Blizzard Bag Lesson Plan 2

Grade Level:	9-12
Lesson:	I.A.2—What is Waste? The Solid Waste Stream Packaging Preferences
Source:	*3Rs of the Common Core*
Activity/Craft:	How to Make a Twig Pencil PDF
Video Link:	5 Zero Waste Tips for Teens (https://www.youtube.com/watch?v=xVtdMjpyd6Q)
Video Link 2:	What Happens When You Try to Recycle a Video Game: (https://www.youtube.com/watch?v=ABAtHAUrNnk)

Lesson Matrix Grades 9-12
3R's of the Common Core

Lesson	Leading Question	Objective	Common Core Alignments		Skills
9-12 Sources of Waste I.A.1	How do we determine the amount of waste we produce?	Research the sources of waste in society Trace the production of waste in industry	**Grade 9-10** CC.RI.9-10.7 CC.W.9-10.7 CC.HSS.ID.1	**Grade 11-12** CC.RI.11-12.7 CC.W.11-12.7 CC.HSS.ID.1	Analyzing Collecting and interpreting data Designing Researching
9-12 Packaging Preferences I.A.2	How have beverage containers changed over the years?	Evaluate the environmental impact of different packaging types	**Grade 9-10** CC.W.9-10.4 CC.WHST.9-10.7 CC.HSS.ID.1	**Grade 11-12** CC.W.11-12.4 CC.WHST.11-12.7 CC.HSS.ID.1	Evaluating Gathering information Graphing data Researching
9-12 Nonrenewable Resources I.B.1	How long will our natural resources last?	Compare estimated life expectancies of some nonrenewable natural resources Understand the role recycling and careful use play in meeting the demand for extending availability of these resources	**Grade 9-10** CC.L.9-10.6 CC.RST.9-10.7 CC.SL.9-10.2 CC.W.9-10.4	**Grade 11-12** CC.L.11-12.6 CC.RST.11-12.8 CC.SL.11-12.2 CC.W.11-12.4	Applying ideas to solve problems Explaining Interpreting data Predicting outcomes
9-12 Shopper Survey I.C.1	What things influence our purchasing choices? Why is there so much waste?	Assess typical purchasing criteria Determine the influence of packaging on consumer choices Determine if consumers consider waste disposal and recycling when making purchases	**Grade 9-10** CC. SL.9-10.3 CC.W.9-10.4 CC.HSS.IC.3	**Grade 11-12** CC. SL.11-12.3 CC.W.11-12.1 CC.W.11-12.4 CC.HSS.IC.3	Analyzing Gathering information Hypothesizing Interviewing
9-12 Garbage I.C.2	Name something that New York City produces more of than any other city in the world.	Read Katie Kelly's essay "Garbage" to examine author's use of analysis and persuasion Examine continuing problems of trash volume and disposal	**Grade 9-10** CC.RI.9-10.3 CC.SL.9-10.3 CC.W.9-10.4 CC.W.9-10.2 CC.HSS.ID.1	**Grade 11-12** CC.RI.11-12.6 CC.SL.11-12.1c CC.W.11-12.4 CC.W.11-12.7 CC.HSS.ID.1	Analyzing Evaluating Interpreting information Researching
9-12 The Dump Ground I.C.3	What do people mean when they use the expression, "One man's trash, another man's treasure"?	Interpret the themes of "The Dump Ground" and "Garbage" Derive history and culture of a people from the essays	**Grade 9-10** CC.RI.9-10.6 CC.RI.9-10.10 CC.SL.9-10.1c CC.W.9-10.4	**Grade 11-12** CC.RI.11-12.6 CC.RI.11-12.10 CC.SL.11-12.1c CC.W.11-12.4	Analyzing Comparing Evaluating Interpreting
9-12 GNP(P):Great New Purchasing Power I.C.4	Does a higher income cost more?	Detect general relationships between GNP/capita and energy consumption per capita Examine the specific factors encouraging high energy use Understand relationship between recycling and conserving energy	**Grade 9-10** CC.L.9-10.6 CC.W.9-10.4 CC.HSS.ID.6	**Grade 11-12** CC.L.11-12.6 CC.W.11-12.4 CC.HSS.ID.6	Evaluating Graphing data Interpreting data Recognizing patterns

