

### 3-5-ETS1-2 Engineering Design

Students who demonstrate understanding can:

- 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to 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

##### Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.

#### Disciplinary Core Ideas

##### ETS1.B: Developing Possible Solutions

- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.
- At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.

#### Crosscutting Concepts

##### Influence of Science, Engineering, and Technology on Society and the Natural World

- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

### Observable features of the student performance by the end of the grade:

1	Using scientific knowledge to generate design solutions	
	a	Students use grade-appropriate information from research about a given problem, including the causes and effects of the problem and relevant scientific information.
	b	Students generate at least two possible solutions to the problem based on scientific information and understanding of the problem.
	c	Students specify how each design solution solves the problem.
	d	Students share ideas and findings with others about design solutions to generate a variety of possible solutions.
	e	Students describe the necessary steps for designing a solution to a problem, including conducting research and communicating with others throughout the design process to improve the design [note: emphasis is on what is necessary for designing solutions, not on a step-wise process].
2	Describing criteria and constraints, including quantification when appropriate	
	a	Students describe: <ol style="list-style-type: none"> <li>The given criteria (required features) and constraints (limits) for the solutions, including increasing benefits, decreasing risks/costs, and meeting societal demands as appropriate.</li> <li>How the criteria and constraints will be used to generate and test the design solutions.</li> </ol>
3	Evaluating potential solutions	
	a	Students test each solution under a range of likely conditions and gather data to determine how well the solutions meet the criteria and constraints of the problem.
	b	Students use the collected data to compare solutions based on how well each solution meets the criteria and constraints of the problem.