

TEACHER NOTES

Engineering Design Process Rubric

Resource Description

This rubric can be used with any engineering design STEM challenge. It can be used to assess mastery of the Engineering, Technology, and Application of Science NGSS Performance Expectations and Science and Engineering Practices, as well as design projects in Project Lead the Way or other STEM curriculums.

Prerequisite Knowledge

This rubric measures student mastery of the engineering design process. It can be used as a formative or summative assessment of student work. No prerequisite knowledge is needed if you are using the rubric to assess your students' initial understanding of the engineering design process. If you are using it as a summative measure of student understanding, your students should be familiar with the engineering design process before they are assessed with the rubric.

Depending on your own comfort with the engineering design process, you may want to review the information from Science Buddies' "[The Engineering Design Process](#)"

If you are looking to teach your students about the engineering design process, you may be interested in this introductory unit: [Engineering Design Process Unit](#)

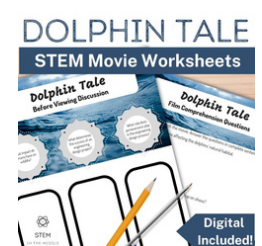
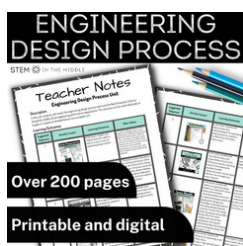
Supporting Next Generation Science Standards

NGSS Performance Expectations

- MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- 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.

STEM Connections

This rubric can be used with any engineering design challenge. If you'd like to incorporate more STEM in your classroom, check out these best-selling resources. Click on the images below to learn more:



Other Notes

- There are 2 versions of the engineering design process rubric included in this resource. The first is more detailed while the second simplified. Choose the one that best meets your students needs or the project.
- If you are using the rubric as a summative assessment, you should review the criteria with students before the project or review a section of the rubric as students are working on that step of the design process.

Digital Rubric

Directions:

1. Sign-In to your Google account.
2. Click the link below to open the document.
3. Once open, go to "File" and "Make a Copy." The document has now been added to your Google Drive.
4. To access the rubric later and share with students, search for "Copy of Engineering Design Process Rubric_STEMintheMiddle" in your Drive.

CLICK HERE!



Grab a Google
version of the
rubric here.



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Name: _____ Date: _____ Project: _____ Score: _____

ENGINEERING DESIGN PROCESS RUBRIC

Assessing NGSS MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, MS-ETS1-4

Key 1 = Beginning (little to no mastery) 2 = Developing (some mastery of skill) 3 = Proficient (mostly mastered skill) 4 = Advanced (fully mastered skill)	Student Evaluation	Teacher Evaluation
Define the Problem		
Carefully analyze the problem and fully describe the problem in your own words.		
Identify the project criteria and constraints.		
Generate Concepts		
Conduct relevant research on scientific principles and topics related to the project criteria and constraints.		
Brainstorm numerous ideas, responses, or solutions.		
Sketches are clear, unique, and/or unusual ideas.		
Work with teammates to explore many different possible solutions, while giving and accepting feedback on ideas.		
Develop a Solution		
Systematically evaluate the team's many solutions to determine which design best meets the criteria and constraints of the challenge.		
Justify the chosen design solution based on the project criteria and constraints and the relevant scientific principles.		
Keep detailed records and sketches of the design possibilities, plans, and revisions.		
Construct and Test the Prototype		
Persevere to create a prototype.		
Test and revise the prototype to ensure it meets the project criteria and constraints.		
Creatively and responsibly use materials and resources.		
Evaluate		
Analyze data from tests to determine the similarities and differences among several design solutions and identify the best characteristics of each.		
Self-assess the prototype and analyze all design flaws or problems		
Suggest multiple solutions to problems or multiple ways to improve the function or quality of the prototype.		
Identify ways the create of the prototype has potential impacts on people and the natural environment.		

Name: _____ Date: _____ Project: _____ Score: _____ out of 20

ENGINEERING DESIGN PROCESS RUBRIC

Assessing NGSS MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, MS-ETS1-4

KEY 1 = Beginning (little to no mastery) 2 = Developing (some mastery of skill) 3 = Proficient (mostly mastered skill) 4 = Advanced (fully mastered skill)	SCORE
DEFINE THE PROBLEM <ul style="list-style-type: none">Carefully analyze the problemIdentify project criteria and constraints	1 2 3 4
GENERATE CONCEPTS <ul style="list-style-type: none">Conduct relevant researchBrainstorm possible solutionsMake sketchesWork with teammates to explore many possible solutions	1 2 3 4
DEVELOP A SOLUTION <ul style="list-style-type: none">Evaluate competing design solutions to determine which idea best meets the project criteria and constraintsKeep detailed records of design possibilities, plans and revisions	1 2 3 4
CONSTRUCT AND TEST PROTOTYPE <ul style="list-style-type: none">Persevere to create a prototypeTest and revise the prototype to ensure it meets the project criteria and constraintsCreatively and responsibly use materials and resources	1 2 3 4
EVALUATE <ul style="list-style-type: none">Analyze data from tests to determine the similarities and differences among several competing design solutionsIdentify the best characteristics in competing design solutionsSuggest solutions to problems or multiple ways to improve the function or quality of the prototype	1 2 3 4

Works Cited

Science Buddies. (2020). The Engineering Design Process. Science Buddies. Retrieved from <https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps>

THANK YOU!

STEM IN THE MIDDLE



HI, I'M TRILBY!

I am a full-time STEM educator with over a decade of experience teaching science, engineering, robotics, and computer science courses. I create ready-to-go STEM resources that are designed to engage and challenge your students while saving you time and energy.

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If you have a question or concern, please reach out to me directly at trilby@steminthemiddle.net

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