RDC Unit Overview

Unit Name: Changing ʻĀina
Topic: How Hawaiʻi's Land's Change
Teacher/s Name:

Grade Level: 1-2

3D Performance Expectations Key: Blue: Science and Engineering Practices, Orange: Disciplinary Core Ideas, Green: Crosscutting Concepts

This unit was modeled according to the NGSS Topic Model for 2nd Grade

Unit Level Information		
Anchor Phenomenon	NGSS PE for the Unit	Unit Student-Level Explanations
Many things change the shape of the land. These changes can happen very quickly or very slowly. Lava, water, and wind change the land in different ways, breaking down larger objects into smaller objects (for wind and waves), or building up smaller objects to create new sections of land (lava). The ʻaina(land) changes over time, lava builds new ʻaina and makani(wind) and wai(water) break ʻaina(land) down. <u>Phenomenon</u>: The land changes over time.	2-PS1-3. **Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.** [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.] 2-ESS1-1. **Use information from several sources to provide evidence that Earth events can occur quickly or slowly.** [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] *[Assessment Boundary: Assessment does not include quantitative measurements of timescales.]* 2-ESS2-1. **Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*** [Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]	• Water and wind break down larger things to make smaller things. • Sand is made when rocks, shells, and reefs are broken down by water, organisms and wind over thousands and even millions of years. • Different events will affect the land at different timescales. • Maps are made up of shapes and symbols that can represent water and land features • Materials have different

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Different mechanisms cause different changes at different timescales.	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.*** [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] *[Assessment Boundary: Assessment of quantitative measurements is limited to length.]* 2-ESS2-2. **Develop a model to represent the shapes and kinds of land and bodies of water in an area.** *[Assessment Boundary: Assessment does not include quantitative scaling in models.]* K-2-ETS1-3. **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**	properties that give them different potential uses • There are mechanism to slow or prevent water and wind from changing the land • Lava flows can add land to areas that were previously underwater and can create landforms like mountains. • You can use patterns to describe the strengths and weaknesses of design solutions and select which solution is best for a desired function.

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What lesson 1 is about: Wind and water break down larger objects			
Lesson question	**Lesson Phenomena**	**3D Learning Objectives**	**Student-Level Explanation**
How has water and wind broken down larger objects to make other things we see today?	Sand is made from many larger object broken down over time	Construct an explanation based on observations for how the different larger components of sand are affected by water or wind to be broken into smaller pieces or change shape.	Water and wind break down larger things to make smaller things. Sand is made when rocks, shells, and reef are broken down by water over thousands and even millions of years.

Adapting this Lesson to Your Wahi Pana

Have students look at sand under a microscope, or look up close-up photos of sand. Check out this article from BBC that has several photos of sand zoomed in. Can they identify any familiar objects? What about pieces of object?

Have students question how the many components of sand were broken down and mixed together. Where is sand typically found and what forces might be present in those places that could break down the components of sand? (i.e., wind, water)

Have students make their own "sand". Collect shells and place them in a clear, empty, plastic jar ful of water and seal it with a lid. Have the students take turns shaking the jar and taking observations. Did the shells break down? How much? If the shells did break, how much strength/how long did it take? Now have the students explore how long do they think it would take to turn all those shells into a fine sand. An hour? Weeks? Years? How long do they think it would take to make an entire beach of sand? (*if shells are not accessible, alternative objects to use include rocks, pieces of coral, or another hard material found in sand in your area)*

Compare beaches based on how large they are and much sand they have. Ask students which beaches they think are older (More sand indicates older beaches, longer abounts of time to erode.) A great exable is Oahu having larger sandy beaches that big island.

Resources:
Video: The amazing life of sand (2:45)

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What lesson 2 is about: Mechanisms that change the land slowly and rapidly			
Lesson question	**Lesson Phenomena**	**3D Learning Objectives**	**Student-Level Explanation**
Why does the land sometimes change very slowly and other times very rapidly?	Changes to the land can occur quickly or slowly	Construct an explanation based on observations of how water, wind, or lava can change the land very quickly or slowly.	Different kinds of events will affect the land differently and at different timescales. Volcanic eruptions, earthquakes, and large storms and flooding will change the land rapidly. Normal wind, rainfall, and flow of water will change the land slowly.

Adapting this Lesson to Your Wahi Pana

Discuss how the land can sometime change at different speeds. Ask students to brainstorm different ways that the land changes.

Show the students videos of different events that change the land. Have students can discuss if they think the event is changing the land quickly or slowly. (Video of slow changes to the land: rain falling, river flowing, waves, rainwater runoff; videos of fast changes to the land: hurricane winds, flooding, storm surges, lava). Have the students rank the events in order of how quickly they think the land changes. What is different about these events? Why does rain falling on a normal day change the earth less than rain falling during a hurricane?

Split the students in to groups. Have each group create a model of one of the fast/slow forms of erosion discussed before. We recommend modeling erosion at a smaller scale, for example, have the students design their models to erode a hole in a piece of paper towel or kleenex. Fore example, students can use paper cups (punching holes in the bottom to mimic rain, pouring water slowly to represent a stream, dumping water to represent a flood).

