



The creation of this curriculum has been funded in part through a N.O.A.A. Outreach and Education Grant.

Lesson 4: How Long Until It's Gone?

Description: An exploration into how long man-made substances can last in the environment and how different materials break down.





In order to continue the cycle of life on earth, living things biodegrade when they die.

Background

This lesson focuses on exploring how materials breakdown and looks specifically at organic materials, metals, and manmade polymers. Here are some outside resources to explore in order to better understand the three ways materials breakdown that are discussed in this lesson:

In order to continue the cycle of life on earth, living things biodegrade when they die. Here's a quote from a Science News for Students article:

"Life would end without rot," observes Knute Nadelhoffer. He's an ecologist at the University of Michigan in Ann Arbor. "Decomposition releases the chemicals that are critical for life." Decomposers mine them from the dead so that these recycled materials can feed the living."

<https://www.sciencenewsforstudents.org/article/recycling-dead>

This is an excerpt from an education.com science experiment that explores rust and corrosion:

Corrosion is the chemical reaction where metals break down slowly because of other elements in their environment. **Rusting**, a well-known example of corrosion, is the breakdown of the metal iron. The reactants of this chemical reaction are iron, water, and oxygen, and the product is **hydrated iron oxide**, better known as rust. Rust, unlike iron, is crumbly, orange, and pretty much useless for building things.

To learn more, or to perform the experiment, follow this link

<http://www.education.com/science-fair/article/iron-rusting/>

Photodegradation occurs when UV light degrades the polymer chains that create plastics. Plastic can also be broken down mechanically. Here is an excerpt from the NOAA Marine Debris Program website that describes how plastics break down in marine environments, follow the hyperlink to learn more:

[Do plastics go away when they're in the ocean or Great Lakes?](#)

Plastics will degrade into small pieces until you can't see them anymore (so small you'd need a microscope or better!). But, do plastics fully go away? Full degradation into carbon dioxide, water, and inorganic molecules is called mineralization (Andrady 2003). Most commonly used plastics do not mineralize (or go away) in the ocean and instead break down into smaller and smaller pieces. We call these pieces "microplastics" if they are less than 5mm long. The rate of degradation depends on chemical composition, molecular weight, additives, environmental conditions, and other factors (Singh and Sharma 2008).

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.



Upon completion
of this lesson
students will be
able to:

Provide
examples of
manmade
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will last many
decades.

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Concepts:

1. Man-made items can last for many years longer than their useful life.
2. Biodegradable materials, metals, and manmade polymers all break down in different ways.
3. Because of the factors that cause materials to breakdown, they breakdown differently in different environments.

Outcomes:

Upon completion of this lesson students will be able to:

1. Provide examples of manmade materials that will last many decades.
2. Define the terms Biodegrade, Corrode, and Photodegrade.
3. Describe why different materials will take more or less time to degrade based on the environment they are in .

Outline:

- I. Set up (20 min.)
 - II. Introduction (5 min.)
 - a. Learner Level Assessment
 - b. Behavior Guidelines
 - III. Breaking it Down! (30 min.)
 - a. How Long Until It's Gone Activity
 - b. Sorting by Breakdown Process
 - c. How Environments Affect Breakdown Times
 - IV. Conclusion and Review (10 min.)
 - V. Follow-up Activities
 - a. Anthropomorphize an Item
 - b. Investigate Biodegradation with Worms!
 - c. Explore Degradation in Depth
 - d. What's in a Diaper?
 - VI. Additional Resources
 - a. Sources
 - b. Vocabulary
-



In this lesson, students will be trying to arrange cards in the order the items actually break down.

I. Set up (20 min.)

Create at least two sets of cards (notecards should work fine) that list items from the “How Long Until It’s Gone” chart below. Make each set of cards distinguishable from the other sets by using colors or numbers. You may need more cards depending on the size of your groups and how large your groups will be. We suggest four to six in a group, so for a class of twenty, you will need four sets of cards. On the cards, just list the item, not how long it will last. You’ll reveal that information after the activity. Each set should have 21 cards.

In this lesson, students will be trying to arrange cards in the order the items actually break down. In order to facilitate this activity, all students should receive the same five cards to begin with so that the class can talk through why they fall in a particular order. The first five cards each group will be handed, and therefore the first five of every set, in random order, should be: Paper Towel, Apple Core, Plastic Bag, Tin Can, and Disposable Diaper. The next five cards, in random order, should be: Orange or Banana Peel, Waxed Milk Carton, Wool Sock, Rubber Boot Sole, and Plastic Beverage Bottle. The order of the next 11 cards of each set does not matter.

This chart provided by NOAA provides estimated decomposition times for 21 items (http://games.noaa.gov/oscar/media/beach_guide.pdf).



| HOW LONG UNTIL IT'S GONE? | |
|---------------------------|-----------------|
| Glass bottle | 1 million years |
| Monofilament fishing line | 600 years |
| Plastic beverage bottles | 450 years |
| Disposable diapers | 450 years |
| Aluminum can | 80-200 years |
| Foamed plastic buoy | 80 years |
| Rubber boot sole | 50-80 years |
| Foamed plastic cup | 50 years |
| Tin can | 50 years |
| Leather | 50 years |
| Nylon fabric | 30-40 years |
| Plastic film canister | 20-30 years |
| Plastic bag | 10-20 years |
| Cigarette filter | 1-5 years |
| Wool sock | 1-5 years |
| Plywood | 1-3 years |
| Waxed milk carton | 3 months |
| Apple core | 2 months |
| Newspaper | 6 weeks |
| Orange or banana peel | 2-5 weeks |
| Paper towel | 2-4 weeks |

Sources: U.S. National Park Service; Mote Marine Lab, Sarasota, FL and "Garbage In, Garbage Out," Audubon magazine, Sept/Oct 1998.



**All materials
break down,
and often this
makes it possible
for organisms
to access the
resources they
need to survive.**

I. Introduction (5 min.)

a. Learner Level Assessment

Ask students why everything that has ever existed does not exist now in the form that it originally did. Give them examples: Why doesn't every tree that has grown still exist? Why doesn't every suit of armor made still exist? Etc.) Discuss the answers as a group, or use this question as a writing prompt. Introduce the concept that all materials break down, and often this makes it possible for organisms to access the resources they need to survive.

Assessment (Outcome 1): Have students take a look around the room from their desks. Ask each student to write down which item that they can see will last the longest and why they think it will.

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. Breaking It Down! (30 min.)

a. How Long Until it's Gone Activity

Divide students into groups of four to six and give each group the first five cards of their set. In random order, those cards should be: Paper Towel, Apple Core, Plastic Bag, Tin Can, and Disposable Diaper. Have the groups race to see who can put the cards in order the fastest. When a team thinks they have the correct order, check their cards. Allow time for at least a few groups to finish, and then reveal the actual order on the board. Discuss as a class why these items break down in the order they are in. Let the students know that this order is based on the idea that all of the items are in an "average" environment that is outside and receives a moderate amount of both sun and rain. We'll explore when happens when items are in particular extreme environments in the next activity.

Once you have discussed as a class why the first five items fall into a particular order, it's time to introduce the next five of each set to each student group and ask them to add in those cards to the order of the first five. The next five cards, in random order, should be: Orange or Banana Peel, Waxed Milk Carton, Wool Sock, Rubber Boot Sole, and Plastic Beverage Bottle. Have the groups race to see who can put all 10 items in order the fastest. Allow time for at least one group to finish, and then reveal the actual order on the board: Paper Towel, Orange or Banana Peel, Apple Core, Waxed Milk Carton, Wool Sock, Plastic Bag, Tin Can, Rubber Boot Sole, Plastic Beverage Bottle, Disposable Diaper.

Before introducing the rest of the cards in each set for the final race, take a close look at the order of the first ten items as a class. It's interesting to consider the function of a fruit peel compared to a fruit core when considering why one lasts longer. It's important to look at the order of these items and recognize that **in general the natural items decompose first, then the metals, then the synthetic polymers.** Although this concept does not hold true in every case, it does when looking at the groups. With this in mind, hand out the final 11 cards in each set to each group, and give them a few minutes to see if they can put all 21 in order. After groups have had time to add the extra items in, reveal the "How Long Until It's Gone" chart. It's important to note that because glass is inert, it does not have a type of decomposition that affects it.

Assessment (Outcome 1): After studying the "How Long Until It's Gone" chart as a group, create a timeline with students on the board of breakdown times for the first five items we put in order: Paper Towel, Apple Core, Plastic Bag, Tin Can, and Disposable Diaper. Based on how far the disposable diaper is from the paper towel, ask students to explain why these breakdown times are so different.



Biodegradation is usually caused by organisms breaking down natural items for food.

b. Sorting by Breakdown Process

In their groups, have students sort their card sets into: items that were once living, metals, and man-made materials. When they are finished, reveal this list for students to check their work:

Biodegrade:

- Leather*
- Wool sock
- Plywood
- Waxed milk carton
- Apple core
- Newspaper
- Orange or banana peel
- Paper towel

Corrode:

- Aluminum can
- Tin can

Photodegrade:

- Monofilament fishing line
- Plastic beverage bottles
- Disposable diapers
- Foamed plastic buoy
- Rubber boot sole
- Foamed plastic cup
- Nylon fabric
- Plastic film canister
- Plastic bag
- Cigarette filter

Stable, does not break down into its constituent molecules:

- Glass bottle

**Actual leather breakdown times vary greatly depending on which chemicals were used to tan the leather. Leather productions sometimes involves very toxic chemicals and is not necessarily sustainable.*

c. How Environments Affect Breakdown Times

In simple terms: Biodegradation is usually caused by organisms breaking down natural items for food, corrosion is a chemical process that oxidizes and breaks down metals, and photodegradation happens when UV rays break down polymers. Here are the dictionary definitions of different breakdown processes from the Merriam-Webster online dictionary:

Biodegrade - to slowly destroy and brake down into very small parts by natural processes, bacteria, etc.

Corrode - to eat away by degrees as if by gnawing; *especially*: to wear away gradually usually by chemical action <the metal was corroded beyond repair>

Photodegrade - chemically degrade by the action of light <photodegradable plastics>

Assessment (Outcome 2): Create class definitions for the terms biodegradation, corrosion, and photodegradation that students are comfortable with and can remember.

If the “How Long Until It’s Gone” chart is based on an “average” environment that contains an average amount of the factors that cause those items to break down (living things, water/corrosives, light), then decide as a class or in small groups if these processes would happen faster or slower in these environments (if it’s helpful, choose three items as examples, e.g. a banana peel, a tin can, and a plastic bottle). Don’t reveal the answers (in parenthesis) until after students have considered each environment and process:

Desert:

- Biodegrade - (slower)
- Corrode - (slower)
- Photodegrade - (faster)

Rain Forest Floor:

- Biodegrade - (faster)
- Corrode - (faster)
- Photodegrade - (slower)

Ocean:

- Biodegrade - (see note*)
- Corrode - (faster)
- Photodegrade - (see note*)

***The ocean is not as straightforward as the other environments here, and is meant to be a point of discussion.** Biodegradation would occur more quickly in ocean environments that are rich with life. Although there are organisms that work to consume the dead in nearly every ocean zone, they do not do so at equal speeds. In general, areas of the ocean that contain abundant amounts of life decompose living things quickly. Photodegradation should also create a discussion.



**At current rates,
each year more
plastic ends
up in the ocean
than the
previous year.**

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When photodegradable items are on the surface of the ocean, they will be exposed to intense light, and will tend to degrade quickly. As they break down and lose the surface area that enabled them to float and/or they begin to accumulate algae and living organisms, they will sink. Many plastics are naturally too dense to float. As soon as items sink below the level UV rays can reach, photodegradation will stop completely.

If time allows and you'd like to continue this thought experiment, add other environments.

Assessment (Outcome 3) Consider which environments items would not break down in at all (e.g. if UV light breaks down plastic, and that plastic is buried, what will happen to it).

IV. Conclusion and Review (10 min.)

The ocean is downhill from nearly everywhere, which is why all elevation is measured from sea level. Because of gravity, everything on earth tends to move downhill. With as much plastic as there is on land, it's no surprise that so much ends up in our oceans.

Now we can see why plastics last a long time in the ocean. At current rates, each year more plastic ends up in the ocean than the previous year. Discuss as a class, given what we know now about how long they last, why this could be a problem. Does plastic cause different issues than other items that end up in the ocean?

Assessment (Outcome 3) Have students choose a specific item from each category: biodegradable, corrodible, and photodegradable, and describe what would happen to that item if it ended up in the ocean. Describe if and how that item might affect animals living in the sea.

V. Follow-up Activities

a. Anthropomorphize an Item

Have students write a narrative on the journey of one item from the time it was created to the time it reached the ocean. Where does it go, who does it meet, how does it ultimately degrade back into its composite molecules?

Assessment (Outcome 3) In their narrative, ask to students to describe whether the item they choose is biodegradable, photodegradable, or corrodible and why.

b. Investigate Biodegradation with Worms!

Use these activities from the Wisconsin DNR to set up biodegradation with worms in the classroom:

Earthworm castle: <http://dnr.wi.gov/org/caer/ce/eeek/critter/invert/worm.htm>

Worm bin for composting: <http://dnr.wi.gov/org/caer/ce/eeek/earth/recycle/compost2.htm>

Assessment (Outcome 2): Use the scientific method to set up decomposition rate experiments using a worm bin.

c. Explore Degradation in Depth

Use NOAA's Turning the Tide on Trash curriculum, lesson three, "A Degrading Experience," to compare and monitor actual items breaking down over many weeks.

https://marinedebris.noaa.gov/sites/default/files/publications-files/2015_TurningTideonTrash_HiRes_Final.pdf



Have each student research one item that changed from being made of natural materials to plastic and describe why/how the change happened.

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d. What's in a Diaper?

On the "How Long Until It's Gone" chart, it's estimated that a diaper can last 450 years. How can diapers last so long? It all goes back to how they are made. Go through this process with your students or have them investigate and report on it on their own using this detailed description from madehow.com:

<http://www.madehow.com/Volume-3/Disposable-Diaper.html>

Assessment (Outcome 1) After taking a close look at diapers, have each student research and report on another item from the "How Long Until It's Gone" chart and report on what it's made of and how it's created. This could be for any item, natural or manmade.

Assessment (Outcome 1) Have each student research one item that changed from being made of natural materials to plastic and describe why/how the change happened.

