2nd Grade Earth Science Unit

The Earth Is Constantly Changing

Drought Affected the Landscape of Oroville Lake

By: Katherine Altmann

2nd-Grade Teacher, San Diego Unified School District

Anchor Phenomenon:

"I want to go swimming, but the lake is dry!" (Drought in California)

Learning Sequence Summary:

Second grade students will go through a seven 5E lesson sequence over the course of 6-8 weeks learning about how wind and rain shape the landscape, and how the climate can affect the landscape. Students will end the unit with a human impact component to discover and share ways that people can make a difference during periods or drought or anytime.

NGSS Performance Expectations Addressed:

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.]

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.]

2-ESS2-3. **Obtain information to identify where water is found on Earth and that it can be Solid or liquid.**

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K-2- ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

3 Dimensions Taught:

Science and Engineering Practices (SEP):

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Defining Solutions
- Developing and Using Models
- Obtaining, Evaluating, and Communicating Information

Disciplinary Core Ideas (DCI):

- ESS2.D: Weather and Climate
- ESS3.B: Natural Hazards
- ESS2.B: Plate Tectonics and Large-Scale System Interactions
- ESS2.C: The Roles of Water in Earth's Surface Processes
- ESS1.C: The History of Planet Earth

Crosscutting Concepts (CCC):

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Structure and Function
- Stability and Change

California Environmental Principles and Concepts Addressed:

Principle 1 - People Depend on Natural Systems

The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

- **Concept A**. The goods produced by natural systems are essential to human life and to the functioning of our economies and cultures.

- **Concept B.** The ecosystem services provided by natural systems are essential to human life and to the functioning of our economies and cultures.

Lessons:

The Role of Water and the Earth

1. Water, Water Everywhere
2. Water and Ice
3. Where Do Rivers Start?

Plate Tectonics and Large-Scale System Interactions

4. Making Sand Models/Landforms

The History of Planet Earth

5. Rain and Wind
6. Climate vs. Weather

The Role of Water and The Earth

7. People CAN Make a Difference

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Grade Two Earth Science Instructional Segment 1: Landscape Shapes

(From the *2016 Science Framework for California Public Schools K-12*, Chapter 3, Page 163, California Department of Education)

California is known for its majestic mountains, sculpted glacial valleys, rolling coastal hills, and expansive central valley. This Instructional Segment (IS) is the first step on students' path to understand how California came to look the way it does today. Many second grade students are not yet familiar with these broad features the state, but can recognize the local landscape such as a slight tilt in sections of their schoolyard or mountains seen in the distance between buildings. In this IS, students notice and describe different shapes in their local landscape. They use physical or pictorial models to represent these landscapes (as 3-D models and 2-D maps) and use published maps and models to learn about landscape features in California and around the world. They ask questions about what causes these features to form and how quickly or slowly it takes place.

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The Role of Water and the Earth

Lesson #1: Water, Water Everywhere

Grade: 2nd Grade

Anchor Phenomenon: “I want to go to the lake, but it is dry.”

Investigative Phenomenon: Globe- Where is water found on Earth and in what state?

PE’s Building Towards: 2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be a solid or liquid.

Learning Sequence Concept: In this activity, the students are introduced to the anchoring phenomenon. The students obtain information & collect data to explain patterns of where water is found on different places on Earth.**(1 - 50 minutes lesson)**

Guiding Questions: *How can we describe the shape of land and water on Earth?*

Teacher Preparation/Materials
1. 2-3 Earth balls 2. Chart paper 3. Student Sense-Making Notebooks

5E Stage	Student Does	Teacher Does	3D Concept
Engage Prior knowledge of concepts to be learned.	Introduced to the anchor phenomena.	Tell a story about wanting to go to the lake to go swimming in the summer. Show Lake Oroville Pictures Before and After.	DCI ESS2.C : The roles of water in earth’s surface processes. Water is found in the ocean,

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Introduction of phenomena and opportunity for students to ask questions.		Explain that Lake Oroville didn't always look this way. Ask students to explain their thinking as to what happened and why? What questions they have. And how has it changed the landscape?	rivers, lakes, and ponds. SEP: Ask questions CCC: Patterns
	Students write their explanation and wonderings about Lake Oroville. ESR: It was too hot. Maybe it didn't rain. I think the plates may have moved and the water drained out.	Use this explanation as a pre-assessment to see what students prior-knowledge is and to identify any misconceptions. Start a phenomena board. (A phenomena board is an interactive, living board, that includes the anchor phenomenon, questions and wonderings, as well as, new vocabulary learned.) See examples in student artifacts. Explain to students that over the next few weeks we will be learning together and gathering evidence to explain what happened to the lake.	

