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Lesson 6: Away is Not Away Anymore

Description: An introduction to three of the most common destinations of our trash: the landfill, the recycling center, and the environment.

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Unsecured items on land tend to travel to the ocean.

Concepts:

1. When we are finished using things, they don't just go away.
2. Landfills are the main destination for trash in the United States.
3. Recycling works differently for different materials.
4. Unsecured items on land tend to travel to the ocean.

Outcomes:

Upon completion of this lesson students will be able to:

1. Identify the main destinations of our trash.
2. Describe the pros and cons of landfills.
3. Define downcycling.
4. Describe how items on land can reach the ocean.

Outline:

I. Set up (15 min.)

II. Introduction (5 min.)
- a. Learner Level Assessment
- b. Behavior Guidelines

III. Tracking Our Trash (35 min.)
- a. A Trip to the Dump
- b. Downcycling
- c. The Majestic Plastic Bag

IV. Conclusion and Review (5 min.)

V. Follow-up Activities
- a. Burn Baby, Burn!
- b. Landfills vs. Garbage Dumps
- c. Where Does YOUR Trash Go?
- d. Composting at School

VI. Additional Resources
- a. Sources
- b. Vocabulary

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In this lesson, we are going to focus on trash that ends up in landfills, recycling centers, and the environment.

I. Set up (15 min.)

This lesson requires a screen and projector to show three videos. The videos are available on youtube, so an internet connection is also required. Links are provided within this lesson. Students will also need pencils and paper for brainstorming activities. One activity in this lesson involves making recycled paper. The materials for this activity are:

- **Used paper scraps (four to six pages used white paper)**
- **A blender**
- **Water (2 cups)**
- **A screen (We suggest a 12 inch splatter guard screen that can be found in most bargain store kitchen sections, but any screen will work)**

To prepare your materials, rip the paper into strips no longer that an inch or two wide by an inch or two long. The smaller you rip them, the easier it will be to blend them. The resulting recycled paper will become the whites of the eyes of one of the giant masks being created in this curriculum.

II. Introduction (5 min.)

a. Learner Level Assessment

Ask students to begin with an individual writing brainstorm activity. Have them list the three most common places stuff goes after we are done using it. This shouldn't be limited to where things from their household go, but should reflect a broader theme of where things go when people are done using them. After everyone has had time to consider, ask students to share their answers.

Assessment (Outcome 1) As a class, identify the most common destinations of our trash.

In this lesson, we are going to focus on trash that ends up in landfills, recycling centers, and the environment. These are the three main waste stream paths in the United States, even though students may have thought of other important possibilities that are worth taking time to discuss.

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.

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The vast majority of our stuff in the United States ends up in landfills after we are finished using it.

III. Tracking our Trash (35 min.)

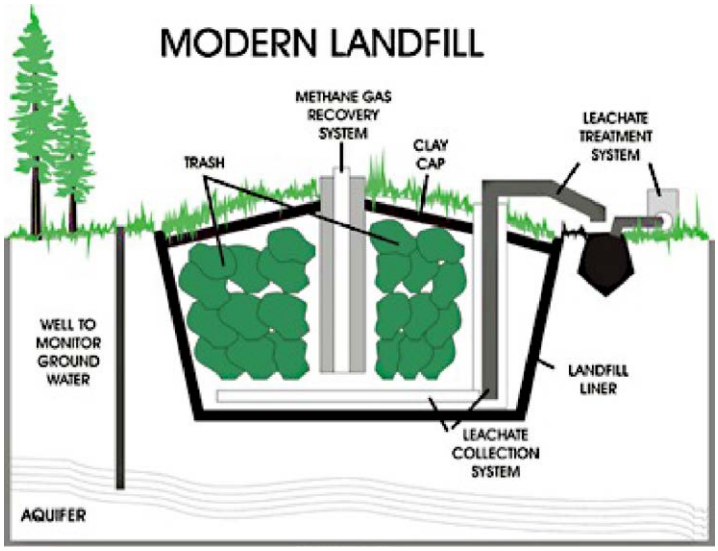
a. A Trip to the Dump

The vast majority of our stuff in the United States ends up in landfills after we are finished using it. Using this video from The Las Vegas Sun about the largest landfill in the country, we will consider the pros and cons of landfills. While watching, have students take notes on the positive and negative aspects of the landfill that appears in the video.

