



# WHERE DOES ALL THE 'ŌPALA GO?

How did the needs of early Hawaiians influence the development and use of technology, and how does this compare to our needs and use of technology today?

## HAWAI'I DOE STANDARD BENCHMARKS Science 2: The Scientific Process: NATURE OF SCIENCE

- **SC.6.2.2** Explain how the needs of society have influenced the development and use of technologies.

## Language Arts 4: Writing: CONVENTIONS AND SKILLS

- **LA.6.4.3 & LA.6.4.4** Edit writing to correct punctuation and use a variety of strategies and resources to spell grade-appropriate words.

## Language Arts 5: Writing: RHETORIC

- **LA.6.5.1** Select appropriate details, examples, reasons, and/or facts to support an insight, message, or thesis.

## Language Arts 6: Oral Communication CONVENTIONS AND SKILLS

- **LA.6.6.3** Give short prepared oral presentations to inform and persuade.

## NĀ HONUA MAULI OLA

- **NHMO 8-4** Apply cultural and traditional knowledge of the past to the present.

## KEY CONCEPTS

- Hawaiians manufactured tools made from natural materials that would easily decompose.

- Our consumer habits have made it necessary for us to develop new ways and technologies to manage our waste, much of which is non-biodegradable.

## ACTIVITY AT A GLANCE

Students learn about tools and products that early Hawaiians manufactured from natural materials that easily decompose. They form teams, read about current technologies to manage waste, and sift through their classroom “garbage dump” to identify various types of waste that reflect our consumer habits.

## ASSESSMENT

- **Oral presentation:** Students present their findings to their classmates, reflecting on how our consumer habits have influenced the way we manage our waste.
- **Journal reflection:** Students write two paragraphs using correct punctuation, spelling, and grammar, to reflect the value of *mālama* and how traditional knowledge of waste management can be applied to the present.

## TIME

3 class periods



## SKILLS

analyzing, collaborating,  
reflecting, writing,  
presenting

## MATERIALS

### Provided:

- ✓ Learning Log cover sheet (provided in the Unit Introduction)
- ✓ Student Assessment Overview (provided in the Unit Introduction)
- ✓ 'ōpala technology cards
- ✓ Learning Logs 1 – 2
- ✓ Student Reading 1
- ✓ Letter to Families
- ✓ Power Point presentation (provided on CD)

### Needed:

- ✓ folders (one for each student's Learning Log)
- ✓ tarp (to display 'ōpala)

### Hawaiian materials:

- ✓ dried *ti* leaf (used for cordage)
- ✓ coconut (used as cordage and utensils)
- ✓ small smooth stone (used as a bath stone to cleanse the skin)
- ✓ a small finger of white coral (used for sandpaper)
- ✓ an 'ōpīhi shell or similar type (used as a food scraper)
- ✓ a small calabash or *ipu* (used as a water gourd or food server)

## VOCABULARY

integrated approach – in this context, using a combination of different methods to help reduce waste



'ōpala – trash, rubbish, litter

recycling – the method involving collecting, separating, processing and marketing a material that would have been thrown away

source reduction – (also known as waste prevention) any change in the design, manufacturing, purchase, or use of materials or products to reduce the amount of toxicity or the amount of waste before materials become municipal solid waste

technology – the study, development and application of devices, machines, and techniques for manufacturing and productive processes

waste prevention – the reuse of products or materials, or reduction of use

## ADVANCE PREPARATION

- Make one copy of the 'ōpala technology cards. Cut and laminate cards.
- Copy a Learning Log cover sheet and Student Assessment Overview (from the Unit Introduction), the Letter to Families, Learning Logs 1 – 2, and Student Reading 1 for each student.
- Before beginning this unit, distribute the Letter to Families and ask each student to bring three items from the modern-day materials listed in the letter.**
- Collect the materials that Hawaiians used to make things in their everyday lives.
- On the day you plan to teach the lesson, set up your classroom “garbage dump.” Display all of the items your students brought from home on a tarp.



## TEACHER BACKGROUND INFORMATION

In this lesson, students compare early Hawaiian products and tools to more modern-day tools and products. They consider the innovation and usefulness of products as well as the raw materials used to make them and the challenges of disposal.

The emphasis for modern-day materials is on plastics, since they have become so prevalent in our society and they pose a number of challenges to the environment and human health. Plastics have many advantages including light weight, flexibility and relatively inexpensive raw materials. These advantages don't come without a cost, however. Plastics are manufactured from fossil fuels (petroleum and/or natural gas), which are nonrenewable resources. Their manufacture requires energy and can lead to air and water pollution. Plastic packaging alone uses approximately 200,000 barrels of oil daily in the U.S. (Royte, 2006). Plastic wastes are accumulating in landfills, where they take up 25 percent of the landfill volume (Royte, 2006). And Americans only recycle about 5 percent of all plastics produced in the U.S. (EIA Kids Page, 2006).

In addition, there are health concerns about chemicals from plastic bottles and food containers leaching into foods. Plastics #1, 3, and 6, as well as nalgene bottles (#7), have been shown to release toxins into food or liquids under certain conditions. It is not recommended that containers made from these plastics be reused because of potential health risks (About.com, 2007).