Lesson	Leading Question	Objective	Common Core Alignments		Skills
9-12 **New Landfills** **II.A.1**	If we need a new landfill, how will we go about siting and designing one?	Become familiar with local government, land-use planning, and complexities of solid waste planning process	**Grade 9-10** CC.RI.9-10.7 CC.SL.9-10.2 CC.WHST.9-10.8 CC.HSG.MG.3	**Grade 11-12** CC.RI.11-12.7 CC.SL.11-12.2 CC.WHST.11-12.8 CC.HSG.MG.3	Comparing solutions Designing Gathering information and data Problem solving
9-12 **Methane** **II.A.2**	Can we recover energy from solid waste?	Understand the energy-producing potential of some solid wastes Understand some systems of generating methane from waste	**Grade 9-10** CC.RST.9-10.3 CC.SL.9-10.1 CC.WHST.9-10.7	**Grade 11-12** CC.RST.11-12.3 CC.SL.11-12.1 CC.WHST.11-12.8	Carrying out investigation Interpreting data Observing Researching
9-12 **Spreading Sludge** **II.A.3**	Is it safe to put sludge on land all year round?	Determine the benefits and drawbacks of land application of sewage sludge	**Grade 9-10** CC.SL.9-10.1c CC.SL.9-10.4 CC.W.9-10.6 CC.W.9-10.7	**Grade 11-12** CC.SL.11-12.1c CC.SL.11-12.4 CC.W.11-12.6 CC.W.11-12.7	Evaluating Formulating questions Gathering information Hypothesizing Interviewing
9-12 **Toxic Waste in the Lab** **II.A.4**	Are there alternatives to disposal of toxic wastes in the solid waste stream?	Upgrade the school's lab cabinet	**Grade 9-10** CC.RST.9-10.3 CC.SL.9-10.4 CC.W.9-10.7	**Grade 11-12** CC.RST.11-12.3 CC.SL.11-12.4 CC.W.11-12.7	Carrying out investigation Evaluating Explaining Researching
9-12 **Community Solid Waste** **II.B.1**	How do we manage our solid waste?	Evaluate both the current solid waste disposal practices and future plans in their community	**Grade 9-10** CC.SL.9-10.2 CC.SL.9-10.4 CC.W.9-10.4	**Grade 11-12** CC.SL.11-12.2 CC.SL.1-12.4 CC.W.11-12.4	Communicating information Designing Gathering information and data Synthesizing
9-12 **Twenty Foot Swath** **III.A.1**	Have personal or global problems such as poverty or environmental pollution ever become so overwhelming that you were immobilized or driven to some action that actually aggravated the problem?	Discern the author's purpose in writing the essay Develop a plan for decreasing pollution in environment by setting realistic personal goals	**Grade 9-10** CC.RI.9-10.3 CC.SL.9-10.1c CC.W.9-10.4	**Grade 11-12** CC.RI.11-12.6 CC.SL.11-12.1d CC.W.11-12.4	Analyzing Applying ideas to solve problems Engaging in collaborative conversation Evaluating

