# Earth and Space Sciences—Grade Eight

# —Alternate Item Content Specifications

**Prepared for the California Department of Education by Educational Testing Service**



**Presented August 1, 2020**

 

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MS-ESS1-1 Earth’s Place in the Universe

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Use an Earth-Sun-Moon model to show that the Earth-Moon system orbits the Sun once an Earth year and the orbit of the Moon around Earth corresponds to a month. | 1. Ability to use an Earth-Sun-Moon model to show that the Earth-Moon system orbits the Sun once an Earth year.
2. Ability to use an Earth-Sun-Moon model to show that the orbit of the Moon around Earth corresponds to a month.
 | Recognize components of a model of the Earth, Moon, and Sun system. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.** [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

### Mastery Statements

Students will be able to:

* Identify the Moon, Sun, or Earth
* Recognize that Earth orbits the Sun
* Recognize that the Moon orbits Earth
* Recognize that it takes Earth one year to orbit the Sun
* Recognize that it takes the Moon one month to orbit Earth
* Recognize that it takes the Moon one year to orbit the Sun

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Models used to compare the rates of rotation and revolution of the Moon and Earth
* Models that show the Sun, Earth, and Moon
* Models that diagram the orbital paths of Earth around the Sun and the Moon around Earth

### Additional Assessment Boundaries

* Do not label diagrams with the names of the Sun, Moon, and Earth.

### Additional References

California Science Test Item Specification for MS-ESS1-1

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ess1-1.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

The *2016 Science Framework for California Public Schools Kindergarten through Grade Twelve* <https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp>

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade Twelve

<https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

Appendix 2: Connections to Environmental Principles and Concepts

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MS-ESS2-1 Earth’s Systems

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify relationships between components in a model of energy flows and matter cycles within and among Earth’s systems, including the Sun and Earth’s interior as primary energy sources. | 1. Ability to identify relationships between components in a model of energy flows and matter cycles (e.g., weathering, erosion, sedimentation) among Earth’s systems, with the Sun as the primary energy source.
2. Ability to identify relationships between components in a model of energy flows and matter cycles (e.g., melting, crystallization, deformation) among Earth’s systems, with Earth’s interior as the primary energy source.
 | Identify types of Earth materials that can be located at the surface (exterior) and/or in the interior. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process.** [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth’s materials.] *[Assessment Boundary*: *Assessment does not include the identification and naming of minerals.]*

### Mastery Statements

Students will be able to:

* Identify common materials used by humans that are found on or in the crust of Earth
* Identify the role of wind and water in erosion of sediments
* Identify the process of forming layers of rock and soil (sediments)
* Identify examples of rock being melted by the heat from Earth’s core
* Identify examples of melted magma cooling to become solid rock
* Identify the Sun as the driver of weathering and erosion due to its role in the water cycle and formation of wind
* Identify the core of Earth as the cause of rocks melting and changing

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Models of weathering (e.g., rocks breaking up), erosion, and deposition that include the Sun as a source of energy
* Models that focus on the Sun as a source of the energy for some weathering and erosion processes
* The changes as rocks become sediment and then sedimentary rock
* The changes as rock is melted and then cooled to form crystals
* Earth’s hot interior provides energy to drive processes that cause rocks to melt or change

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-ESS2-1

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ess2-1.docx>

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MS-ESS2-5 Earth’s Systems

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify how air masses influence weather using data and/or simulated demonstrations. | 1. Ability to identify how air masses influence local weather using temperature models.
2. Ability to identify how air masses influence local weather using landform models.
3. Ability to identify how proximity to an ocean influences local weather using models.
 | Identify weather information used to compare weather conditions in different locations on the same day. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.** [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as with condensation).] *[Assessment Boundary*: *Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]*

### Mastery Statements

Students will be able to:

* Identify weather conditions on a map
* Compare weather conditions in two different locations
* Recognize the effect the movement of air masses has on the weather
* Recognize the effect the proximity to the ocean has on weather
* Recognize the influence of landforms on weather
* Recognize the effect that the temperature of air masses has on the weather
* Recognize how air masses will move based on temperatures

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* The role of mountain ranges in influencing weather patterns
* The effect of proximity to an ocean on weather patterns
* The effect of heating and cooling air on the movement of air masses

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-ESS2-5

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ess2-5.docx>

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MS-ESS3-2 Earth and Human Activity

