

Beach Buckets

Lawrence Hall of Science

This activity outline was developed for use in a variety of informal venues. By design, it provides the content, pedagogy and strategy necessary for implementation by both the novice and experienced informal educator. It is expected that this outline will be adapted and improved upon by the user. We welcome your feedback!

Synopsis of the Activity

Visitors explore a bucket of sand and beach drift and debris, sort the items using observable characteristics and use a model to show how sand could be composed of items found on a beach. They also infer how the beach drift might have traveled to the beach.

Audience Learners of all ages with up to 3-5 visitors per beach bucket. It may be possible for a facilitator to work with several of these groups if their start is staggered.

Setting Anywhere outside or inside the informal science center.

Activity Goals

Learners will become much more interested in looking closely at sand and other items on a beach and asking questions about their observations, such as “What is the sand composed of? How could these items have traveled to the beach? What is my evidence?” They will also be more aware of how beach debris might harm organisms.

Concepts

- The world’s beaches are composed of material from natural sources and from material made by people.
- The natural material on a beach can be from animals, plants or seaweed, or rocks and minerals.
- Material on the beach can be broken into smaller pieces called sand by the motion of the crashing waves.
- There is only one ocean and materials left on one coastline or thrown into the ocean can travel to other coastlines around the world.

Ocean Literacy Principles The Earth has one big ocean with many features.

2. The ocean and life in the ocean shape the features of the Earth.
 - c. Erosion – the wearing away of rock, soil and other biotic and abiotic earth materials – occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediments.
 - d. Sand consists of tiny bits of animals, plants, seaweed, rocks and minerals. Most beach sand is eroded from land sources and carried to the coast by rivers, but sand is also eroded from coastal sources by surf. Sand is redistributed by waves and coastal currents seasonally.

Materials

Shallow plastic tub or shoe box

Sand

15-20 pieces of beach debris: shells, tests of sand dollars, small rocks, feathers, trash (plastic, paper, corks, toys), coral, driftwood, seaweed, crab parts from a seafood dinner, Tray

Large white chart or butcher paper

Markers or crayons

Tupperware or plastic peanut butter jar with lid (empty)

Jolly Rancher hard candy or other assorted hard candy (4-5 different colors)

*Optional, but helpful: Globe or world map poster, broom and dustpan, book on shells

Prep Section

Collect sand and beach debris.

Make 2-3 beach buckets as follows: Place 2-3 inches of sand in a plastic shoe box and add shells, small rocks, sand dollars, and trash to the surface of the sand.

Procedure and Set-up

- Double check that your beach buckets are ready with 2-3 inches of sand in a plastic shoe box and 15-20 beach drift items including: shells, small rocks, sand dollars, coral, seaweed, and trash on the surface of the sand.
- Place tub on large tray.
- Fold a sheet of chart paper into four sections and label each section with one of the following categories: animal (non-human); plant or seaweed; people; and unknown.
- Unwrap 7-10 Jolly Ranchers (using all the colors) and place in plastic jar with lid. (This can also be done with the visitors at the station.)

Guiding Questions

Have you ever been to a beach?

What did you see there?

What color was the sand?

What could make all the different colors of sand?

What do you think sand is made of?

What is your evidence?

How can we tell what sand is made of?

How might natural and manmade materials be broken down into sand?

How do you think some of these items got to the beach where they were found?

Activity Description

Introduction

1. **Greet the visitor.** Invite the visitors to come over to investigate a beach in a bucket. Ask them if they have ever been to a beach? (Follow up with where and perhaps what they saw there.) Tell them that today you

are going to give them a chance to explore this little beach and see what they can find. Let them know that it is ok to pull items out and look at them more closely, while leaving the sand inside the tub as much as possible.

2. Free exploration of the beach bucket. Give the visitors time to freely explore the bucket and offer tools (like hand lenses or scope on a rope). Respond to their questions and allow them to direct the exploration. As appropriate, ask a few of the following guiding questions to keep/spark their interest and engage them in a discussion. Some possible questions you might ask include:

- What do you think that is?
- Where do you think it came from?
- Do you think it was from an animal?
- Do you think people left it on the beach?
- Did you see this?
- I wonder what it is?
- What do you think?

3. Listen to what the visitors are saying. While they explore the bucket, notice what the visitor is saying about each of the objects. Be patient and let them explore and describe them. Encourage them to talk about where/what they think the objects are from.

