IS1 Grade Two Instructional Segment 1: Landscape Shapes

California is known for its majestic mountains, sculpted glacial valleys, rolling coastal hills, and expansive central valley. This instructional segment is the first step on students' paths to understand how California came to look the way it does today. Many grade two students are not yet familiar with these broad features of 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 instructional segment, 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 the change takes place.

GRADE TWO INSTRUCTIONAL SEGMENT 1: LANDSCAPE SHAPES

Guiding Questions

- How can we describe the shape of land and water on Earth?

Performance Expectations

Students who demonstrate understanding can do the following:

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.

The bundle of performance expectations above focuses on the following elements from the NRC document *A Framework for K–12 Science Education*:

Highlighted Science and Engineering Practices	Highlighted Disciplinary Core Ideas	Highlighted Crosscutting Concepts
[SEP-1] Asking Questions (for science) and Defining Problems (for engineering) [SEP-2] Developing and Using Models [SEP-4] Analyzing and Interpreting Data [SEP-8] Obtaining, Evaluating, and Communicating Information	ESS2.B: Plate Tectonics and Large-Scale System Interactions ESS2.C: The Roles of Water in Earth's Surface Processes	[CCC-1] Patterns [CCC-3] Scale, Proportion, and Quantity [CCC-4] Systems and System Models

CA CCSS Math Connections: 2.MD.10, 2.G.1–2

CA CCSS for ELA/Literacy Connections: W.2.2, W.2.7–8, W.2.10, SL.2.2, SL.2.e

CA ELD Standards Connections: ELD.PI.2.6, ELD.PI.2.10

CA History–Social Science Content Connections: K.4.4, 1.2.3, 2.2.1

There is no better way to experience Earth materials and the forces that shape them into a landscape than digging, pouring, and piling in a sandbox. Even with today's modern computers and tools, researchers at California's top universities still use physical **models [SEP-2]** called *fluvial geomorphology flumes* that are essentially giant sandboxes. While formal experiments in the schoolyard sandbox can be useful, this instructional segment begins with relatively unstructured time to play in the sandbox. Teachers provide materials to dig, perhaps some water, and then observe and photograph different aspects of the play to highlight later during the instructional segment. Schools that don't have a sandbox could consider building one as a class project, or teachers could use small plastic tubs filled with sand.

Teachers next connect the play in the sand to what students know about local landscapes. Are there mountains nearby? Hills? Places that are higher or lower than others? Walking around the schoolyard, students search for places where the landscape is not flat. They roll balls or pour water and identify evidence that there are slopes even in some of the flattest looking places by noticing the motion of the balls or water. How would they describe the locations of these mini hills to someone in another class? Earth scientists use maps for this challenge. Maps are **models [SEP-2]** of the world; they not only represent geographic features, but maps are tools used to answer questions. Road maps depict how long it will take to travel from place to place, weather maps predict where air will move, and geologic maps record the history of ancient plate motions. Students may have designed their own maps in earlier grades (CA History–Social Science Content Standards K.4.4, 1.2.3), and now they must be able to represent the shape of landscapes on maps (including hills and slopes). Teachers can return to the schoolyard sandbox (or classroom trays of sand or clay) and challenge each student to design a mini landscape where they would like to live. Then, students draw a map of their landscape and the teacher snaps a photo of the sandbox. Trading maps, another student must try to recreate the landscape from scratch. Which maps were most effective at communicating a landscape's features?

Students progress to **modeling [SEP-2]** larger spaces, such as the entire school or a park where they must indicate variations in topography (2-ESS2-2). Students are not expected to construct or even be familiar with traditional topographic maps; they need to develop their own ways of representing hills and valleys. Maps in grade two do not need to include a precise scale. Students can then use maps to **obtain information [SEP-8]** about geographic and environmental features of their town, a local park or region, or the entire state.

Students then focus on how these maps depict bodies of water. The intent is not for students to memorize where water is found, but to recognize **patterns [CCC-1]** in where water is found on Earth (2-ESS2-3). Water can move fast down a narrow path in a river or

spread out in a lake or pond. It can be salty like the ocean or fresh like a lake. Maps help students recognize that most of these bodies are connected as part of a water **system [CCC-4]**. By tracing the paths of rivers on maps, students notice that most of California's rivers flow into and out of lakes and eventually make their way to the ocean. In fact, the vast majority of water on Earth exists in the oceans. Tossing around an inflatable globe, students can tally up the number of times their index finger lands on ocean versus land and make a bar graph (CA CCSSM 2.MD.10) that illustrates the **proportion [CCC-3]** of Earth's surface that is covered by land and water. In grade two, students notice patterns in Earth's features that they will analyze in more detail during grade four (4-ESS2-2).

Opportunities for ELA/ELD Connections

While scientists use maps to depict geographic features, they also use language to describe them. Students can make a list of all the different words they know to describe land and water features (mountain, hill, valley, river, lake, pond, etc.). Some of these words have very similar meaning (i.e., stream and creek) while others depict differences in **scale [CCC-3]** (i.e. stream versus river or hill versus mountain). Students **gather information [SEP-8]** from books and media to create a booklet about landforms and the words to describe them. They draw and label a different landform or body of water on each page, starting with the smallest bodies of water or the lowest landforms on the first page and adding progressively larger or taller features on subsequent pages.