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Use resources (e.g., maps, charts, images of natural hazards) to identify patterns in past occurrences of catastrophic events in each of two regions to predict which location may receive a future similar catastrophic event. | 1. Use resources (e.g., maps, charts, images of natural hazards) to identify patterns in past occurrences of catastrophic events in each of two regions to predict which location may receive a future similar catastrophic event.
 | Recognize that some natural hazards (e.g., volcanic eruptions, severe weather) can be predicted while others are not predictable. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

### Mastery Statements

Students will be able to:

* Recognize examples of natural hazards that can be predicted
* Recognize examples of natural hazards that cannot be predicted
* Use information in a map, chart, data table, or image of a natural hazard to identify a pattern in past occurrences of catastrophic events
* Use identified patterns in past occurrences of catastrophic events in each of two regions to predict which location will most likely have a similar catastrophic event

### Environmental Principles and Concepts

Principle 1—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.

Principle 2—The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Predicting severe weather and volcanic activity using monitoring technology
* Identifying hazards that are difficult to predict accurately, such as landslides or earthquakes.
* Predicting flooding based on weather information and the history and geography of an area
* Using historic data to identify regions with a higher risk of natural hazard

### Additional Assessment Boundaries

* Do not include tsunamis in item contexts. May refer to flooding waves or ocean floods.

### Additional References

California Science Test Item Specification for MS-ESS3-2

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ess3-2.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

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MS-ESS3-3 Earth and Human Activity

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Use data from an existing design solution for minimizing a human impact on the environment to identify limitations of the use of technologies employed by the solution.  | 1. Ability to use data from an existing design solution for minimizing a human impact on the environment to identify limitations of the use of technologies employed by the solution.
 | Identify a way humans can minimize their impact on the environment. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.** [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

### Mastery Statements

Students will be able to:

* Identify ways people can help the environment
* Identify ways people can mitigate harm to the environment
* Recognize the limitations of a solution which minimizes harm to the environment
* Use data to determine which technology provides the best solution to an environmental problem

### Environmental Principles and Concepts

Principle 1—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.

Principle 2—The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Building in undeveloped areas
* Conserving or wasting water
* Farming or gardening practices
* How land is used
* Deforestation
* Pollution
* Reuse and recycling of materials

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-ESS3-3

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ess3-3.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

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MS-ESS3-4 Earth and Human Activity

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Using a variety of resources (e.g., tables, graphs, maps), identify whether changes made by humans to Earth’s natural resources have impacted natural systems. | 1. Ability to identify if changes that humans have made to Earth’s natural systems have positive impacts, negative impacts, or some combination of positive and negative impacts using a variety of resources.
 | Recognize the relationship between an increase in human population and an increase in the consumption of food and natural resources. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth’s systems.**

[Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth’s systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

### Mastery Statements

Students will be able to:

* Recognize the relationship between more people and the use of more resources
* Identify a positive impact that is a result of a human-caused change to a natural system
* Identify a negative impact that is a result of a human-caused change to a natural system

### Environmental Principles and Concepts

Principle 1—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.

Principle 2—The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Scenarios showing the relationship between increases in human population and the increased use of a resource
* Impact of farming practices
* Impact of efforts to improve the environment such as recycling, green building, use of renewable resources, etc.
* Impact of development
* Impact of water use practices

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-ESS3-4

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ess3-4.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

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MS-ESS3-5 Earth and Human Activity

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Find evidence of the effects of human activities on changes in global temperatures over the past century by using a variety of resources (e.g., tables, graphs, maps of global and regional temperatures, data on atmospheric levels of gases (such as carbon dioxide and methane), data on rates of human activities. | 1. Ability to find evidence of the effects of human activities on changes in global temperatures over the past century by using a variety of resources.
 | Identify ways that human activities affect the environment (e.g., agriculture, pollution, recycling, city growth). |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.** [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

### Mastery Statements

Students will be able to:

* Identify one example of a human activity that helps the environment
* Identify one example of a human activity that is harmful to the environment
* Use information to recognize that the temperature of Earth has been increasing over the last century
* Identify two pieces of evidence that support the assertion that the temperature of Earth has been increasing over the last century

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* The relative impacts of human activities such as recycling, conserving water, and reducing automobile travel.
* Human activities that harm or help the environment such as littering, clearing forests, using less-polluting forms of transportation or turning out lights when not in use.
* Patterns and relationships in climate change data, such as the relationship between the increase in greenhouse gases and increasing temperatures.

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-ESS3-5

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ess3-5.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

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*Posted by the California Department of Education, August 2020*