in small groups. Then share the following information with them: Before milk bottles became common and long before milk cartons existed, milk was often distributed door to door using a bucket or other large container. This changed in the late 19th century because of a packaging innovation.

From How Products are Made:

"One of the first glass milk bottles was patented in 1884 by Dr. Henry Thatcher, after seeing a milkman making deliveries from an open bucket into which a child's filthy rag doll had accidentally fallen. By 1889, his Thatcher's Common Sense Milk Jar had become an industry standard. It was sealed with a waxed paper disc that was pressed into a groove inside the bottle's neck. The milk bottle, and the regular morning arrival of the milkman, remained a part of American life until the 1950s, when waxed paper cartons of milk began appearing in markets."

Read more: <http://www.madehow.com/Volume-4/Milk.html#ixzz4Hdb2Q4CJ>

2nd prompt, ask students to write on this prompt sixty seconds:

"Imagine that you are a prospector at a gold mining camp in 1865. You don't have time to fish, hunt, or gather your own food. Your entire focus is gold, gold, gold! You are in the wilderness far from civilization, but there's a small trading post nearby. It's the middle of winter, but you really miss the taste of fresh peaches. You decide to buy some at the trading post. If they have any in stock, how will you likely find them packaged?"

Before discussing the story below with students, take a few answers from students or have them discuss in small groups. Then share the following story with students from Dale Blumenthal published in the FDA Consumer:

"The steamboat Bertrand was heavily laden with provisions when it set out on the Missouri River in 1865, destined for the gold mining camps in Fort Benton, Mont. The boat snagged and swamped under the weight, sinking to the bottom of the river. It was found a century later, under 30 feet of silt a little north of Omaha, Neb.

Among the canned food items retrieved from the Bertrand in 1968 were brandied peaches, oysters, plum tomatoes, honey, and mixed vegetables. In 1974, chemists at the National Food Processors Association (FPA) analyzed the products for bacterial contamination and nutrient value. Although the food had lost its fresh smell and appearance, the NFPA chemists detected no microbial growth and determined that the foods were as safe to eat as they had been when canned more than 100 years earlier."



The vast majority of the products we buy are encased in some type of packaging.

b. Behavior Guidelines

Some lessons and activities in this curriculum require tools and/or physical activity, so there may be a need to discuss behavior expectations before activities. For this lesson, there are no specific behavior guidelines beyond standard classroom rules.

III. Pack It Up, Pack It In (30 min.)

a. What is Packaging?

In both the examples in the introduction, we discussed types of food packaging used before plastic became common. The majority of packaging of all types is now made of plastic, and it isn't at all limited to food. Packaging is used to protect and transport goods of every type around the globe. Here's a definition from the New World Encyclopedia:

Packaging is the science, art, and technology of enclosing or protecting products for distribution, storage, sale, and use.

Go through this definition with students and carefully consider each element. This is a very dense description of packaging with many elements. It may not make sense at this point to students. The following activity should help to unpack it.

So, what counts as packaging? A huge range of products from cellophane wrap and bags to toothpaste tubes! The vast majority of the products we buy are encased in some type of packaging. In order to explore this concept, have students play two or three rounds of Scattergories. This is a fun way to brainstorm in the classroom.

Divide students into groups of two to five. Explain the game: They will be given a category and their goal is to create a list of five items that they don't think any other group will think of in that category. They will only be given points for unique answers. Each round, they will only have two minutes to brainstorm. At the end of the round, have one representative come up and write the group's answers on the board.

Example: (You can share this with the students and/or use this category as the first round)

Things that usually packaged when transported or sold:

Group 1:	Group 2	Group 3
Cookies—	Coca-Cola	Cookies
Toothbrushes	Pencils—	Pencils
Hamburgers	Tennis racquets	Video games
Detergent	Hamburgers	Movies
Toothpaste	Toothpaste—	Cheese
Points = 2	Points = 2	Points =3



**Are movies
and video games
commonly
packaged
anymore?
If you buy
them online,
does the web
page created to
sell them count
as packaging?**

In this round, group three wins because they have the most unique answers. You can keep track of scores through the rounds, or start over each round. Some answers may spark some debate. Are movies and video games commonly packaged anymore? If you buy them online, does the web page created to sell them count as packaging? In these instances, the teacher should ask the group that provided the answer to specify what they meant and based on their answer decide if they get the point.