Note: If they have had a lot of experience with ocean artifacts or ocean creatures, they may know the names for the objects and that the shells and sand dollar test are from animals and perhaps which animals specifically. On the other end of the spectrum, this may be the first time for some of them to have seen these objects. This will inform your next steps.

If the visitors seem to have a lot of experience, you may want to give them a few more challenging pieces of debris such as an odd piece of coral, a unique shell or weird bit of trash. If you get a sense that they have less experience, then go more slowly through the free sort activity.

Free Sort

1. Introducing beach bucket items free sort. Tell the visitors that they can work together to sort the items in the beach bucket into as many groups as they want, but they need to have at least two groups and each group needs to contain at least two items. Emphasize that they should leave the sand in the tub and just remove individual items. Distribute paper and colored markers or crayons. Tell them they should remove the

items from the bucket and place them on the paper and then use the markers to label the groups with names or enclose them in circles.

2. Do the free sort. Have visitors sort the beach bucket items into any categories (or groups) that they want based on an observable characteristic of their choice. Encourage individuals to show interesting objects to each other and share their ideas about why they decided to place an item in a particular category. Remind them to label their categories.

3. Discuss the categories. After the visitors have had a chance to sort the items, have them tell you about their groups and what made them decide to group particular items together. Spark discussion with questions like: What is their “evidence” that it belongs with others in that group? Are there some items that might fit into two of the categories? Are there some items they are unsure about? Have them set aside things they are unsure about into the unknown category but get their ideas about what it might be and where it would then go.

4. Mystery Sort. Get everyone’s attention and quickly sort the items into three groups yourself using 2-3 objects per group. Have the visitors guess what characteristic you were sorting by. Discuss the categories and see if they can add to your groups or if you can add to theirs. Give the visitors the opportunity to create their own mystery sort and have others guess what characteristic they used.

5. Further explorations. If they show an interest, give the visitors further time to explore their beach buckets with the idea of looking for more clues or evidence and putting new objects into categories

Note: If they have exhausted the first bucket you can always pull out another. If they seem done with the beach bucket, move on to the next discussion.

Guided Sort

1. Introducing the guided sort. After completing the free sort, ask the visitors if they found any of the following items in the list below. Have them hold up something from each of the categories as you mention it.

- something from an animal (evidence of animals)
- something from plants or seaweed (evidence of plants or seaweed)
- something from people (evidence of humans)
- any objects that they are not sure about

2. Guided sort chart. Show visitors the chart paper labeled with categories: animal (non-human); plant or seaweed; people; and unknown. Model how to place an item from the beach bucket on the chart paper within one of the categories. Also model how they could label the chart paper with the names of each of the items within the category or they could even choose alternate names for the categories (human-trash).

3. Do the guided sort. Have the visitors sort the beach bucket items again, but this time have them sort into one of the four categories: evidence of– animals, plants or seaweed, people, and unknowns.

4. Discuss how beach bucket items got to beach. After visitors complete the guided sort, have them think and share their ideas about where the objects are from and how they may have gotten to the beach. [People carrying trash to the beach , birds visiting, shells from the ocean, rocks from a river, wind blowing objects there...] Show them the globe or the map with currents and discuss the possibilities of things being thrown into the ocean near you and where it might go. Ask, are any of the beach items likely to be dangerous to animals on the beach or in the water? Which items should we be especially careful about keeping out of the environment?

Sand

1. Focus on sand. Next have the visitors turn their attention to the sand– the largest part of what is in the bucket and on the beach. Lead a discussion using the following questions as prompts: What is left in the bottom of the bucket after all the beach items were removed? Where does the sand come from? What is it made of? What makes you think that? What is your evidence? Are there other ideas?

2. Introducing the Jolly Ranchers Candy Sand Model. Show the visitors the jolly rancher whole candies in the container. Tell them that we are going to use the candy to represent the items we found in the beach bucket. We will use a model to show what might happen to real items on a real beach. Say the green candy represents seaweed, the purple is shells, the red is rocks, the yellow is trash and pink is feathers. Have them pretend all these things are on the beach. Ask, what might happen to them there? (If they don't mention waves yet continue with the questions.) What's happening to them all day, everyday? What's crashing on the beach? [waves] If the waves are hitting the beach and they hit all day and all night, and all the next day, what might happen to all the beach debris?

