  
MS-ETS1-3 Engineering Design

California Science Test—Item Content Specifications

# MS-ETS1-3 Engineering Design

Students who demonstrate understanding can:

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

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 |
| --- | --- | --- |
| Analyzing and Interpreting Data  Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.  Analyze and interpret data to determine similarities and differences in findings. | ETS1.B: Developing Possible Solutions  7. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.  8. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.  ETS1.C: Optimizing the Design Solution  3. Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. | Not applicable |

## 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

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

### Disciplinary Core Idea Assessment Targets

#### ETS1.B.7

* Evaluate the effectiveness of three or more potential design solutions to an engineering problem based on provided data
* Identify appropriate analysis techniques to analyze data based on the problem definition
* Identify relationships in data sets between design solutions and given criteria and constraints

#### ETS1.B.8

* Identify similarities and differences in various features of multiple potential (or pre-existing) design solutions
* Identify unique characteristics of each design that best meet the given criteria and constraints based on analyzed data

#### ETS1.C.3

* Compile the best features of each design into a new and improved redesigned solution based on analyzed data and fundamental physical principles

### Crosscutting Concept Assessment Target(s)

Not Applicable

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a scenario and data sets of multiple design solutions:

* Identifies relationships in the data sets, including relationships between design solutions and given criteria and constraints (4.2.1 and ETS1.C.3)
* Presents a new and improved redesigned solution when given analyzed data by comparing features of each design (4.2.1 and ETS1.C.3)
* Identifies limitations in the data sets that prevent direct comparison of the effectiveness of one design solution against another (4.2.4 and ETS1.B.7)

## California Environmental Principles and Concepts

* EP5: Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Re-evaluating methods to minimize negative environmental impacts such as pollution mitigation (air, water, or light), water conservation, oil spill cleanup, air quality maintenance, and endangered species protection
* Re-evaluating design solutions to address bioengineering challenges
* Re-evaluating sustainable design solutions, including green buildings (e.g., with solar panels, living roofs, or both) and hazard-resilient buildings or structures

## Common Misconceptions

Note that the list in this section is not exhaustive.

* A problem only has one true solution.
* A problem cannot be solved.
* A solution can be perfect, with no limitations or drawbacks.
* Everyone will benefit from the best solution.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ETS1-3 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ETS1-3 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ETS1-3%20Evidence%20Statements%20June%202015%20asterisks.pdf)

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

California Education and the Environment Initiative <http://californiaeei.org/>

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>

Appendix 2: Connections to Environmental Principles and Concepts <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf>

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