VOLCANOES ON STAGE

Grade 4

Lesson at a Glance

Groups of students produce story boards that creatively depict the stages of Hawaiian volcanoes.

Key Concepts

Most of the Hawaiian volcanoes go through nine stages. The geological age of the Hawaiian Islands increases in a northwesterly direction and ranges from the present, at Lō'ihi Seamount and part of the island of Hawai'i, to 75 million years, the age of the oldest Emperor Seamount.

Objectives

Students will be able to:

1) Sequentially arrange cards depicting nine stages of a shield volcano.
2) Develop a written script and a story board showing the stages of one Hawaiian volcano.

Time

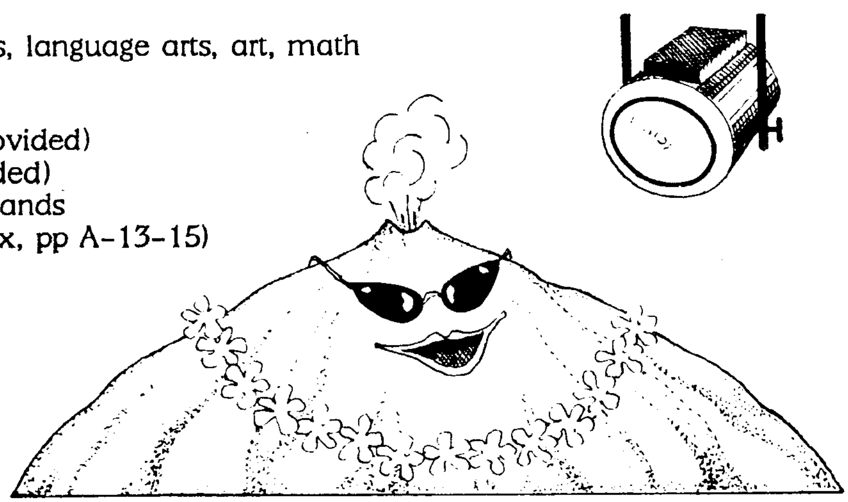
two - three class periods

Subject Areas

science, Hawaiian studies, language arts, art, math

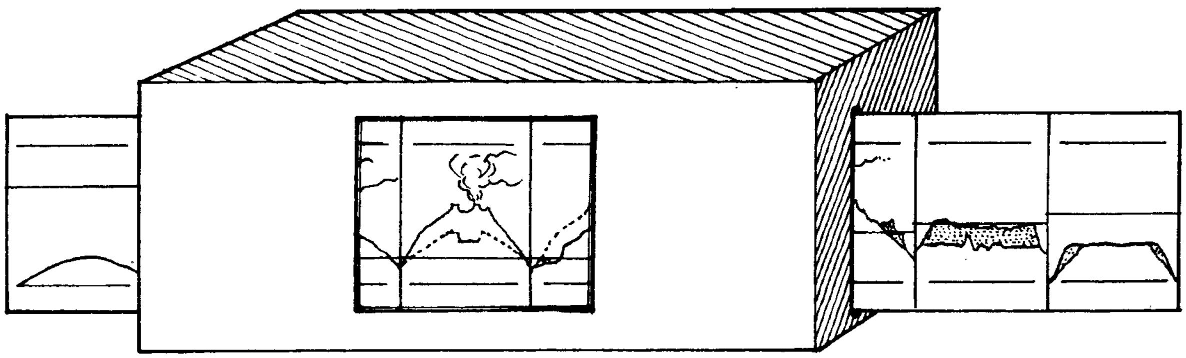
Materials

student activity cards (provided)
student data sheet (provided)
maps of the Hawaiian Islands
(see Geology Appendix, pp A-13-15)
scissors
colored markers
staplers
shoe box
2 large sheets of oak tag
glue or rubber cement
transparent tape



Preparation

Duplicate and cut the student activity cards into six sets, one set for a sample story board and five sets for groups of students to use. To make the story board viewing box, cut a narrow slit on each side of a shoe box. The slits should be slightly wider than the cards. Cut a window in the front of the box slightly narrower than the width of the slits cut in the sides. Then create a story board by gluing or stapling the nine cards onto a strip of oak tag. Allow a 15 cm (6 in) space at the beginning of the story board as a leader. (See illustration on next page.)



