

MS-ESS2-5 Earth's Systems

California Science Test—Item Content Specifications

# MS-ESS2-5 Earth's Systems

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 weather maps, diagrams, and visualizations) or obtained through laboratory experiments (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.*]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Planning and Carrying Out InvestigationsPlanning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. | ESS2.C: The Roles of Water in Earth's Surface Processes1. The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.

ESS2.D: Weather and Climate 1. Because these patterns are so complex, weather can only be predicted probabilistically.
 | Cause and EffectCause and effect relationships may be used to predict phenomena in natural or designed systems. |

## 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.

3.3 Ability to collect the data for the investigation

### 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.

3.3.1 Ability to use appropriate tools for accurate and precise measurements

3.3.2 Ability to make observations according to the investigation plan

3.3.3 Ability to evaluate the quality of data to determine if the evidence meets the goals of the investigation

### Disciplinary Core Idea Assessment Targets

#### ESS2.C.5

* Identify gravity as the force acting to power convection currents in the atmosphere
* Describe how an air parcel is able to move due to the energy it contains, either from received sunlight or from trapped water molecules
* Identify which weather patterns correspond to particular mass movements (e.g., tornados forming when cold air and hot air collide), energy availability (e.g., storm systems needing contained water energy), and landforms (e.g., the role of mountain ranges in inducing snowfall)
* Identify the interacting causes of weather patterns

#### ESS2.D.5

* Identify sources of uncertainty when predicting weather patterns from measurements of wind, temperature, pressure, humidity, and other parameters
* Describe the probability of the occurrence of a particular weather event based on measurements, and differentiate high probability from certainty

### Crosscutting Concept Assessment Target(s)

CCC2 Use cause and effect relationships to predict phenomena in natural or designed systems

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides an experimental setup in which a student is going to measure temperature, humidity, and amount of rainfall each day for a month:

* Identifies the correct tools needed for each measurement (3.3.1, ESS2.C.5, and CCC2)
* Describes the correct use of each tool (3.3.1, ESS2.C.5, and CCC2)

Task provides a scenario of an investigation into the increased tendency of a particular weather event that cannot be explained merely by any one single condition (e.g., snow occurs in mountain ranges because wind pushes humid air into regions colder than it might otherwise go):

* Describes the evidence necessary to attribute that pattern to more than a single cause-single effect relationship (3.3.2, ESS2.C.5, and CCC2)

Task provides a scenario which details the mechanism by which a meteorologist makes predictions about the likelihood of a particular weather event:

* Identifies the challenges to making accurate predictions about a weather event and distinguishing between a claim of low chance of a weather event and a claim that a weather event will not occur (3.3.3, ESS2.D.5, and CCC2)

Task provides a scenario with details of an investigation by scientists regarding the contribution of air parcel temperature to weather patterns, concluding that a certain weather event (e.g., tornados) will not occur in a particular region because it is too cold:

* Identifies that the temperatures measured during the investigation are only a limited set of all possible temperatures that a region may experience (3.3.3, ESS2.C.5, and CCC2)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* The role of mountain ranges in influencing weather patterns
* Wind chill occurring when the movement of air acts to increase the rate of heat exchange from surface objects to the surrounding air
* A probabilistic weather prediction, such as, “There is an X percent chance of rain today.”
* The formation and movement of major weather events (e.g., tornadoes, hurricanes)
* Predicting wind movement between two locations

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Weather and climate are identical.
* The water molecules contained in the atmosphere are all in visible forms, such as fog and clouds.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ESS2-5 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ESS2-5 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ESS2-5%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>

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