



Hawai'i Wildlife Fund: Marine Debris Keiki Education and Outreach (MDKEO) Program

Lesson 2 - Sorting Marine Debris

Grade Levels: K-5

Time: 60 minutes (grades K-1) or 90 minutes (grades 2-5)

Summary

Students will have a short review from Lesson 1 focusing on impacts of marine debris. After the review, students will participate in a hands-on activity where they will be asked to utilize parts of the scientific method including, observing, hypothesizing, experimenting (classifying), and conclusion forming. Depending on grade level and ability, this may include graphing/ charting, and communicating results. Students will be introduced to the science of understanding and solving problems related to marine debris.

Objectives

- Utilize the Scientific Method and emphasize the cooperation/teamwork that is needed in sciences
- Predict the effects that different types of debris will have on marine animals
- Categorize different types of marine debris
- Learn the difference between biodegradation and photodegradation as related to plastic marine debris
- Create a group poster with information gathered from the classification exercise (grades 4-5 may produce bar graphs or pie charts)

Background

The scientific method, in short, is a way to ask and answer scientific questions by making observations and testing hypotheses via experimentation. The scientific method can be simplified into a series of steps and explained via the acronym "OHECK!"¹:

¹ Adapted from: "[Chapter 1: Science of Biology, 1.1-1.4 Science of Biology Show](#)"

Observation - What do I see, hear, feel, smell and/or know?

To observe is to both collect information and use prior knowledge about the physical world around us. The five senses (sight, touch, smell, hearing, and taste) may be used to make observations (NOTE: it may not always be safe to use *all* senses!). Often observations can also be made using special instruments such as, a thermometer or salinity probe. When observations are recorded they become data that can later be analyzed.

Hypothesis - Given my observations, what do I think?

A hypothesis is, essentially, an educated guess or prediction based on observations. This is the second step of the scientific method. An important characteristic of a hypothesis is that it is falsifiable. What this means is that a hypothesis can be shown to be wrong.

Experiment - How do I test my hypothesis? Is my hypothesis correct? Collect the data.

Experimentation can be one of the most exciting parts of the scientific method. Experiments in science are completed to determine if a hypothesis is correct or incorrect. Often a variety of experiments must be done for a single hypothesis. An important quality of a well-designed experiment is its' ability to be replicated (repeated) by other scientists. NOTE: For the "Sorting Marine Debris" activity you will be collecting data via observations for the experimentation process.

Conclusion - What did I find?

In this step the evidence provided by the results of our experiment is examined. This information is used to determine if the original hypothesis is correct or incorrect. A single experiment is not usually enough evidence to prove or disprove a hypothesis. In science, the best way to test the hypothesis is through the repetition of the experiment by other scientists. Once a hypothesis has been proven true by a large number of respected scientists, then the hypothesis becomes a theory. Outside of science, if someone used the word "theory" it is assumed they mean "guess," but in science, the word has a different meaning. If a scientist calls something a theory, that is the closest it will come to being a fact. Science is constantly correcting itself as new information is learned.

Knowledge! - What did I learn?

Knowledge is the ultimate goal and final step of the scientific method. The root of the word "knowledge" is the verb "to know". Simply put, knowledge is what is known. What is known about the natural, physical world, is a collection of scientific theories from throughout the history of mankind. Each theory builds on those that came before it, like blocks of a pyramid. Like a pyramid, the higher knowledge climbs, the wider the base of scientific theories below it. The more knowledge we have, the more prepared we are to tackle problems like marine debris! It is important to remember that science is, generally, not completed individually and that the scientific process or method requires numerous levels of participation, communication, and teamwork from a large number of individuals.

The marine debris your classroom will receive is from Kamilo Point, Hawai'i island. Kamilo Point is located along the southernmost coastline, of the southernmost island of the Hawaiian Archipelago and is known for its' marine debris accumulation. Kamilo Point and the surrounding shoreline are inundated with an estimated 15 - 20 tons of, mostly, plastic debris every year.² This marine debris is transported to Hawai'i via wind and currents and is concentrated in the the North Pacific Subtropical Gyre, also referred to as the North Pacific Garbage Patch.³ There are many different types of marine debris, some items are recyclable while other items must be discarded into landfills or incinerated.