This is a suggested list of additional categories for each round that can be simplified, expanded, or modified depending on the time available and the group involved in the lesson:

- Man-made products that can be used as packaging
- Natural materials that can be used as packaging
- Techniques used for packaging
- Reasons for using packaging

After this brainstorm session, once again bring up the definition of packaging from the New World Encyclopedia:

Packaging is the science, art, and technology of enclosing or protecting products for distribution, storage, sale, and use.

Assessment (Outcome 1): Work through the definition again with students to see if they have a broader understanding of it after playing this game. If it still proves difficult to understand, create a class definition.



The popularity of plastic packaging has been growing since plastic started to be used extensively during and after World War Two.

b. The Plastic Packaging Evolution

Background for students

Packaging has many goals. It must effectively deliver the product to the consumer intact and sometimes it must also help to sell the product. Producers prefer a packaging solution that is effective, cheap, and lightweight as possible to reduce shipping cost. They also often prefer a material that looks good and makes their products look good. For these reasons, the popularity of plastic packaging has been growing since plastic started to be used extensively during and after World War Two. In 1955, Life Magazine featured the picture below in an article titled, "Throwaway Living".

The article begins, "The objects flying through the air in this picture would take 40 hours to clean—except that no housewife need bother. They are all meant to be thrown away after use." We know now that this transition to "throwaway living" from the habits of resourcefulness developed during the Great Depression ended up creating a lot of trash. The concept extended to packaging.



Before the 1950s, packaging was mainly created from materials that could be recycled multiple times or reused. Even single use plastics often came in reusable packages in the 1930's. Compare this example of a 1930's Scotch Tape metal tin to a modern package of tape:

After the plastic evolution, cheap single use packaging became standard for many items. This transition had both positive and negative points for consumers.

Assessment (Outcome 2): Have students work in small groups to discuss the pros and cons of the plastic packaging evolution for five to ten minutes depending on time. Ask them to make a list with at least five points for each side. Have each group share their thoughts with another group.



Why does so much packaging end up on the beach and how is this related to throwaway living and the plastic packaging revolution?

C. Packaging in the World's Oceans

Now let's return to the International Coastal Cleanup top ten items found in 2015:



Assessment (Outcome 3) Identify as a class the items on the list that qualify as packaging related. (Beverage Bottles, food wrappers, plastic bottle caps, other plastic bags, glass beverage bottles, plastic grocery bags, metal bottle caps, plastic lids.)

Why does so much packaging end up on the beach and how is this related to throwaway living and the plastic packaging revolution? Discuss as a class.

How is all this packaging debris affecting the world's oceans? Last class we focused on turtles and plastic bags. This class, we'll focus on sea birds.



**Albatrosses
commonly
mistake plastic
for food.**

This is a photo of an albatross carcass taken by Chris Jordan on Midway Island:



Photo courtesy of Chris Jordan



Photo courtesy of Chris Jordan

Albatrosses commonly mistake plastic for food. They are ocean going birds with brains that have evolved to find and eat small brightly colored objects in the ocean. Before plastic was prevalent, these objects were generally food. Now thousands of albatross are eating our trash. Zoom in on the lower image and as a class estimate how many items related to packaging can be seen in this carcass.

Assessment (Outcomes 3 and 4) Ask students what the most common item seen in these pictures is. What is one way that we can all help to reduce the amount of plastic bottle caps on land and in the ocean? (Many possible answers, but one of the top answers should be to use a reusable bottle)

For more images, visit Chris Jordan's website.



"Bio-based plastics are the same in terms of polymer behavior and do not degrade any faster in the environment."