CA CCSS for ELA/Literacy Standards: W.2.2, 7, 8, 10; SL.2.2
CA ELD Standards: ELD.PI.2.6, 10

Sample Integration of Science and ELD Standards in the Classroom

In small groups, students engage in developing models to represent the shapes and kinds of land and bodies of water in an area (2-ESS2-2). Each group examines graphics of a different type of landscape, labeling and writing brief text explanations on the location and characteristics of the area. Students collaborate and plan with their peers, using the image and text evidence to support their choices for the materials, size, and process that they use to develop their models. After creating their models, students briefly explain in writing why they chose the materials they did and why they built the model the way they did. Before the students write, the teacher leads them through examining a text with a similar structure so students can see the way an author introduces the choices and supports them with reasons and evidence (e.g., We chose to use crumpled paper to show mountains because we can make them tall and jagged. Mountains in real life are tall and jagged.) To support students at the Emerging level of English proficiency, the teacher pulls a small group and co-constructs an explanation with them, taking ideas from the students while recasting and asking probing questions to strengthen the writing.

CA ELD Standards: ELD.PI.2.11
Source: Lagunoff et al. 2015, 226–227

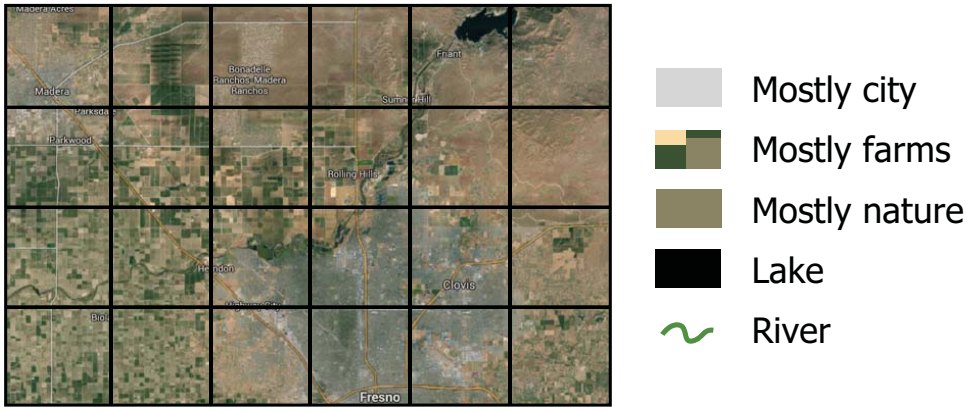
Maps and globes can also have symbols to depict ice and snow, another form of water. This is the first time that students formally discuss the relationships between solids and liquids. They discuss these materials more in the next instructional segment (IS2).

The class could then work together to create a giant model of California (or their own town) using the entire sandbox, piling up mountains and carving out major river channels in the places indicated on a map. They can add a grid system and practice locating features (CA History–Social Science Content Standards 2.2.1).

Opportunities for Mathematics Connections

Students draw a grid on a map or aerial photo of their community (figure 3.6) by dividing up a rectangle into rows and columns with same size squares. They count the total number of squares that have a particular feature (city versus nature versus farms, land versus water, mountains versus valley floors, etc . . .) (CA CCSSM 2.G.2). They create a bar chart communicating the comparison (CA CCSSM 2.MD.10).

Figure 3.6. Aerial Photo of a Community



Source: Illustration by M. d'Alessio using an image from Google Maps 2016.

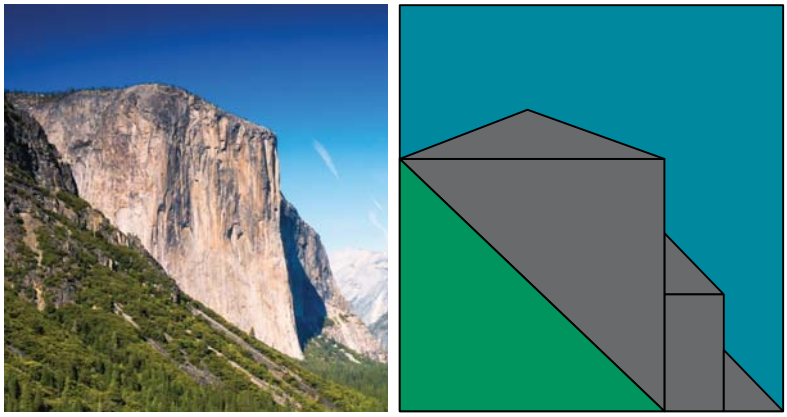
CA CCSSM: 2.MD.10, 2.G.2

Up to this point, students have used the sandbox, drawings, and maps as representations of their landscape, which is not quite the same as a model in the CA NGSS. A model is a thinking tool that can be used to predict or explain how different objects will interact. A representation can be used as a model when students ask questions like, "How long does it take for water to travel from the mountains to the ocean?" or, "What happens when the wind blows across this valley and then hits the mountains on the other side?" Students will put their representations to work as models in the grade two IS3.

Opportunities for Mathematics Connections

Paralleling the study of shapes in the CA CCSSM for K–2, the CA NGSS has students exploring the significantly more complex shapes of natural landscapes. While students have mastered the ability to identify simple shapes (CA CCSSM K.G.1) and create composite shapes (1.G.2), how can they represent the bends and curves of real-life objects in nature? Looking at a picture of a mountain, a valley, or a coastline, students can draw a simplified version of the landscape (figure 3.7) using only simple shapes such as triangles, quadrilaterals, and circles (CA CCSSM 2.G.1). Students observe that a great variety of objects can be built from a small set of pieces (PS1.A, 2-PS1-3). How well do these simple shapes represent the curves and bends in nature?

Figure 3.7. Using Shapes to Represent Natural Landscapes



Source: Cook 2013 (left); M. d'Alessio (right)

CA CCSSM: 2.G.1