



Activity #3

The Dating Game

● ● ● In Advance *Game Preparation*

- Prepare game cards (master, pp. 35-48) by copying, cutting apart, and folding each in half along the dotted line. In this way, you will create a “front” and “back” of the card. The front will have only the card type and corresponding shape on the game board. The back will contain the question, answer, and/or playing instructions. You may wish to laminate these cards, as well as an instruction card for each group.

● ● ● Class Period One *The Dating Game*

Materials & Setup _____

For each group of up to six students

- Game board (provided with this curriculum)
- 1 die
- Game instructions card (master, p. 34)
- Game cards (master, pp. 35-48)
- Six player pieces (small objects such as buttons, stones, or shells that can be easily distinguished)

Instructions _____

- 1) Conduct the game with groups of up to six students each. Use the game materials provided with the curriculum and “The Dating Game Instruction Card.”

Assessment Tools _____

- Participation in the game
- Optional: During the class period following the game, use some of the game cards to conduct an in-class written quiz. Draw cards randomly or select them in advance.



The Dating Game Instruction Card

The game begins at Sliding Sands Trailhead, follows the trail to Palikū, and ends at Halemau‘u Trailhead. Move your player pieces by the roll of the die, answering questions, and/or following instructions given on the game cards. The first player to Halemau‘u Trailhead wins!

Once you have used a game card, put it on the bottom of the pile it was drawn from.

Each player rolls the die **once** per turn and draws **one card**. Play advances **clockwise**.

When you land on a space, follow the symbol.

Here’s what happens:

A, B, C, D = Special Interest!

Draw the corresponding card. Use clues provided to locate the site on the game board/map and read the card to the other players.

Locate the site on the map = **Move forward 3 spaces**

1-7 = Dating Sites

Follow the arrow to the corresponding dating site.

Read aloud the card with the matching number.

After reading the card, **follow the arrows back to the trail.**

TM = Dating Questions

Another player draws a card and reads you the question on it. You try to answer the question.
Movement

Correct answer = **Move forward 2 spaces.**

Incorrect answer = **Move back 1 space.**

n = Landforms & Volcanic Products

Another player draws a card and reads you the question on it. You try to answer the question.

Correct answer = **Move forward 2 spaces.**

Incorrect answer = **Move back 1 space.**

H = Risks & Challenges

Another player draws a card and reads you the instructions on it. There are two kinds of cards:

- Situational cards: You choose the correct answer from 3-4 choices.
Incorrect answer = **Move back 1 space.**
- Potluck cards: You have no control here!
Follow the directions on the card.

U = Double Jeopardy

Choose to risk 2, 4, or 6 spaces before you hear the question. Then listen to the question and answer it.

Correct answer = **Move forward number of spaces risked.**

Incorrect answer = **Move backward number of spaces risked.**

l = Connector Trails

You may choose to take a “connector” trail. Another player draws a card and reads you the question. You try to answer it. To cross the connector trail, answer a question correctly for each space on the trail.

Correct answer = **Move forward one dot on the connector trail.**

Incorrect answer = **Go back to where you started on the main trail and continue down the normal trail.**



The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">A Special Interest</p>	<p style="text-align: center;">B Special Interest</p>
<p>High atop the <i>pali</i> at Haleakalā, the Kilohana area is an archeological site. This site has basalt lava flows and was used for an adze quarry.</p>	<p>Up on the rim of the summit basin or valley sit the remnants of a <i>heiau</i>. This <i>heiau</i> is located due south of Pu‘u o Pele.</p>
<p style="text-align: center;">C Special Interest</p>	<p style="text-align: center;">D Special Interest</p>
<p>Pōhaku Pālaha is a point on Haleakalā where the <i>ahupua‘a</i> boundaries are determined for the east side of Haleakalā.</p>	<p>Lava tubes, rock crevices, and other sites were areas commonly used as burial sites for <i>piko</i> (umbilical cords) and for burials.</p>