	Have students hold up right index finger. Explain that the Earth ball will be gently tossed around the room (outside or in a multipurpose room is even better) from one person to another. Students should be divided into groups of 7-10. One student will be needed to record tally marks for their group: land and water. Each time the ball is tossed, the “recorder” marks a tally. ,When the “catcher” catches the ball they should look to see where their right index finger is touching. The “catcher” will tell everyone whether they touched land or water.	Show students the Earth ball. Students will be asked to identify what the colors on the Earth ball represent. Ask: What on Earth do the green and yellow areas represent? (land) What do you think the blue areas are? (water) What do you think the white areas are? (clouds, glaciers, snow, ice). What are the clouds, glaciers, snow and ice made of? (water) Chart student responses.	

	If it landed on a green or yellow area, they will shout “land”. If it landed on a blue or white area, they will shout “water”. The ball will be tossed a total of 10 times. At the end of 10 tosses, the “recorder” totals up how many times the group landed on land and water. Share data from each group.	Ask the question: “What patterns do you see from all of times we threw the Earth ball? Teacher note: The difference should be about 70% water and 30% land (no matter what the numbers, it should be higher for water than land).	
Explore Concepts students explore to build understanding of the “explain” concept.	Expected Student Responses: oceans, lakes, streams, rivers. A few students might know that the atmosphere, glaciers/ ice caps, and inland seas. Expected Student Responses: Some will state liquid (water) vs. solid (ice). Some will state that they are the same, just in different places.	Ask the students to think of all the different types of water that are on Earth. Using the Earth ball, ask students to describe where the ice/ glaciers exist on the planet (poles). Ask if anyone knows why the ice/ glaciers are at the poles? (colder, less sun) types of water Ask students what is the difference between many of the water sources they saw or know about.	DCI ESS2.C: The roles of water in earth’s surface processes. Water is found in the ocean, rivers, lakes, and ponds. SEP: Obtain information and collect data CCC:Patterns
Explain	Students will record the tally data in their student	Facilitate discussions if needed, check in with	DCI ESS2.C: The roles of water in earth’s

Concepts students know or understand (students do the explaining), students explain what they are starting to understand about the phenomenon.	notebooks. Ask students to make a claim based on the data collected. I claim _____ (there is more water on Earth than land). I claim _____ (there is less water on Earth than land).	students, and guide their thinking. Facilitate a science talk discussion about their claims.	surface processes. Water is found in the ocean, rivers, lakes, and ponds. SEP: Argue from evidence CCC:Patterns
Elaborate Concept application.	Revise their claim after the science talk conversation. Students then have the opportunity to revise and improve their thinking and explanation. They should include the new vocabulary in their notebook. All revisions should be done with a colored pen. (example blue or green)	Optional- Read Aloud- All the Water in the World by George Ella Lyon (After student revision.)	DCI ESS2.C: The roles of water in earth's surface processes. Water is found in the ocean, rivers, lakes, and ponds. SEP: Argue from evidence CCC: Patterns
Evaluate Concept(s) students understand at the end of the learning sequence, includes explanation of how and why the phenomenon occurs using understanding		Review student notebooks to check for understanding.	DCI ESS2.C The roles of water in earth's surface processes. Water is found in the ocean, rivers, lakes, and ponds. SEP: Argue from evidence

of 3D science ideas/concepts.			CCC: Patterns

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The Role of Water and the Earth

Lesson #2: Water and Ice

Grade: 2nd Grade

Anchor Phenomenon: “I want to go to the lake, but it is dry.”

Investigative Phenomenon: Water- What is its state? Solid or Liquid

PE’s Building Towards: 2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be a solid or liquid.

Learning Sequence Concept: The students make observations while collecting data to explain how water can change from liquid to solid. **(1 - 50 minutes lesson)**

Teacher Preparation/Materials
1. Per student or groups: 2. Cups with water 3. Freezer or ice cubes 4. Student Sense-Making Notebooks

