

4-ESS2-2 Earth's Systems

California Science Test—Item Content Specifications

# 4-ESS2-2 Earth's Systems

Students who demonstrate understanding can:

Analyze and interpret data from maps to describe patterns of Earth’s features.

[Clarification Statement: Maps can include topographic maps of Earth’s land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Analyzing and Interpreting Data  Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.  Analyze and interpret data to make sense of phenomena using logical reasoning. | ESS2.B: Plate Tectonics and Large-Scale System Interactions   1. The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. | Patterns  Patterns can be used as evidence to support an explanation. |

## 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.

4.2 Ability to analyze data to identify relationships

### 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.

4.2.1 Ability to use empirical data to describe patterns and relationships

4.2.2 Ability to identify patterns (qualitative or quantitative) among variables represented in data

4.2.3 Ability to apply concepts of statistics and probability to data

4.2.4 Ability to consider limitations of data analysis (e.g., measurement error, sample selection)

### Disciplinary Core Idea Assessment Targets

#### ESS2.B.2

* Identify patterns in the location of Earth’s physical features, including the locations of mountain ranges, deep ocean trenches, and ocean floor structures
* Describe the relationship between the occurrence of volcanoes and earthquakes in bands that are often located along the boundaries between continents and oceans
* Describe the relationship between the formation of mountain chains inside continents or near plate edges and their location in relation to moving plates
* Locate Earth’s physical features (e.g., mountain ranges) and determine patterns of events (e.g., earthquakes) associated with those features using maps

### Crosscutting Concept Assessment Target(s)

CCC1 Use patterns as evidence to support an explanation

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a map with the locations of volcanoes, mountain ranges, and plate boundaries:

* Uses data to describe patterns in the map (4.2.1, ESS2.B.2, and CCC1)
* Predicts if a newly formed mountain range at location X would have a volcano based on the patterns in the map (4.2.1, ESS2.B.2, and CCC1)

Task provides maps of Earth’s physical features as well as a map of the plate boundaries:

* Identifies which features are evidence of plate boundaries (e.g., volcanoes and ocean trenches) and which are not evidence of plate boundaries (e.g., forests and cities) (4.2.2, ESS2.B.2, and CCC1)

Task provides a world map of plate boundaries, a world map of earthquakes, and a California map of plate boundaries:

* Predicts most likely locations of earthquake epicenters in California (e.g., more likely at San Francisco than Sacramento) (4.2.3, ESS2.B.2, and CCC1)

Task provides maps of major earthquakes and volcanic eruptions along with data about the size of potential earthquake or eruption:

* Predicts that earthquakes and volcanic eruptions will most likely occur along plate boundaries (4.2.4, ESS2.B.2, and CCC1)
* Identifies that predictions of the timing of an earthquake or the timing and duration of a volcanic eruption are limited (4.2.4, ESS2.B.2, and CCC1)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Identifying patterns in the location of physiographic features on the continents:
  + - The location of earthquakes
    - Location of mountain ranges
    - Likelihood of volcanoes being found along plate boundaries
* Identifying patterns in physiographic features on the ocean floor:
  + - Location of mountain ranges and volcanoes
    - The location of deep ocean trenches
    - Earthquakes on the seafloor
    - Island formation from hotspots on the ocean floor (e.g., Hawaiian Islands formation)
    - Sea floor spreading
* Describing the relationships between patterns in physiographic features on Earth’s surface and events that may have caused these features

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Earthquakes and volcanoes only occur along plate boundaries.
* Earthquakes result in the surface suddenly being split by huge canyons.
* Mountains do not change over time.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

[4-ESS2-2 Evidence Statement](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-ESS2-2%20Evidence%20Statements%20June%202015%20asterisks.pdf) <https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-ESS2-2%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