

STEM Project Planning Guide

Innovation, Engineering and Coding



Middle/High School

Rubric

Engineering Rubric - Instruction and Assessment of Science Skills

Science Skill	Exceeding - 4	Meeting - 3	Approaching - 2	Working Below - 1
PP1 - Testable Question		Language of question suggest the design of a device using specific language	Language of question suggest the design of a device but not specific to the parameters	Any other answer
PP4 - Planning an Investigation	Students can independently <ul style="list-style-type: none"> - procedures have a set of steps to test a single question - procedural design minimizing experimental bias - procedures are detailed enough to be repeated by someone else - procedure identifies needed equipment and materials - procedure identifies relevant measurements and/or observations to be made 	Students can independently <ul style="list-style-type: none"> - procedures have a set of steps to test a single question - procedural design minimizing experimental bias - procedures are detailed enough to be repeated by someone else - procedure identifies needed equipment and materials - procedure identifies relevant measurements and/or observations to be made 	Students can independently <ul style="list-style-type: none"> - procedures have a set of steps to test a single question - procedures are detailed enough to be repeated by someone else - procedure identifies needed equipment and materials - procedure identifies relevant measurements and/or observations to be made 	Students require support to perform 3 of the following: <ul style="list-style-type: none"> - procedures have a set of steps to test a single question - procedures are detailed enough to be repeated by someone else - procedure identifies needed equipment and materials - procedure identifies relevant measurements and/or observations to be made
			Students may require support with: <ul style="list-style-type: none"> - procedural design minimizing experimental bias 	Any other answer
PP5 - Collecting and Recording Data		Students are recording as many numbers as accurately as possible. They are detailed in their working and accounting for every piece of relevant data possible	Students are recording some numbers and are recording most relevant data	Students are not recording number data as a priority and are focussed on irrelevant observations
				Any other answer
AE4 - Evaluation of Design	Students identify all relevant flaws that require change and describes how each item will be changed	Students identify all relevant flaws that require change	Students identified one relevant flaw that requires change	Any other answer

Science Skill	Exceeding - 4	Meeting - 3	Approaching - 2	Working Below - 1
AE2 - Identify and Quantify the Amount of Error from Design		Identifies a significant flaw in design that leads to a quantifiable error with a reasonable suggestion for the amount of error	Identifies a significant flaw in design. However, students are not able to quantify or their value is beyond the accepted range	Any other answer
AE3 - Conclusions	<ul style="list-style-type: none"> Is relevant to initial question Describes the key factors to the design Evaluate the usefulness of a constructed design Must included suggestions to improve experimental design (i.e., efficiency of design or materials) 	<ul style="list-style-type: none"> Is relevant to initial question Describes the key factors to the design Evaluate the usefulness of a constructed design 	<ul style="list-style-type: none"> Is relevant to initial question Restates only the recorded results or is a result of flawed reasoning 	Any other answer
Content Understanding	Student demonstrates mastery of content understanding and reflects deep understanding of current applications	Student demonstrates content understanding and reflects understanding of current applications	Content explanation is fair, however further attention to details is required	Any other answer ----- Inconsistent evidence of content understanding
Creativity	Relevant data and results are presented using a distinctly unconventional and creative approach	Some creative effort was demonstrated in the presentation of data and results	Project creativity designed more for attention that presentation of relevant data	Any other answer ----- Minimal use of creativity
Innovative use of technology	Distinguished use of technology is evident both in product and project design	Use of technology is evident both in product and project design	Technology used simply as a presentation tool rather than integrated within project	Any other answer ----- Minimal use of technology
Evidence of Problem Solving	Student uses a complex method of problem solving throughout project	Some problem solving evident	Inconsistent problem solving technique	Any other answer ----- Minimal use of effective problem solving

Student Worksheets

Innovation/Engineering/Coding Projects

Develop and evaluate new devices, models, methods in technology, engineering, and Code.

1. Purpose of your Project

Regardless of whether you are planning an experiment or going to test the design of something you planned and built, **you need to write a question or statement that will direct you.** (PP1)

- Write a statement using language that suggests the design of a device, writing code or inventing something new for a specific purpose
 - Use language that is precise and relevant to the question
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2. Planning Your Design - it's time to design.

A. List the Materials (& Quantities) needed for your initial prototype of your device or invention (PP4)

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B. Sketch initial design of your prototype or your device or invention

C. Plan the set of steps needed for someone else to build your device (PP4)
(If you are writing code describe the programs necessary to get started not the code)

1.

2.

3.

4.

5.

...

3. Testing Your Design

- Does your prototype look that way you sketched it?
 - Is your sketch a better design than what you built?
 - Is the device you built better than you designed? How?

- Does the prototype of your device meet the purpose (#1) (PP5)
 - Does your prototype perform how you expected? YES NO
 - If not, what adjustments do you have to make?

4. Evaluating The Results of Your Design (AE4)

The biggest challenge to being an innovator and designer is that your first (maybe second, third...) designs of your prototype never seem to accomplish the task as you thought they would.

- What specific design changes are you going to make to help your prototype device accomplish its purpose?

5. Re-Designing - its time to design... Again

Use the specific changes highlighted in the evaluation of the design (step 4)

**Please note that you may redesign your prototype several times, for each redesign please complete steps 5,6,7.*

A. List any changes in Materials needed for the prototype of your device (PP4)
(Highlight only the materials that are added and/or subtracted from original list)

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-
-
-
-
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B. Sketch the re-design(s) of the prototype of your device

C. Identify the specific modifications that you are changing from your initial procedures (PP4)

Identify the original step(s) that are changed and rewrite it to reflect the change

6. Re-Testing Your Design.

- Does your prototype look that way you sketched it?
 - Is your sketch a better design than what you built?
 - Is the device you built better than you designed? How?

- Does the prototype of your device meet the purpose (#1) (PP5)
 - Does your prototype perform how you expected? YES NO
 - If not, what adjustments do you have to make?

7. Re-Evaluating The Results of Your Design (AE4)

This may be the Second, Third, or ... version of your design.

- What specific design changes are you going to make to help your prototype device accomplish its purpose?

8. Identifying Error

Please remember that nobody is perfect and you are not expected to do everything without fault. Sometimes, when we are doing STEM projects we get to the end and we realize that something is not right with my data or the way I recorded my data was not the same for each.

Do Not Worry About It! This is the section where you will identify and suggest explanations for sources of error and determine the amount of error in the measurement. (AE2)

9. Conclusion

- Will be framed around the initial question that was tested
- Must describe the “key” factors to your design
- Evaluating the usefulness of a constructed design
- May comment on improvements i.e., efficiency of design, better materials, etc... (AE3)