5E Stage	Student Does	Teacher Does	3D Concept
Engage Prior knowledge of concepts to be learned. Introduction of phenomena and opportunity for		Review what was learned in the previous lesson. Have students review the anchor phenomena. Give students small cups with water to examine and observe. Let them	DCI ESS2.C: Water is found on Earth and it can be a liquid or solid SEP: Ask questions

students to ask questions.		touch it and look at it. Chart the words students used to describe the water. After simple words like liquid, wet, clear are used, probe further by asking students What other things are like water? What does water do?	CCC: Stability and change
Explore Concepts students explore to build understanding of the "explain" concept.	Students will place their cups into a freezer (if available), this should happen before recess or some other activity to give the water a chance to freeze. If containers are small enough, it will take an hour to freeze. If this is not possible, simply use readymade ice and continue with observations of the ice. Ask students if they know where ice comes from. (frozen/ solid water)	Give students a small cup with some ice cubes to examine and observe. Let them touch it and look at it. Chart the words students used to describe the ice. After simple words like hard, cold, white are used, probe further by asking what other things are like ice? What can ice do? Show students images of types of water on Earth. types of water	DCI ESS2.C: Water is found on Earth and it can be a liquid or solid SEP: Make observations and collect data CCC: Stability and change

Explain Concepts students know or understand (students do the explaining), students explain what they are starting to understand about the phenomenon.	Students record their findings from their observations of the ice in their notebooks. ESRs: Ice is frozen water. Ice is solid water. Water that is cold turns into a solid called ice.	Add any new information learned that might help explain the anchor phenomena to the phenomena wall. In addition add any new student wonderings.	DCI ESS2.C: Water is found on Earth and it can be a liquid or solid SEP:Obtaining information CCC: Stability and change
Elaborate Concept application.		Literacy connection: Create a diamante poem (or other type of poem). Students will use the words they have generated to create the poem. The poem assists students with nouns, adjectives and -ing words. For examples: http://www.readwritethink.org/files/resources/interactives/diamante/ Line 1: noun Line 2: 2 adjectives Line 3: 3 -ing words Line 4: 4 nouns Line 5: 3 -ing words Line 6: 2 adjectives	DCI ESS2.C: Water is found on Earth and it can be a liquid or solid SEP: Obtaining and communicating information CCC: Stability and change
Evaluate Concept(s) students understand at the end of the learning sequence, includes		Review student notebooks to check for understanding.	DCI ESS2.C: Water is found on Earth and it can be a liquid or solid

explanation of how and why the phenomenon occurs using understanding of 3D science ideas/concepts.			SEP: Obtaining and communicating information CCC: Stability and Change

The Role of Water and the Earth

Lesson 3: Where Do Rivers Start?

Grade: 2nd Grade

Anchor Phenomenon: "I want to go to the lake, but it is dry."

Investigative Phenomenon: Water Bottle Floating- What is happening and why?

PE's Building Towards: 2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be a solid or liquid.

Learning Sequence Concept: The students obtain information & collect data to explain how balanced forces allow a system to be stable. (1 - 50 minutes lesson)

Guiding Question: Why do you think the rivers flow and end at the ocean?

Teacher Preparation/Materials
<u>For groups:</u> (groups of 2 or 4) 1. Copy paper (3 per group) 2. Spray water bottle 3. Tape (4 pieces) 4. Blue or green marker (non permanent, like Crayola)

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5. Plastic table cloths for tables or work outside (spray outside)
6. Student Sense-Making Notebooks

5E Stage	Student Does	Teacher Does	3D Concept
Engage Prior knowledge of concepts to be learned. Introduction of phenomena and opportunity for students to ask questions.	ESRs: (middle of the map) (near the ocean) I noticed a pattern that all of the rivers end at the ocean.	water bottle floating Show above link Ask: What is causing the water bottle to move? (wind, something is pushing it) where do you think it will end up? map of U.S. rivers This is a map of the United States. These blue lines show the rivers that are found on the land. What do you notice about the rivers? Where do they start? Where do they end? Did you notice any patterns about where the rivers end? Ask a few students to share out. Did you notice a patterns about where the rivers begin/ start? They all start in the middle of the map. Why do you think the rivers start in the middle on the map? What	DCI: ESS2.B: Maps show where things are located. SEP: Ask questions CCC: Stability and change

		pattern do all of these rivers have in common? (turn and talk with partner). Ask a few students to share out. Why do you think the rivers flow and end at the ocean? This is the question we are going to solve.	
Explore Concepts students explore to build understanding of the "explain" concept.	1. One student will make a fist. The other partner will take two pieces of paper and crumple it around the fist. Remove the fist, and crumple the paper more. Carefully, uncrumple the paper. Tape the four corners of the paper mountain onto the other paper, leaving about a two finger space across the top and bottom edge. (the paper mountain should be three dimensional). 2. Look at your mountain. Talk with your partner about what your land looks like. Do you see any mountains, high places where the land goes up? Do you notice any low places, like	Partner/ groups will make a mountain using the paper. In a minute, we are going to make it rain on your mountain. Talk with your partner about where you	DCI: ESS2.B: Maps show where things are located. SEP: Obtain information and collect data CCC: Stability and change

