2011-12 Engineering Design Sample Student Language Scoring Template

Name: _____ Period: _____

Start Date: _____ End Date: _____

Engineering Design

Title: _____

1. Define the Engineering Design Problem
Learning Target: Explain exactly what the problem is and what needs to be designed to solve this problem. Identify the criteria as well as the constraints for the product, process, or system.

Identify the Problem Scoring Guide

Nearly Meets	Meets	Exceeds
I need to define the problem more clearly so it is better understood, and can be tested.	I can clearly define the engineering problem so it can be tested.	I can clearly define the engineering problem in a way that can be scientifically tested.

State the problem: Who? What? Where? When? How? Why?

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Background Information and Existing Solutions Scoring Guide

Nearly Meets	Meets	Exceeds
I need to give more detailed background information about previous solutions, and scientific concepts that can be used in my design.	I can relate background information, previous solutions, and scientific concepts to my design.	I can extensively describe background information, previous solutions, and scientific concepts that relate to my design.

Background information: Write about the problem, and describe the science, math and/or engineering concepts you will use to create a new solution. Include previous solutions such as products, processes or systems that have been used to solve the problem in the past, and reference the source(s) of your information*.

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(Continue on next page, and add an illustration.)

(Add additional pages as needed)

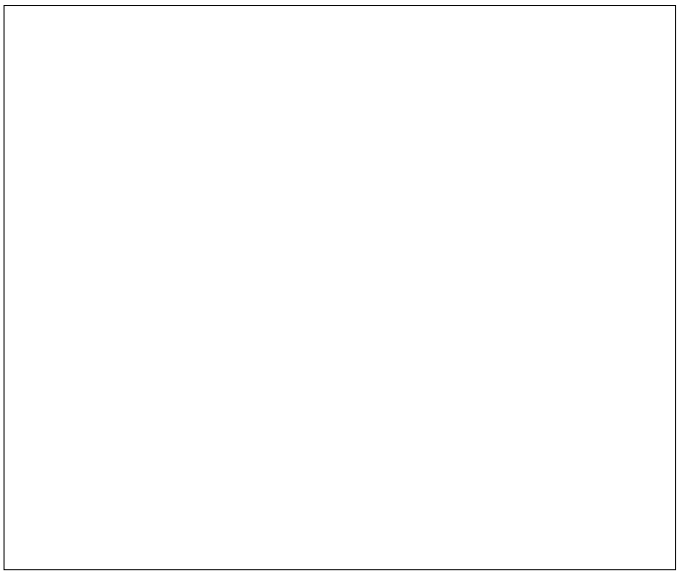

Figure 1: Example of an existing Engineering Design

***References:** Use APA style.

Author, A. A., & Author, B. B. (Date of publication). Title of article. *Title of Online Periodical, volume number*(issue number if available). Retrieved from http://www.someaddress.com/full/url/ (Date of retrieval)

Evaluation Criteria and Constraints Scoring Guide

Nearly Meets	Meets	Exceeds
The criteria and constraints are missing or lack detail.	I can clearly identify the criteria and constraints.	I can clearly list criteria that could be used to judge the design, and the constraints that limit the possible design solutions.

Evaluation criteria: Define how you will rate/evaluate the quality of your design(s).

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Constraints: Define the limits for your project in terms of time, resources, material strength, sustainability, cost (if appropriate), etc.

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2. Design of Solution
Learning Target: Explain how the solution is designed, and describe how to make a prototype.

Exploring Options Scoring Guide

Nearly Meets	Meets	Exceeds
I need to compare my options in more detail, or more clearly.	I can clearly describe and compare each option.	I can use a decision tool to analyze all reasonable possibilities in terms of the criteria and constraints.

Explore different options to find the best solution: Describe different options that you might use in your design, and then, use the Pugh chart, list of pros and cons, or decision tree to choose the one(s) you will test.