The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">1 Dating Site</p>	<p style="text-align: center;">2 Dating Site</p>
<p>A paleomagnetic dating technique was used to date the youngest flow from Ka Lu‘u o ka ‘Ō‘ō. The results came back inconclusive. However, based on relative ages of surrounding flows, we know this flow is younger than 970 years and probably younger than 900 years.</p>	<p>This flow on the south rim of the “crater” was dated using a radiocarbon method. It is estimated to be 3750 (+/- 50) years old.</p>
<p style="text-align: center;">3 Dating Site</p>	<p style="text-align: center;">4 Dating Site</p>
<p>A carbon-14 dating technique was used here on this flow from Pu‘u Maile. A date of 4070 (+/- 50) years ago was determined. This flow was dated using the paleomagnetic method as well. That method came up with an age of around 4000 years.</p>	<p>Kālua ‘Awa is one of the few <i>pāhoehoe</i> flows within the “crater.” This flow was dated by both the radiocarbon and the paleomagnetic techniques. An age of 1040 (+/- 40) years was determined.</p>







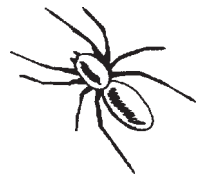
The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">5 Dating Site</p>	<p style="text-align: center;">6 Dating Site</p>
<p>The Hanakauhi fissure produced the youngest flow dated on the east side of the summit basin. This flow has an age of 870 (+/- 40) years, based on both a radiocarbon and a paleomagnetic analysis.</p>	<p>A paleomagnetic dating technique was used for Pu'u o Māui. The approximate age of this flow is 3000 years.</p>
<p style="text-align: center;">7 Dating Site</p>	<p style="text-align: center;"> Dating Card</p>
<p>An older flow from Ka Lu'u o ka 'Ō'ō was dated both by carbon-14 and paleomagnetic analyses. The flow is estimated to be 970 (+/- 50) years old.</p>	<p>Question Paleomagnetic drilling works because which components of rocks align to the magnetic orientation of the poles when heated to high temperatures?</p> <p>Answer Minerals</p>



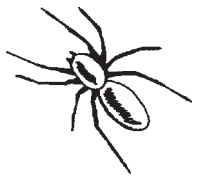
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 <p>Dating Card</p>	 <p>Dating Card</p>
<p>Question Why might lava flows at high elevations not be able to be dated by radiocarbon methods?</p> <p>Answer These lava flows have very little organic matter associated with them, which is what the carbon-14 method dates.</p>	<p>Question What type of material is used to date flows using the radiocarbon method?</p> <p>Answer Organic material (such as plants, stems, roots, trunks)</p>
 <p>Dating Card</p>	 <p>Dating Card</p>
<p>Question Radiocarbon dating is most accurate on flows with organic materials less than how old?</p> <p>Answer 50,000 years old</p>	<p>Question Name the three types of dating processes used on Haleakalā.</p> <p>Answer Radiocarbon (or carbon-14), Paleomagnetic, Potassium-Argon</p>



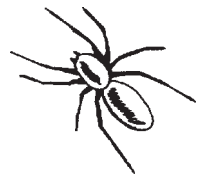
The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">n</p> <p style="text-align: center;">Landforms & Volcanic Products</p>	<p style="text-align: center;">n</p> <p style="text-align: center;">Landforms & Volcanic Products</p>
<p>Question What is the most probable hypothesis about how the summit basin or valley formed?</p> <p>Answer Erosional processes</p>	<p>Question What are two of the three kinds of volcanic ejecta that Dave Sherrod expects to see from the next eruption of Haleakalā?</p> <p>Answer Two of these: cinder, spatter, ash</p>
<p style="text-align: center;">n</p> <p style="text-align: center;">Landforms & Volcanic Products</p>	<p style="text-align: center;">n</p> <p style="text-align: center;">Landforms & Volcanic Products</p>
<p>Question Can an 'a'ā flow turn into <i>pāhoehoe</i>?</p> <p>Answer No</p>	<p>Question What chemical element determines higher or lower viscosity?</p> <p>Answer Silica</p>