Lesson Matrix Grade 9-12

3R's of the Common Core

Lesson	Leading Question	Objective	Common Core Alignments		Skills
9-12 Recycling Paper Pollution III.B.1	Does recycling solve all our solid waste problems?	Investigate methods of recycling paper and the technical problems encountered in the recycling industry	**Grade 9-10** CC.RST.9-10.3 CC.SL.9-10.1c CC.W.9-10.7 CC.HSS.ID.1	**Grade 11-12** CC.RST.11-12.3 CC.SL.11-12.1d CC.W.11-12.7 CC.HSS.ID.1	Carrying out investigation Communicating solutions Interpreting Researching
9-12 Collecting and Sorting III.B.2	What kind of recycling program would be best for our town or our school?	Understand some of the design considerations of establishing a recycling facility Use the information to design a hypothetical recycling center for their town or school	**Grade 9-10** CC.RI.9-10.7 CC.SL.9-10.2 CC.W.9-10.4 CC.HSG.MG.3	**Grade 11-12** CC.RI.11-12.7 CC.SL.11-12.2 CC.W.11-12.7 CC.HSG.MG.3	Applying mathematical concepts Designing Gathering information Problem solving
9-12 Speaking for Recycling III.B.3	What do we need to know about recycling?	Become more familiar with recycling and solid waste management issues Develop their public presentation skills	**Grade 9-10** CC.RI.9-10.8 CC.SL.9-10.4 CC.W.9-10.2	**Grade 11-12** CC.RI.11-12.8 CC.SL.11-12.4 CC.W.11-12.1	Communicating information Researching Sharing research and writing Synthesizing
9-12 The Cart Before the Horse? III.B.4	Why isn't everybody recycling?	Consider ways to reduce waste in the United States	**Grade 9-10** CC.RI.9-10.7 CC.SL.9-10.1 CC.W.9-10.4	**Grade 11-12** CC.RI.11-12.7 CC.SL.11-12.1 CC.W.11-12.1	Analyzing Engaging in collaborative conversations Gathering information Using evidence
9-12 Microorganisms III.C.1	Can you identify microorganisms responsible for the composting process?	• Relate the importance of healthy microorganism activity to composting	**Grade 9-10** CC.RST.9-10.3 CC.SL.9-10.1 CC.WHST.9-10.4	**Grade 11-12** CC.RST.11-12.3 CC.SL.11-12.1 CC.WHST.11-12.4	• Carrying out investigations • Collecting and interpreting data • Observing • Predicting
9-12 Effective Fertilizers III.C.2	What are fertilizers made of?	Rate the effectiveness of various organic and inorganic fertilizers	**Grade 9-10** CC.L.9-10.6 CC.SL.9-10.1 CC.WHST.9-10.4	**Grade 11-12** CC.L.11-12.6 CC.SL.11-12.1 CC.WHST.11-12.4	Carrying out investigation Hypothesizing Interpreting data Observing

Concept
Some types of packaging are better for the environment than others.

Objective
Students will evaluate the environmental impact of different packaging types.

Method
Students will graph environmental costs of different containers.

Materials
Attached worksheets

Subjects
Mathematics, Social Studies, Science

Skills
Evaluating, gathering information, graphing data, researching

Time
One class period; one year-long project

Vocabulary
Thermoplastic, thermosetting, polymer, biodegradable, photodegradable

Resources
George Pess, *Thermoplastics in The Post-consumer Waste Stream*; articles on plastics

3R's of the Common Core
Parallel Activities
K-3, Egg Cartons
4-6, The Story of …
7-8, Potato Cakes
Information
Packaging
Resources
Green Consumption, Consumerism and Sustainable Development
Solid Waste and Recycling

How Does Packaging Contribute to Waste?

Background
Plastics currently comprise about 12.7% of our solid waste stream, a figure that is steadily increasing. Plastics are not biodegradable or easily recycled, they are made from nonrenewable fossil fuels and some plastic produce toxins when burned. There are hundreds of different types of plastics in use today. Once they enter the waste stream, they are often contaminated with food and other substances and are practically impossible to identify and separate for recycling. PET soda bottles and milk and cider jugs as well as detergent and waste oil containers are beginning to find markets for recycling because they are made from one kind of plastic and are easily identifiable. But recycling for other plastic films, food container lids, wraps and tapes is still not easy. Most plastics are made primarily from hydrogen and carbon elements extracted from natural gas and crude oil.

"Biodegradable plastic are made by fermentation of natural substances such as sugar and other carbohydrates. One firm has produced biodegradable plastic with the help of a vigorous strain of bacteria found in canals. The bacteria are cultivated in vats and fed a sugary diet on which they thrive. In doing so they multiply and produce biological plastic rather like mammals make fat in their bodies as they grow. The plastic is extracted in fermentation vessels and is then dried and sold as granules. This plastic is readily broken down by algae, fungi or bacteria in the soil. A bag made from it will disappear within twelve or fifteen months or indeed within only three or four months if it is placed in a compost heap."
–John Seymour and Herbert Girardet

Leading Question
How have beverage containers changed over the years?

Procedure
Introduce the lesson and provide the background information. Distribute The Choice Is Clear worksheet. Have students read the information and create six bar graphs. Students will analyze the data to draw conclusions about the best beverage containers to use. Students will display bar graphs and concluded findings on a poster to be shared in class.