	valleys? Are there any flat areas, like plains? The fist partner uses the blue/green marker to trace all high crease lines. The crumple partner re-traces the lines to make them thicker. Use a lot of ink. Move your model onto the plastic or take it outside. 3. Next, use the spray bottle to create rain. Students discuss observations with partners. Ask: what happens to the “rain” on the mountain? 4. The other partner sprays 5 more times. Waiting one minute. Students discuss the following: What happened when it rained on your mountain? Why do you think the water went where it did? Did it make anything that looks like a river?	think the rain will go. Talk and decide where you think the highest points are on your land. Remember, the ink will color the rain water and show us where the rain flows. ** Have students hold the spray bottle above the mountain at the same height. Spray 5 times and wait 1 minute..	

Explain Concepts students know or understand (students do the explaining), students explain what they are starting to understand about the phenomenon.	Students record observations in their sense-making notebook. ESRs: It flowed down the mountain. We learned that all rivers start in mountains, and flow down and end at the ocean.	Have student bring notebooks to the carpet, and share with a partner. Have a few students to share with the class. Show students the link below: Now what if I told you that these rivers all begin in mountains? (show students map and point to the mountain areas. Also show that the rivers start in the mountains). U.S. rivers- showing mountains Teacher: Today we were trying to determine why rivers flow from the middle of the map and end at the ocean. What observations can you share that will answer this? Ask the students to explain how the water got from the top of the mountain to the bottom. Vocabulary: flow (have students write term in their science notebook and highlight it for quick reference)	DCI: ESS2.B: Maps show where things are located. SEP: Obtain information and construct explanations CCC: Stability and change

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		Add any new information learned that might help explain the anchor phenomena to the phenomena wall. In addition add any new student wonderings.	
Elaborate Concept application.	Students than have the opportunity to revise and improve their thinking and explanation about how water (rivers) flows from high areas (mountains) ending at the oceans. They should include the new vocabulary of flows in their notebook. All revisions should be done with a colored pen. (example blue or green)		DCI: ESS2.B: Maps show where things are located. SEP: Construct explanations CCC: Stability and change
Evaluate Concept(s) students understand at the end of the learning sequence, includes explanation of how and why the phenomenon occurs using understanding of 3D science ideas/concepts.	Students should be able to explain that rivers begin in high areas, such as mountains, and FLOW down to lower areas. All rivers end at oceans. Understanding that the water in rivers moves/ flow is key to building knowledge of weathering and erosion.	Check student notebooks for a quick check for understanding.	DCI: ESS2.B: Maps show where things are located. SEP: Construct explanations CCC: Stability and change

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Plate Tectonics and Large-Scale System Interactions

Lesson #4: Making Sand Models/Landforms

Grade: 2nd Grade

Anchor Phenomenon: “I want to go to the lake, but it is dry.”

Investigative Phenomenon: Landforms in their neighborhood. (Nature Walk)

PE’s Building Towards: 2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.

Learning Sequence Concept: The students develop a model to show how patterns exist in the shape and kinds of land and water on Earth. (1- 50 minutes lesson)

Guiding Questions: What are landforms? How were the landforms developed?

Teacher Preparation/Materials
1. Student Sense-Making Notebooks 2. For groups or partners: 3. Plastic tub (shoebox size) 4. Sand 5. Spray bottle (for teacher) 6. Fill each plastic tub about halfway with sand (lightly spray with water so that it is moldable, but not wet)

5E Stage	Student Does	Teacher Does	3D Concept
Engage	Take the students for a nature walk, around	Raise questions about what the landforms are	DCI ESS2.B: Shape and kinds of land and

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Prior knowledge of concepts to be learned. Introduction of phenomena and opportunity for students to ask questions.	your school or neighborhood.	called, how landforms they see might have developed. Encourage students to talk and discuss what they see. “Children, what might be the difference between the hill over there and that mountain?”What may have made this area where the sand and dirt are higher on two sides and lower in the middle? *Alternatively, if you are unable to take a nature walk, use the internet to find pictures of different types of landforms. landforms	water on Earth SEP: Ask questions CCC: Patterns
Explore Concepts students explore to build understanding of the “explain” concept.	Students use the dampened sand to create a model of landforms that they observed on their nature walk.	Chart all of the landforms students saw on their walk. Have pictures ready to show any landforms they may not have seen. Provide each group with a tub of damp sand. Allow students to create a model of landforms that they saw on the nature walk.	DCI ESS2.B: Shape and kinds of land and water on Earth SEP: Develop a model CCC: Patterns