https://www.youtube.com/watch?v=zR2eqZIu40M

Assessment (Outcome 2) Create either individual, group, or class list of the positive and negative aspects of the landfill depicted in the video. (Possible positives: the landfill won't affect groundwater, they catch methane that is produced, the landfill won't fill up for a long time. Possible negatives: Some trash is clearly escaping the landfill, burning methane still produces carbon dioxide, the birds shown in the video may be eating trash, landfills still affect the environment)

As a class, discuss the strengths and weakness of using landfills for disposal in general. Form a class list of the positives and negatives. This is a simple diagram of a modern landfill from the Wayne County, North Carolina Official Website for reference. (There are many diagrams online if you'd prefer to look for your own)



http://www.waynegov.com/393/Landfill

In addition to landfills and recycling, over 10% of our trash is incinerated by waste to energy plants around the country. This topic is not explored directly in this lesson for sake of time, but if you are interested in exploring the issue with your students, please see the extension listed in follow-up activities.

Another optional extension listed in follow-up activities involves exploring the difference between modern landfills and garbage dumps of the past, which are still in use in some areas.

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From the Old Farmer's Almanac Household Plastics Chart: "The number, usually found with a triangle symbol on a container, indicates the type of resin used to produce the plastic."

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b. Downcycling

While watching this video, have students take notes on what each material can be recycled into. Can the material be used to make the same items that were brought to the recycling facility?

https://www.youtube.com/watch?v=b7GMpjx2jDQ

Assessment (Outcome 3) Using these five examples of items that represent the five materials with were discussed in the video: a newspaper, a steel can, a glass bottle, an aluminum can, and a plastic bottle (paper, steel, glass, aluminum, plastic), discuss as a class which materials can be made into the same product they started out as. (All except the plastic bottle). Use the plastic by the numbers chart from lesson 3 as a reference for plastic:

Household

Plastics

■ In your quest to go green, use this guide to use and sort plastic. The number, usually found with a triangle symbol on a container, indicates the type of resin used to produce the plastic. Call **1-800-CLEANUP** for recycling information in your state.

1 PETE

Number 1 • *PETE or PET (polyethylene terephthalate)*
IS USED IN . . . . . microwavable food trays; salad dressing, soft drink, water, and beer bottles
STATUS . . . . . hard to clean; absorbs bacteria and flavors; avoid reusing
IS RECYCLED TO MAKE . . carpet, furniture, new containers, Polar fleece

2 HDPE

Number 2 • *HDPE (high-density polyethylene)*
IS USED IN . . . . . household cleaner and shampoo bottles, milk jugs, yogurt tubs
STATUS . . . . . transmits no known chemicals into food
IS RECYCLED TO MAKE . . detergent bottles, fencing, floor tiles, pens

3 V

Number 3 • *V or PVC (vinyl)*
IS USED IN . . . . . cooking oil bottles, clear food packaging, mouthwash bottles
STATUS . . . . . is believed to contain phalates that interfere with hormonal development; avoid
IS RECYCLED TO MAKE . . cables, mudflaps, paneling, roadway gutters

4 LDPE

Number 4 • *LDPE (low-density polyethylene)*
IS USED IN . . . . . bread and shopping bags, carpet, clothing, furniture
STATUS . . . . . transmits no known chemicals into food
IS RECYCLED TO MAKE . . envelopes, floor tiles, lumber, trash-can liners

5 PP

Number 5 • *PP (polypropylene)*
IS USED IN . . . . . ketchup bottles, medicine and syrup bottles, drinking straws
STATUS . . . . . transmits no known chemicals into food
IS RECYCLED TO MAKE . . battery cables, brooms, ice scrapers, rakes

6 PS

Number 6 • *PS (polystyrene)*
IS USED IN . . . . . disposable cups and plates, egg cartons, take-out containers
STATUS . . . . . is believed to leach styrene, a possible human carcinogen, into food; avoid
IS RECYCLED TO MAKE . . foam packaging, insulation, light switchplates, rulers

7 OTHER

Number 7 • *Other (miscellaneous)*
IS USED IN . . . . . 3- and 5-gallon water jugs, nylon, some food containers
STATUS . . . . . contains bisphenol A, which has been linked to heart disease and obesity; avoid
IS RECYCLED TO MAKE . . custom-made products

THE OLD FARMER'S ALMANAC

Lesson 6

Many materials can only be recycled a certain amount of times.