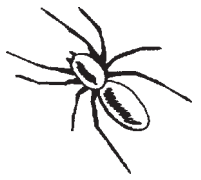
The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">u</p> <p style="text-align: center;">Landforms & Volcanic Products</p>	<p style="text-align: center;">u</p> <p style="text-align: center;">Landforms & Volcanic Products</p>
<p>Question What is the youngest volcanic formation on Haleakalā?</p> <p>Answer Hāna Volcanic formation</p>	<p>Question Name the three volcanic formations of Haleakalā.</p> <p>Answer Honomanū Basalt, Kula Volcanic, Hāna Volcanic</p>
<p style="text-align: center;">u</p> <p style="text-align: center;">Landforms & Volcanic Products</p>	<p style="text-align: center;">u</p> <p style="text-align: center;">Landforms & Volcanic Products</p>
<p>Question What is the oldest volcanic formation of Haleakalā?</p> <p>Answer Honomanū Basalt</p>	<p>Question What two factors will determine whether or not an eruption will be explosive or more gentle?</p> <p>Answer</p> <ul style="list-style-type: none">•Viscosity or fluidity of lava• Gas content of lava



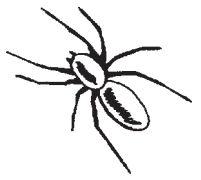
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<p style="text-align: center;">n</p> <p style="text-align: center;">Products</p> <p style="text-align: center;">Landforms & Volcanic</p>	<p style="text-align: center;">n</p> <p style="text-align: center;">Products</p> <p style="text-align: center;">Landforms & Volcanic</p>
<p>Question Define volcanic ejecta.</p> <p>Answer Any solidified lava fragment thrown into the air by a volcanic explosion</p>	<p>Question Define cinders.</p> <p>Answer Volcanic ejecta less than 4 cm in diameter (Other answers may include “frothy” volcanic ejecta with irregular shapes.)</p>
<p style="text-align: center;">n</p> <p style="text-align: center;">Products</p> <p style="text-align: center;">Landforms & Volcanic</p>	<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>
<p>Question This lava is ejected in irregularly shaped globs that fall in heaps around the vent. They flatten out or splash when they hit. What is this type of ejecta called?</p> <p>Answer Spatter</p>	<p>You go off the trail, fall into a lava tube, and break your leg.</p> <p>Go back to Start.</p>



The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>	<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>
<p>You fed a <i>nēnē</i>, encouraging it to bother other humans for food that's not in its natural diet.</p> <p>Go back 5 spaces.</p>	<p>You climb over the railing at Kawilinau (the Bottomless Pit). You fall in and have to be rescued.</p> <p>Go back to Start.</p>
<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>	<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>
<p>You didn't bring your rain gear and got caught in the early-morning fog and rain.</p> <p>Lose a turn while you wait for your clothes to dry out.</p>	<p>What do you need to bring with you when you hike in Haleakalā National Park?</p> <ul style="list-style-type: none">a) rain gear and warm clothesb) Gameboy and extra batteriesc) food & waterd) a and c <p>Answer: D</p>



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<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>	<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>
<p>You didn't bring enough water with you.</p> <p>Lose a turn while you wait for your hiking companions to share their water with you.</p>	<p>You wore slippers instead of hiking boots and sprained your ankle.</p> <p>Lose a turn while you wrap your ankle.</p>
<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>	<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>
<p>You are drinking plenty of water, which helps keep your body hydrated in the dry, sunny environment.</p> <p>Move ahead one space since you're feeling so strong.</p>	<p>You picked up <i>'ōpala</i> (garbage) on the trail.</p> <p>Move ahead two spaces for cleaning up after thoughtless visitors.</p>



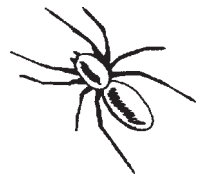
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<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>	<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>
<p>You saw another visitor going off the trail and politely asked that person to stay on established and marked trails.</p> <p>Move ahead one space for helping to protect the plants and insects that live among the cinders.</p>	<p>You see a <i>nēnē</i> begging. What do you do?</p> <ul style="list-style-type: none"> a) feed it Oreos b) feed it your granola bar c) chase it away d) ignore it <p>Answer D (You shouldn't chase a <i>nēnē</i> since it is an endangered species and it may feel threatened and try to attack you.)</p>
<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>	<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>
<p>You see another visitor feeding a <i>nēnē</i>. What do you do?</p> <ul style="list-style-type: none"> a) join in b) push the other person out of the way so you can feed the <i>nēnē</i> c) ask the other visitor not to feed the <i>nēnē</i> d) tell the person to feed the chukars instead <p>Answer: C</p>	<p>You see two other students going off trail and making designs in the cinder. What do you do?</p> <ul style="list-style-type: none"> a) help them because you are a better artist than they are b) ask them to come on trail as the design won't go away for many years c) ignore them d) make your own design somewhere else <p>Answer: B</p>



