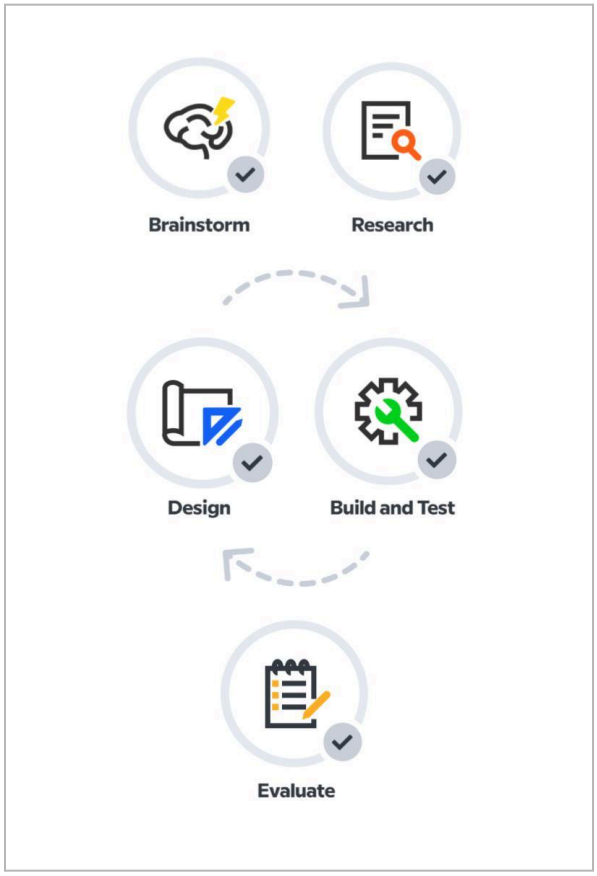
BrainPOP Science

Engineering Project Rubric Guide

This document shows scores assigned to student responses in a sample Engineering Project. The project details are shown in the green box below. Sample student responses are shown in orange next to rubric text (italics indicate written responses). We've also added some notes in blue for more support.

SAMPLE PROJECT	**Problem:** How can you turn the lights off without getting out of bed? **Student Objective:** Create a tool to flip the light switch from your bed.
	Design criteria: turns off lights, works from bed
	Design constraints: must be completed before bedtime, only uses materials provided (string, ball, duct tape, books, wood, apple)
	Science concepts: simple machines, force, motion, mass

The rubric is divided into **4** sections corresponding to the 3 versions of a student's design and a final reflection. This allows you to evaluate the progression of students' ideas from their initial brainstorming (Version 1), to their first sketch (Version 2), to their test-informed design changes (Version 3), and their big-picture takeaways.



Rubric and Sample Responses:

Version 1

This section of the rubric focuses on the first “version” of the student’s design: the sticky note selected from their brainstorming. This section is worth **4** points and is split into 2 subsections.

Addresses the Problem

○ Needs support The selected idea ignores the problem.	0 points	*Create a bowl that prevents ice cream from melting.*
○ Developing proficiency The selected idea indirectly or partially addresses the problem.	1 point	*Build shoes with wheels to skate over to the light switch.*
○ Proficient The selected idea directly and fully addresses the problem.	2 points	*Tape a string to the light switch.*

Considers the Constraints

○ Needs support The selected idea ignores all constraints.	0 points	*Build a walking robot that can turn off the light.*
○ Developing proficiency The selected idea considers some constraints.	1 point	*Use rubber bands to slingshot a coin at the light switch.*
○ Proficient The selected idea considers all constraints.	2 points	*Tape a string to the light switch.*

Version 2

This section of the rubric focuses on the student's first sketch of their design. This section is worth **6** points and is split into 2 subsections. The first subsection evaluates how well science concepts from the project's Research section are incorporated into the design. The second focuses on student takeaways from prototype testing.

