

HS-ETS1-3

Students who demonstrate understanding can:

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions</p> <p>Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.</p> <ul style="list-style-type: none"> Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. 	<p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. 	<p style="text-align: center;">-----</p> <p style="text-align: center;">Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

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

1	Evaluating potential solutions										
	a In their evaluation of a complex real-world problem, students: <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 20px;">i.</td> <td>Generate a list of three or more realistic criteria and two or more constraints, including such relevant factors as cost, safety, reliability, and aesthetics that specifies an acceptable solution to a complex real-world problem;</td> </tr> <tr> <td>ii.</td> <td>Assign priorities for each criterion and constraint that allows for a logical and systematic evaluation of alternative solution proposals;</td> </tr> <tr> <td>iii.</td> <td>Analyze (quantitatively where appropriate) and describe the strengths and weaknesses of the solution with respect to each criterion and constraint, as well as social and cultural acceptability and environmental impacts;</td> </tr> <tr> <td>iv.</td> <td>Describe possible barriers to implementing each solution, such as cultural, economic, or other sources of resistance to potential solutions; and</td> </tr> <tr> <td>v.</td> <td>Provide an evidence-based decision of which solution is optimum, based on prioritized criteria, analysis of the strengths and weaknesses (costs and benefits) of each solution, and barriers to be overcome.</td> </tr> </tbody> </table>	i.	Generate a list of three or more realistic criteria and two or more constraints, including such relevant factors as cost, safety, reliability, and aesthetics that specifies an acceptable solution to a complex real-world problem;	ii.	Assign priorities for each criterion and constraint that allows for a logical and systematic evaluation of alternative solution proposals;	iii.	Analyze (quantitatively where appropriate) and describe the strengths and weaknesses of the solution with respect to each criterion and constraint, as well as social and cultural acceptability and environmental impacts;	iv.	Describe possible barriers to implementing each solution, such as cultural, economic, or other sources of resistance to potential solutions; and	v.	Provide an evidence-based decision of which solution is optimum, based on prioritized criteria, analysis of the strengths and weaknesses (costs and benefits) of each solution, and barriers to be overcome.
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2	Refining and/or optimizing the design solution										
	a In their evaluation, students describe which parts of the complex real-world problem may remain even if the proposed solution is implemented.										