VI. Additional Resources

a. Sources

- **Compound Interest, A Guide to Common Household Plastics:**
<http://compoundchem.com/2015/04/30/plastics/>
- **The Encyclopedia of Occupational Health and Safety from the International Labour Office:**
<http://ilocis.org/documents/chpt77e.htm>
- **Merriam-Webster**
<http://merriam-webster.com/dictionary/>
- **NOAA**
https://marinedebris.noaa.gov/sites/default/files/publications-files/2015_TurningTideonTrash_HiRes_Final.pdf
- **United Nations World Ocean Assessment Website:**
<http://worldoceanassessment.org/>

b. Vocabulary

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

Synthetic Polymer: A man-made substance created from multiple repeating chains of monomers.

Biodegrade: "To slowly destroy and brake down into very small parts by natural processes, bacteria, etc." Merriam-Webster

Corrode: "To eat away by degrees as if by gnawing; especially: to wear away gradually usually by chemical action." Merriam-Webster

Photodegrade: "Chemically degrade by the action of light." Merriam-Webster

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



**2016
Washed Ashore
Fact:
Over 35,000
pounds of
marine debris
have been
processed.**

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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-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.]

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-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.]

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 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 #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.



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Lesson 3: What is Plastic?

Description: An introduction to man-made polymers, both why they were created and how they are used.





Upon completion of this lesson students will be able to:

Describe basic polymer structure and characteristics.

Concepts:

1. Plastics are polymers.
2. The scientific method is a useful tool for conducting experiments.
3. There are many different types of plastic.

Outcomes:

Upon completion of this lesson students will be able to:

1. Describe basic polymer structure and characteristics.
2. List the basic steps of the scientific method.
3. Describe the characteristics that make different types of plastic unique.

Outline:

- I. Set up (10 min.)
 - II. Introduction (5 min.)
 - a. Learner Level Assessment
 - b. Behavior Guidelines
 - III. Creating a Polymer Activity (35 min.)
 - a. Student Experiment
 - b. Polymer Discussion
 - IV. Conclusion and Review (5 min.)
 - V. Follow-up Activities
 - a. Research the Origin of Plastics
 - b. Track the Changes in Your Created Products
 - c. Plastics by the Numbers Sorting Activity
 - VI. Additional Resources
 - a. Sources
 - b. Vocabulary
-



There are many examples of natural polymers including hair, spider silk, natural rubber, and DNA.

I. Set up (10 min.)

A projector and computer will be needed to show a few charts. You can also print these off if you prefer not to use a projector.

Materials:

- **Borax (found in the laundry section of the store)**
- **Cornstarch (found in the baking section of the store)**
- **White glue (e.g., Elmer's glue)**
- **Warm water**
- **Multiple sets of measuring spoons (ranging from 1/2 tsp. to 1 tbs.)**
- **Spoon or craft stick**
- **Dixie cups or other containers for mixing**
- **1 Cup measuring cup**

Set out cornstarch, glue, Borax, and water for student experiments. Arrange measuring devices, mixers, and mixing cups so that all student teams have access to them. Depending on the number of students in the class, it may be helpful to set up multiple ingredient stations in different areas in the room. Another option is to provide each student desk group with a set of materials.

I. Introduction (5 min.)

a. Learner Level Assessment

Simple definition of polymer (Provided by Merriam-Webster):

A chemical compound that is made of small molecules that are arranged in a simple repeating structure to form a larger molecule.

Polymers are all around us and always have been. Although we have been creating man made polymers for about the past 150 years, there are many examples of natural polymers including hair, spider silk, natural rubber, and DNA. Polymers are repeating chains of molecules and can be very durable and strong. Use strips of paper and a stapler to create a chain of paper loops while discussing polymers in order to create a visual. Discuss the fact that the paper would be the hydrocarbon in the case of plastic and the stapler would be the chemical introduced to chain it together.

Let the students know, "Today we have a science challenge! You will work in teams to replicate the creation of a product that can be made into almost anything!"

Background:

In the early 20th century, there was a race to discover new polymers. Scientist and inventors around the world were using new chemical extraction processes to try and create substances that would meet demands for products that were being created with very limited resources. At that time, ivory was being used for billiard balls and fancy combs were made from tortoise shell. Although fulfilling the demand for scarce products and making profit was often the goal, it was vital to the preservation of those species to find a suitable replacement for products based on their harvest. Plastic was to be that replacement. It could be made into any shape or color, it was durable, and it was cheap. Many combinations of chemicals were experimented with before the first plastics were successfully created.



Use the scientific method to experimentally create various substances.

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, students will be working with a variety of substances that while not toxic, have the ability to create a mess if spilled. Stress that students are scientists conducting an experiment and should treat their materials with respect. Measuring is especially important, and it may be necessary to give students a mini lesson on using measuring devices if they are not familiar. Stress respect for classmates, self, and their environment before the experiment phase of the lesson begins.

III. Creating a Polymer (35 min.)

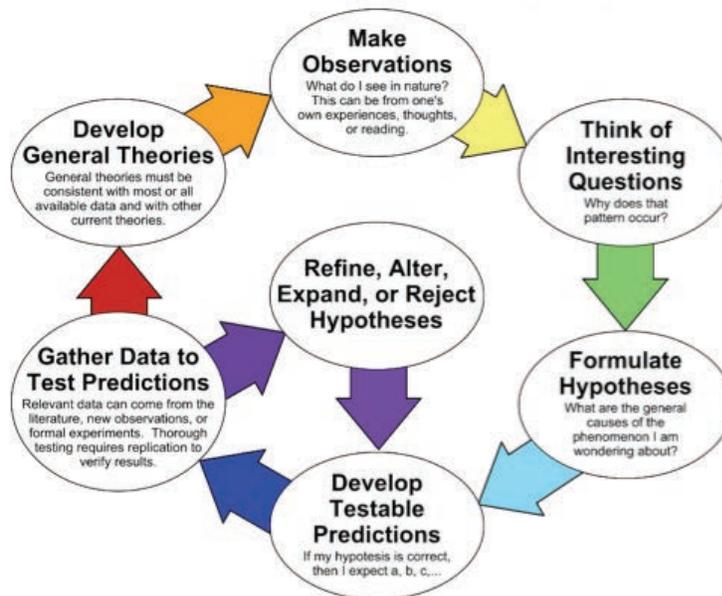
a. Student Experiment

Pretend that you are scientists and inventors and that you must create a substance that can be formed into any shape, be made into any color, and last a long time. You have a good idea of what ingredients may be necessary to create what you'd like.

Instructions for students: "On the table you will find four substances, a few of which you might be familiar with. By combining a particular set of them, you can create a flexible and strong product. The amount of the substance will make a difference. You can use half a teaspoon to one tablespoon of any of them. You may not need all of them. The order they are combined may make a difference."

Have students use the scientific method to experimentally create various substances. Introduce the scientific method if students are not familiar with it.

The Scientific Method as an Ongoing Process





**Polymers
 are made up
 of repeated
 patterns of
 molecules,
 called
 monomers.**

Observe: (Ask students what observations led to the experiments that created the first plastics. You can include this for each experiment the students do, or just write it up on the board as an assumption for all experiments.)

Question: What combination of substances will create a useful material?

Hypothesis: (Choose substances and amounts and predict what will happen when they are combined)

Experiment: (Carefully record the steps of your process. How are you combining your substances? What do you add first?)

Results: (Record the results of your experiment. How stretchy is the material you created? How bouncy? What could it be used for? Name your product and set it aside.)

Have the students modify and repeat the experiment as many times as time allows. If they create a particularly interesting product, see if they can reproduce it two or three times (valid science relies on replicability).

Run this experiment for 10 to 15 minutes. Have the students keep a record of each trial run using the scientific method and also keep their resulting substances. This is not a competition, it is a cooperative effort. Students should feel free to share their results with other teams during the experimental phase. After the time is up, have each team appoint a representative to describe their work and demonstrate their most successful result. What could their product be used for?

Ask the students how they could recreate each substance they made (refer to their notes and ensure they used the same method). Discuss why the scientific method is useful in conducting research. Emphasize the necessity of repetition for verification of results.

Assessment (Outcome 1) Ask students to describe the creation of their substances in terms of what we have learned about polymers. (They should be able to discuss the combination of two substances into a new substance with a different structure in very general terms).

Assessment (Outcomes 2): Quiz students on the basic steps of the scientific method

b. Polymer Discussion

Here's a great description of plastic monomers and polymers from Science Buddies, http://www.sciencebuddies.org/science-fair-projects/Classroom_Activity_Teacher_MilkPlastic.shtml

Plastics are a group of materials that can look or feel different, but can all be molded into many shapes. The similarities and differences between different plastic products come down to the molecules they are made of. Plastics are all similar because they are all made up of molecules that are repeated over and over again in a chain, called a polymer. Polymers can be chains of one type of molecule, or chains of different types of molecules linked together in a regular pattern. In a polymer, a single repeat of the pattern of molecules is called a monomer (even if the polymer is made up of only one type of molecule).

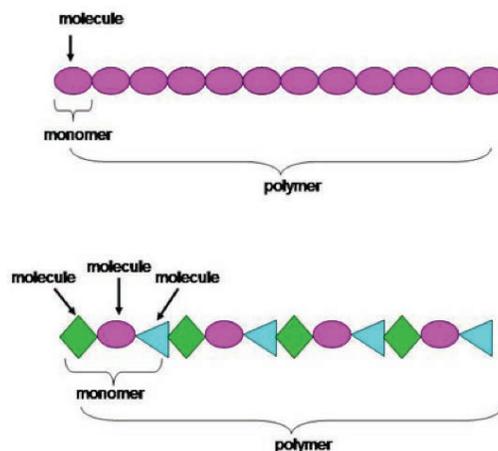


Figure 1. Polymers are made up of repeated patterns of molecules, called monomers. Monomers can be made up of one type of molecule (such as the top polymer) or multiple different molecules (such as the bottom polymer).



Plastics are created from different chemical combinations.

Plastics are created from different chemical combinations. Different combinations result in different types of plastic being created, and these different types of plastic are used to create different products. Use this chart to find out what type of plastic is used to make the items you use. What can those products be recycled to make?

| Household | |
|--|---|
| Plastics | |
| <p>■ 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.</p> | |
| PETE | <p>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</p> |
| HDPE | <p>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</p> |
| V | <p>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</p> |
| LDPE | <p>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</p> |
| PP | <p>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</p> |
| PS | <p>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</p> |
| OTHER | <p>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</p> |

THE OLD FARMER'S ALMANAC



Most new plastics must be created from raw materials to maintain the products in our current supply stream.

IV. Conclusion and Review (5 min.)

During this lesson we learned about man made polymers and the race to create various types of plastic in the early 20th century. We used the scientific method to experiment with substances we were familiar with in order to create a different products. We also studied how using different types of chemicals can create different types of plastic.

Assessment (Outcome 2) Ask students to think of something they have noticed about the natural world that interested them. Have them create a theoretical experiment to test an observation in terms of the scientific method.

Assessment (Outcome 1) Based on their new knowledge of polymers, ask students why spider silk is so strong for its size

Assessment (Outcome 3) Ask students which type of resin, by number, is used to create most plastic drinking bottles. (This may take further review of the plastic by numbers chart)

V. Follow-up Activities

a. Research the Origin of Plastics

This project could be done either before or after this lesson. Have students write a report on why plastics were created, what the most popular items were originally, and which species the creation of plastic impacted during the first few years they were created (this may be focused on animals saved by production of a manmade material).

b. Track the Changes in Your Created Products

Have students predict how each of their created products will change over the course of a week. Use the scientific method with the given question, "How will my creation change in one week?" Have students create a hypothesis, describe the experiment, and record their results. Compare group results and predict why they are the same or different.

c. Plastics by the Numbers Sorting Activity

Project or print out a plastics by the numbers chart, the one used earlier in this lesson will work or you can find your own. Sort the plastics that have been collected for this curriculum into their number groups. Provide examples of the other types of plastic that aren't available in the class set of materials. Record what the types of plastic have in common and their differences. Note the fact that they generally can't be recycled into what they started out as. This is because the polymers are not able to maintain their original integrity once they go through the recycling process. This means that most new plastics must also be created from raw materials to maintain the products in our current supply stream.



The United Nations World Ocean Assessment is one of the most comprehensive studies done on the current state of global oceans.

WashedAshore.org
541-329-0317
325 2nd St. SE,
Bandon, Oregon 97411

VI. Additional Resources

a. Sources

- **About.com**
<http://chemistry.about.com/od/demonstrationexperiments/ss/bounceball.htm>
- **Algalita**
<http://algalita.org/credible-information-and-statistics>
- **Merriam-Webster**
<http://merriam-webster.com/dictionary/polymer>
- **NOAA**
http://games.noaa.gov/oscar/media/beach_guide.pdf
http://marinedebris.noaa.gov/sites/default/files/Gen_Plastic-hi_9-20-11_1.pdf
- **The Old Farmer's Almanac**
<http://almanac.com/content/plastics-recycling-chart>
- **Plastic: A toxic love story**
Freinkel, S. (2011). Plastic: A toxic love story. Boston: Houghton Mifflin Harcourt.
- **Science Buddies:**
http://sciencebuddies.org/science-fair-projects/Classroom_Activity_Teacher_MilkPlastic.shtml
- **United Nations World Ocean Assessment Website:**
<http://www.worldoceanassessment.org/>
- **University of California**
http://idea.ucr.edu/documents/flash/scientific_method/story.htm

b. Vocabulary

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

Molecule: "The smallest particle of a substance that retains all the properties of the substance and is composed of one or more atoms." Merriam-Webster.

Monomer: The base units that can create the chains which form polymers.

Polymer: A substance created from multiple repeating chains of monomers.

Scientific Method: "Principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses." Merriam-Webster.

Resin: "Any of a large class of synthetic products that have some of the physical properties of natural resins but are different chemically and are used chiefly in plastics." Merriam Webster. Examples of plastic resins are PET, PVC, and Polystyrene.

Hydrocarbon: "An organic compound (as acetylene or butane) containing only carbon and hydrogen and often occurring in petroleum, natural gas, coal, and bitumens." Merriam-Webster.



**2016
Marine Debris
Fact:**

**Every ocean
and every marine
environment
contain pieces
of our trash.**

WashedAshore.org
541-329-0317
325 2nd St. SE,
Bandon, Oregon 97411

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.

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-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.]

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-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-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 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 #10)** Civic Ideals and Practices: Include experiences that provide for the study of the ideals, principles and practices of citizenship in a Democratic Republic.



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Lesson 9: Resourcefulness in a Bottle

Description: A continuation of the study of using art as a language, focused on creating lines through processing materials.





Upon completion of this lesson students will be able to:

Demonstrate how everyday objects and debris can become art supplies.

Concepts:

1. Artists use the language of the arts to communicate.
2. Resourcefulness is creating something of value out of something seemingly worthless.
3. Creativity is thinking in new ways about old ideas.