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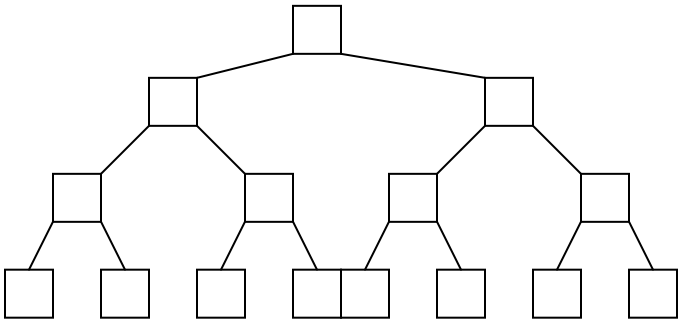
Pugh Chart: Use this tool to compare different options with a datum. A datum is similar to a control and could be an existing design. Use your evaluation criteria to compare different options to the datum. Select different options, and decide if each option is better (+), worse (-), or the same (0) as the datum. Add scores for each option to help decide which option is best.

	Datum	Option 1	Option 2	Option 3
Evaluation Criteria	Description:	Description:	Description:	Description:
	0			
	0			
	0			
	0			
	0			
Totals	0			

Pros and Cons:
Use this tool to compare one or two different options. Pros are positive outcomes, and Cons are negative outcomes. Make a table for each option.

Pros	Cons

Decision Tree:
Use this tool like a map to show how one choice was selected over another. Identify decision criteria at each step.



(Make on new page, or use Inspiration on the computer, print and attach.)

Identification of Solution Scoring Guide

Nearly Meets	Meets	Exceeds
The solution I chose needs to be linked to the criteria and/or constraints more closely.	I can use the criteria and constraints to show why I chose the solution that I did.	I can explain the scientific thinking behind why the solution I picked is the best based on the design criteria and constraints.

Solution (Describe the chosen solution, explain why it was selected over the others, and how it fits within the design criteria and constraints.)

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Claim: State a claim or a desired outcome that can be tested for the design you selected.

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Creation of a Prototype Scoring Guide

Nearly Meets	Meets	Exceeds
The prototype needs to have a practical design that can be tested.	I can explain the basics of how to build my prototype. It is testable and safe, even if it doesn't work. It fits with both the criteria and constraints.	I can explain how to make my prototype well enough that anyone could build it. It is testable (even if it doesn't work), well thought out, and safe. It fits with both the criteria and constraints.

