NEXT GENERATION SCIENCE STANDARDS For States, By States

Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.

MS-ETS1-4   Engineering Design

Students who demonstrate understanding can:

MS-ETS1-4. **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

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	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs.	**ETS1.B: Developing Possible Solutions** • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. • Models of all kinds are important for testing solutions. **ETS1.C: Optimizing the Design Solution** • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	

	Observable features of the student performance by the end of the course:	
1	Components of the model	
	a	Students develop a model in which they identify the components relevant to testing ideas about the designed system, including:
		i. The given problem being solved, including criteria and constraints.
		ii. The components of the given proposed solution (e.g., object, tools, or process), including inputs and outputs of the designed system.
2	Relationships	
	a	Students identify and describe* the relationships between components, including:
		i. The relationships between each component of the proposed solution and the functionality of the solution.
		ii. The relationship between the problem being solved and the proposed solution.
		iii. The relationship between each of the components of the given proposed solution and the problem being solved.
		iv. The relationship between the data generated by the model and the functioning of the proposed solution.
3	Connections	
	a	Students use the model to generate data representing the functioning of the given proposed solution and each of its iterations as components of the model are modified.
	b	Students identify the limitations of the model with regards to representing the proposed solution.
	c	Students describe* how the data generated by the model, along with criteria and constraints that the proposed solution must meet, can be used to optimize the design solution through iterative testing and modification.