Outcomes:

Upon completion of this lesson students will be able to:

1. Demonstrate an understanding of how lines can be used to communicate.
2. Demonstrate how everyday objects and debris can become art supplies.
3. Change the form of objects to fulfill a new function.

Outline:

- I. Set up (20 min.)
 - II. Introduction (10 min.)
 - a. Learner Level Assessment
 - b. Behavior Guidelines
 - III. Processing Materials (30 min. See timing note in this section)
 - a. Looking at Materials in a New Way
 - b. Technique Stations
 - IV. Conclusion and Review (5 min.)
 - V. Follow-up Activities
 - a. Repurpose Your Own Debris
 - VI. Additional Resources
 - a. Sources
 - b. Vocabulary
-



In order to prepare for this lesson, complete the giant masks templates.

I. Set up (20 min.)

Masks have been made from various materials in many cultures over thousands of years. They have been used for protection, disguise, entertainment, rituals, storytelling, to scare off enemies, in ceremonies and in theaters. They have also been used as symbols of certain attributes of people, animals or ancestors.

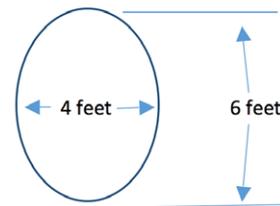
Through this curriculum, we are going to create a giant plastic mask and a giant eco mask. The plastic mask represents the habits of the throwaway lifestyle that have resulted in plastic pollution in nearly every ecosystem on earth. The eco mask represents the alternatives to the throwaway habits that can stop plastic pollution at its source. These masks will serve as reminders in the classroom to create earth friendly habits.

In this lesson, we will begin creating the masks by making the hair and eyes for both.

The lesson requires a screen and projector to show visuals to the class. Before this lesson, make sure to download the Art Lessons IAMDC PowerPoint. You will be using slides ten through fourteen.

In order to prepare for this lesson, complete the giant masks templates. These can be created by cutting out two large cardboard ovals roughly four feet by six feet. Size can be adjusted based on class size. The suggested size works well for a group of roughly 20 students. These cardboard templates can be cut from one large box or several small boxes taped together.

Cardboard blank should be in the shape of a face, roughly four by six feet:



Before this lesson, as a class decide on the colors and shapes of the masks' eyes and attach them. Place the eyes on the mask for size and placement and modify as necessary before securing. We'll attach both sets of eyes using the buttonhole technique described below.

To create the eyes of the plastic mask:

Choose thin white plastic from the materials set collected for this curriculum and cut it into the shape you would like to use for the eyes of the plastic mask. Yogurt containers cut into an oval often work well for the whites of the eyes. Use thick water bottle bottoms for the iris and pupil. These bottoms should be thick enough that they have a distinct center that is darker than the surrounding plastic. If this cannot be found, you may want to use a black bottle cap as the pupil. Attach the eyes by using the buttonhole technique. Using a power drill, drill one set of holes through the bottle bottoms, the plastic used for the whites of the eyes, and the cardboard mask backing. Secure the eyes firmly by twisting the wire behind the mask. As an alternative option, acrylic latex caulk can be used to secure the eyes to the mask as long as time is allowed for the caulk to dry before the hair is attached later in this lesson.

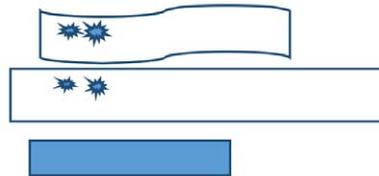
To create the eyes of the eco mask:

Cut the recycled paper created in lesson seven into the shape you would like to use for the eyes of the earth mask. If your paper did not turn out, choose light cardboard packaging from the materials set to use as the whites of the eyes. Next, cut out paper or thin cardboard the color of your choice to layer on top of the whites of the eyes and serve as the iris and pupil of the eye. The three paper layers can be glued together and then attached to the earth mask using the buttonhole technique, or if each layer is thick enough all three can be layered and attached without glue using the buttonhole technique. Alternatively, the entire eye can also be glued to the mask if you prefer and can allow time to dry before attaching the hair.

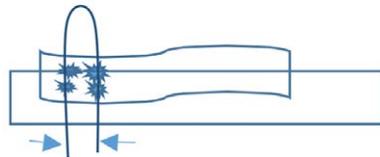


**In this lesson,
 we will begin
 processing
 materials so
 they can be
 more easily
 used to create
 the lines, shapes,
 and forms
 that best suit
 our work.**

The buttonhole technique: Punch two holes through the material you are attaching and through the cardboard you are attaching to. Use a nail to punch the holes and place a piece of Styrofoam packing material underneath to punch the nail into. These holes should be between 1/4" and 1/2" of an inch apart (about a finger width). If they are further, it will affect the appearance of the mask. If they are closer, the attachment won't hold. The holes should match up, so try to punch through both materials at once. Use a paperclip or small piece of 17 gauge wire bent into a U shape to push through both pairs of holes you create. Bend the paperclip or wire behind the cardboard to create a stable attachment. After it's complete, the attachment should look like a large staple. The ends of the staple can be twisted to create a more secure attachment if you choose.



Punch through the material you are attaching and the cardboard backing of your mask into a Styrofoam block using a sixteen penny nail.



Secure the material you are attaching to your cardboard by using wire or a paper clip to create a large staple.

Additional Materials:

- 1 t-shirt per student – from thrift stores or donations (washed)*
- 2 - 3 empty water bottles per student
- Several plastic bags per student*
- Strong sharp scissors – one per student
- 17 gauge wire cut into 12 " pieces, loop one end, one per student
- Several 16 penny nails
- Scrap large Styrofoam packing cubes
- Large paper clips (not scored) – to use as wire
- Wire cutters

* The colors of the t-shirts and the plastic bags used will determine the color of the hair and eye-brows of the two giant masks. Decide as a class what colors you would like to use. Do not use more than three colors total. Consider what we learned about color in lesson two and try to choose colors that are complimentary.

PLEASE NOTE: DURING THIS LESSON, PARENT OR COMMUNITY VOLUNTEERS WILL BE NEEDED TO HELP AT EACH STATION. A MINIMUM OF 5-7 ARE REQUIRED TO HELP TEACH TECHNIQUES AND MONITOR SAFETY.



Artists make choices to communicate their ideas.

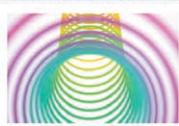
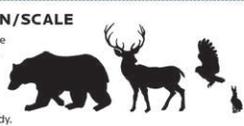
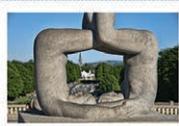
II. Introduction (10 min.)

Background:

Artists make choices to communicate their ideas. These choices include:

- **Design elements (the building blocks):** line, shape, form, color, texture, space, etc.
- **Design principles (how you arrange the building blocks):** repetition, pattern, balance, movement, focal point, contrast, unity, etc.
- **Materials:** paint, plastic, wire, clay, pencil, stone, canvas, etc.
- **Techniques:** painting, drawing, sculpting, photography, weaving, etc.
- **Expression:** ideas, issues, moods, etc.

Today, we are going to focus on learning more about how to intentionally use lines. This Washed Ashore graphic shows all the elements and principles of visual art for reference:

| ELEMENTS AND PRINCIPLES OF ART | |
|--|--|
| LINE Line is the path of a point moving through space  | PATTERN Pattern refers to the repetition or reoccurrence of a design element, exact or varied, which establishes a visual beat.  |
| SHAPE/FORM Shape implies spatial form and is usually perceived as two-dimensional. Form has depth, length, and width and resides in space. It is perceived as three-dimensional.  | RHYTHM/MOVEMENT Rhythm or movement refers to the suggestion of motion through the use of various elements.  |
| COLOR Colors all come from the three primaries and black and white. They have three properties: hue, value, and intensity.  | PROPORTION/SCALE Proportion is the size relationship of parts to a whole and to one another. Scale refers to relating size to a constant, such as a human body.  |
| VALUE Value refers to relative lightness and darkness and is perceived in terms of varying levels of contrast.  | BALANCE Balance is the impression of equilibrium in a pictorial or sculptural composition. Balance is often referred to as symmetrical, asymmetrical, or radial.  |
| TEXTURE Texture refers to the tactile qualities of a surface (actual) or to the visual representation of such surface qualities (implied).  | UNITY Unity is achieved when the components of a work of art are perceived as harmonious, giving the work a sense of completion.  |
| SPACE/PERSPECTIVE Space refers to the area in which art is organized. Perspective is representing a volume of space or a three-dimensional object on a flat surface.  | EMPHASIS Emphasis refers to the created center of interest, the place in an artwork where your eye first lands.  |



Spiral cutting involves cutting a bottle from the bottom up in such a way that you turn the bottle into a long strip of material.

a. Learner Level Assessment

Hold up a water bottle and challenge the students to make it as tall as they are. Arrange students in groups of two to four to quickly brainstorm. Hand out a few water bottles to each group for students to experiment with. See if students can find any solutions just using the bottles to start. Next, ask students if there is a tool they could use to make this task more achievable. Hand out scissors to the students so that they can continue their experiments.

After the students have had some time to experiment, demonstrate spiral cutting a bottle to make it as tall as you.



Spiral cutting involves cutting a bottle from the bottom up in such a way that you turn the bottle into a long strip of material. The only bottle parts that aren't part of this long strip are the very top and very bottom. Begin a spiral cut by pushing the scissors into the side of the bottle just above the bottom. Careful of your hands! You may want to set the bottle down to create this initial plunge cut.

Assessment (Outcome 3) Ask students to create as long a strip as possible from one bottle and brainstorm what they could do with this plastic strip.

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. In this lesson, students will be using scissors. Sharp scissors will work best and can be dangerous if students are not familiar with how to use them. If they don't have much experience with scissors, or if you're teaching this lesson to younger students, you may want to go through scissor etiquette and technique when you reach that point in the lesson.

Scissor etiquette and technique points include:

- Don't ever cut toward your hand. Demonstrate how to move the object and cut from the other direction.
- If possible, keep the material you're cutting stretched tight.
- It will be easier to cut with scissors using the back of the blade, closest to the handle.

Students will also be using nails to poke holes in cardboard. Discuss keeping hands out of the way of the sharp end of the nail.



A line is a path that we can visually follow. Lines create the boundaries of shapes and forms.

III. Processing Materials (30 min. see timing note below)

Timing note: the goal of this lesson is to help students learn two techniques that will be used to create the giant mask and also to learn how to attach their created materials to the cardboard mask blank. The time of thirty minutes for this section refers to the time it will likely take students to learn these skills. While it is possible that students may complete this work in one lesson, it is likely additional class time will be needed to complete this stage of the mask before the next art lesson, lesson 11. Plan to spend two to three class periods on the activities described in section “B” below.

a. Looking at Materials in a New Way

A line is a path that we can visually follow. Lines create the boundaries of shapes and forms. In the previous art lessons, we have been using whole, unmodified objects as art supplies. This has sometimes made it difficult to create new lines in our work because the objects we were using already had their own lines. In this lesson, we will begin processing materials so they can be more easily used to create the lines, shapes, and forms that best suit our work.

Use slides ten through fourteen of the Art Lessons IAMDC PowerPoint to show how water bottles are used for the Washed Ashore Project. Work through the questions on the slides. Ask students why Washed Ashore uses so many water bottles. Refer to the ICC chart from lesson eight. (Bottles are one of the most commonly found trash items on the beach).

Assessment (Outcome 1) Project slide fourteen and ask students if it looks like any of the jellies could be in motion. As a class, discuss how the direction, thickness, and length of a line can be used to communicate a sense of movement. Are there other ideas that lines can communicate besides movement and direction?

b. Technique Stations

Before beginning this activity, cardboard mask blanks should be cut out and ready to use. Eyes should be attached and mouths should be sketched in pencil as place holders.

Students will rotate between five stations to learn techniques of braiding, knotting, spiral cutting and wiring trash kabobs.

Before setting up stations, note that the colors of the t-shirts and the plastic bags used will determine the color of the hair and eye-brows of the two giant masks. Decide as a class what colors you would like to use. Choose a maximum of three colors for each type of hair.

PLEASE NOTE: PARENT OR COMMUNITY VOLUNTEERS WILL BE NEEDED TO HELP AT EACH STATION. A MINIMUM OF 5-7 ARE REQUIRED TO HELP TEACH TECHNIQUES AND MONITOR SAFETY.

Allow 15-30 minutes to teach your volunteers the techniques before they work with students.

Space needed: Set up five stations with a large table for each technique. These stations can stay up longer than the lesson and students can work at them when time allows. Teachers or volunteers should demonstrate techniques at each station before students begin.

Spiral cutting station

- Supplies:
- Water bottles
 - Scissors ——SAFETY FIRST – DO NOT CUT TOWARDS FINGERS!

Use the spiral cutting technique described in the “Grabber” section of this lesson to turn plastic bottles into long strips at least one inch wide that will be used by the trash kabob station.

Tearing fabric and cutting bags station

- Supplies:
- Plastic bags
 - T-shirts
 - Scissors

Tear and rip t-shirts into fabric strips no more than two inches wide. This is most easily done by snipping the end of the shirt with scissors to create a place to rip from. Cut plastic bags widthwise to create strips no more than two inches wide. These plastic and fabric strips will be used separately by the braiding station to create hair for our masks.



The time of thirty minutes for this section refers to the time it will likely take students to learn these skills. While it is possible that students may complete this work in one lesson, it is likely additional class time will be needed.

Braiding and knotting station

- Supplies:
- Fabric strips from T-shirt tearing station
 - Plastic strips created from plastic bags

Tie three fabric or three plastic strips together and braid them until you run out of material. Leave enough to tie at the finished end and complete the braid. It may be helpful to work with a partner to hold the knotted end of the strips while they are being braided. Do not mix the plastic with the fabric in the braid. These two materials must remain separate.

Teaching braiding – If students are not familiar with braiding, here is one way to explain it: There are three strands of material, one on each side and one in the middle. The ones on the outside are always arguing with the one in the middle, alternating sides say, “No I want to be in the middle!”, and jump over the middle strand into the middle. Then the other one says, “No I want to be in the middle!”, and jumps over. The argument continues until the strands are all braided and they say, “Wow, look what we made by working together!”

Teaching Knotting - Knotting the fabric rather than braiding can be an effective alternative for anyone challenged by braiding. Simply tie two strands together, overlap over and under and pull tight, then repeat. These knotted strips can add a nice texture to the hair.

Ribbon kabob station

- Supplies:
- Spiral cut plastics from spiral cut station
 - Sixteen penny nails to create holes in the plastic
 - Styrofoam to punch into
 - Pre-cut 12 inch sections of 17 gauge wire, looped and twisted on one end

Use a nail to punch holes into the spiral cut plastic strips in a repeated sequence, 2-3 inches apart. Use a pre-cut 12 inch section of 17 gauge wire with a loop on one end as a needle and thread the wire through the holes, (down up down up down up, etc.) Continue threading plastic strips onto the wire until the plastic is tightly bunched. Finish this kabob by creating a loop on the open end to hold the plastic on.