V. Follow-up Activities

a. Ocean Animals Affected by Packaging Debris

In this lesson, we explored the effect of packaging debris on albatrosses. This is one of many examples of marine animals being affected by packaging debris that finds its way to the ocean. Have students choose one packaging based item from the ICC top ten chart. Research one ocean species that is affected by that item and how it is affected.

Assessment (Outcome 3) Have students present their findings to the class.

b. Life Before Plastic

Students will interview an elder who can remember a time before plastic packaging became a major factor in everyday life. In general, this means that a person can remember the 1930's or 1940's. This interview can be conducted individually or as groups or teams. It can be conducted in person, or over the phone. This is a great opportunity for students to connect with elders in their families and communities.

To begin, students should focus on devising questions for the interview. Possible questions could include:

- Did you used to bring your lunch to school as a kid? If so, what did you bring and how was it packaged?
- When you went to the grocery store as a child, how were goods packaged?
- What types of packaging did you repurpose going up, and what do you still repurpose today?

Limit the amount of questions to three to five, and try to maximize response discussion.

Assessment (Outcome 4): Have students create a list of ways that they could change their habits regarding plastic packaging based on their interview. Ask them to present their list to the class in terms of ways that they could reduce, reuse, and refuse.

c. Innovative Alternatives

Starch based packing peanuts are a great example of a truly biodegradable plastic. They break down quickly in water to their constituent molecules and don't add to the waste stream. Biodegradable plastics often do not break down as easily as starch based packing peanuts and bio-based plastics may not degrade any differently than their petroleum based counterparts. Here's a description of the two from NOAA:

Bio-Based Plastics

There are some bio-based (e.g., corn, wheat, tapioca, algae) plastics on the market and in development. Bio-based plastics use a renewable carbon source instead of traditional plastics that source carbon from fossil fuels. Bio-based plastics are the same in terms of polymer behavior and do not degrade any faster in the environment.

Biodegradable Plastics

Biodegradable plastics are designed to break down in a compost pile or landfill where there are high temperatures and suitable microbes to assist degradation. However, these are generally not designed to degrade in the ocean at appreciable rates.

Challenge students to find truly biodegradable plastics. Decide as a class whether to include plastics that are compostable only by industrial composting.

Assessment (Outcome 4): Have students present their research to the class. Create a list of those products that are truly biodegradable.



**Throwaway Living:
The mode of buying disposable products in order to avoid maintaining more durable goods.**

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VI. Additional Resources

a. Sources

- **Chris Jordan photographic arts**
<http://chrisjordan.com/gallery/midway/#CF000313%2018x24>
- **FDA Consumer article featured on the High Beam Research Website**
<https://highbeam.com/doc/1G1-9009146.html>
- **History Magazine**
<http://history-magazine.com/refrig.html>
- **How products are made**
<http://madehow.com/Volume-4/Milk.html#ixzz4Hdb2Q4CJ>
- **IUCN Red List**
<http://iucnredlist.org/details/22698365/0>
- **Green Talk**
<http://green-talk.com/terracycle-and-3m-partner-to-recycle-tape-dispensers/>
- **Life Magazine, via Google**
<https://books.google.ca/books?id=xLYEAAAAMBAJ&printsec=frontcover&dq=Life+Magazine+August+1,+1955&hl=en&sa=X&ei=cwKzVKHwL4v5yQT3zoDACQ&ved=OCB4Q6AEwAA#v=onepage&q&f=false>
- **Local.com**
<http://entertainmentguide.local.com/official-rules-scattergories-10617.html>
- **New world encyclopedia**
http://newworldencyclopedia.org/entry/Packaging_and_Labeling
- **NOAA**
<https://marinedebris.noaa.gov/discover-issue/types-and-sources>
- **Ocean Conservancy**
<http://oceanconservancy.org/our-work/international-coastal-cleanup/2016-ocean-trash-index.html>
- **Plastics make it possible**
<https://plasticmakeitpossible.com/about-plastics/history-of-plastics/plastic-innovations-in-packaging-through-the-decades/>
- **Sustainable Packaging Coalition**
<http://sustainablepackaging.org/uploads/Documents/Definition%20of%20Sustainable%20Packaging.pdf>
- **U.S. Packaging and Wrapping**
<http://uspackagingandwrapping.com/blog/The-History-of-Packaging.html>
- **United Nations World Ocean Assessment:**
<http://worldoceanassessment.org/>
- **Walter Soroka, Fundamentals of Packaging Technology**
Soroka (2002) Fundamentals of Packaging Technology, Institute of Packaging Professionals ISBN 1-930268-25-4



