MS-ETS1-2  Engineering Design

Students who demonstrate understanding can:

MS-ETS1-2.  Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

**Science and Engineering Practices**

**Engaging in Argument from Evidence**

- Engaging 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.

**Disciplinary Core Ideas**

**ETS1.B: Developing Possible Solutions**

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

**Crosscutting Concepts**

**Observable features of the student performance by the end of the course:**

1. Identifying the given design solution and associated claims and evidence
   - a. Students identify the given supported design solution.
   - b. Students identify scientific knowledge related to the problem and each proposed solution.
   - c. Students identify how each solution would solve the problem.

2. Identifying additional evidence
   - a. Students identify and describe* additional evidence necessary for their evaluation, including:
     - i. Knowledge of how similar problems have been solved in the past.
     - ii. Evidence of possible societal and environmental impacts of each proposed solution.
   - b. Students collaboratively define and describe* criteria and constraints for the evaluation of the design solution.

3. Evaluating and critiquing evidence
   - a. Students use a systematic method (e.g., a decision matrix) to identify the strengths and weaknesses of each solution. In their evaluation, students:
     - i. Evaluate each solution against each criterion and constraint.
     - ii. Compare solutions based on the results of their performance against the defined criteria and constraints.
   - b. Students use the evidence and reasoning to make a claim about the relative effectiveness of each proposed solution based on the strengths and weaknesses of each.