Option: create flat kabobs in addition to the ribbon kabobs. There are several types of trash kabobs. We just created a ribbon kabob. Try the others to see which you prefer to use on your mask. To create flat kabob, cut the spiral cut plastics into diamonds or squares and thread each piece separately like a bead.

Attachment station

- Supplies:
- Braids and kabobs from the other stations
 - Cardboard masks cut outs with eyes attached
 - Paperclips bent into U shapes or two to three inch sections of 17 gauge wire
 - Sixteen penny nails
 - Styrofoam to punch into

In this station, use the buttonhole technique described in the “Set-Up” section to attach the braids and kabobs to the cardboard blanks as hair. We are creating two masks with two distinct sets of material. For one masks, use only plastic materials. For the other, used only cardboard and fabric.

Assessment (Outcome 1 and 2) Students successfully braid two sections of hair, spiral cut a water bottle and make one “trash kabob” from repurposed materials, focusing on how to create intentional lines by processing materials.



During this lesson students learned how to be resourceful by using objects usually thrown away to create art supplies.

IV. Conclusion and Review (5 min.)

During this lesson students learned how to be resourceful by using objects usually thrown away to create art supplies. They practiced techniques used by Washed Ashore to create community art and began to create the giant masks they will focus on for the rest of the art lessons in this unit. Finishing the hair for both masks may take more time than is allowed for in this lesson. If that is the case, leave stations set up in the back of the class for students to work at independently or arrange for an additional lesson with these stations.

Assessment (Outcome 1, 2, and 3) Students work together to complete the hair of both masks using repurposed materials while keeping design elements and principles in mind.

V. Follow-up Activities

a. Repurpose Your Own Debris

Work with students to craft a letter about recycling and reusing items that you can send home to parents. Emphasize the positive aspects of the projects we have been working on in class and try to stay away from negative or judgmental language. Ask parents to help students collect and clean items that were bound for the trash so that students can create their own recycled art project at home. After students' projects are complete, ask them to bring them into class and have a recycled art show. If students need ideas and inspiration, watch Washed Ashore's, "The Making of Turtle Ocean." This video details the process of Angela Pozzi creating a Washed Ashore exhibit for the Smithsonian National History Museum.

Assessment (Outcomes 2 and 3) When students present their work to the class, ask them go through the process of what they used, how they chose their materials, and the idea behind their art. Have the students talk about the techniques and design ideas they used and if they used any of the ideas from the mask lessons.



**Resourcefulness:
Creating
something of
value out
of something
seemingly
worthless.**

VI. Additional Resources

a. Sources

- **NOAA Marine Debris:**
<http://marinedebris.noaa.gov/>
- **United Nations World Ocean Assessment:**
<http://worldoceanassessment.org/>
- **Washed Ashore**
www.washedashore.org
- **YouTube, The Making of Turtle Ocean**
https://youtube.com/watch?v=E4V_RZ-p9-Y

b. Vocabulary

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

Line: A line is a path that we can visually follow. Lines create the boundaries of shapes and forms.

Process Materials: Change the form of objects by cutting, folding, compressing, or other techniques.

Resourcefulness: Creating something of value out of something seemingly worthless.

Language of the Arts: At Washed Ashore, we believe that the arts are a language that can be learned and used to communicate with, just as any other language can be with practice. In visual art, design elements are the letters of this language, and design principles are the words.

Design elements: The building blocks of visual art, which include line, shape, form, color, texture, space, etc.

Design principles: These are ways to arrange the building blocks which include repetition, pattern, balance, movement, focal point, contrast, unity, etc.

Materials: Items or substances used to create visual art.

Techniques: Methods of creating visual art including painting, drawing, sculpting, photography, weaving, etc.

Expression: The underlying ideas, issues, and moods communicated through visual art.



2016 Washed Ashore Fact:

Plastic pollution is becoming one of the most common items in the sea and has entered the bottom of the ocean food chain.

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:

National Core Art Standards

Creating: Conceiving and developing new artistic ideas and work.

- **Anchor Standard #1:** Generate and conceptualize artistic ideas and work.
- **Anchor Standard #2:** Organize and develop artistic ideas and work.
- **Anchor Standard #3:** Refine and complete artistic work.

Presenting (visual arts): Interpreting and sharing artistic work.

Producing (media arts): Realizing and presenting artistic ideas and work.

- **Anchor Standard #4:** Analyze, interpret, and select artistic work for presentation.
- **Anchor Standard #5:** Develop and refine artistic work for presentation.
- **Anchor Standard #6:** Convey meaning through the presentation.

Responding: Understanding and evaluating how the arts convey meaning.

- **Anchor Standard #7:** Perceive and analyze artistic work.
- **Anchor Standard #8:** Interpret intent and meaning in artistic work.
- **Anchor Standard #9:** Apply criteria to evaluate artistic work.

Connecting: Relating artistic ideas and work with personal meaning and external context.

- **Anchor Standard #10:** Synthesize and relate knowledge and personal experiences to make art.
- **Anchor Standard #11:** Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.



With Support from N.O.A.A.

Integrated Arts Marine Debris Curriculum
Art Lessons PowerPoint



Integrated Arts Marine Debris Curriculum

Art Lessons PowerPoint

Lesson 2 (slides 3-7), Color

Lesson 5 (Slides 8-9), Texture

Lesson 9 (slides 10-14), Line

Lesson 11 (slides 15-25), Mosaic



THE BIG EIGHT
BRAND COLORS
PSYCHOLOGY BEHIND COLORS

THE BIG EIGHT
BRAND COLORS
 PSYCHOLOGY BEHIND COLORS

RED: Red is the color of fire and blood, so it is associated with energy, war, danger, strength, power, determination as well as passion, desire, and love.



ORANGE: Orange combines the energy of red and the happiness of yellow, it is associated with joy, sunshine, and tropics.



BLACK: Black is associated with power, elegance, formality, death, evil, and mystery.



YELLOW: Yellow is the color of sunshine. It's associated with joy, happiness, intellect, and energy.

WHITE: White is associated with light, goodness, innocence, and purity. It symbolizes safety, purity, and cleanliness. In heraldry, white depicts faith and purity.



GREEN: Green is the color of nature. It symbolizes growth, harmony, freshness, and fertility.

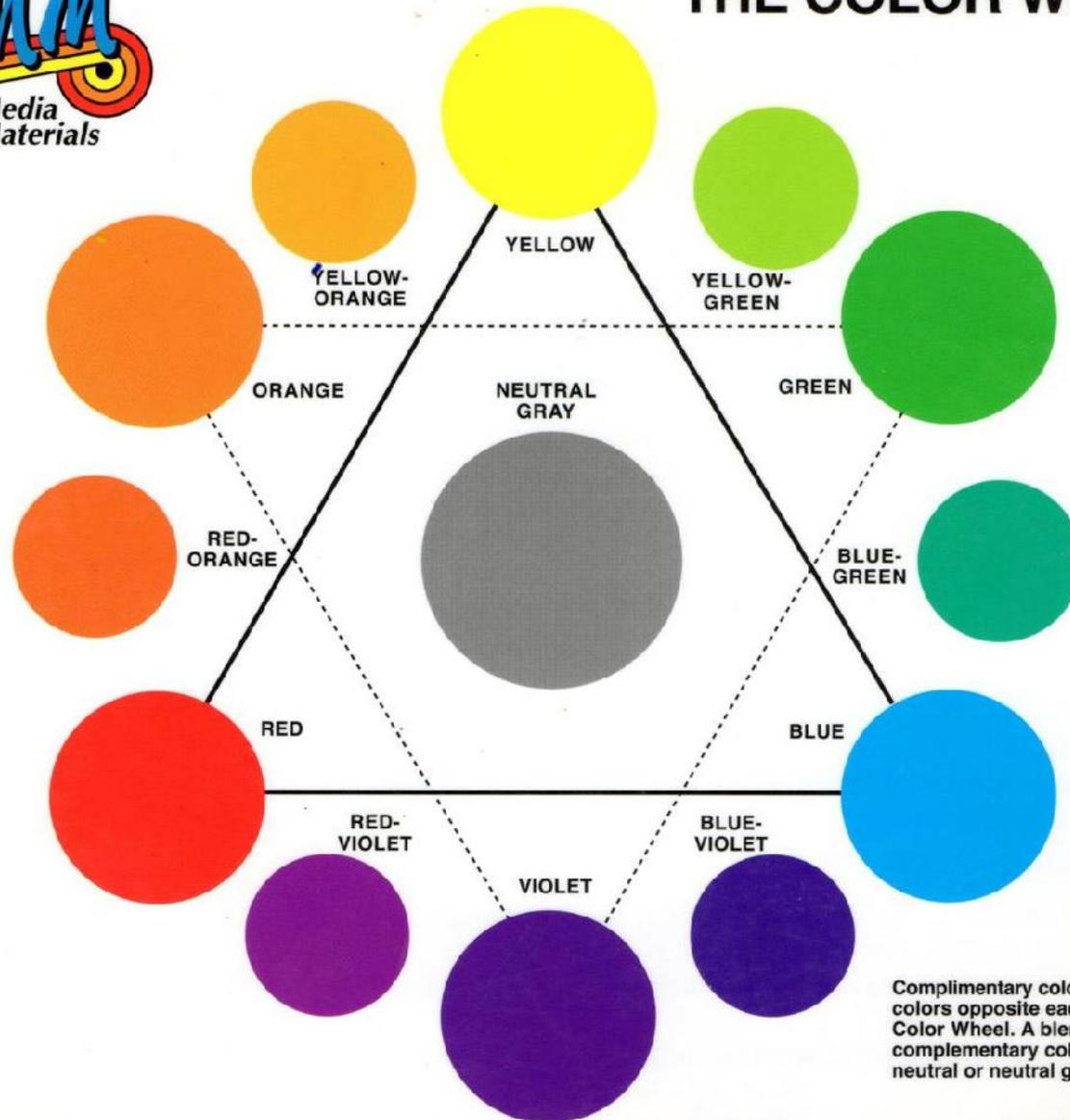


PURPLE: Purple combines the stability of blue and the energy of red. Purple is associated with royalty. It symbolizes power, nobility, luxury, and ambition.

BLUE: Blue is the color of the sky and sea. It is often associated with depth and stability. It symbolizes trust, loyalty, wisdom, confidence, intelligence, faith, truth, and heaven.



THE COLOR WHEEL



Complimentary colors are any two colors opposite each other on the Color Wheel. A blend of any two complementary colors is called a neutral or neutral gray.

PRIMARY COLORS

Red
Yellow
Blue
(Shown by solid line triangle)

SECONDARY COLORS

Orange
Green
Violet
(Shown by broken line triangle)

INTERMEDIATE COLORS

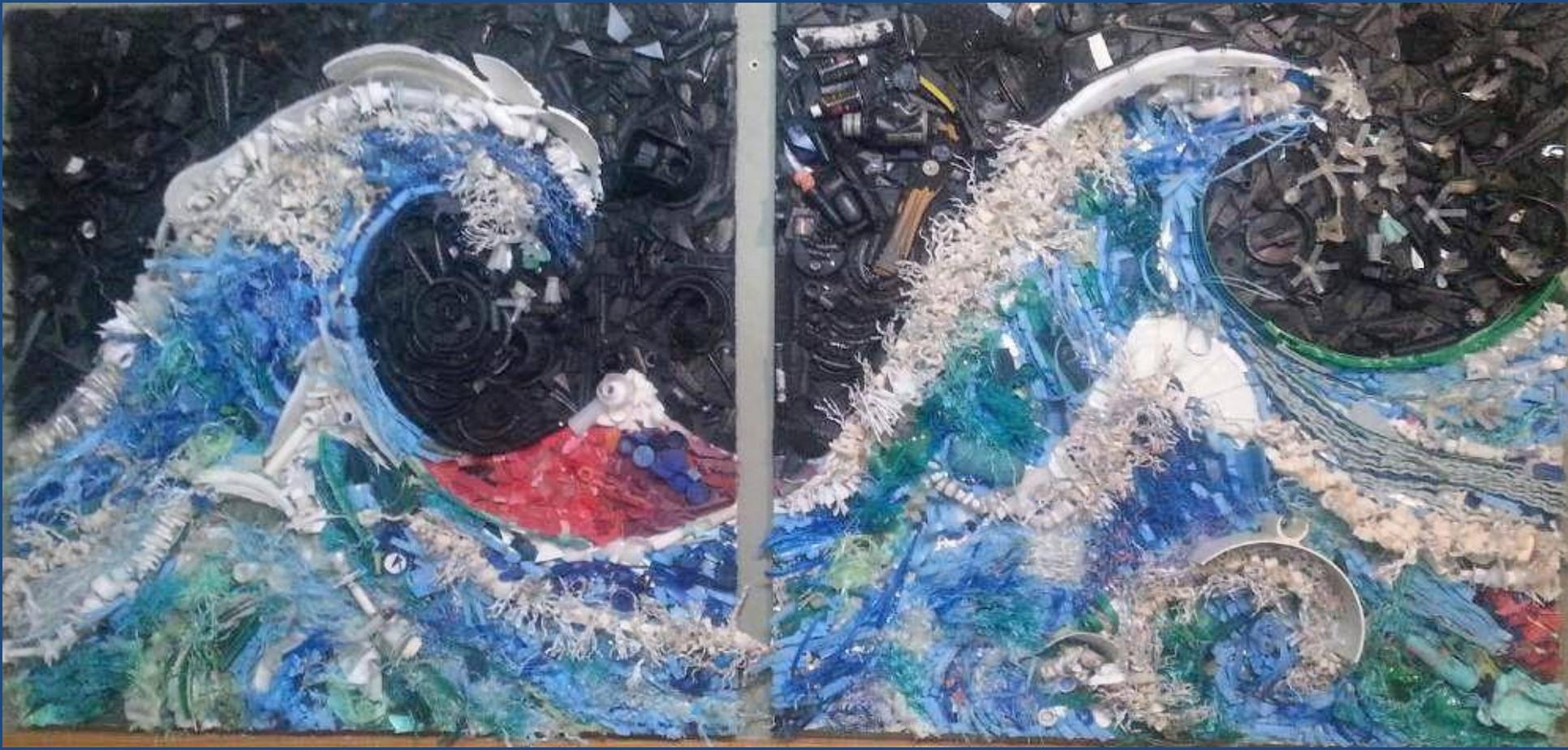
Red-Orange
Yellow-Orange
Yellow-Green
Blue-Green
Blue-Violet
Red-Violet