### Recycling Plastics

Since plastics are made from fossil fuels, it would seem that recycling them would help to conserve energy. However, it is not always possible to find a place that will accept the different types of plastics for recycling. The chasing arrows symbol on plastic containers does not mean the plastic is recyclable; it is just the indication of the type of plastic material. Most recycling centers are only accepting Plastic #1 PET (Polyethylene Terephthalate) and Plastic #2 HDPE (High Density Polyethylene) for recycling. These are the two types of plastics we can place in curbside recycling containers in Hawai'i.

- Plastic #1 (soda and water bottles) is being recycled into a number of products including fiberfill for jackets and sleeping bags, rope, car bumpers, cassette tapes, furniture, and new plastic bottles.
- Plastic #2 (heavier containers such as bleach or milk jugs) is being recycled into plastic lumber, rope, toys and piping.
- Plastic #3 (shower curtains, toys, medical tubing, pipes); Plastic #4 (grocery and sandwich bags); and Plastic #5 (containers such as Tupperware) have a very low rate of recycling.
- Plastic #6 (Styrofoam cups and containers, egg cartons) is recycled into foam insulation and cassette tapes.
- Plastic #7 is made from combinations of different plastics and are not usually accepted for recycling.



Alternative types of packaging that are similar to plastic are being developed from renewable natural resources such as corn. A product known as PLA (polylactic acid) is produced from corn and developed into a resin that can be melted and reshaped into fibers or containers. While this new material has the advantage of using less energy and being biodegradable, some have raised concerns about converting food crops to nonfood uses when so many people in the world are going hungry (Royte, 2006).

There are also concerns about the feasibility of recycling this new material.

Ultimately, in order to reduce the amount of plastics that we dispose of in landfills or burn in waste-to-energy plants, we can examine our own consumer habits. This would include reducing our consumption of disposable plastic products (including excessive packaging), buying things in bulk, and reusing or refilling containers.

## TEACHING SUGGESTIONS

### 1. Introduce the unit with the Learning Log and the Student Assessment Overview.

- Pass out one folder and a copy of the Learning Log cover sheet and the Student Assessment Overview to each student.
- Instruct students to glue the cover sheet to the outside of their folder and to glue the assessment sheet to the inside cover of the folder—this will serve as each student's Learning Log or portfolio.
- Review the unit topic, standards, assessment procedures and expectations.
- Introduce the unit essential question and standards you will be addressing.

**Unit Essential Question:** How has technology changed the way we consume and dispose of products and what can we do to reduce waste to *ho'ōla* (heal) our *ahupua'a*?

- If students are unfamiliar with the concept of *ahupua'a*, help them to define it and locate your *ahupua'a* on a map of your island (see Resources).
  - Review expectations for culminating projects.
- ### 2. Define and identify different types of technology found at home and in school.
- Ask students to define "technology" and identify different kinds of technology that are found around the home and school, for example, computers, telephones, stove, refrigerator, car, boat, etc.
  - List their responses on the board under the heading "Technology Today" (column A).
- ### 3. Display types of ancient Hawaiian materials and have a discussion.
- Explain to students that each item represents an early form of Hawaiian technology.
  - Hold up each object and ask students to identify the item and how it may have been used.
  - List their responses on the board under the heading "Early Hawaiian Technology" (column B).



**4. Discuss the difference between traditional and modern-day materials.**

Discussion Questions

- How do the materials in column A and B differ? (*Most of the items in column A are made of plastic, nylon and aluminum or synthetic materials, which do not easily decompose. The items in column B are primarily biodegradable; made of wood, stone and other natural materials.*)
- How do you think early Hawaiians disposed of their waste materials? (*Pits were dug and covered with earth to dispose of food leftovers. Stone implements and some woods do not break down as easily, and as a result, fragments of these artifacts have been recovered in archaeological digs.*)
- What are some ways that we dispose of our waste products today? (*Reducing and reusing items. Establishing recycling centers. Composting of green waste. Developing waste-to-energy combustion facilities. Creating landfills.*)

**5. Distribute the student reading.**

- Ask students to read the material and initiate a discussion.
- Discuss what students know about reducing our waste stream.

**6. Share the PowerPoint presentation with the class and review the main points:**

- Humans have produced an incredible amount of waste.
- Society has had to figure out a way to deal with it.
- New technology has helped deal with the problem.
- Humans have also developed ways to reduce waste.

**7. Divide the class into five teams.**

- Distribute an **'ōpala technology card** to each group and **Learning Log 1** to each student.
- Have each group read the information on the card.

**8. Have students “sift” through the class garbage dump.**

- Ask each group to choose two items that could be disposed of, eliminated, or reduced using the technology described on the card.
- Show them how to read the chasing arrows on the plastic items and discuss those that can be recycled (see Teacher Background Information).
- Have each student complete Learning Log 1.
- Ask students on each team to present their findings.

**9. Complete the assessment.**

- Distribute **Learning Log 2** to each student and review the reflection (assessment).
- Ask students to complete the reflection and set a due date.



## ADAPTATIONS / EXTENSIONS

Distribute an 'Ohana sheet (provided at the end of this lesson) to each student. Have students choose an item from the list and challenge the students and their families to reduce their amount of waste at home. Ask students to write a two-page reflection based on their experience.

Set up a recycling drive at your school. Contact information to receive free recycling bins can be found by contacting the City and County of Honolulu Department of Environmental Services online at [www.opala.org](http://www.opala.org)

Have students research the problem of marine debris. Student activities are available in *A Teachers Guide to Navigating Change*. To download lessons, see: <http://www.hawaiianatolls.org>.

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