Common items found at Kamilo include bottle caps, toothbrushes, items with foreign characters, toiletry, and beauty product containers. The debris comes in all shapes and sizes from microplastics to large shipping pallets and net bundles. Hawai'i Wildlife Fund regularly sorts marine debris during its clean up events so as to minimize and divert the tonnage of debris added to local landfills. Sorting and landfill diversion categories include:

- 1) Local recyclables (typically redeemable single-use plastic beverage bottles aka "HI-5's"; 2) METHOD Home [cleaning product company] utilizes "relatively clean", non-brittle, opaque plastic for reusable soap dispensers;
- 3) Fishing nets and line;
- 4) Specific requests for art and jewelry projects, educational activities, museum displays, etc.; and
- 5) Sorting/sifting microplastics from the sand.

Hawai'i Wildlife Fund works with different organizations, businesses, non-profits, and government agencies to upcycle, recycle, divert, and reuse some of the marine debris collected from Kamilo Point before it ends up in a landfill.

Activities List

Optional: completed "Follow Along Activity" worksheet (grades 2-5)
"Sorting Marine Debris Activity" worksheet (grades 3-5)

Alternate Activity: [Hawaii PRISM Curricula: Types of Marine Debris](#)

² Hawai'i Wildlife Fund, unpublished data, 2016.

³ Howell, E.A., Bograd, S.J., Morishige, C., Seki, M.P., Polovina, J.J., 2012. "[On North Pacific circulation and associated marine debris concentration.](#)" Marine Pollution Bulletin 65, 16e22.

Materials

Marine debris from Kamilo Point (gloves may or may not be included)

*Contact Hawai'i Wildlife Fund at kahakai.cleanups@gmail.com for any questions or information regarding marine debris and how to get a Marine Debris Kit shipped to your classroom.

Electronic marine debris photo identification guide (see [NOAA marine debris field ID guide](#))

Marine debris sorting activity datasheet (1 copy per student)

Tarps

Pencils

Calculators (optional)

Board or drawing pad for graphing

Procedure

1. This activity may be completed as a class (grades K-2), or in small student groups depending on age, ability, and teachers' preference (grades 3-5). *Optional:* Utilize the "Follow Along Activity" sheet from Lesson 1 as guide to review repeated concepts and vocabulary. (10 min)

2. Begin slideshow by showing [short clip](#) (14 sec) and other pictures of Hawai'i Wildlife Fund volunteers sorting marine debris at Kamilo Point, Hawai'i Island. Explain that students get to act as scientists for the day and that within science there are numerous observations to make, plus data to collect, analyze, and then communicate. As such, scientists often work as part of a team where each person has a specific task within the scientific process/method. (20 min) (slide 1-4)

3a. For grades K-2 (30 minute):

- a. Set up marine debris sample on a small tarp, have students sit around and makes visual observation about the marine debris sample. (5 min)
- b. Have each student pick out a piece of debris and describe their observations aloud to the class. (18 min)
- c. Ask if anyone notices any patterns in the debris samples (i.e., colors, bite marks, identifiable writing / foreign characters). Can they tell where the debris may be from? Generate a discussion and/or have students draw their debris item. (4 min)
- d. Clean up debris and answer any questions the children might have. (2 min)

3b. For grades 3-5 (60 minutes):

- a. Break students into groups. (3 min)
- b. Describe the different "Team roles" each group will have (4 min) (slide 4):
 - ❖ Speaker - The person who will report their group's findings to the class at the end of the activity.
 - ❖ Recorder - The person repeating the numbers being reported to them, by the "sorter(s)" (to reduce miscommunication/human error), writing the data down on the data sheet and adding numbers when necessary.