Common Core Alignments

GRADE 9-10

CC.W.9-10.4
Writing:
Production & Distribution of Writing

CC.WHST.9-10.7
Writing in History/Social Studies,
Science & Technical Subjects:
Research to Build & Present Knowledge

CC.HSS.ID.1
Mathematics:
Statistics & Probability

GRADE 11-12

CC.W.11-12.4
Writing:
Production & Distribution of Writing

CC.WHST.11-12.7
Writing in History/Social Studies,
Science & Technical Subjects:
Research to Build & Present Knowledge

CC.HSS.ID.1
Mathematics:
Statistics & Probability

Evaluation

What kind of containers are best for the environment?

Classroom Activities

A. Have students complete The Restaurant Garbage Counter worksheet as a homework assignment. Compare results from different restaurants. How can we encourage less packaging waste?

B. Send a letter to the restaurant with class suggestions for waste reduction and recycling.

C. Conduct a year-long research project to compare the decomposition time of biodegradable plastic bags and regular plastic bags. Set a goal and predict outcomes. Create a lab record worksheet to track the experiment taking into account the effects of sun, temperature, humidity, water, etc. Keep a journal of observations, questions and predictions. Analyze and interpret the records. Share the documentation and conclusions of this research project in class.

The Choice is Clear

Your grandparents may well remember when milk and soda came in glass bottles. The empty bottles were returned to the store. When the store collected enough bottles, they were trucked back to the bottling company. Sterilization guaranteed there would be no germs left on the bottles. Then each bottle was refilled and sent back to the store. Some bottles made this trip as many as 20 times. When the bottle broke or became too badly scratched, the glass was melted down and reformed.

In the 1970s things began to change. Milk started appearing on grocery store shelves in wax cartons and plastic jugs. The soda industry switched to plastic containers. Businesses made this choice based on cost. They found it cheaper to make millions of plastic bottles than to reuse glass ones. Perhaps, for the manufacturer, it does cost less. But what about us? We pay for this through energy and water consumed. Air pollution and increased solid wastes are also part of our cost.

Study the chart below. Use the information to create six bar graphs.

	Plastic	Glass	Aluminium	Cardboard/Paper	
Average container size	16.9 ounces	12 ounces	12 ounces	32 ounces	
Average container weight	18-20 grams	210 grams	14.9 grams	47 grams	
Recycling rate of packaging (2012)	13.8%	34.1%	38%	76.1%	
MMTCO2E*	217	1	6.3	85	
Equivalent of cars taken off the road	454 thousand	210 thousand	1.3 million	17.5 million	
Recycling 1 ton saves:				Cardboard	Paper
kWk energy	5,774	42	14,00	390	4,100
Gallons of oil	685	5	1,663	46	380
Btu's of energy	98 million	714,286	237 million	6.6 million	54 million
Cubic yards of landfill space	30	2	10	9	3.3

*Millions of metric tons of CO_2 Equivalent

Sources: "Recycling Facts and Tips," Waste Management, accessed June 13, 2016, https://www.wm.com/location/california/ventura-county/west-hills/recycle/facts.jsp

United States Environmental Protection Agency, Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2012, EPA-530-F-14-001 (Washington, D.C.: United States Government Printing Office: 2014

Name:_____ **Date:** _____

The Restaurant Garbage Counter

There certainly are a lot of quick food restaurants around. The food is served quickly and you don't have to do any dishes. All you have to do is pay the bill. You really pay twice. One price is the money you pay at the cash register. The other cost is harder to calculate. It is an environmental cost. Fast food restaurants produce a lot of waste material. It has to be disposed of. You should understand the problem. You should know about the wastes that you cause in these restaurants.

Here's what to do:

1. Write down each thing you receive when your order is filled.
2. Identify each item as either food or non-food.
3. For each non-food item, identify the material of which it is made.
4. State whether the material comes from a renewable or a nonrenewable resource.
5. Think about the waste that you produce.