3. Making candy sand. Tell the visitors that they are going to model the waves crashing on the beach. Place the lid tightly on the container and

demonstrate how to shake it vigorously as if you were a crashing wave. Pass around the container, letting each visitor shake it about ten times before passing it on. Remind them that they are pretending to be waves crashing. As it is being shaken, ask them what they think is happening to all those model beach items inside. Stop when it looks like you have some good candy sand to observe. Give each visitor an opportunity to take a look in the container. Ask, what happened to our model shells and rocks and seaweed and plastic trash and feather? [They have been broken into smaller and smaller pieces – candy sand.] Line up pieces of the purple jolly rancher by size and point out how even the tiniest pieces can be evidence that the model shells (the purple candy) were present.

4. Return to beach bucket items. Ask, what does the candy sand model tell us about how sand might be made and what it might be composed of? Encourage discussion and ask, if you looked really closely at the sand in your bucket, do you think you would be able to see little bits of all the different beach bucket objects? Remind them to use the handlenses to look more closely at the sand. Encourage them to share what they discover. (Here you can discuss the idea that some of these beach items biodegrade or breakdown **much** faster than others.)

5. Apply ideas to nature. Ask visitors if they would mind sharing what the take home message of this activity was for them. [Tell them that next time they go out in nature, they might think about looking closely at the sand along a river or on a beach and try to determine its composition. What evidence can they find to support their ideas? They might even think about how they might keep dangerous items out of environment so they won't harm organisms.]

Related Activities/Extensions/Modifications

Modification: Do the Jolly Rancher Sand activity first and the Beach Bucket second. Or break the activities up into separate stations (Introduction, Free Sort, Guided Sort, Sand) on the floor of the ISEI to allow more interaction between visitors and to allow for more time on each activity. This activity may be followed up with the COSIA Sand activity, or have a station with microscopes and sand samples from around the world, with or without a facilitator.

Additional Resources

On Sandy Shores Teacher's Guide LHS GEMS ISBN 0-912511-98-2

Background

(from On Sandy Shores)

A sandy shore reveals evidence of nearly everything that has been to the beach or has been in the adjacent ocean. Look closely at sand and you might see pieces of rocks that have broken free from the rocky seashore, cliffs, and ocean floor. Rocks and minerals are also carried from tall and distant mountains to beaches through streams and rivers. There might be shells or shell fragments from animals that once lived on nearby reefs, bones from animals living in the ocean and on land, algae, coral fragments, glass, driftwood, plastics, feathers, and much more. Waves and wind push sediment and beach drift from the ocean onto beaches around the world. Marine debris (garbage that ends up in the ocean or at the seashore) is carried from land by the millions of visitors to the world's beaches and dumped from the world's fleet of private, commercial, and military boats and ships. As waves crash against the shoreline, all these objects are ground into sediments and rough edges are progressively smoothed and rounded into sand grains.

The things you find at the beach can be separated into many categories. You can find evidence of things that were once alive (or biotic materials), such as shells, bones, feathers, corals, egg casings, driftwood, and seaweeds. Biotic material can be further subdivided into evidence of plants or evidence of animals. You can also find evidence of things that were never alive (or abiotic materials). A few common types of abiotic materials are rocks, minerals, glass, and plastics. Evidence of people is another category, but these materials can be biotic (paper, pieces of lumber, chicken bones), or abiotic (plastic, glass, metal).

Beaches throughout the world are strewn with drift and debris, both natural and human-made. The human-made debris, mostly in the form of plastics, is often deadly to ocean and sandy beach inhabitants. It is important to recognize the different types of drift and debris, and to be able to distinguish between those that should be removed for the safety of people and animals from those that should not. For instance, drift and debris such as kelp and broken shells should be left on the beach because they form part of an important ecosystem. We can protect our beaches and keep them healthy through beach clean-up projects and prevention of littering in the first place.

Vocabulary

Erosion- the wearing away of rock, soil, and other biotic and abiotic material due to interaction with wind, water, ice and other forces.

Sand- small particles between the size of pebbles and silt (between 0.0625 to 2 millimeters in diameter).

Abiotic-non-biological, not involving or produced by an organism, never-alive

Biotic- biological, living, produced by an organism, or once alive