Introduce the term downcycle and discuss as a class why plastic recycling is an example of downcyling. Here's the definition from Merriam-Webster:

Downcycle: *to recycle (something) in such a way that the resulting product is of a lower value than the original item: to create an object of lesser value from (a discarded object of higher value)*

Refer to the "is used in" and "is recycled to make" sections of the plastics by the numbers chart to compare what each type of plastic starts as and can be recycled to make.

Assessment (Outcome 3) Discuss as a class why plastic items can be recycled an average of one time.

Many materials can only be recycled a certain amount of times. Paper fiber bonds eventually weaken, recycled glass and steel are not necessarily as strong after they are recycled, but plastic bonds are affected more than other materials when they are recycled. With our knowledge of polymer structure and decomposition, discuss why this is as a class. (Polymer bonds are not easily reformed to their original integrity once they have been broken).

Next, we are going to see recycling and downcycling in action. Paper is relatively easy to recycle because it is made of cellulose fibers that can be broken apart and rebounded. However, each time they are broken and rebounded, they get shorter and weaker. On average, paper can be recycled five to seven times before it is no longer a useful material. Let the students know that, "Today, we are going to create recycled paper using one of the simplest methods possible. We are going to breakdown the cellulose in used paper by combining it with water, blending it, and letting it dry."

Combine your paper scraps and water in the blender, blend for a few seconds, pause for a moment, and blend for another few seconds. Repeat this process until all visible paper scraps have been turned into pulp. Over a sink or towel, pour the pulp onto a screen. Make sure your resulting pulp puddle is at least ten by ten inches. Set aside the screen with the pulp in a safe place to dry. The recycled paper will be used to create the eyes of the eco mask in lesson nine.

Assessment (Outcome 3) Ask students to define downcycling in their own terms.

Once the paper is dry, this will often take 7-10 days, discuss why it is an example of downcyling.

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Whether it's intentional or not, a lot of our trash ends up in the environment.

c. The Majestic Plastic Bag

Whether it's intentional or not, a lot of our trash ends up in the environment. As seen in the landfill video of this lesson, even if we throw our trash away properly, it can sometimes escape into the environment. In fact, according to the United Nations Global Ocean Assessment, 80% of the trash in our oceans comes from land. To illustrate this issue, we are going to watch a mockumentary called, "The Majestic Plastic Bag." Before we do, it's important to define the term mockumentary for students so that they understand the idea behind the video. Here's the definition from Merriam-Webster:

Mockumentary : *a facetious or satirical work (as a film) presented in the style of a documentary*

Once students understand this definition, watch the video. During the video, have students take notes on each of the ways that the plastic bag is able to travel to the ocean:

https://www.youtube.com/watch?v=GLgh9h2ePYw

Ask the students in what way this video is a mockumentary. Which elements of the video did they think were funny and why? What advantage is there in presenting the issue in this way?

Next, compile a class list of all the ways the plastic bag travelled to the ocean.

Assessment (Outcome 4) Using a projected map, discuss as a class how a bag from the Las Vegas landfill in the first video could reach the ocean and which ocean it would be most likely to reach.

IV. Conclusion and Review (5 min.)

In this lesson, we have investigated three of the main destinations of our trash: landfills, recycling centers, and the environment. We explored landfills by watching a video one of the biggest landfills in the country and looking at a modern landfill diagram, we explored recycling by watching a video on how recycling centers work, and we explored trash entering the environment by watching the mockumentary, "The Majestic Plastic Bag."

Assessment (Outcome 4) As a class, discuss how trash can enter into the environment.

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What can you do as a classroom, school, or community to help create greener options?

V. Follow-up Activities

a. Burn Baby, Burn!