Incorporates Science Concepts

○ Incomplete No design is attempted.	0 points	*Workspace shows an image of an apple.*
○ Needs support The design does not incorporate any relevant science concepts.	1 point	*Workspace shows a piece of string taped to the light switch.*
○ Developing Proficiency The design incorporates at least one science concept but not in a way that is central to the design's function.	2 points	*Workspace shows a piece of string taped to the light switch and a ramp on the floor below it.*
○ Proficient The design incorporates science concepts in a way that is central to the design's function.	3 points	*Workspace shows an apple pendulum attached to the light switch with string, positioned at the end of a ramp.*

Evaluating Criteria

○ Incomplete No self-evaluation is attempted.	0 points	*The ball fell off the ramp.*
○ Needs support The self-evaluation identifies parts of the design to keep and/or change without reasoning.	1 point	*Replace the ball with a marble on the ramp.*
○ Developing proficiency The self-evaluation identifies parts of the design to keep and/or change and provides partial reasoning.	2 points	*Add short walls to the ramp to keep the ball from falling off.*
○ Proficient The self-evaluation identifies parts of the design to keep and/or change and provides reasoning for both.	3 points	*Add short walls to the ramp to keep the ball from falling off towards the bottom. Keep the same angle and position of the ramp since the ball was traveling fast enough and in the right direction.*

Version 3

This section of the rubric focuses on the second sketch of the student's design. This sketch should include improvements to the previous design based on the results of prototype testing. This section is worth **6** points and is split into 2 subsections.

Makes Changes After Testing

○ Incomplete No changes to the design are attempted.	0 points	*Workspace shows no changes to prior design.*
○ Needs support Changes to the design do not address the new constraint or any unmet criteria.	1 point	*Workspace shows an extraneous string added to the design.*
○ Developing proficiency Changes to the design partially address the new constraint or some unmet criteria.	2 points	*Workspace shows short walls added to the ramp.*
○ Proficient Changes to the design fully address the new constraint or all unmet criteria.	3 points	*Workspace shows short walls added to the ramp and a larger peg to keep the apple in place.*

Optimizes the Design

○ Incomplete No changes to the design are attempted.	0 points	*Workspace shows no changes to prior design.*
○ Needs support Changes to the design do not increase the chances of a future prototype's success.	1 point	*Workspace shows an extraneous string added to the design.*
○ Developing proficiency Attempt to increase the chances of meeting criteria, but misconceptions are evident	2 points	*Workspace shows short walls added to the upper portion of the ramp only.*
○ Proficient Reasonably increase the chances of meeting criteria	3 points	*Workspace shows short walls added all along the ramp and a larger peg to keep the apple in place.*

Design Reflection

This section is worth **4** points and is split into 2 subsections. The first subsection evaluates the student's written reflection on the evolution of their ideas from beginning of the project to the end. The second subsection focuses on the student's identification of information used in their design decision-making.

Describes Design Thinking

○ Needs Support The student's response to Question 1 is incomplete or inaccurate.	0 points	*My ideas didn't change from the beginning of the project to the end.*
○ Developing proficiency The student's response to Question 1 is accurate but lacking detail.	1 point	*As I went through the project, my design improved. I added more parts to the tool I designed to turn off the lights and I tested my prototype.*
○ Proficient The student's response to Question 1 is accurate and specific.	2 points	*I started with the idea of taping a string to the light switch. Then, I revised my idea to include a pendulum and a ramp. The third version of my design tried to address issues in testing, so I added walls to the ramp and a larger peg to keep the apple in place.*

Describes Decision-Making

○ Needs support The student's response to Question 2 is incomplete or inaccurate.	0 points	*I changed my design from a string taped to the light switch to a pendulum and ramp.*
○ Developing proficiency The student's response to Question 2 is accurate but lacking detail.	1 point	*I made changes to my design based on science concepts and the results of prototype testing.*
○ Proficient The student's response to Question 2 is accurate and specific.	2 points	*After reading about simple machines and kinetic energy, I sketched a design with a ramp (inclined plane) and a pendulum (lever). I put a ball at the top of the ramp so that it would have enough kinetic energy to knock the pendulum loose. In testing, the ball fell off before it hit the apple, so we added walls to the ramp in the next sketch. We also added a larger peg to keep the pendulum in place until the collision.*