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What lesson 3 is about: Modeling land and water with maps			
Lesson question	**Lesson Phenomena**	**3D Learning Objectives**	**Student-Level Explanation**
How do maps use shapes and symbols to represent different kinds of land and water?	Different kinds of land and water are represented using symbols on maps	Develop a map to represent the shapes and kinds of land and water in an area	Maps are made up of shapes and symbols that can represent water and land features We can use maps to describe patterns of water and land in an area (e.g., A stream with many waterfalls, an area with many tidepools)

Adapting this Lesson to Your Wahi Pana

Introduce students to maps and their symbols. How might a map symbolize a lake? Mountains? Rivers? Start simply with the students, using basing symbols to represent common features (sample worksheet here for inspiration). Use both the english and Hawaiian words for each feature you identify.

Explore more complex maps how world maps indicate lakes, rivers, mountains. Have an outline of your island or even zoom into a specific area on google maps. Choose an area with visually definable features (i.e. a mountain, big valley, river, waterfall, tidepool, coastline, beaches). have the students make their own maps and develop symbols for all of the land and water features they want to identify.

Resources

Hawaiian words for different features of the land

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What lesson 4 is about: The properties and usefulness of different materials			
Lesson question	**Lesson Phenomena**	**3D Learning Objectives**	**Student-Level Explanation**
How do the properties of an object make it helpful for certain purposes?	Different matierials can have different properties that are best suited for certain purposes	Test different materials and analyze data to discover their properties (i.e. strength, absorbency, hardnes, texture, flexibility) and explore how well they may be suited for different purposes	Matierials have different properties that give them different potential uses (e.g., hardness is good for breaking objects or supporting objects; roughness is good for keeping objects in place; flexibility is good to keep a materials from breaking, but not good for keeping materials origidly in place).

Adapting this Lesson to Your Wahi Pana

Start off class with having students test the properties of different materials. Possible items to test are rocks, paper towel, rubber bands, sand paper, and small sticks.

Have each student collect and organize data to support/refute why those objects are best suited for an intended purpose. For each item, have students determine: How hard/soft is it? How rough/smooth? How flexible/ridgid? How permeable/impermeable? It may be helpful to have students rank the object on a scale from 1-5, with each end of the scale being the extreme end of the spectrum. (ex 1-very soft and 5 is very hard).

Break students into groups, and assign to each group one of the materials previously texted by the class. Have the group brainstorm potential uses for the given material based on its features, and have each group present their proposed uses at the end of class.

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What lesson 5 is about: Exploring design solutions to slow or prevent water/wind from changing the land			
Lesson question	**Lesson Phenomena**	**3D Learning Objectives**	**Student-Level Explanation**
How do different materials and methods prevent water or wind from shaping the land?	Different materials are more/less affected by wind or water	Design a solution to slow or prevent how rapidly water or wind changes the shape of the land.	There are many ways to slow or prevent water from changing the land, such as: • build with stronger materials • vegetation cover to hold soft soil/sand • sea walls to stop waves • fencing to block wind • dikes and drainage ditches

Adapting this Lesson to Your Wahi Pana

Start off discuss how water or wind has been shaping the land locally. You could focus on a large erosion event somewhere on island (A great example is the 2018 flooding and landslides that occurred on Kauai) or even a smaller erosive issue on your schools campus. Have students question and investigate why the erosion was so severe. Are there any characteristics about the land that make it more susceptible to being changed quickly by water and wind (i.e. no plants, near a stream that is prone to flooding, near sea cliffs, steep slope of the land). Brain storm with the students potential design solutions that might have prevented the event from occurring or lessened the impact of erosion.

Divide students into groups to develop a model of their design solution. Have them go online to explore different methods of erosion control to base their model off of (common erosion control methods include: reforestation, sea walls, contour lines, etc). Students will then write out their plans for their researched design solution, using the materials listed in the previous class (justifying the use of each material). They will also write a hypothesis of why and how they think their design solution will help protect the land and give their sources. (test their solutions the following class)

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What lesson 6 is about: Comparing the strengths and weaknesses of different design solutions			
Lesson question	**Lesson Phenomena**	**3D Learning Objectives**	**Student-Level Explanation**
What are the strengths and weaknesses of different design solutions	There is always more than one possible solution to a problem.	Compare solutions and analyze results to optimize a design to slow or prevent how rapidly water or wind changes the shape of the land	You can use patterns to describe the strengths and weaknesses of design solutions and select which solution is best for a desired function.

Adapting this Lesson to Your Wahi Pana

If possible, access to a watertable for this lesson is preferred (Materials needed: sand, large trays with a drainage hole at the bottom, and two 5 gallon buckets- one to catch water, one to pour).

Begin class allowing students test their different design solutions. Compare and contrast each solution and its strengths/weaknesses. Brainstorm what they could do to improve their designs, and decide on one design as a class.

If the erosion problem is on the schools campus, have the students install their solution and monitor its effectiveness in the coming weeks.