One common destination for trash not discussed in depth in this lesson is incinerators. About 10% of our trash is sent to waste to energy facilities each year, and that number is likely to rise. There is much debate on whether this is our best option. Those who support this option say that it produces less greenhouse gas than landfills and produces energy from an otherwise untapped source. Those who oppose it say that going in this direction is taking us away from Reducing, Reusing, and Recycling, while still producing large amounts of CO2. Use this article from Scientific American to discuss the issue with students. This topic could also serve as a classroom debate issue or research topic if time is available.

http://www.scientificamerican.com/article/does-burning-garbage-to-produce-energy-make-sense/
Additional resources to explore this topic:

- **New York Times article on new incinerators:** http://www.nytimes.com/2015/01/11/us/garbage-incinerators-make-comeback-kindling-both-garbage-and-debate.html?_r=0
- **Eco Ants incineration pros and cons:** http://www.ecoants.com/wasteincineration.html
- **New York Times Opinion Page expert debate:** http://roomfordebate.blogs.nytimes.com/2010/04/13/should-the-u-s-burn-or-bury-its-trash/?_r=0

b. Landfills vs. Garbage Dumps

In this lesson, we focused on modern landfills as opposed to garbage dumps. In order to better understand this distinction, have students create a model of an old school garbage dump using this lesson from the Green Education Foundation:

http://www.greeneducationfoundation.org/institute/lesson-clearinghouse/446-The-Landfill-Debate.html

c. Where Does YOUR Trash Go?

Throughout this lesson, we have focused on the destination of trash in the United States, but every community and state deals with its waste differently. Have students research where trash from your area ends up. How much of your waste is recycled or composted? Does your waste go to a garbage dump or a landfill? What can you do as a classroom, school, or community to help create greener options? Earth911 is a website that can give you details of where your nearest recycling options are for almost any material and may help you consider your options:

http://earth911.com/

d. Composting at School

Although a worm bin is a great way to look at decomposition in the classroom, you can take it a step further with a school wide composting project. Even though it's a little outdated, this Cornell University created curriculum and resource list is a great way to engage students in the benefits of composting:

http://compost.css.cornell.edu/schools.html

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Downcycle: "To recycle (something) in such a way that the resulting product is of a lower value than the original item."

VI. Additional Resources

a. Sources

- **Cornell Composting:**
  http://compost.css.cornell.edu/index.html
- **Earth 911**
  http://earth911.com/
- **Environmental Protection Agency's What is Integrated Solid Waste Management?**
  https://www3.epa.gov/climatechange/wycd/waste/downloads/overview.pdf
- **Law Street Media**
  http://lawstreetmedia.com/issues/energy-and-environment/really-happens-trash/
- **Merriam Webster**
  http://merriam-webster.com/
- **NOAA**
  https://marinedebris.noaa.gov/info/plastic.html
- **Republic Services**
  http://site.republicservices.com/corporate/environmenteducation/landfill-engineering.aspx
- **Scientific American**
  http://scientificamerican.com/article/does-burning-garbage-to-produce-energy-make-sense/
- **United Nations Global Oceans Assessment Website**
  http://worldoceanassessment.org/
- **Wolf Ridge Environmental Learning Center Paper Making**
  http://wolf-ridge.org/content/uploads/2013/11/lesson_wolfridge_paper_making.pdf

b. Vocabulary

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

Downcycle: "To recycle (something) in such a way that the resulting product is of a lower value than the original item: to create an object of lesser value from (a discarded object of higher value)." Merriam-Webster.

Mockumentary: "A facetious or satirical work (as a film) presented in the style of a documentary." Merriam-Webster.

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

Modern Landfill: A pit used for burying trash that is designed to catch the waste liquid and methane created by the trash as it decomposes.

Groundwater: "Water within the earth especially that supplies wells and springs." Merriam-Webster.

Leachate: In reference to landfills, this is the liquid that leaches out of trash as it decomposes. It often contains numerous chemicals that have the potential to contaminate groundwater.

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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.

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National Standards Addressed:

Next Generation Science Standards

5-PS1-1.
Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

5-LS2-1.
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. 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 Curriculum Standards for Social Studies

- **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.