MIXING PRIMARIES

Magenta
Yellow
Turquoise Blue



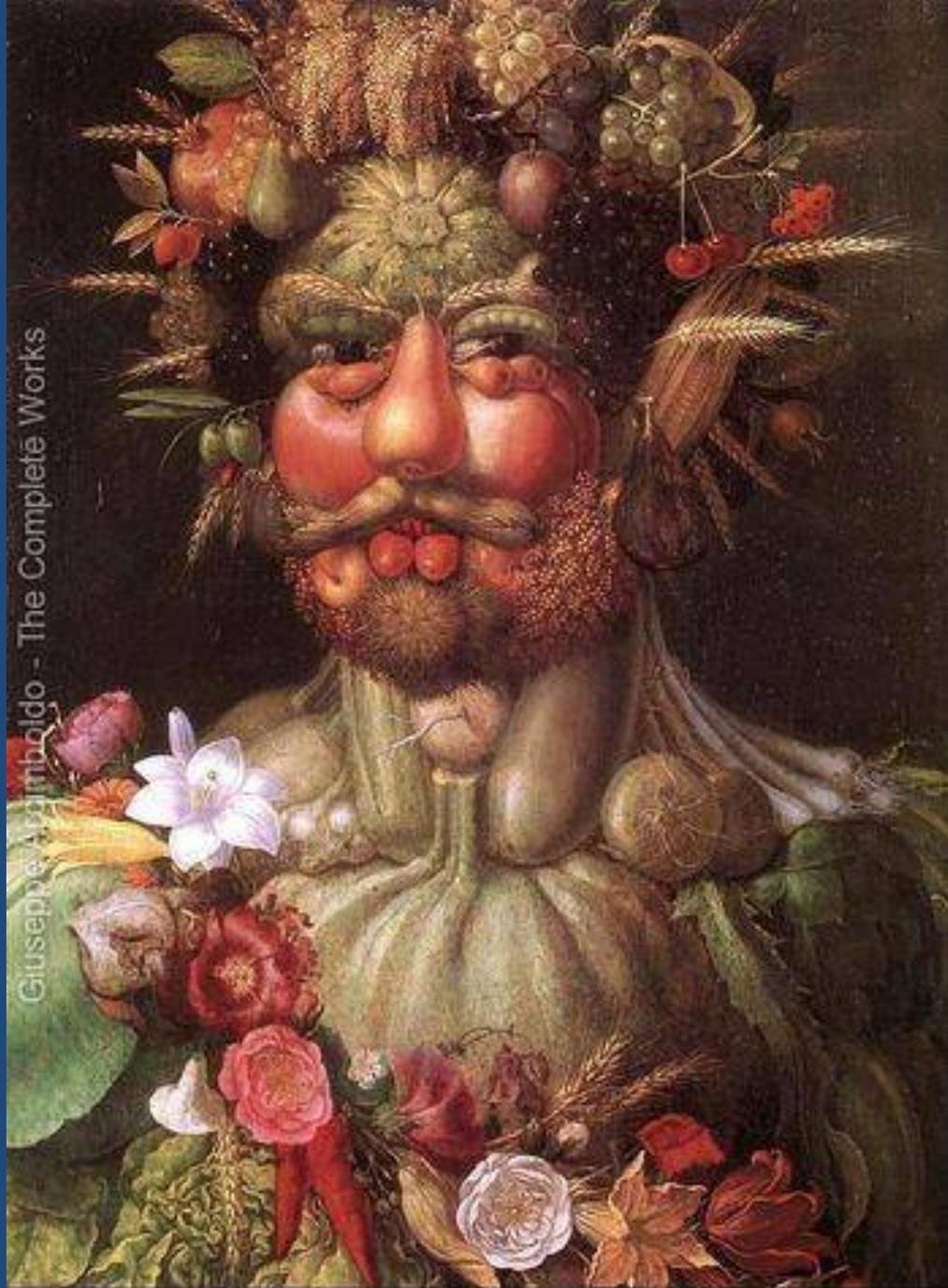
“Sunset Beach” by Washed Ashore



“Tsunami Waves” by Washed Ashore



Giuseppe Arcimboldo - The Complete Works



Giuseppe Arcimboldo - The Complete Works

courtesy of www.giuseppe-arcimboldo.org



WashedAshore.org

This is the debris yard at the Washed Ashore processing facility, where we store thousands of water bottles and other debris that has washed up on beaches.



Washedashore.org

This is the future bell of a jellyfish made of marine debris. To create Washed Ashore Jellyfish, hundreds of water bottles are processed into the shapes and lines needed for the sculptures. Each jelly is created by Washed Ashore volunteers working together.



Look at how many different ways water bottles are used in this sculpture.

Every part of the bottle creates a part of this jellyfish through the process of cutting and stitching parts and stringing bottles together wire.

Can you identify other materials that have been process to create parts of this jelly?



WashedAshore.org

Giant sea anemones are created by stuffing, stringing and cutting water bottles in order to form distinct lines. .



How many ways do you see water bottles used here? Can you find three jellies that used spiral cut bottles? How has processing the bottles changed the type of lines they can create?



Car parts, lids, crates and trays found on the beach were used by Washed Ashore to create a giant salmon. Using the mosaic technique helped to make this possible.





WashedAshore.org

Many Washed Ashore Sculptures use mosaic technique by taking items that are too big to work with and breaking them down into small pieces that can be used to create specific colors, textures, lines, and patterns.

Lots of people can work together to create mosaic art.

Over 600 people made small parts of Nora the Salmon.



All photos courtesy of Washed Ashore



WashedAshore.org

A closeup view shows how individual panels combined to create the scales of the fish.

The colors in the body were repeated on the head and fins to create unity with the design.



WashedAshore.org



This is Nora
The Salmon

Notice the
blending of
color from
all the
different
materials.

We will also
be blending
colors to
create the
skin or our
giant masks.



This mosaic mask was made by a high school student in a Washed Ashore workshop.

Small bits of beach plastics were glued onto a plaster tape mask form. Sand was added for effect.



Photo © 2006 Branislav L. Mantchev

Frieze with Masks Mosaic, House of the Faun in Pompeii, Italy

Mosaic technique has been used for centuries all around the world. What type of expression does this mask seem to have? .

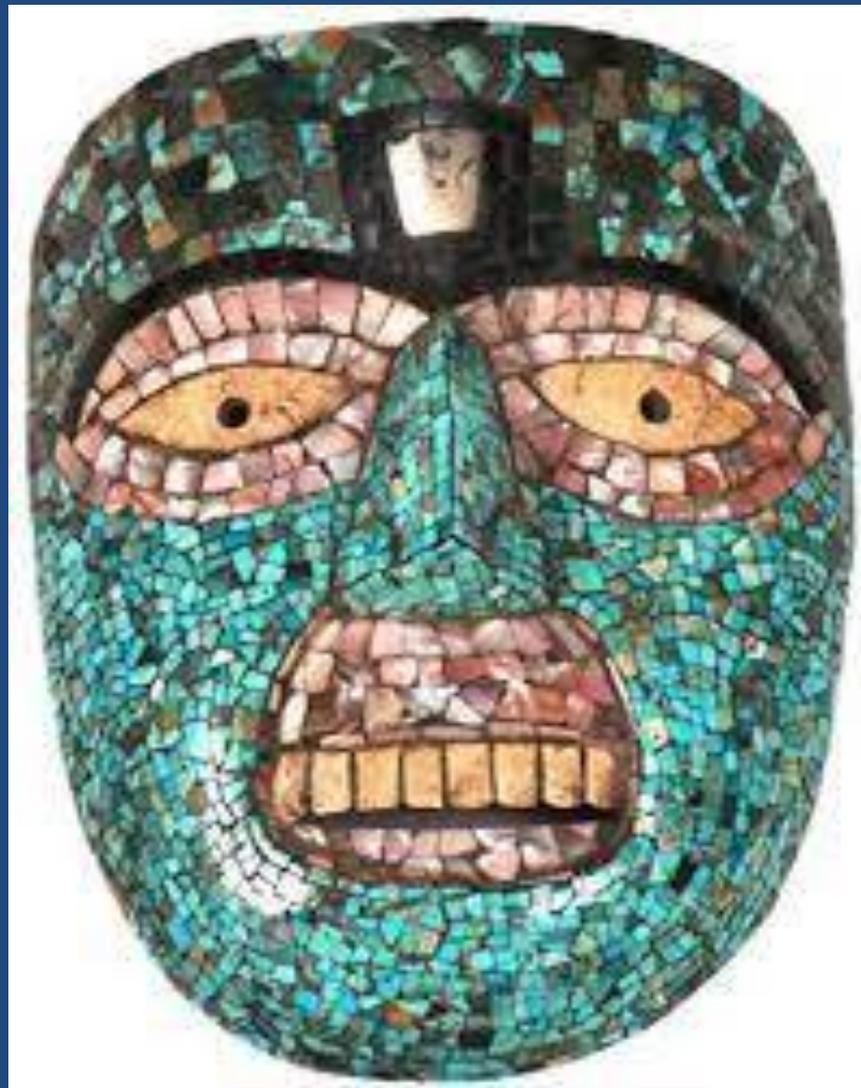


Theatrical masks of Tragedy and Comedy. Mosaic, Roman Mosaic 2nd century
Mosaic technique was used on buildings with stone and glass. Can you tell which one is Comedy and which is Tragedy? Look at their mouth shapes and eyebrow lines.

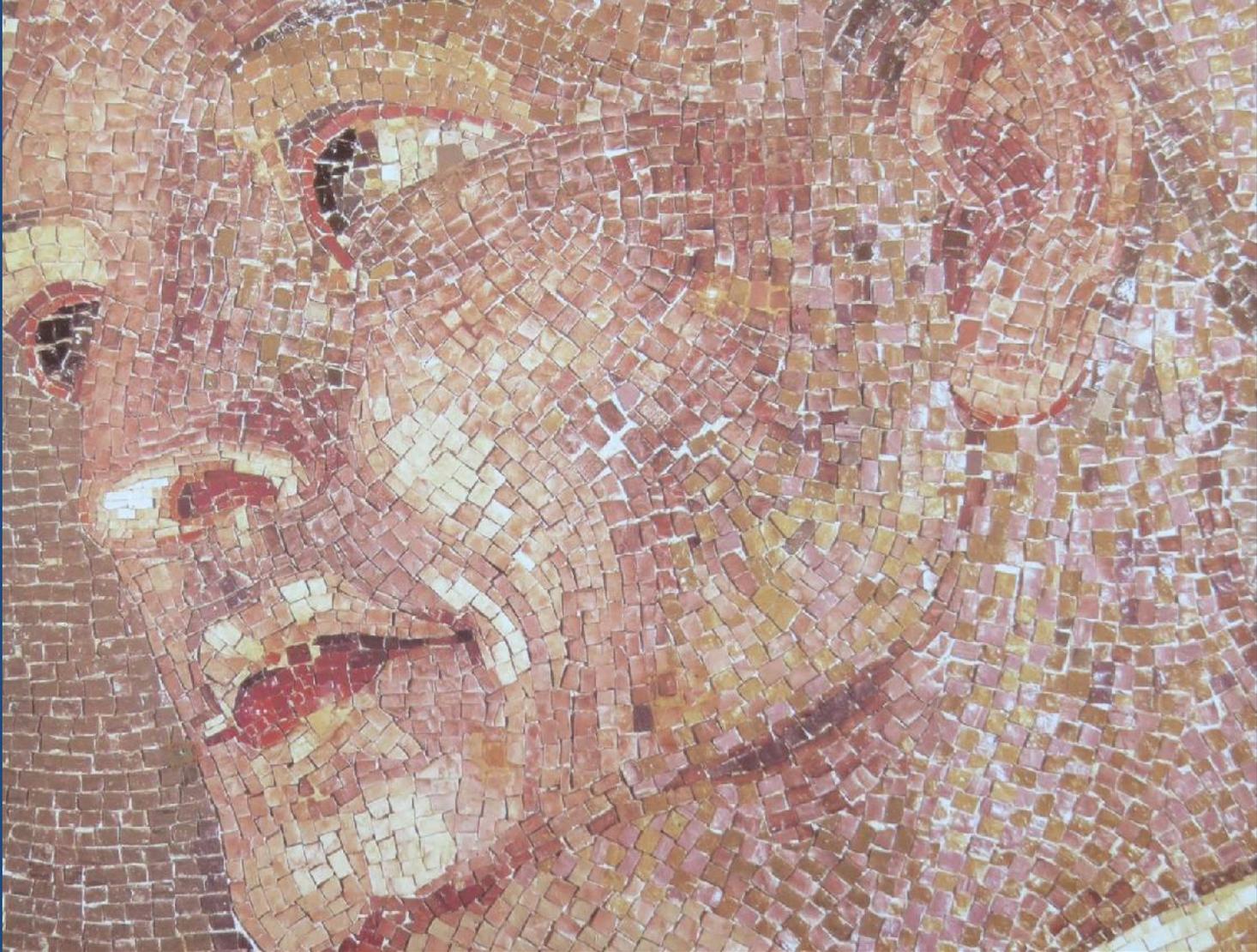


A turquoise mosaic mask representing Xiuhtecuhtli, the Aztec god of fire, 1400-1521

Notice the way the stone is laid around the eyelids, nose and mouth. Lined up shapes can be used to emphasize an expression or part of the face.



Mixtec mosaic mask, c. 1000 AD , Made with cedar wood with turquoise, malachite, obsidian and other ornamental stones. Notice that the lines of stones follow the outside shapes of the the eyes and mouth. Where do you see repetition of colors and shapes? Notice the symmetrical balance.



5th Century representation of St. Bernard of Clairvaux, Crypt of St Peter's Church, The Vatican.

Slight variations in color can help to show shading and lines in the face. Look at how the entire face is filled in with very small shapes. You will be using the same idea of skin tones and showing a difference in color value from nose to cheeks when you make the giant masks.



The creation of this curriculum has been funded in part through a N.O.A.A. Outreach and Education Grant.

Lesson 11: Divide and Conquer!

Description: An introduction to using mosaic technique to create community art.





**Upon completion
of this lesson
students will be
able to:**

**Work together
to create a
work of
community art.**

Concepts:

1. Mosaic technique has been used for centuries.
2. Using mosaic technique enables artists to stretch limited resources.
3. Everyone working together can make big things happen.

Outcomes:

Upon completion of this lesson students will be able to:

1. Describe the history of mosaic technique.
2. Demonstrate use of the mosaic technique.
3. Work together to create a work of community art.

