

HS-ESS2-1 Earth’s Systems

 California Science Test—Item Content Specifications

# HS-ESS2-1 Earth’s Systems

Students who demonstrate understanding can:

Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

[Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [*Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth’s surface.*]

Continue to the next page for the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Developing and Using ModelsModeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).Develop a model based on evidence to illustrate the relationships between systems or between components of a system. | ESS2.A: Earth Materials and Systems1. Earth’s systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.

ESS2.B: Plate Tectonics and Large-Scale System Interactions1. Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth’s surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth’s crust. *(ESS2.B Grade 8 GBE)*
 | Stability and ChangeChange and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. |

## Assessment Targets

Assessment targets describe the focal knowledge, skills, and abilities for a given three-dimensional Performance Expectation. Please refer to the Introduction for a complete description of assessment targets.

### Science and Engineering Subpractice(s)

Please refer to appendix A for a complete list of Science and Engineering Practices (SEP) subpractices. Note that the list in this section is not exhaustive.

2.1 Ability to develop models

### Science and Engineering Subpractice Assessment Targets

Please refer to appendix A for a complete list of SEP subpractice assessment targets. Note that the list in this section is not exhaustive.

2.1.1 Ability to determine components of a scientific event, system, or design solution

2.1.2 Ability to determine the relationships among multiple components of a scientific event, system, or design solution

2.1.3 Ability to determine scope, scale, and grain-size of models, as appropriate for their intended use

2.1.4 Ability to represent mechanisms, relationships, and connections to illustrate, explain, or predict a scientific event

### Disciplinary Core Idea Assessment Targets

#### ESS2.A.6

* Identify and describe the interactions and feedbacks between processes that affect change and rates of change of Earth’s surface
* Describe the rate at which a feature changes related to the time scale on which the processes operate

#### ESS2.B.4

* Identify and describe specific continental and seafloor features
* Identify and describe internal processes, such as volcanism and tectonic uplift, and surface processes, such as weathering and erosion, including the different spatial and temporal scales on which they operate
* Identify the causal agents that build up or wear down (i.e., constructive and destructive forces) Earth’s surface over time
* Use a model to illustrate the relationship between the formation of continental and ocean floor features and Earth’s internal and surface processes operating on different temporal or spatial scales

### Crosscutting Concept Assessment Target(s)

CCC7 Develop models that quantify change and rates of change over very short to very long periods of time, and recognize irreversible changes

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides information about a geomorphic feature and a list of relevant and irrelevant components of a model:

* Identifies and selects relevant components to illustrate or explain the internal and/or surface process(es) that produced the feature (2.1.1, ESS2.A.6, and CCC7)

Task provides information about a geomorphic feature, an incomplete model representing the feature, and a list of relevant and irrelevant components:

* Identifies and selects the missing components to complete the model (2.1.1, ESS2.B.4, and CCC7)
* Describes how the model illustrates or explains the internal and/or surface process(es) that produced the feature (2.1.1, ESS2.B.4, and CCC7)

Task provides information about a geomorphic feature and a list of models:

* Selects the appropriate model to illustrate or explain the internal and/or surface process(es) that produced the feature (2.1.2, ESS2.B.4, and CCC7)

Task provides a model and/or information about a geomorphic feature and a list of relevant and irrelevant representations of the geomorphic feature:

* Selects and uses the appropriate representations to describe the mechanisms underlying changes to Earth’s surface (2.1.3, ESS2.A.6, and CCC7)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Volcanoes, mountain ranges, valleys, and ocean trenches at colliding plate boundaries
* Mid-ocean ridges and rift valleys at divergent plate boundaries
* Weathering and erosion shaping landforms on continents
* Volcanoes at hot spots as evidence of plate movement
* Erosion and deposition of continental materials forming features such as barrier islands, continental shelves, and continental slopes

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Volcanoes only form at plate boundaries.
* All valleys are the result of downcutting by rivers.
* Internal and surface processes operate on the same spatial and temporal scale.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

HS-ESS2-1 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/HS-ESS2-1 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/HS-ESS2-1%20Evidence%20Statements%20June%202015%20asterisks.pdf)

The *2016 Science Framework for California Public Schools Kindergarten through Grade 12*

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade 12 <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

Posted by the California Department of Education, March 2021 (updated February 2024)