Explain Concepts students know or understand (students do the explaining), students explain what they are starting to understand about the phenomenon.	Students recreate their model in their student sense-making notebook. Students explain their thinking to the class. Share in partner groups and then share out in a science talk.	Have students begin to explain or define what makes one landform and what makes another. EX:What did you make? A cliff. Why is it a cliff? It is steep (sharp, missing) on one side. Facilitate a science talk conversation about the student explanations. Add any new information learned that might help explain the anchor phenomena to the phenomena wall. In addition add any new student wonderings.	DCI ESS2.B: Shape and kinds of land and water on Earth SEP: Communicating information and construct explanations CCC: Patterns
Elaborate Concept application.	Students than have the opportunity to revise and improve their thinking and explanation. They should include the new vocabulary in their notebook. All revisions should be done with a colored pen. (example blue or green)		DCI ESS2.B: Shape and kinds of land and water on Earth SEP: Construct explanations CCC: Patterns
Evaluate Concept(s) students understand at the end of the learning sequence, includes explanation of how	Students should understand that there are different types of landforms on Earth.	Check student notebooks for a quick check for understanding.	DCI ESS2.B:Shape and kinds of land and water on Earth SEP: Construct explanations

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and why the phenomenon occurs using understanding of 3D science ideas/concepts.			CCC: Patterns

The History of Planet Earth

Lesson #5: Rain and Wind

Grade: 2nd Grade

Anchor Phenomenon: “I want to go to the lake, but it is dry.”

Investigative Phenomenon: Weather in San Diego (Use weather from your area.)

PE’s Building Towards: 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 time scales could include volcanic explosions and earthquakes, which happen quickly, and erosion of rocks, which occur slowly.] [Assessment Boundary: assessment does not include quantitative measurement of time scales.]*

Learning Sequence Concept: Using the lens of stability and change and observations from several sources we see that fast changes are the result of weather. **(1- 50 minute lesson)**

Guiding Questions: What evidence do natural processes leave behind as they shape the Earth? How long is a long time?

Teacher Preparation/Materials
Students will be working in groups of 4 1. Pictures of weather Weather Photos 2. Gray plastic tubs 3. Paper plates 4. Bag of gravel or sand 5. Model of a house (a Lego brick may be used, or one can be constructed from the clay in your kit) 6. Model of a tree 7. Eye dropper (a straw can be used instead) 8. Plastic cup full of water

5E Stage	Student Does	Teacher Does	3D Concept

Engage Prior knowledge of concepts to be learned. Introduction of phenomena and opportunity for students to ask questions.	Students are shown photos of weather, and will think, then discuss with partners. **Expected students responses:** (sunny) The sky is blue. I know those buildings. The water is blue. It is warm. I've been on a boat. (windy) The umbrella is backwards. His jacket is moving. He's going to get wet. (rainy) It is wet. His umbrella is fixed. I see rain drops. The sky is grey/ dark. **Expected students responses for what they know about weather:** It can rain. It can snow. It can be windy. It is sunny and warm. Students identify that the weather isn't always the same. Hopefully students use the word	Show students photos that show examples of weather happening at the same location (sunny, windy, rainy) **Weather Photos** Students are asked what they notice and what they know about it. (I notice, I wonder, it reminds me of…) After some think time, students are asked to do a turn and talk and teacher listens in on the conversations. After some time, the class is redirected as the teacher asks students who discussed weather to share out loud. Teacher then asks class, "what do you know about the weather?" and calls on a few students to share. Teacher charts responses. Teacher then asks class,	DCI: **ESS1.C The history of planet Earth** • Some events happen very quickly; others occur very slowly over a time period much longer than one can observe. SEP: Make observations from several sources to construct an evidence-based account for natural phenomena. CCC: Stability and Change: Things may change slowly or rapidly.

	change.	"Is the weather always the same?" Have students view photos in groups and look at photos as a group, one at a time, **Weather Photos**	
Explore Concepts students explore to build understanding of the "explain" concept.	Students will be working in groups of three. They will take turns following the lab directions. They will record their observations on their individual observation sheets. **Before pictures:** Lego house & tree in same position. The description of the soil, what it looks like and feels like. Identify station and label picture and write and	There will be two sets of each of the 3 investigations set up at tables, each showing the effects of weather (sun, rain, wind). All have a pie tin with soil and a fake tree and fake house. ● heat lamp- wet soil ● water drops- soil ● wind- turkey baster Students are asked to consider the overall question: *Does the weather do anything?* as they investigate As students explore they are asked to create a before and after picture (pass out pre folded paper, have students	DCI: ESS1.C The history of planet Earth Some events happen very quickly; others occur very slowly over a time period much longer than one can observe. SEP: Make observations from several sources to construct an evidence-based account for natural phenomena. CCC: Stability and Change: Things may change slowly or rapidly.