Outline:

- I. Set up (20 min.)
 - II. Introduction (5 min.)
 - a. Learner Level Assessment
 - b. Behavior Guidelines
 - III. Using Mosaic Technique (35 min. See timing note in this section)
 - a. Use of Mosaic Technique by Washed Ashore and Earlier Artists
 - b. Technique Stations
 - IV. Conclusion and Review (5 min.)
 - V. Follow-up Activities
 - a. Modern Mosaic Artists
 - b. Mini Mosaics
 - VI. Additional Resources
 - a. Sources
 - b. Vocabulary
-



The plastic mask represents the habits of the throwaway lifestyle that have resulted in plastic pollution in nearly every ecosystem on earth.

I. Set up (20 min.)

Background:

Masks have been made from various materials in many cultures over thousands of years. They have been used for protection, disguise, entertainment, rituals, storytelling, to scare off enemies, in ceremonies and in theaters. They have also been used as symbols of certain attributes of people, animals or ancestors.

Through this curriculum, we are going to create a giant plastic mask and a giant eco mask. The plastic mask represents the habits of the throwaway lifestyle that have resulted in plastic pollution in nearly every ecosystem on earth. The eco mask represents the alternatives to the throwaway habits that can stop plastic pollution at its source. These masks will serve as reminders in the classroom to create earth friendly habits.

In this lesson, we will continue working on the masks by creating the skin and noses for both.

The lesson requires a screen and projector to show visuals to the class. Before this lesson, make sure to download the Art Lessons IAMDC PowerPoint. You will be using slides 15 through 25.

In order to prepare for this lesson, all activities from lesson nine need to be complete. Lesson eleven will focus on finishing the masks that were started in that lesson.

Materials:

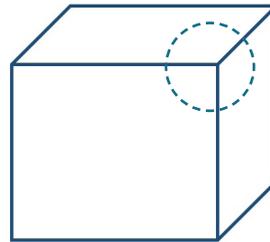
- **Cardboard masks with hair and eyes attached and mouth sketched in**
- **Additional cardboard to create mask noses**
- **Thin cardboard boxes and packaging materials (cereal boxes, egg crates, tissue boxes, etc.)**
- **Thin plastic containers (yogurt/dairy containers, takeout containers, etc.)**
- **Strong sharp scissors**
- **White school glue**
- **Acrylic latex caulk plus silicone in a squeeze tube***
- **1 Large rock**
- **1 Jar of gravel**

* For this we recommend Alex Plus Acrylic Latex Caulk Plus Silicone. It is relatively inexpensive, safe to use, easily found in a squeeze tube, and works well on plastic. You can view the material safety data sheet for more information on use recommendations. **White school glue does not work on plastic.**

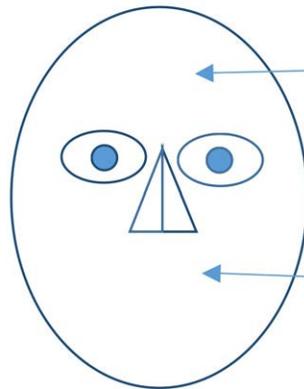


Before this lesson, create the noses of the masks.

Before this lesson, create the noses of the masks. In order to do this, cut cardboard triangles of an appropriate size for the masks' noses. Bend these triangles in the middle to create a 3D pyramid shape. Another option for creating the noses is to cut the corner out of an intact box to create your pyramid shape, like this:



Use the buttonhole technique from lesson nine to attach this piece of cardboard at the top and on each side. Before this lesson, your masks backgrounds should look something like this:



You should also have hair attached here before this lesson.

Sketch a mouth on your mask that won't be covered using mosaic technique.*

*The mouth you sketch does not necessarily need to show the final expression your mask will have, but will act as a placeholder. In general, the plastic mask will have an unhappy expression and the eco mask will have a happy one. Sketching a smile on one and a frown on the other will help to properly attach mosaic materials around the mouths. We will finalize the expressions in lesson twelve.

PLEASE NOTE: DURING THIS LESSON, PARENT OR COMMUNITY VOLUNTEERS WILL BE NEEDED TO HELP AT EACH STATION. A MINIMUM OF 4 ARE REQUIRED TO HELP TEACH TECHNIQUES AND MONITOR SAFETY.



Mosaic technique uses materials that may be difficult to create art from by breaking them up into color and texture palates.

II. Introduction (5 min.)

a. Learner Level Assessment

As an introduction to mosaic technique, we are going to take students back to another time in which nobles commissioned artist to create their likenesses from available materials.

Stand in front of the class, put on a hat, and hold up a large rock. Proclaim to the class, "I am the (king or queen) of (school's name) and want you to use this rock to create a portrait of me. By the end of the day, I want to hang it on my wall!" Ask students to strategize on how they are going to do this.

After a few minutes of stomping around the room in the king or queen role and scoffing at ideas, take off the hat and step out of the role. Hold up a jar of gravel and ask the class if doing this to the rock would help. Mosaic technique uses materials that may be difficult to create art from by breaking them up into color and texture palates.

Another advantage of mosaic technique is that it allows many artists to work together. This enables much faster work than one artist could do alone. Test/demonstrate the idea that many hands make light work with students. Challenge ten students to a race to prep materials for our mosaic technique activities.

Using two equal size pieces of thin cardboard, (egg cartons are preferred because the color works well when used on cardboard) challenge the group of students to see if they can prepare materials faster than you. The goal is to tear the cardboard piece into half inch to one inch squares. Build this up for effect, let them know you're a cardboard tearing champion. Conduct the race. Students should beat you by a fair amount. Let them know we are going to use this concept, that many hands make light work, to do our mosaic work later in the lesson.

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. In this lesson, students will be using scissors. Sharp scissors will work best and can be dangerous if students are not familiar with how to use them. If they don't have much experience with scissors, or if you're teaching this lesson to younger students, you may want to go through scissor etiquette and technique when you reach that point in the lesson.

Scissor etiquette and technique points include:

- Don't ever cut toward your hand.
- If possible, keep the material you're cutting stretched tight.
- It will be easier to cut with scissors using the back of the blade, closest to the handle.

Students will also be using nails to poke holes in cardboard. Discuss keeping hands out of the way of the sharp end of the nail.

Remind students to be especially respectful of their classmates' ideas and opinions by trying not to alter other people's ideas with their own. Art can and will affect people differently, and this should be allowed.



**Community art
is about
everyone
working together
towards a
common purpose
and putting
all the small
parts together to
form a whole.**

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541-329-0317
325 2nd St. SE,
Bandon, Oregon 97411

III. Using Mosaic Technique (35 min. See timing note below)

Timing note: the goal of this lesson is to help students learn techniques that will be used to create the giant masks and also to attach their created materials to the cardboard masks blanks. The time of thirty-five minutes for this section refers to the time it may take students to learn these activities. While it is possible that students may complete this work in one lesson, it is likely additional class time will be needed to complete this stage of the mask before the next lesson of this unit. Plan two to three class periods for this lesson.

a. Use of the Mosaic Technique by Washed Ashore and Earlier Artists

Background Knowledge:

The Washed Ashore project relies on thousands of volunteers to work on many small parts of the large sculptures. Washed Ashore staff often cut large pieces of plastic into smaller pieces to spread the color and texture over a large surface. Community art is about everyone working together towards a common purpose and putting all the small parts together to form a whole.

Mosaic Technique has been used by many different cultures for thousands of years. Some countries have whole buildings made of mosaic ceramic tiles, glass pieces or stone. Rocks, shells, and wood are often still used. In the last few hundred years, broken ceramic dishes and glass were repurposed into mosaics for decorative and functional purposes. Mosaic faces have been part of large murals in buildings, and used for storytelling and decoration. In addition to spreading out the resources, mosaic is often used to create an overall texture or pattern to the work of art. Repeated texture creates unity.

Use slides 15 through 25 of the Art Lessons IAMDC PowerPoint to show how the Washed Ashore Project uses mosaic technique and how it has been used throughout history.

Assessment (Outcome 1) Discuss the history and function of the mosaic technique as a class

b. Technique Stations

Students will rotate between four stations to create materials and attach them to the giant masks to form skin.

PLEASE NOTE: PARENT OR COMMUNITY VOLUNTEERS WILL BE NEEDED TO HELP AT EACH STATION. A MINIMUM OF 4 ARE REQUIRED TO HELP TEACH TECHNIQUES AND MONITOR SAFETY.

Space needed: Set up four stations with a large table for each technique. These stations can stay up longer than the lesson and students can work at them when time allows.

NOTE: This project can be set up like a factory assembly line in which each person does one job over and over rather than each person doing all the different jobs and rotating between stations.

NOTE: The mouths of the masks will be created in lesson twelve. Leave space for them when using the mosaic technique to create the background.



**Good
craftsmanship
means materials
are well attached
and thoughtfully
spaced.**

Teachers or volunteers should demonstrate techniques at each station or assembly line step before students begin.

Cardboard tearing station

Supplies:

- A variety of brown tones of cardboard, egg cartons, cereal boxes, and paper packing for the skin tone of the Eco Mask.

Tear cardboard into squares and rectangles no larger than one by one inch. Create a demo set of pieces for students to refer to. Pieces should be a variety of sizes, but should have clean edges. Separate different shades/tones of cardboard into different piles.

Cardboard attachment station

Supplies:

- Cardboard pieces from the cardboard tearing station
- Cardboard giant mask with recycled paper eyes and braided cotton hair
- White school glue

Use a minimum amount of glue to attach pieces keeping these points in mind:

1. Have the background color of the cardboard show as a thin line around each piece applied to the face. This creates a unified line of color throughout the mask.
2. Use the various shades of color, and textures to outline the eyes, and nose. Start by attaching one color of cardboard all around the eyes in a mosaic line and then add more lines going from the center out. Use the same technique for the eyebrows.
3. Select one type of material or color of material for the nose that is a just slightly different than the rest of the face.
4. Good craftsmanship means materials are well attached and thoughtfully spaced.
5. Attaching any writing side down may help eliminate a chaotic look to the masks. Otherwise be selective to use only two colors of writing showing and use it as a design feature to outline a feature of the face.

NOTE: Have the group decide on a strategy for using the various tones of cardboard before they get started so there are no disagreements along the way. Teach collaboration and cooperation.

Plastic preparation station

Supplies:

- A variety of tones of white thin plastic, dairy containers, and plastic packaging for the skin tone of the Plastic Mask.
- Scissors

Use the spiral cut technique from lesson nine to create long strips of plastic roughly one inch in width. Cut plastic into squares and rectangles no larger than one by one inch. Create a demo set of pieces for students to refer to. Pieces should be a variety of sizes. Separate different shades/tones of plastic into different piles.



Have the group decide on a strategy for using the various types of white plastic before they get started so there are no disagreements along the way.

Plastic attachment station

Supplies:

- Plastic pieces from the plastic preparation station
- Plastic giant mask with homemade plastic eyes and braided plastic hair
- Acrylic latex caulk plus silicone in a squeeze tube*

* For this we recommend Alex Plus Acrylic Latex Caulk Plus Silicone. It is relatively inexpensive, safe to use, easily found in a squeeze tube, and works well on plastic. You can view the material safety data sheet for more information on use recommendations. White school glue does not work on plastic.

Use a minimum amount of glue to attach pieces keeping these points in mind:

1. Have the background color of the cardboard show as a thin line around each piece applied to the face. This creates a unified line of color throughout the mask.
2. Use the various shades of color, and textures to outline the eyes, and mouth.
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NOTE: Have the group decide on a strategy for using the various types of white plastic before they get started so there are no disagreements along the way. Teach collaboration and cooperation.

Assessment (Outcome 2) Students successfully use the mosaic technique to create the background/skin of two masks.

When all glue and caulk has dried, hold the masks up to get perspective on the progress made. Look at the masks up close and at a distance. Does it look different? If so, why? As a class discuss the importance of perspective in mosaic.



When these two masks are finished we are going to use them to create a message about what we have learned about plastic and alternatives.

IV. Conclusion and Review (5 min.)

During this lesson, students learned about the use and history of the mosaic technique. They practiced the technique to create the background of the two giant masks. Finishing the backgrounds of both masks may take more time than is allowed for in this lesson. If that is the case, leave stations set up in the back of the class for students to work at independently or arrange for an additional lesson with these stations.

When these two masks are finished we are going to use them to create a message about what we have learned about plastic and alternatives. How we place their eyebrows and mouth and what type of expression we give them will make a difference.

Assessment (Outcome 3) Students work together to complete the backgrounds of both masks while keeping design elements and principles in mind.

Assessment (Outcome 3) Discuss as a class how the work we did in this lesson is similar or different than what Washed Ashore does when creating a sculpture.

V. Follow-up Activities

a. Modern Mosaic Artists

During the introductory slideshow of this lesson, we mainly looked at ancient mosaics. However, mosaic technique is still being used around the world to create art. In addition to the Washed Ashore artwork, research other modern mosaic artists like Emma Biggs, Saimir Strati, or Sonia King.

Assessment (Outcome 1) Have students present one work of a modern mosaic artist to the class. Ask them to describe the design elements and principles used to create it and, if possible, the artist's intent.

b. Mini Mosaics

During this lesson, we practiced the mosaic technique to create the background of our large masks. Mosaic technique can also be used to create small works of art. Ask students to use the same material set used in class to create a personal sized mask. Discuss as a class what will need to change and what will stay the same as we shrink the scale of the work.

Assessment (Outcome 2) Students use mosaic technique to create a personal mask and present it to the class.



Community Art:
Art, often constructed through a conglomeration of small pieces brought together into a larger work, created through the collaboration of artist and volunteers based in a community location.

WashedAshore.org
541-329-0317
325 2nd St. SE,
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VI. Additional Resources

a. Sources

- **Emma Biggs**
<http://emmabiggsmosaic.net/>
- **NOAA Marine Debris:**
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- **Sonia King**
<http://mosaicworks.com/>
- **This is Marvelous, Saimir Strati**
<http://thisismarvelous.com/7-time-guinness-world-record-holder-saimir-strati-mosaic-artist/>
- **United Nations World Ocean Assessment:**
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- **Washed Ashore**
www.washedashore.org

b. Vocabulary

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

Community Art: Art, often constructed through a conglomeration of small pieces brought together into a larger work, created through the collaboration of artist and volunteers based in a community location.

Mosaic: "A surface decoration made by inlaying small pieces of variously colored material to form pictures or patterns." Merriam-Webster.

Language of the Arts: At Washed Ashore, we believe that the arts are a language that can be learned and used to communicate with, just as any other language can be with practice. In visual art, design elements are the letters of this language, and design principles are the words.

Design elements: The building blocks of visual art, which include line, shape, form, color, texture, space, etc.

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- 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:

National Curriculum Standards for Social Studies

- **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.

National Core Art Standards

Creating: Conceiving and developing new artistic ideas and work.