- ❖ Sorter(s) -These students will take turns sorting debris by categories on data sheet. Students will report their numbers to the “recorder.”
 - ❖ Knowledge Seeker - This is the only person who may leave their station to ask questions for the team.
4. Pass out “Sorting Activity” worksheet or follow instructions for [Alternative activity](#) (grades 3-5).
 5. If using HWF’s “Sorting Marine Debris Activity” worksheet, explain the different categories of debris they may find. Explain how to use the datasheet by utilizing tally marks (middle column) and totaling (adding the right column). If utilizing “Sorting Marine Debris Activity” worksheet refer to slide show for visual representation. (5 min)
 - ❖ Total number of items
 - ❖ Whole items
 - ❖ Fragmented items
 - ❖ Items with “Foreign characters”
 - ❖ Items that used to be a toy
 - ❖ Items with bite marks
 - ❖ Items that are “Single Use Plastic” (a.k.a. SUP)
 6. Give each group their sample of marine debris along with gloves, which all students should wear before handling debris. Describe WHERE the debris was found (on Hawai’i Island) and provided by Hawai’i Wildlife Fund. (3 min)
 7. Instruct the groups to begin categorizing their debris samples. (25 min)
 8. Float around to each group to make sure students are cooperating with each other and on task.
 9. Have each group report their findings aloud to the class and discuss. At this time the teacher may collect data from each group in order to make a bar graph utilizing categories from the “Sorting Marine Debris Activity” worksheet. For example, you may graph (x axis: marine debris category, and y-axis: marine debris value) and compare the percent of single use plastic found by each group and have a short discussion. (10 min)
 10. Clean up debris and have students wash hands, tables, and floor. (4 min)
 11. Collect data sheets. (2 min)
 12. Recap the day and get kids excited about the next visit: “Solutions at Work.” (4 min)

Resources

Collaborators in Kamilo Point marine debris waste diversion, upcycling, recycling, and reuse:

[Method | Ocean Plastic](#)

[Hawai'i Nets-to-Energy Program](#)

[Nurdle In The Rough Jewelry](#)

[Drifters Project](#)

[Elwing's 'Kamilo, Men in Black' wins Trash Art Show](#)

Additional Resources

[An Educator's Guide to Marine Debris](#)

[Hawai'i PRISM Curricula](#)

[NOAA: Guidebook to Beach and Waterway Cleanups](#)

[Protect Our Ocean Activity Book](#)

[Understanding Marine Debris: Games And Activities For Kids Of All Ages](#)

Vocabulary

Scientific method (O-H-E-C-K!)	Entanglement	Hitchhikers
Observations	Ingestion	Invasive species
Hypothesis	Buoyancy	Photo-
Experiment	Knowledge	degrade
Conclusion	Data	Biodegrade
Sort	Gyre	Single-use plastic
	Category	Disposable

Benchmarks:

NGSS Lead States. (2013). Next Generation Science Standards: For states, by states. Washington, DC: The National Academies Press.

Grade K:

K-ESS3- 3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

K-PS3- 1. Make observations to determine the effect of sunlight on Earth's surface (photodegradation).

Common Core State Standards Connections:

ELA/Literacy – RI.K.1 With prompting and support, ask and answer questions about key details in a text. SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.

Mathematics – K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference.

Grade 1:

1-LS1- 1. Use materials to design a solution to a human problem. LS1.A: Structure and Function. All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. LS1.D: Information Processing. Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive.

1-PS4- 2. Make observations to construct an evidence-based account that objects can be seen only when illuminated.

1-PS4- 3. Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light (photodegradation).

Common Core State Standards Connections:

ELA/Literacy RI.1.1 Ask and answer questions about key details in a text. RI.1.2 Identify the main topic and retell key details of a text. W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Mathematics – MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically.

Grade 2:

2-PS1- 1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

K-2- ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

2-PS1- 2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1- 4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot (photodegradation).

Common Core State Standards Connections:

ELA/Literacy W.2.8 Recall information from experiences or gather information from provided

sources to answer a question.

Mathematics- MP.5 Use appropriate tools strategically.

Grade 3:

3-LS4- 3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4- 4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Common Core State Standards Connections:

ELA/Literacy – RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

Mathematics – MP.5 Use appropriate tools strategically.

Grade 4:

4-LS1- 2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

4-PS3- 3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.

4-ESS2- 1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Common Core State Standards Connections:

ELA/Literacy – SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Mathematics – MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics.

Grade 5:

5-ESS3- 1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

5-PS1- 1. Develop a model to describe that matter is made of particles too small to be seen.

5-PS1- 3. Make observations and measurements to identify materials based on their properties.

Common Core State Standards Connections:

ELA/Literacy – RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Mathematics – MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics.

5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. 5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.