	description. **After picture:** Position of Lego house and tree, position of the soil. What the soil looks like and feels like. Identify and label picture and write description.	keep it folded this time so students only mark on ½, labeled “before”... later they will label “after”), ask for things they see and build a chart with their words. Remind students to be as precise as possible with respect to position of items: ● with labels ● and a description of what their set-up looks like, feels like, and what happened ● “remember how you might touch an animal with a two finger gentle touch? You may do that once and once only”. ● Label the parts of your drawing. Teachers monitor students as they work and if student is showing movement happened in the picture, the teacher directs students are asked to use arrows to show direction of movement. If students aren’t identifying that the	

		weather (wind, water, sun) changed the land, teacher redirects group with questions such as, “why is your before picture different from after? What happened? What made that change?” Throughout - when you ask students “why”, follow up with, “what’s your thinking for that” At stations give post-it to each team once they have identified the type of weather they are modeling: Type of Weather: _____	
Explain Concepts students know or understand (students do the explaining), students explain what they are starting to understand about the phenomenon.	Each team is asked to come up with a statement “I claim that… my evidence is… my reason for thinking this is…” to share their findings with the class.	Teacher charts responses. After hearing from all teams, the teacher asks: “Did you notice any similarities between teams? Turn and talk to your partner.” After sharing with partner,	DCI: ESS1.C The history of planet Earth Some events happen very quickly; others occur very slowly over a time period much longer than one can observe.

	I claim that (type of weather) caused... My evidence (observation) is .... My reason for thinking this is … Challenge: use the word change	students are asked to share out whole class. If students don't recognize that the activities all modeled types of weather, teacher asks, "What does the water, the air, and the light in your investigation all have in common?" "Here's what everybody found out… what do you think about that as a scientist? Turn to a scientist next to you and share your thinking." "Why was there more change from wind than from sun? Things that do change fast we call *change*, things that don't change much we call that *stable*." Add any new information learned that might help explain the anchor phenomena to the phenomena wall. In addition add any new student wonderings.	SEP: Make observations from several sources to construct an evidence-based account for natural phenomena. CCC:Stability and Change: Things may change slowly or rapidly.

Elaborate Concept application.	Students than have the opportunity to revise and improve their thinking and explanation. They should include the new vocabulary in their notebook. All revisions should be done with a colored pen. (example blue or green) Students should be able to identify the 3 types of weather (wind, rain, and sun) from the investigations. They should be able to tell if the weather caused a change or was stable.	Ask students if they think that this change would occur quickly or slowly in the natural world.	DCI: ESS1.C The history of planet Earth Some events happen very quickly; others occur very slowly over a time period much longer than one can observe. SEP: Make observations from several sources to construct an evidence-based account for natural phenomena. CCC: Stability and Change: Things may change slowly or rapidly.
Evaluate Concept(s) students understand at the end of the learning	**Low:** I claim that ...	Check student notebooks for a quick check for understanding.	DCI: ESS1.C The history of planet Earth Some events happen very quickly; others

sequence, includes explanation of how and why the phenomenon occurs using understanding of 3D science ideas/concepts.	My evidence is .... My reason for thinking this is ... **Med:** I claim that ... My evidence is .... My reason for thinking this is ... **High:** I claim that ... My evidence is .... My reason for thinking this is …		occur very slowly over a time period much longer than one can observe. SEP: Make observations from several sources to construct an evidence-based account for natural phenomena. CCC: Stability and Change: Things may change slowly or rapidly.

The History of Planet Earth

Lesson #6: Climate vs. Weather

Grade: 2nd Grade

Anchor Phenomenon: The lake is too dry to go swimming!

Investigative Phenomenon: Planning a vacation to a new place.

PE's Building Towards: 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.]

Learning Sequence Concept: Students will analyze and interpret data about Earth's weather and climate systems using the lens of patterns.

Prior knowledge: By this point in the drought unit, students should know, weather happens minute-by-minute, weather includes rain, temperature, and wind, weather can be measured and observed, scientists use weather patterns to make predictions, severe weather affects living things and land, droughts are when a place does not get enough rain, drought happens over a long time and some weather events happen quickly.

Misconceptions: Climate is weather.

Weather happens minute-by-minute and Climate is the weather patterns that occur over a long period of time.