- **Anchor Standard #1:** Generate and conceptualize artistic ideas and work.
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Connecting: Relating artistic ideas and work with personal meaning and external context.

- **Anchor Standard #10:** Synthesize and relate knowledge and personal experiences to make art.
- **Anchor Standard #11:** Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.



With Support from N.O.A.A.

Integrated Arts Marine Debris Curriculum
Art Lessons PowerPoint



Integrated Arts Marine Debris Curriculum

Art Lessons PowerPoint

Lesson 2 (slides 3-7), Color

Lesson 5 (Slides 8-9), Texture

Lesson 9 (slides 10-14), Line

Lesson 11 (slides 15-25), Mosaic



THE BIG EIGHT
BRAND COLORS
PSYCHOLOGY BEHIND COLORS

THE BIG EIGHT
BRAND COLORS
 PSYCHOLOGY BEHIND COLORS

RED: Red is the color of fire and blood, so it is associated with energy, war, danger, strength, power, determination as well as passion, desire, and love.



ORANGE: Orange combines the energy of red and the happiness of yellow, it is associated with joy, sunshine, and tropics.



BLACK: Black is associated with power, elegance, formality, death, evil, and mystery.



YELLOW: Yellow is the color of sunshine. It's associated with joy, happiness, intellect, and energy.

WHITE: White is associated with light, goodness, innocence, and purity. It symbolizes safety, purity, and cleanliness. In heraldry, white depicts faith and purity.



GREEN: Green is the color of nature. It symbolizes growth, harmony, freshness, and fertility.

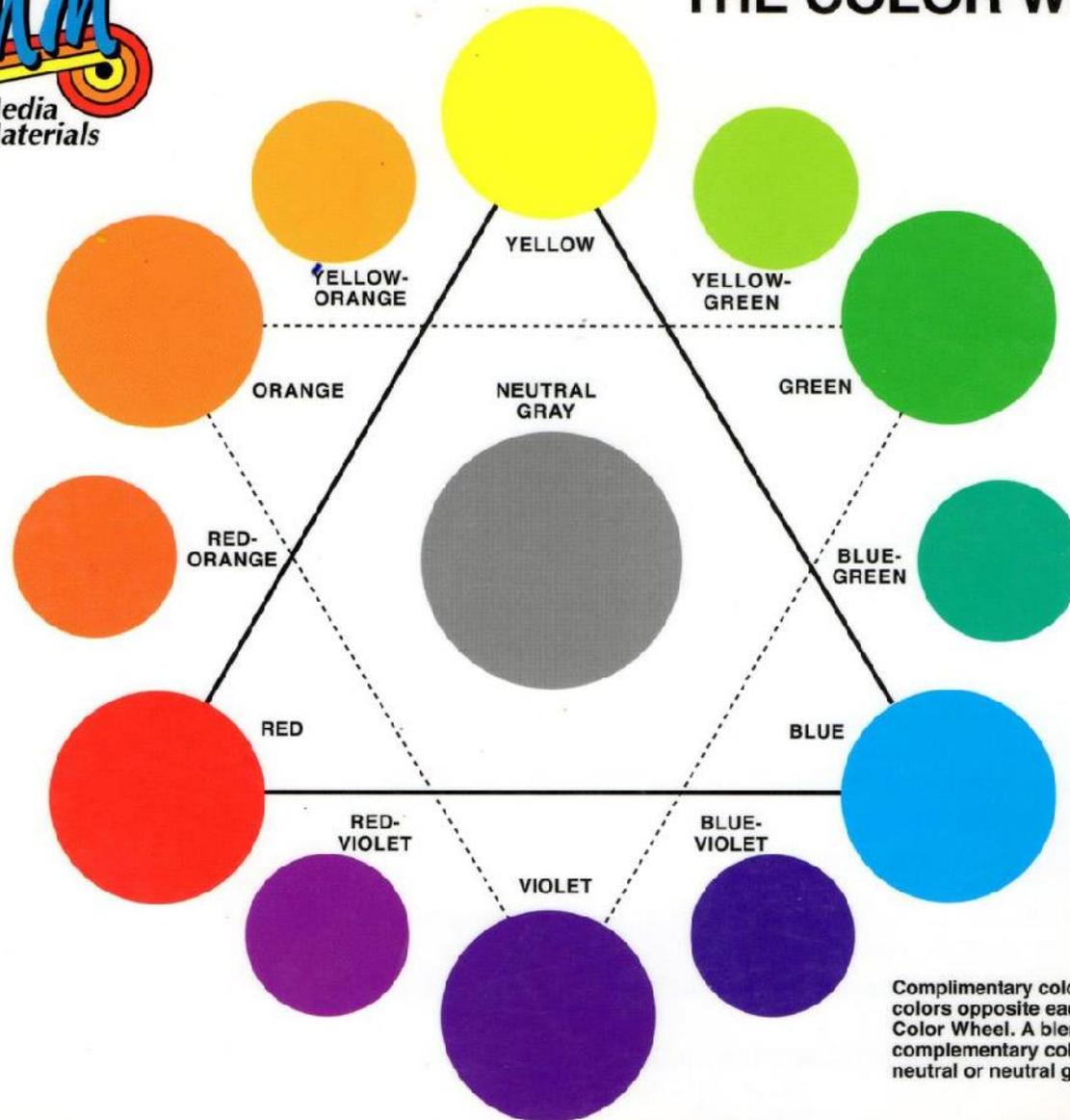


PURPLE: Purple combines the stability of blue and the energy of red. Purple is associated with royalty. It symbolizes power, nobility, luxury, and ambition.

BLUE: Blue is the color of the sky and sea. It is often associated with depth and stability. It symbolizes trust, loyalty, wisdom, confidence, intelligence, faith, truth, and heaven.



THE COLOR WHEEL



Complimentary colors are any two colors opposite each other on the Color Wheel. A blend of any two complementary colors is called a neutral or neutral gray.

PRIMARY COLORS

Red
Yellow
Blue
(Shown by solid line triangle)

SECONDARY COLORS

Orange
Green
Violet
(Shown by broken line triangle)

INTERMEDIATE COLORS

Red-Orange Blue-Green
Yellow-Orange Blue-Violet
Yellow-Green Red-Violet

MIXING PRIMARIES

Magenta
Yellow
Turquoise Blue



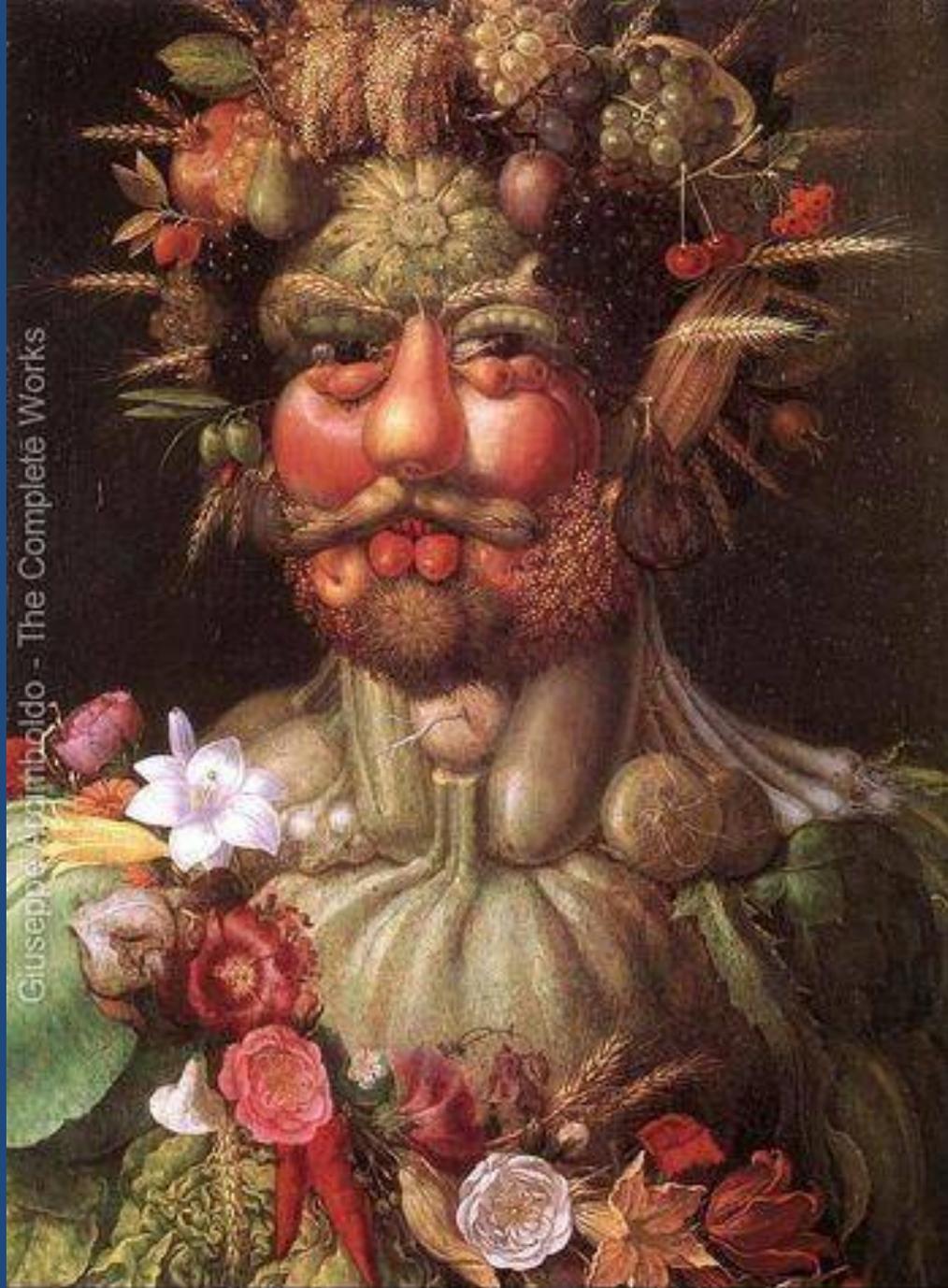
“Sunset Beach” by Washed Ashore



“Tsunami Waves” by Washed Ashore



Giuseppe Arcimboldo - The Complete Works



Giuseppe Arcimboldo - The Complete Works

courtesy of www.giuseppe-arcimboldo.org



WashedAshore.org

This is the debris yard at the Washed Ashore processing facility, where we store thousands of water bottles and other debris that has washed up on beaches.



Washedashore.org

This is the future bell of a jellyfish made of marine debris. To create Washed Ashore Jellyfish, hundreds of water bottles are processed into the shapes and lines needed for the sculptures. Each jelly is created by Washed Ashore volunteers working together.



Look at how many different ways water bottles are used in this sculpture.

Every part of the bottle creates a part of this jellyfish through the process of cutting and stitching parts and stringing bottles together wire.

Can you identify other materials that have been process to create parts of this jelly?



WashedAshore.org

Giant sea anemones are created by stuffing, stringing and cutting water bottles in order to form distinct lines. .



How many ways do you see water bottles used here? Can you find three jellies that used spiral cut bottles? How has processing the bottles changed the type of lines they can create?



Car parts, lids, crates and trays found on the beach were used by Washed Ashore to create a giant salmon. Using the mosaic technique helped to make this possible.





WashedAshore.org

Many Washed Ashore Sculptures use mosaic technique by taking items that are too big to work with and breaking them down into small pieces that can be used to create specific colors, textures, lines, and patterns.

Lots of people can work together to create mosaic art.

Over 600 people made small parts of Nora the Salmon.



All photos courtesy of Washed Ashore



WashedAshore.org

A closeup view shows how individual panels combined to create the scales of the fish.

The colors in the body were repeated on the head and fins to create unity with the design.



WashedAshore.org



This is Nora
The Salmon

Notice the
blending of
color from
all the
different
materials.

We will also
be blending
colors to
create the
skin or our
giant masks.



This mosaic mask was made by a high school student in a Washed Ashore workshop.

Small bits of beach plastics were glued onto a plaster tape mask form. Sand was added for effect.



Photo © 2006 Branislav L. Mantchev

Frieze with Masks Mosaic, House of the Faun in Pompeii, Italy

Mosaic technique has been used for centuries all around the world. What type of expression does this mask seem to have? .

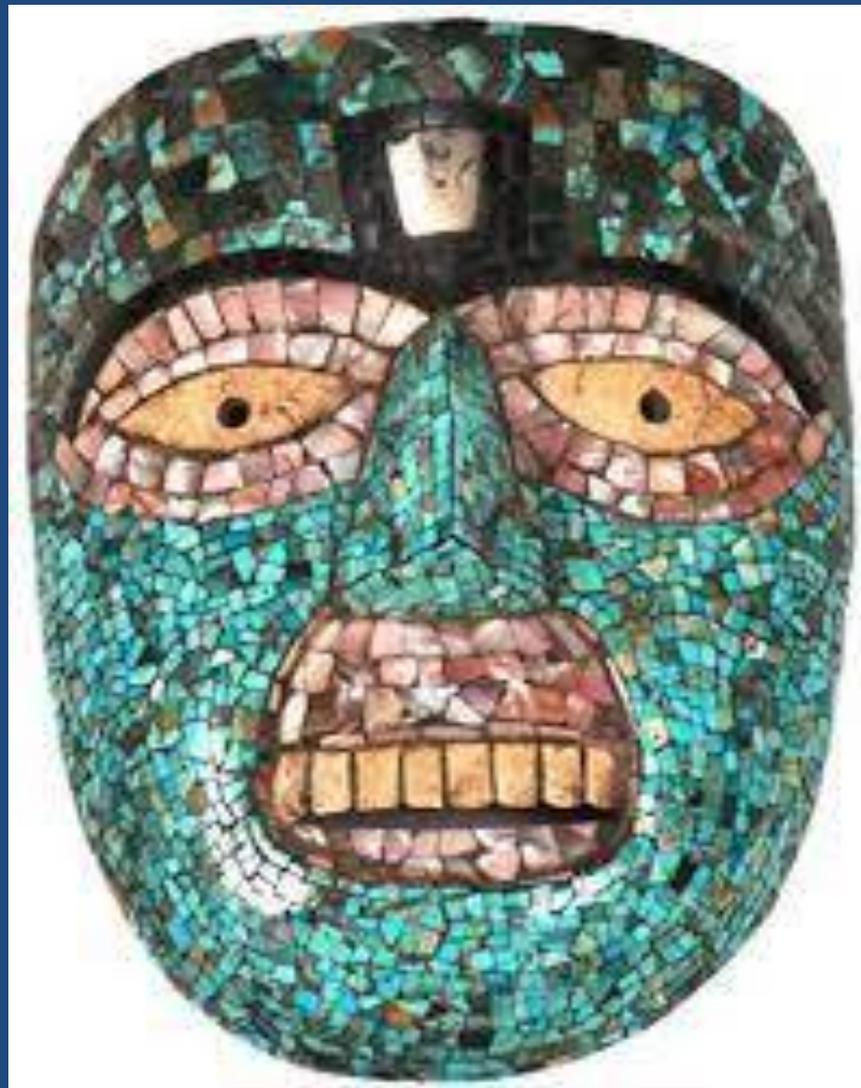


Theatrical masks of Tragedy and Comedy. Mosaic, Roman Mosaic 2nd century
Mosaic technique was used on buildings with stone and glass. Can you tell which one is Comedy and which is Tragedy? Look at their mouth shapes and eyebrow lines.