Packaging:
“The science,
art, and
technology
of enclosing
or protecting
products for
distribution,
storage, sale,
and use.”

b. Vocabulary

In this lesson, these are words that may be unfamiliar to students. In this context, they have the following definitions:

Packaging: “The science, art, and technology of enclosing or protecting products for distribution, storage, sale, and use.” New World Encyclopedia.

Reduce: Use less of something. For example, use less packaging by buying in bulk.

Reuse: Use an item for an additional purpose than it was manufactured. For example, using anything that was manufactured to be single use multiple times.

Recycle: Create newly manufactured items from materials that entered the waste stream.

Refuse: Decline to accept something offered. For example, declining the offer a bag at the grocery store.

Environment: “The circumstances, objects, or conditions by which one is surrounded.” Merriam-Webster.

Throwaway Living: The mode of buying disposable products in order to avoid maintaining more durable goods.



2016 Washed Ashore Fact:

Over 65 giant sculptures have been created by Washed Ashore from marine debris.

Washed Ashore Mission Statement:

Washed Ashore builds and exhibits aesthetically powerful art to educate a global audience about plastic pollution in oceans and waterways and spark positive changes in consumer habits.

How We Fulfill Our Mission:

Our travelling exhibit of sculptures made completely of marine debris moves around the country in order to reach as many people as possible. Through both educational programs and interactions with our art and signage, we help audiences understand the problems of plastic pollution and marine debris. We offer educational programming at exhibit sites and support materials to educators interested in spreading awareness about plastic pollution through community art.

In order to create the sculptures we build, we first collect trash that has been removed from beaches through community beach cleanups and individual volunteers. This trash is then washed, sorted and prepared for the creation process. Each sculpture is designed and directed by a lead artist and then created through a collaboration of Washed Ashore team members, volunteers, students and artists.

Washed Ashore Facts as of 2016:

- Over 65 giant sculptures have been created.
- Over 35,000 pounds of marine debris have been processed.
- Over 12,500 volunteers have contributed to this project.

Marine Debris Facts as of 2016:

- Every ocean and every marine environment contain pieces of our trash.
- 80% of marine debris comes from land; from streets to streams to rivers to oceans.
- Plastic pollution is becoming one of the most common items in the sea and has entered the bottom of the ocean food chain.

National Standards Addressed:

Next Generation Science Standards

5-LS1-1.

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

[Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

5-ESS3-1.

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

MS-PS1-3.

Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

[Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

MS-LS2-1.

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

[Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-ESS3-3.

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*

[Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4.

Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

[Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

National Standards Addressed:

National Common Core Language Arts Standards

- **CCSS.ELS-LITERACY.W.6.3:** Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

National Common Core Language Arts Standards

- **Thematic Standard #1) Culture:** Include experiences that provide for the study of culture and cultural diversity.
- **Thematic Standard #2) Time, Continuity, and Change:** Include experiences that provide for the study of the past and its legacy.
- **Thematic Standard #3) People, Places and Environments:** Include experiences that provide for the study of people places and environments.
- **Thematic Standard #7) Production, Distribution, and Consumption:** Include experiences that provide for the study of how people organize for the production, distribution and consumption of goods and services.
- **Thematic Standard #8) Science, Technology, and Society:** Include experiences that provide for the study of relationships among science, technology, and society.
- **Thematic Standard #9) Global Connections:** Include experiences that provide for the study of global connections and interdependence.
- **Thematic Standard #10) Civic Ideals and Practices:** Include experiences that provide for the study of the ideals, principles and practices of citizenship in a Democratic Republic.