

3-5-ETS1-3 Engineering Design

Students who demonstrate understanding can:

- 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

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

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Disciplinary Core Ideas

ETS1.B: Developing Possible Solutions

- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.

ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Crosscutting Concepts

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

1	Identifying the purpose of the investigation
a	Students describe* the purpose of the investigation, which includes finding possible failure points or difficulties to identify aspects of a model or prototype that can be improved.
2	Identifying the evidence to be address the purpose of the investigation
a	Students describe* the evidence to be collected, including: <ol style="list-style-type: none"> How well the model/prototype performs against the given criteria and constraints. Specific aspects of the prototype or model that do not meet one or more of the criteria or constraints (i.e., failure points or difficulties). Aspects of the model/prototype that can be improved to better meet the criteria and constraints.
b	Students describe* how the evidence is relevant to the purpose of the investigation.
3	Planning the investigation
a	Students create a plan for the investigation that describes* different tests for each aspect of the criteria and constraints. For each aspect, students describe*: <ol style="list-style-type: none"> The specific criterion or constraint to be used. What is to be changed in each trial (the independent variable). The outcome (dependent variable) that will be measured to determine success. What tools and methods are to be used for collecting data. What is to be kept the same from trial to trial to ensure a fair test.
4	Collecting the data
a	Students carry out the investigation, collecting and recording data according to the developed plan.