Obtain a copy of Volcanoes in the Sea (optional, see Unit Resources) to show students photographs of later stages of volcanoes seen in the northwestern Hawaiian Islands (plates 30-31, opposite p. 199).

Teacher Background

Compared to the 4.5 billion year-old Earth, the Hawaiian Islands are very young. Kaua'i emerged above the ocean surface about 5 million years ago. The approximate ages of volcanoes on the main Hawaiian Islands are listed on the student data sheet that accompanies this activity. The youngest of the Islands, Lō'ihi, is still approximately 950 m (3,000 ft) below sea level.

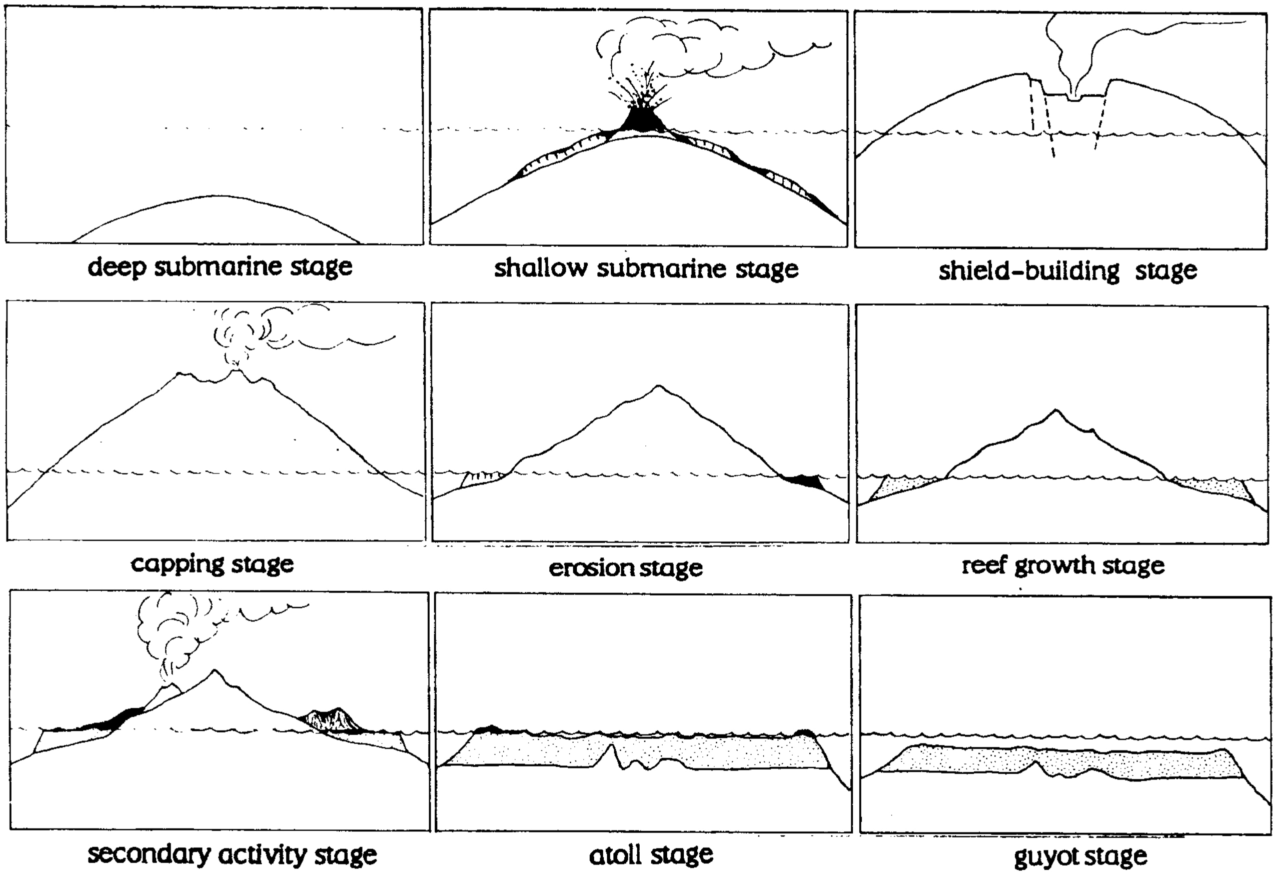
Hawaiian volcanoes typically pass through nine stages, although the erosion, reef growth and secondary activity phases occur simultaneously. Present landforms provide examples of these stages:

Stage 1	Deep **submarine** — Lō'ihi
Stage 2	Shallow submarine — Lō'ihi in thousands of years
Stage 3	**Shield-building** — Kīlauea, Mauna Loa
Stage 4	Capping — Mauna Kea
Stage 5	**Erosion** — Kohala, W. Maui, E. Moloka'i, Ko'olau, Wai'anae, Kaua'i, Lāna'i
Stage 6	Reef growth — W. Maui, E. Moloka'i, Ko'olau, Wai'anae, Kaua'i, Lāna'i
Stage 7	**Secondary activity** — W. Maui, Haleakalā, Ko'olau, E. Moloka'i, Kaua'i
Stage 8	**Atoll** — Kure Atoll, Midway (northwestern Hawaiian Islands)
Stage 9	**Guyot** — many of the Emperor **Seamounts**

Hawaiian volcanoes do not necessarily go through all of these stages. The capping stage was skipped on the W. Moloka'i volcano, and W. Moloka'i and Lāna'i have not had secondary activity even though younger volcanoes have passed into this stage.

From the study of Lō'ihi, scientists have discovered that a **caldera** may form when the volcano is still in the deep submarine stage and may be present throughout the shield-building stage as magma repeatedly withdraws and returns. However, there is no evidence that Hualālai on Hawai'i or the W. Moloka'i volcano ever had a caldera.

Volcanic stages can be compared to young, middle-aged or old people. A volcano has reached old age when the shield stops building and continues to erode. At this point, the volcano's smooth shield shape begins to "wrinkle" as streams cut into the shield's surface. It will continue to erode as the volcano matures. Note that even though the volcano is in the secondary activity stage, reef growth and erosion will continue to occur. (For additional information on the stages of volcanoes, refer to the Geology Unit Introduction.)



Teaching Suggestions

1. Ask students to guess the age of their home island. Write their guesses on the board. To help them put the age of the island into perspective, compare the age of the Earth (4.5 billion years) to a nine-month school year. With this scale, each one million years would be equal to one hour and 24 minutes. Refer to the student data sheet and ask students to compute an average age for the island and use the "school-year" scale to figure how old their island would be. (O'ahu would be four - five hours old.)

2. Divide the class into small groups and distribute a set of student activity cards to each group. Ask students to arrange the cards from the youngest to oldest stage. Present this either as a challenge with little introductory material, or as a review after discussing volcanic stages.

✓ 3. Ask a group that has sequenced the stages correctly to tape its cards on the board. Discuss each of the stages.

4. Place the story board viewing box in front of the class. Demonstrate how the story board was made and pull it through the opening in the box.

5. Place the names of the main Hawaiian Islands in a container and have a student from each group pick a name. One of the volcanoes on the island they select will be the subject of a story board the group creates.

6. Distribute the student data sheets and the appropriate island map (see Geology Appendix) to each group. For additional background on the formation of each island, include pages 1-12 from The Hawaiians of Old (see Unit Resources).

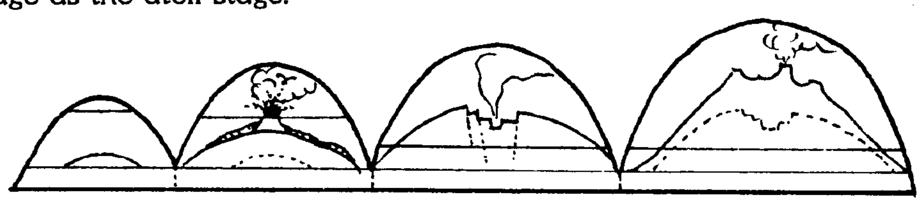
7. Students can divide tasks of writing the script and illustrating one of the volcanoes. All story boards should depict current stages of volcanoes accurately but creative art and writing skills should be encouraged! Help students to see how a volcano could take on a personality as it matures from infancy through adolescence, maturity and old age.

