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*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
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</thead>
<tbody>
<tr>
<td>Engaging in Argument from Evidence</td>
<td>ETS1.B: Developing Possible Solutions</td>
<td>Engaging in Argument from Evidence</td>
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<tr>
<td>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.</td>
<td>• There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.</td>
<td>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.</td>
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<tr>
<td>• Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.</td>
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**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.