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<p style="text-align: center;">H</p> <p style="text-align: center;">Risks & Challenges</p>	<p style="text-align: center;">n</p> <p style="text-align: center;">Double Jeopardy</p>
<p>Why do you need to stay on trails in Haleakalā National Park?</p> <p>a) there are endangered species that you could accidentally crush b) just because c) because the park ranger told you to d) so you don't get lost</p> <p>Answer: A</p>	<p>How many spaces are you willing to risk? 2? 4? 6?</p> <p>Which two stages of volcanic activity are the most likely for Haleakalā to be in currently?</p> <p>Answer: Alkalic capping and renewed volcanism (or rejuvenation) stages</p>
<p style="text-align: center;">n</p> <p style="text-align: center;">Double Jeopardy</p>	<p style="text-align: center;">n</p> <p style="text-align: center;">Double Jeopardy</p>
<p>How many spaces are you willing to risk? 2? 4? 6?</p> <p>How tall does Haleakalā stand above sea level today?</p> <p>Answer: 3056 meters (10,023 feet)</p>	<p>How many spaces are you willing to risk? 2? 4? 6?</p> <p>How old is Haleakalā Volcano?</p> <p>a) 1.7 million years b) 0.7 million years c) 1 million years d) none of the above</p> <p>Answer: 1.7 million years</p>



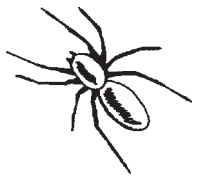
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<p style="text-align: center;">n</p> <p style="text-align: center;">Double Jeopardy</p>	<p style="text-align: center;">n</p> <p style="text-align: center;">Double Jeopardy</p>
<p>How many spaces are you willing to risk? 2? 4? 6?</p> <p>On average, how frequently has Haleakalā erupted?</p> <p>Answer: Every 200-500 years</p>	<p>How many spaces are you willing to risk? 2? 4? 6?</p> <p>What are vesicles?</p> <p>Answer: Holes in the lava from when the lava cooled quickly and trapped gases</p>
<p style="text-align: center;">n</p> <p style="text-align: center;">Double Jeopardy</p>	<p style="text-align: center;">n</p> <p style="text-align: center;">Double Jeopardy</p>
<p>How many spaces are you willing to risk? 2? 4? 6?</p> <p>What does pyroclastic mean?</p> <p>Answer: Fire-broken</p>	<p>How many spaces are you willing to risk? 2? 4? 6?</p> <p>What are the two types of lava flows?</p> <p>Answer: 'A'ā and pāhoehoe</p>



The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">Connector Trails</p>	<p style="text-align: center;">Connector Trails</p>
<p>Question True or False? Based on past patterns of eruption, Haleakalā is not expected to erupt again for another 50,000 years.</p> <p>Answer False</p>	<p>Question True or False? The basin at the summit of Haleakalā was caused by a huge explosion which blew the top of Haleakalā off.</p> <p>Answer False</p>
<p style="text-align: center;">Connector Trails</p>	<p style="text-align: center;">Connector Trails</p>
<p>Question True or False? Hawaiian volcanoes tend to have very explosive eruptions compared to other types of volcanoes around the world.</p> <p>Answer False</p>	<p>Question What is an isotope?</p> <p>Answer An atom of an element that has a different number of neutrons than other atoms of the same element.</p>



The Dating Game Cards (cut on solid lines, fold on dashed lines)

<p style="text-align: center;">Connector Trails</p>	<p style="text-align: center;">Connector Trails</p>
<p>Question True or false? Chemical analyses have found many differences between rocks from the Kula Volcanics series and the Hāna formation.</p> <p>Answer False</p>	<p>Question What percentage of the total volume of Haleakalā stands above sea level?</p> <p>Answer 5 percent</p>
<p style="text-align: center;">Connector Trails</p>	<p style="text-align: center;">Connector Trails</p>
<p>Question True or false? Dave Sherrod believes there were glaciers on the summit of Haleakalā during the last ice age.</p> <p>Answer False</p>	<p>Question When did Haleakalā last erupt?</p> <p>Answer About 1790 (although this answer is debatable since recent evidence suggests these flows may be about 400 years old)</p>