✔ 8. Ask groups to put their volcanoes on stage and present their story boards to the class. Each group could omit the volcano's name and see if others can determine its identity.

Extended Activities

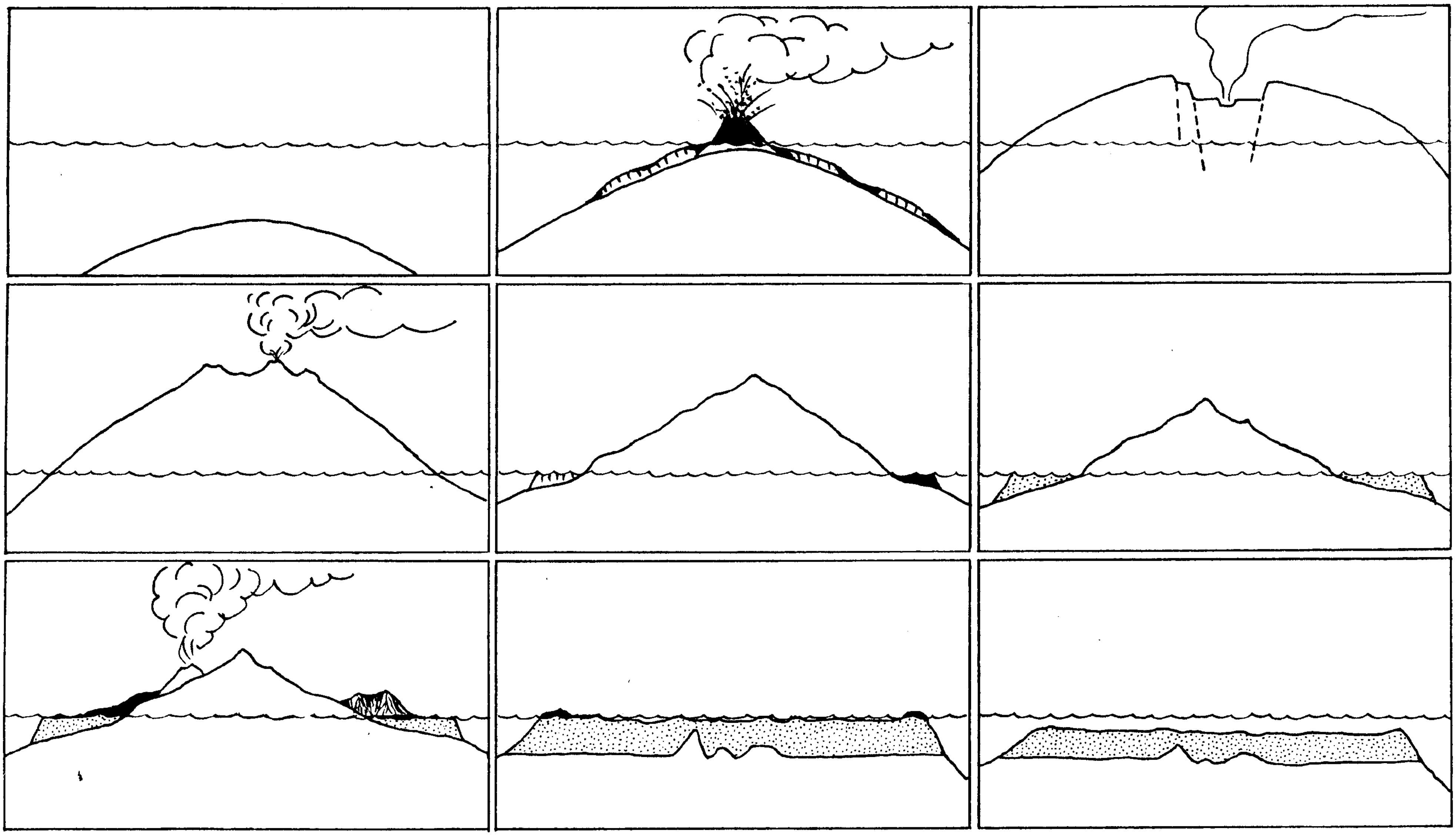
- Read the book, How Much Is a Million?, (see Unit Resources) and compare the ages of the Islands to examples in the book.

