6/18

MS-ESS2-2 Earth's Systems

California Science Test—Item Content Specifications

# MS-ESS2-2 Earth's Systems

Students who demonstrate understanding can:

Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

[Clarification Statement: Emphasis is on how processes change Earth’s surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

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 |
| --- | --- | --- |
| Constructing Explanations and Designing SolutionsConstructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. | ESS2.A: Earth Materials and Systems1. The planet’s systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth’s history and will determine its future.

ESS2.C: The Roles of Water in Earth's Surface Processes1. Water’s movements—both on the land and underground—cause weathering and erosion, which change the land’s surface features and create underground formations.
 | Scale Proportion and QuantityTime, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. |

## Assessment Targets

Assessment targets describe the focal knowledge, skills, and abilities for a given three-dimensional Performance Expectation. Please refer to the Introduction (hyperlink to section on explanation of assessment targets) 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.

6.1 Ability to construct explanations of phenomena

### 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.

6.1.1 Ability to construct quantitative and/or qualitative explanations of observed relationships based on valid and reliable evidence

6.1.2 Ability to apply scientific concepts, principles, theories, and big ideas to construct an explanation of a real-world phenomenon

6.1.3 Ability to use models and representations in scientific explanations

### Disciplinary Core Idea Assessment Targets

#### ESS2.A.4

* Recognize that surface features are the result of geological processes operating at varying temporal and spatial scales
* Recognize that present-day surface features will continue to undergo active change by the same processes that operated in the past (i.e., the concept of uniformitarianism)
* Identify and describe plate tectonics and the surface features that result from plate motions
* Identify and describe surface processes—such as weathering, erosion, and deposition—and the surface features that result from the processes
* Identify and describe catastrophic events—such as earthquakes, volcanoes, and meteor impacts—and the surface features that result from the events
* Distinguish between slow, large-scale geological processes and rapid, sometimes catastrophic geological events

#### ESS2.C.7

* Identify and describe how water, through various processes on both a microscopic scale and a large scale, can change Earth’s surface

### Crosscutting Concept Assessment Target(s)

CCC3 Identify that time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides data from an experiment about a geological process that changes Earth’s surface:

* Explains whether or not there is a causal relationship between the independent and dependent variables in the experiment (6.1.1, ESS2.C.7, and CCC3)

Task provides evidence (e.g., a description, observations, or data) about a change in a surface feature:

* Uses the evidence and the appropriate scientific concepts (e.g., force), principles (e.g., superposition), theory (e.g., plate tectonics), or big ideas (e.g., energy) to explain the change in the surface feature (6.1.2, ESS2.A.4, and CCC3)
* Uses a model to represent an explanation for the change in the surface feature over time (6.1.3, ESS2.A.4, and CCC3)

Task provides a model illustrating the change over time of a surface feature:

* Constructs an explanation based on the change illustrated in the model (6.1.3, ESS2.A.4, and CCC3)
* Uses the model to explain the change in the surface feature (6.1.3, ESS2.A.4, and CCC3)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Data or observations (e.g., before-and after-images) from an investigation of a geological process (e.g., soil erosion) or sudden geological event (e.g., a landslide)
* Comparisons of duration and scale of examples of a geological process (e.g., erosion by landslide or soil creep, different types of volcanic eruptions, movement along faults under different conditions)
* Evidence of a surface feature formed by plate tectonics (e.g., a mountain range)
* Representations of present-day geologic processes that operated in the past

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Rock layers are deposited or formed at the same rate.
* Rock layers erode at the same rate.
* Mountains are permanent structures, unchanged over long periods of time.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ESS2-2 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ESS2-2 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-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 (updated February 2024)