

Lesson 3: Geology of Waipi`o Valley

Overall problem: To determine the impact of restoration of the Lālākea stream on stream flow, water quality, habitat and biota.

Lesson Context: In this lesson, students will become familiar with geologic history of Waipi`o Valley. By looking at a progression of geologic images through time, students will be able to see how Waipi`o Valley has evolved into what it is today. Through an interactive lab demonstration, students will be able to see how the valley formed and understand what factors play a role in the formation of streams.

Time Frame: 2 class periods

Objectives:

Student will be able to:

1. Understand the basic geologic history of Waipi`o Valley.
2. Learn about what factors play a role in the formation of streams.

Materials:

1. Sand
2. Gravel
3. Three Plastic washtub
4. Three Blocks or bricks
5. Three Plastic-foam cups
6. Three Clothespins
7. Water

Procedure:

Class Period 1

1. Show the students the series of graphics showing how the Big Island formed. This document is called **Big Island Growth** can found in "Teacher Resources". Ask the student to identify where Waipi'o Valley is on the NOW picture. (Hint: It is resting atop Kohala volcanics on the border between Kohala and Mauna Kea). How long ago did the volcano which makes up Waipi`o valley form? (Between 400-300 thousand years ago).
2. Now that the students have an idea of how old Kohala Volcano (which makes up Waip`o Valley) is, have them focus on Waipi`o Valley. Ask the students to look at the aerial image of Waipi`o Valley below. Have them write a short story of how they think Waipi`o Valley formed.

Ask the students to get into their teams which they formed in lesson 1. Have briefly them share their Waipi`o Valley formation story with one another.

3. Download and print 3 copies of the Harold Stearns diagrams (which show four stages of development of Waipi'o and Waimanu Valley) and the accompanying descriptions, which are found in "Teachers Resources" and named **Waipi'o and Waimanu Valley stages of development**.
4. Ask the students to work as teams to label the diagrams 1- 4 in order of earliest (1) to latest (4) and match up the descriptions with the diagrams. Remind them that this process started about 100-200 thousand years ago.
5. Have each group designate a spokesman and share their answers with the class. (You can find the answer key in "Teacher Resources" under **Waipi'o and Waimanu Valley stages of development- answer key**).
6. Wrap up the class by showing an **animation of how Waipi'o and Waimanu Valley** formed highlighting the four main stages.

Class Period 2

7. Now that students have an overall understanding of the geologic history of Waipi'o Valley, let them conduct a scientific experiment to determine how streams develop.

Break the students into their teams again. You will need the materials listed above to carry out this experiment. If you don't have enough materials, you can do this as a class exercise.

8. Obtain a bucket of sand and enough gravel to fill the bottom of a rectangular plastic washtub.
9. Spread the gravel in a layer at the bottom of the washtub. Place 4-6 cm of sand on top of the gravel. Create a slope by adding more sand to one end of the washtub.
10. Make a small hole in the bottom of a plastic-foam cup. Attach the cup to the inside of the tub with a clothespin. The cup should be placed at the end that has more sand. Fill the cup with water, and observe the water's movement over the sand.
11. Record your observations on a sheet of paper.
12. Answer the following questions:
 - a. At the start of your experiment, how did the moving water affect the sand?
 - b. As time passed, how did the moving water affect the sand?
 - c. How do you think your results might relate to stream development?
13. Perform the same activity, but this time increase the slope of the washtub by adding a brick/block under the tub. How does the increase in slope affect the development of the "stream"?
14. Have the teams share their observations and answers with one another?
15. Ask the students how this might relate to the formation of Waipi'o Valley?