- Have students use the activity cards to make volcano booklets. The first four cards could be cut out and glued on pages shaped like a growing volcano to show construction stages (see illustration). The book could then be flipped over to show destruction stages with the next four cards. The last stage could be glued onto the same page as the atoll stage.

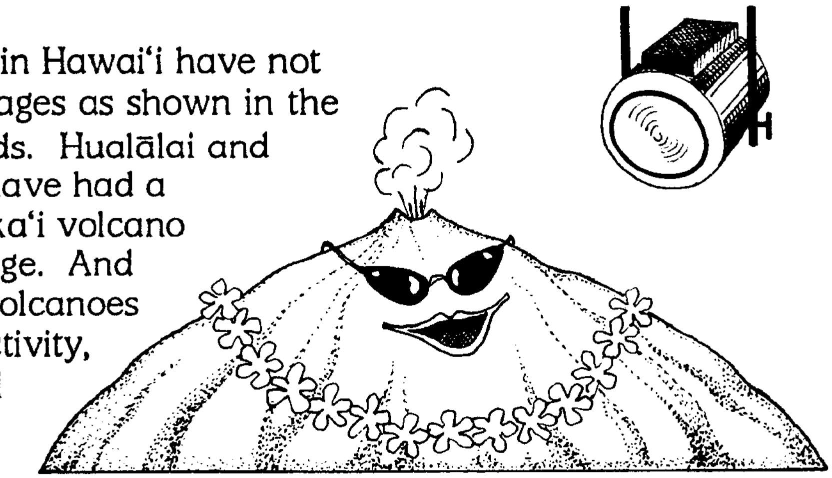


- Each group of students could use creative dramatics to demonstrate the stages of a volcano on one of the Islands. Using hand and arm motions, students could demonstrate magma rising and a shield shape being created. They could drop arms to depict the collapse of the caldera and then create a bumpy cap with their hands. They could sink to the floor as erosion occurs and another group of students could "swim" to the island and join hands to form a coral reef around it.

- Students could develop a time line depicting the ages of the main Hawaiian Islands. The time line could be created with string and a paper tag label for each island. Students will need to experiment with various scales until they can represent millions of years in a manageable space! If a scale of 1 m equals 100,000 years were used, a time line including Kaua'i would stretch 47 m (154 ft)! The time line could be laid out in the schoolyard or in the cafeteria and shared with other classes.



Some of the volcanoes in Hawai'i have not exactly followed the stages as shown in the nine volcano stage cards. Hualālai and W. Moloka'i may not have had a caldera. The W. Moloka'i volcano skipped the capping stage. And even though younger volcanoes have had secondary activity, Lāna'i and W. Moloka'i have not!



Volcano	Approximate Age (millions of years)	Current Stage
Lō'ihi	still forming	submarine
Kilauea	still forming	shield building
Mauna Loa	still forming	shield building
Hualālai	may still be forming	capping (no caldera)
Mauna Kea	0.4	capping
Kohala	0.5	erosion
Haleakalā	0.7	secondary activity
Kaho'olawe	1.0	secondary activity
W. Maui	1.0	secondary activity
Lāna'i	1.5	erosion
E. Moloka'i	1.5	secondary activity
W. Moloka'i	1.8	erosion (no caldera, no capping)
Ko'olau	2.5	secondary activity
Wai'anae	3.5	secondary activity
Kaua'i	4.7	secondary activity

1. Locate the island your group has selected on a map of the Hawaiian Islands. How many volcanoes are on your island? Find the volcanoes on the list above.

2. Use the information on this sheet and your knowledge about volcanoes to make a paper story board showing the stages of one of the volcanoes on your chosen island.

3. Be creative with your story! You could try comparing the volcano to a human. Is your volcano in infancy, childhood, adolescence (teenage), middle age or old age? Give the volcano a personality and write a script that will give your classmates clues to the volcano's identity.