Teacher Preparation/Materials
1. Places pictures 2. Sticky notes 3. Stacking cube blocks (20 per group, one color for each group, 3-5 student groups)

Original 5E developed by BSCS, Adapted by K-12 Alliance @WestEd including addition of concept column.

2018 California Science Education Conference Climate Summit Learning Sequence: Kindergarten: California Drought by Katherine Altmann.

4. Block graph data page
5. Sheet protector (optional)
6. Computer (optional)
7. Google Earth (optional)
8. Student Sense-Making Notebooks

5E Stage	Student Does	Teacher Does	3D Concept
Engage Prior knowledge of concepts to be learned. Introduction of phenomena and opportunity for students to ask questions.	Looking at a variety of destination pictures, choose where they would like to go on vacation to a new place. Write name on a sticky note and place it where you would love to go. In group discussion, explain why you chose the destination.	Introduce investigative phenomenon: planning a vacation to a new place. Show and hang up pictures of the different places. Give students sticky notes. Why do some people want to go to _____ and others want to go to _____? Chart reasons why students chose the destination. Group or highlight the reasons related to climate.	DCI: ESS2.D Weather and climate. Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time. SEP: Asking Questions and Defining Problems; Use observations (firsthand or from media) to describe patterns and/or relationships in the natural world in order to answer scientific questions and solve problems CCC:Patterns in the natural and designed world can be observed, used to describe

			phenomena, and used as evidence.
Explore Concepts students explore to build understanding of the "explain" concept.	ESR: I predict that Nairobi will be a dry climate because it doesn't have many trees.	Introduce each destination using google earth. Google Earth Have students make predictions based on the landscape and terrain as to what type of climate each destination is. Form 3-5 student groups of 2-4 students in pairs. Each pair will create a block graph yearly precipitation data for their destination. Introduce the data that has rain and snow amounts in different years for the place. Model how to make a block graph using the data table. Distribute destination chart and stacking cubes to each group.	DCI: ESS2.D Weather and Climate. Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time. SEP: Analyzing and Interpreting Data; Use observations (firsthand or from media) to describe patterns and/or relationships in the natural world in order to answer scientific questions and solve problems CCC: Patterns in the natural and designed world can be observed, used to describe phenomena, and used as evidence. Identify patterns in

	Students work with a partner to use stacking cubes. Use stacking cube blocks to create a physical bar graph of annual rainfall in a place over a year. Compare the block graphs of the different places and look for patterns.	1 Year Precipitation Charts	rainfall data from a variety of locations to begin to identify the difference between daily weather differences and regional climate variations.
Explain Concepts students know or understand (students do the explaining), students explain what they are starting to understand about the phenomenon.	Compare climate block graph with weather calendar. ESR: "Climate is weather patterns over a long time and weather changes everyday." Walk and whisper with a partner to determine the climate of the given destination based on the 3D precipitation graph. ESR: Islamabad, Pakistan has a dry and	Explain that a long time of weather patterns is called climate. Have students do a gallery walk with their partner. Allow students to gallery walk with partners around the room to look at each group's work to determine the climate at that destination. Have students view the	DCI: ESS2.D Weather and Climate. Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time. SEP: Asking Questions and Defining Problems; Use observations

	hot climate. Students make a claim about the climate of their destination supported by evidence from the 3D bar graph. Students then present their findings for their destination to the class using evidence from the 3D graph.	Neil degrasse Tyson Video: Climate Explanation Add any new information learned that might help explain the anchor phenomena to the phenomena wall. In addition add any new student wonderings.	(firsthand or from media) to describe patterns and/or relationships in the natural world in order to answer scientific questions and solve problems CCC: Patterns in the natural and designed world can be observed, used to describe phenomena, and used as evidence.
Elaborate Concept application.	*Compare temperatures of different places compare snowy place vs rainy place (similar precipitation amount but different temperature)* Students repeat the same process as the Explore using the 10 year Precipitation Data for the destinations. 10 Year Climate Data		DCI:ESS2.D Weather and Climate. Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time. SEP: Asking Questions and Defining Problems; Use observations (firsthand or from media) to describe patterns and/or

			relationships in the natural world in order to answer scientific questions and solve problems CCC: Patterns in the natural and designed world can be observed, used to describe phenomena, and used as evidence.
Evaluate Concept(s) students understand at the end of the learning sequence, includes explanation of how and why the phenomenon occurs using understanding of 3D science ideas/concepts.	Using all the information they have learned, students will create a model of what happened to Lake Oroville. Ideal Student Response: Lake Oroville was full in 2011 and the water's edge was near the tree line. Then California was in a drought. It did not rain very much, and it was very sunny. The sun causes evaporation and then the water wasn't replaced by rain causing Lake Oroville to	Show students the anchor phenomena photographs of Lake Oroville. Using the phenomena wall and all the information that they have learned, as well as, their sense making notebooks...have them create a model to explain what has happened to the lake, why, and how it has changed the landscape. Remind students that models contain both what can be seen and unseen in them.	DCI: ESS2.D Weather and Climate. Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time. SEP: Asking Questions and Defining Problems; Use observations (firsthand or from media) to describe patterns and/or relationships in the natural world in order to

