

MS-ETS1-2 Engineering Design

California Science Test—Item Content Specifications

# MS-ETS1-2 Engineering Design

Students who demonstrate understanding can:

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Engaging in Argument from EvidenceEngaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. | ETS1.B: Developing Possible Solutions1. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
 | 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.

7.2 Ability to evaluate and/or refine solutions to design problems

### 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.

7.2.3 Ability to evaluate competing perspectives/claims using reasoning and evidence

### Disciplinary Core Idea Assessment Targets

#### ETS1.B.7

* Describe a given design solution, including identifying the scientific knowledge related to the problem and solution, identifying how the solution solves the problem, and identifying the given supported design solution
* Identify and describe the additional evidence needed for evaluation of a solution by comparing the problem context to similar problems that were solved in the past
* Identify and describe the additional evidence needed for evaluation of a solution considering possible impacts on society and the environment
* Define and describe the criteria and constraints for evaluating the design solution collaboratively with other students
* Use a systematic method to identify the strengths and weaknesses of each solution
* Evaluate each solution against each set of criteria and constraints
* Compare solutions based on their performance
* Construct an argument by making a claim supported by evidence and reasoning about the relative effectiveness of each competing solution and include the strengths and weaknesses of each solution

### 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 description of a design problem with specified criteria and constraints and multiple possible design solutions:

* Matches each of several designs with a list of the prioritized criteria and constraints or tradeoffs represented, or student provides or selects an explanation of the impact of criteria and constraints on given designs (7.2.3 and ETS1.B.7)
* Constructs an argument by making a claim supported by evidence and reasoning about the relative effectiveness of each competing solution and includes the strengths and weaknesses of each solution (7.2.3 and ETS1.B.7)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Design solutions to minimize negative environmental impacts such as pollution mitigation (e.g., air, water, or light), water conservation, oil spill cleanup, air quality maintenance, and endangered species protection
* Design solutions to address bioengineering challenges
* Sustainable design, 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 one solution.
* Solutions do not have to meet criteria.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ETS1-2 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ETS1-2 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ETS1-2%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>

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