A turquoise mosaic mask representing Xiuhtecuhtli, the Aztec god of fire, 1400-1521

Notice the way the stone is laid around the eyelids, nose and mouth. Lined up shapes can be used to emphasize an expression or part of the face.



Mixtec mosaic mask, c. 1000 AD , Made with cedar wood with turquoise, malachite, obsidian and other ornamental stones. Notice that the lines of stones follow the outside shapes of the the eyes and mouth. Where do you see repetition of colors and shapes? Notice the symmetrical balance.



5th Century representation of St. Bernard of Clairvaux, Crypt of St Peter's Church, The Vatican.

Slight variations in color can help to show shading and lines in the face. Look at how the entire face is filled in with very small shapes. You will be using the same idea of skin tones and showing a difference in color value from nose to cheeks when you make the giant masks.



The creation of this curriculum has been funded in part through a N.O.A.A. Outreach and Education Grant.

Lesson 12: Culmination

Description: In this final lesson, the masks will be completed to use in creating a classroom conservation project.





Upon completion of this lesson students will be able to:

Use the giant masks as communication tools.

Concepts:

1. Faces show emotion through the direction and shape of the eyebrows and mouth.
2. The choices we make in the classroom affect what we add to the waste stream.
3. Art can be a powerful language to communicate ideas.

Outcomes:

Upon completion of this lesson students will be able to:

1. Use the eyebrows and mouths of the giant masks to show a particular emotion.
2. Assess classroom habits.
3. Use the giant masks as communication tools.

Outline:

- I. Set up (5 min.)
 - II. Introduction (5 min.)
 - a. Learner Level Assessment
 - b. Behavior Guidelines
 - III. Matching the Masks with the Message (35 min.)
 - a. What Can We Do
 - b. Finishing the Masks
 - c. Putting it All Together
 - IV. Conclusion and Review (5 min.)
 - V. Follow-up Activities
 - a. Join our Facebook!
 - VI. Additional Resources
 - a. Sources
 - b. Vocabulary
-



Before this lesson, the giant masks should be complete except for the mouths and eyebrows.

I. Set up (5 min.)

Background:

Masks have been made from various materials in many cultures over thousands of years. They have been used for protection, disguise, entertainment, rituals, storytelling, to scare off enemies, in ceremonies and in theaters. They have also been used as symbols of certain attributes of people, animals or ancestors.

Through this curriculum, we are going to create a giant plastic mask and a giant eco mask. The plastic mask represents the habits of the throwaway lifestyle that have resulted in plastic pollution in nearly every ecosystem on earth. The eco mask represents the alternatives to the throwaway habits that can stop plastic pollution at its source. These masks will serve as reminders in the classroom to create earth friendly habits.

In this lesson, we will finish these masks and decide how to use them to deliver reminders to create new habits.

The lesson requires a screen and projector to show visuals to the class. Students also need pencils and paper for brainstorming activities.

Before this lesson, the giant masks should be complete except for the mouths and eyebrows.

Materials:

- Tangerines or oranges
- Red plastic packaging (chip bags, wrappers, etc.) cut into roughly 1 inch thick strips
- 17 gauge wire (roughly ten feet)
- Wire cutters
- Two to four plastic bag braids*
- Two to four cotton T-shirt braids*
- Black cotton scrap material (enough to use for the background of the earth mask mouth)
- One large black plastic bag
- Several 16 penny nails
- Scrap large Styrofoam packing cubes
- Large paper clips (not scored) – to use as wire

* These braids should be the same color, size and texture that were used to make the hair. We'll be using them to make eyebrows in this lesson. Have a student or group create them before the lesson begins.



**In this lesson,
we will finish
these masks
and decide
how to use
them to deliver
reminders to
create new
habits.**

II. Introduction (5 min.)

a. Learner Level Assessment

Ask students to form pairs and let them know they will be taking part in an observation activity in which one student will make faces based on specified emotions and the other will observe those faces and make note of facial features. Both students will have the opportunity to fulfill both roles, but they should choose who will do what first. Call out one expression at a time (happy, sad, angry, shocked, etc.) for the face makers to make and the observers to observe and take notes on (these notes can be actual or mental). Be certain that the face-maker holds the expression long enough for the teacher to guide the observers with questions such as, “Has the shape of the mouth changed? Which direction are the eyebrows now going? Are there wrinkles on the face? Has the space between facial features changed? What shapes do you see in and around the eyes?” Lead both partners through several expressions.

Assessment (Outcome 1): Ask both partners to fold a piece of paper into fourths and draw one face per space with the following expressions: happy, sad, angry, and shocked. When both partners are done drawing, have them exchange drawing and ask them to label their partners drawing as the expressions they think it depicts. Have partners compare labels to see if they read the expressions correctly.

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. In this lesson, students will be using scissors. Sharp scissors will work best and can be dangerous if students are not familiar with how to use them. If they don't have much experience with scissors, or if you're teaching this lesson to younger students, you may want to go through scissor etiquette and technique when you reach that point in the lesson.

Scissor etiquette and technique points include:

- Don't ever cut toward your hand.
- If possible, keep the material you're cutting stretched tight.
- It will be easier to cut with scissors using the back of the blade, closest to the handle.

Students will also be using nails to poke holes in cardboard. Discuss keeping hands out of the way of the sharp end of the nail.

Remind students to be especially respectful of their classmates' ideas and opinions by trying not to alter other people's ideas with their own. Art can and will affect people differently, and this should be allowed.



**We are both
 the plastic and
 eco mask people
 and wear our
 “masks” every
 time we purchase
 and dispose
 of something.**

III. Matching the Masks with the Message (35 min.)

a. What Can We Do?

In this curriculum, we have worked together to create a work of community art. Before we complete it, we need to work together to decide on a message to deliver using our giant masks and a habit to change because of that message. We will communicate with the expressions of the faces, materials, and techniques.

Ask students to take three to five minutes and make a list of the most common single use plastics used in the classroom. Make note of the items that would fall into one of the top categories of trash picked up on beaches around the world. Project the ICC top ten chart for students.



Less trash on land will lead to less trash in the water and in all environments. Our plastic mask and eco mask will be communicating messages about trash to help us remember to look carefully at our habits. We are both the plastic and eco mask people and wear our “masks” every time we purchase and dispose of something.



By creating our art with meaningful materials, using intentional design and by adding thoughtful words we can convey information and emotion about an important environmental issue.

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Bandon, Oregon 97411

Ask students to focus on one specific item that they see used in the classroom that would fall into one of the ICC categories. Ask them to identify a feeling they have about this item being found in the ocean. Have each student brainstorm how less of this item could be used in class. Have them answer the following questions: How does it get into the classroom? Why do we use it? What habit could we change to use less of this item? Could we use a reusable item instead? What steps would be necessary to make this happen in the classroom?

After students have completed this individual brainstorming activity, form groups of four to six and ask each student to share their thoughts with their group. Once every student has shared, ask groups to choose one favorite idea to share with the class. When all group ideas have been heard, vote on a habit to change and an item to reduce. Next, decide as a class on the amount of time you are going to challenge yourselves to change this habit. Choosing a specific goal will be helpful and enable you to track the successes and challenges of this change. Will you change one habit for a week, a month, a semester?

Assessment (Outcome 2) Choose a habit and an amount of time to change it for as a class

When the class has decided on one item and habit to change, a method to facilitate change, and a timeline for the challenge, it's time to create the message the masks will deliver. These two masks are symbols of consumer habits and will remind us and our audience of what our choices are when we purchase and use items.

The goal of our two masks is to convey a strong message with the artwork. By creating our art with meaningful materials, using intentional design and by adding thoughtful words we can convey information and emotion about an important environmental issue.

These masks are symbols of each one of us. We "wear" both masks every day as we make choices. Discuss with students what a symbolic masks means.

As a class, fill in these blanks:

The plastic mask says:

"I was _____ (fill in an emotion here) to learn most plastic in the ocean comes from land. In 2015 _____ (fill in the item you choose for your challenge here and the number that were found during the 2015 ICC cleanup) were found on beaches around the world."

The eco mask says:

"I am _____ (fill in an emotion here) to take action. Instead of using _____ (name your item of focus here) for the next _____ (fill in an amount of time) we are going to use _____ (fill in an alternative item to use or an alternative habit that will reduce your selected item) in our classroom. Less plastic on land leads to less plastic in the water."

If you would like to create your own messages for the masks, feel free to do so. The important part is to decide on an appropriate emotion for each mask to exhibit, use them to describe the change you are going to make in your classroom, and connect the message back to plastic pollution and marine debris to put it in context.

Assessment (Outcome 1) After students have decided on an emotion each mask will exhibit while giving its message, decide as a class on the shape of the mouth and the direction of the eyebrows.

After we create the mouths in the next section of the lesson, you'll have an opportunity to see how they look before you attach them. The eyebrows will be made from the same supplies used to make the hair of the mask, braided plastic bags and braided cotton. Two to four braids of each type should be prepped before this lesson.



To make the lips of the mask, we are going to use the ribbon kabob technique learned in lesson nine.

b. Finishing the Masks

To make the lips of the mask, we are going to use the ribbon kabob technique learned in lesson nine. Divide students into four groups and have each group create one kabob. The supplies we are going to use are a bit different than the ones used in lesson nine but the technique is the same.

Ribbon kabobs

Supplies:

- Orange or tangerine peels*
- Red plastic packaging (chip bags, wrappers, etc.) cut into roughly 1 inch thick strips
- Sixteen penny nails to create holes in the plastic
- 4 Pre-cut 24 inch sections of 17 gauge wire, looped on one end

*Oranges or tangerines should be peeled just before they are used. Long peels work best and students should try to create peels roughly one inch wide. Give several oranges out to be peel and start by using the longest for the kabob. The fruit can be eaten during this lesson or saved for another time.

Each group should have one section of wire and use either orange peels or plastic to create their kabob. Some plastics will be thin enough to poke through with the wire, but for those that are not, use a nail to punch holes into the plastic in a repeated sequence, 2-3 inches apart. Use a pre-cut 24 inch section of 17 gauge wire with a loop on one end as a needle and thread the wire through the holes. If using thin enough plastic to poke through or orange peels, poke the holes as you go. Continue threading plastic strips or orange peels onto the wire until it is tightly bunched. Finish this kabob by creating a loop on the open end to hold the plastic or peels on the wire.

These kabobs are bendable, and can be used to form any expression. As a class, place them on the masks to create the desired mouth shape. Attach these lips using the buttonhole technique from lesson nine. Fill in the mouth inside the lips with black plastic for the plastic mask and black cotton for the eco mask. If the class prefers to use a different color to give the mask a different feel, that will also work. The important thing is to create the effect of a mouth that is delivering a message. To create this effect, one uniform mouth color should be chosen.

After the mouth has been created, place the eyebrows on the mask and confirm their direction as a class. Attach the eyebrows using the buttonhole technique from lesson nine. Now your mask is complete.

c. Putting it All Together

Now that you have created giant masks and a message, decide as a class on how you'd like the masks to deliver the message. You can place the masks in the classroom with their message written in a speech bubble as a reminder to stick to your habit change goals. You can share the message and the mask with the rest of the school during an assembly or share the masks with the community through a performance. Adding music and theatrics can make the presentation dynamic.

Assessment (Outcome 3) Use the mask to communicate your message



After your class challenge is complete, plan a zero-waste class party to celebrate.

IV. Conclusion and Review (5 min.)

During this lesson we focused on forming the mouth and eyebrows to create expressions, developed a goal to make the classroom more sustainable, and finished the giant masks. Use this lesson and the lessons of this curriculum to consider the habits of the classroom and the school community. Track the challenges of changing habits and materials and discuss these challenges as a class. After your class challenge is complete, plan a zero-waste class party to celebrate.

Assessment (Outcomes 2 and 3) Track the progress of your habit change classroom challenge and use your masks as reminders to create ecofriendly habits in the classroom and beyond.

V. Follow-up Activities

a. Join our Facebook!

Send pictures or videos of your masks delivering their message to Washed Ashore by email (info@washedashore.org). We will review and vote on the first 100 we receive and post the top ten on our website and on social media. This will help to spread the most effective ideas to classrooms and communities around the country and the world.



Language of the Arts: At Washed Ashore, we believe that the arts are a language that can be learned and used to communicate with, just as any other language can be with practice.

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VI. Additional Resources

a. Sources

- **International Coastal Cleanup**
<http://oceanconservancy.org/our-work/international-coastal-cleanup/2016-ocean-trash-index.html>
- **NOAA Marine Debris:**
<http://marinedebris.noaa.gov/>
- **United Nations World Ocean Assessment:**
<http://worldoceanassessment.org/>
- **Washed Ashore**
www.washedashore.org

b. Vocabulary

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

Consumer Habits: The patterns we develop when purchasing goods.

Conservation: "A careful preservation and protection of something; especially: planned management of a natural resource to prevent exploitation, destruction, or neglect." Merriam-Webster.

Stewardship: "The conducting, supervising, or managing of something; especially: the careful and responsible management of something entrusted to one's care <stewardship of natural resources>." Merriam-Webster.

Waste Stream: The path that most of our garbage follows to get from the consumer to the landfill or recycling facility.

Language of the Arts: At Washed Ashore, we believe that the arts are a language that can be learned and used to communicate with, just as any other language can be with practice. In visual art, design elements are the letters of this language, and design principles are the words.

Design elements: The building blocks of visual art, which include line, shape, form, color, texture, space, etc.

Design principles: These are ways to arrange the building blocks which include repetition, pattern, balance, movement, focal point, contrast, unity, etc.

Materials: Items or substances used to create visual art.

Techniques: Methods of creating visual art including painting, drawing, sculpting, photography, weaving, etc.

Expression: The underlying ideas, issues, and moods communicated through visual art.



**2016
Washed Ashore
Fact:
Over 12,500
volunteers
have contributed
to this project.**

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-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.]

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- **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.



Students from Harbor Lights Middle School created these 4' by 6' masks as the culminating project of the IAMDC piloted in 2016.