	look like this in 2014. The water's edge was so low that no one would be able to swim in the lake, and more land was showing causing a change to the landscape.		answer scientific questions and solve problems CCC: Patterns in the natural and designed world can be observed, used to describe phenomena, and used as evidence.

The Role of Water and The Earth

Lesson #7 People CAN Make a Difference

Grade: 2nd Grade

Anchor Phenomenon: The lake is too dry to go swimming!

Investigative Phenomenon: Drought in California- How can weather affect the landscape?

PE's Building Towards: ETS1.B: Developing Possible Solutions
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K–2-ETS1-2)

California Environmental Principle and Concepts: Principle 1 - People Depend on Natural Systems The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Learning Sequence Concept: Humans use natural resources for everything they do and people can make a difference in how they conserve those resources.

Guiding Questions: What is a drought? Can people make a difference? What can people do when they are in a drought?

Teacher Preparation/Materials
1. Student Devices (If student devices are not available, students can create their Public Service Announcement (PSA) on a poster board.) 2. California Drought Images 3. Current California Drought Conditions 4. Student Sense-Making Notebooks

Original 5E developed by BSCS, Adapted by K-12 Alliance @WestEd including addition of concept column.

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5E Stage	Student Does	Teacher Does	3D Concept
Engage Prior knowledge of concepts to be learned. Introduction of phenomena and opportunity for students to ask questions.	Students think, pair share. Students share their noticings, wonderings, and what the images remind them of. ESRs: The plants are dry. The lake has less water, and is dry. The boats are not in the lake. Conservation of Water: Take shorter showers. Turn off the water while brushing teeth. Plant drought resistant gardens. Recycle	Show students images from the California Drought: California Drought Images Ask students what they notice, what they wonder, and what this reminds them of… Brainstorm possible solutions that can combat the effects of a drought.	DCI ESS3.A: Living things need water. Humans use natural resources for everything they do. SEP: Analyzing data- Use and share pictures, drawings, and/or writings of observations. CCC: Cause and effect, events have causes that have observable patterns.
Explore Concepts students explore to build understanding of the “explain” concept.	Students work in expert groups of 4 researching ways that people can make a difference in a drought. Students can create a 60 second video Public Service Announcement that will be shown to the school on how they can make a difference during a drought.	Have students work in expert groups of 4 to create a Public Service Announcement for how people can help combat the effects of a drought.	DCI ESS3.A: Living things need water. Humans use natural resources for everything they do. SEP: Analyzing data- Use and share pictures, drawings, and/or writings of observations.

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			CCC: Cause and effect, events have causes that have observable patterns.
Explain Concepts students know or understand (students do the explaining), students explain what they are starting to understand about the phenomenon.	Students share their PSA with the class. Students evaluate and give feedback on strengths and possible improvements to their PSA. Students revise and improve their PSA. Then students share their PSA with the school community.	Have students share their PSA with the class. Give students the opportunity to revise and improve their PSA.	DCI ESS3.A: Living things need water. Humans use natural resources for everything they do. SEP: Analyzing data- Use and share pictures, drawings, and/or writings of observations. CCC: Cause and effect, events have causes that have observable patterns.
Elaborate Concept application.	Students review current data to decide if the current state of California is in a drought. Students make a claim and use data to support	Share current data: Current California Drought Conditions Have students review current data and answer the question: Is California	DCI ESS3.A: Living things need water. Humans use natural resources for everything they do.

	their claim, I claim the California is currently _____	currently in a drought? How do you know?	SEP: Analyzing data- Use and share pictures, drawings, and/or writings of observations. CCC: Cause and effect, events have causes that have observable patterns.
Evaluate Concept(s) students understand at the end of the learning sequence, includes explanation of how and why the phenomenon occurs using understanding of 3D science ideas/concepts.	Have students expand their knowledge by creating a PSA that then can be shared with their community.		DCI ESS3.A: Living things need water. Humans use natural resources for everything they do. SEP: Analyzing data- Use and share pictures, drawings, and/or writings of observations. CCC: Cause and effect, events have causes that have observable patterns.