Sample Grid:

ITEM	FOOD	NON-FOOD		
		Made of	**Renewable**	**Nonrenewable**
Paper Bag		Paper	x	
Box		Paper	x	
Paper Napkin		Paper	x	
Plastic Fork		Petroleum		x
Plastic Knife		Petroleum		x
3 Chicken Pieces	x			
1 Paper Container (salt)		Paper	x	
Salt	x			
1 Plastic Container (vinegar)		Petroleum		x
Vinegar	x			
French Fries	x			
1 Plastic Glass		Petroleum		x
1 Plastic Lid for Glass		Petroleum		x
Paper Wrapping (straw)		Paper	x	
Soft Drink	x			
Straw (plastic)		Petroleum		x
Foil Container (tart)		Aluminum		x
Tart	x			

Name:_____ Date: _____

The Restaurant Garbage Counter

ITEM	FOOD	NON-FOOD		
		Made of	Renewable	Nonrenewable

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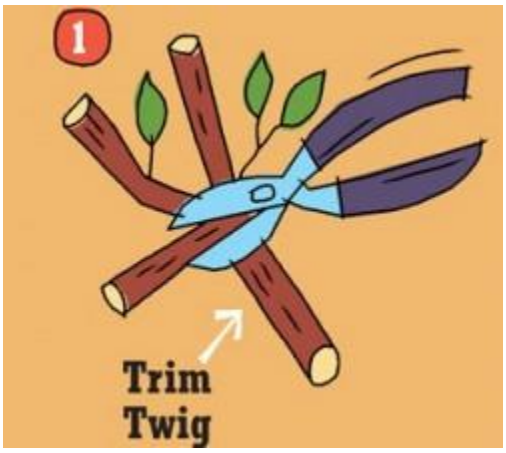
How to make twig pencils

By Robert J. Settich for Boys Life Magazine

Twig pencils are fun, easy and cheap to make. And the expressions on your friends' faces when you start scribbling with a stick will be writetious!

YOU'LL NEED

- Pruning clippers
- Drill and 3⁄32-inch bit
- Clamp
- Scratch awl or nail
- White glue
- 2mm-diameter drafting lead, 2B grade (at art or office supply stores)
- Utility knife or pocketknife
- Adult permission or supervision

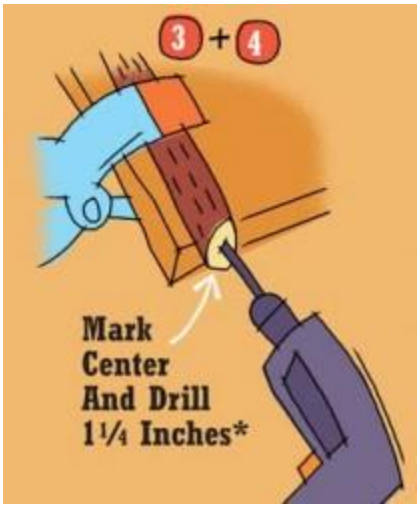


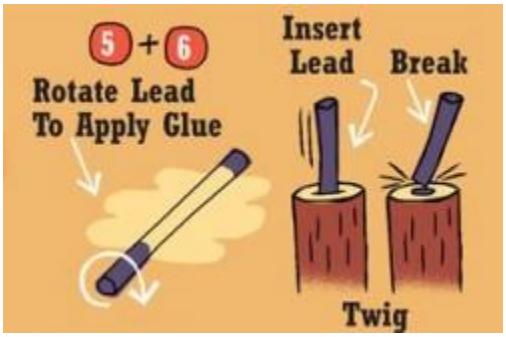
STEP 1: Find a twig. Look for one with interesting color, texture or with a forked shape. (The length of the twig, though, must be straight.) Hold the twig as you would a pencil to find the right size. Use pruning clippers to trim away unwanted parts. Check the twig for bugs (you don't want any).

STEP 2: Clamp the twig to the edge of a workbench or piece of plywood. Be careful! Too much pressure can crush the twig.

STEP 3: Use a scratch awl or the point of a nail to make a dent at the center of the twig's end. The dent will become the starting point for the drill bit.

STEP 4: Drill to a depth of 1 to 1 1⁄4 inches. Make sure to keep both hands on the tool !As you drill, you may need to back out the bit to clear wood chips from the drill's flutes (its spiral grooves). To do this, stop the drill and scrub the bit with an old toothbrush.





STEP 5: Squirt a small puddle of glue on a scrap of wood or cardboard. Roll the end of the lead in the glue, then work it back and forth in the hole to spread the adhesive.

STEP 6: Trim the lead by breaking it sideways against the twig. Let the glue dry overnight.

STEP 7: Sharpen the pencil with a sharp utility knife or pocketknife. Whittle away from your body, removing thin shavings as you work around the pencil. Use your imagination to personalize your pencil, or simply enjoy the colors and textures that nature provides.