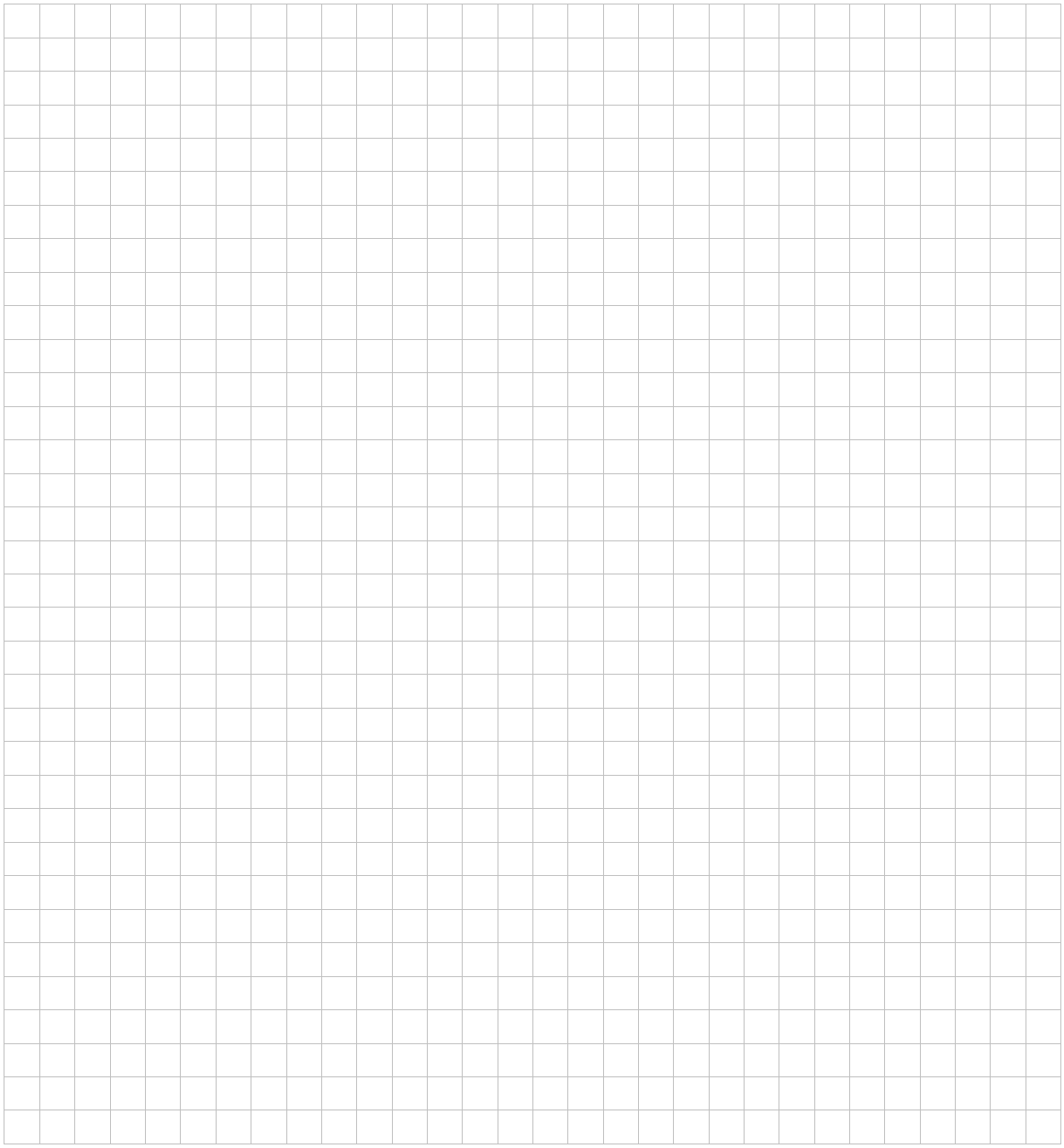
Materials List: (List the tools and type of materials needed to make a prototype. Include the amount of each material needed.)

Tools	Materials	Amount

Procedures for Making Prototype: Number the steps and explain exactly how to build the prototype.

(Add additional pages as needed)

Initial Schematic: Draw the prototype to scale, (with different views if needed (e.g. top/side), and label each part. Include a size legend and key. Use a straight edge and give measurements in metric units.



Scale: 1 square =
Legend:

Testing the Prototype Scoring Guide

Nearly Meets	Meets	Exceeds
My testing procedures need to be improved so I can collect more data so I can determine if my claim is accurate.	I can design procedures that determine if the prototype meets the claim.	I can design precise procedures that systematically determine if the prototype meets the claim. I am using multiple trials and/or versions of the prototype.

Evaluation Criteria: Which evaluation criteria are you going to measure to see if the prototype meets the claim?

Dependent Variable: How will you measure the evaluation criteria, and which units will you use?

Controlled Conditions: List the variables that need to be kept the same to make it a fair test and make results more reliable.

Testing Procedures: (Explain exactly how to test the prototype, identifying the steps used.)

3. Data Collection

Learning Target: Collect, organize, and/or graph the data to show if the prototype meets the claim.

Figure 2: Prototype Testing Set Up

Data Collection Scoring Guide

Nearly Meets	Meets	Exceeds
I need to show how the prototype performed when tested. I need to use some kind of observations or measurements to describe what happened, even if didn't work.	My tables and/or graphs clearly and accurately show how the prototype performed when tested.	My tables and/or graphs clearly and accurately show how the prototype performed when tested. The information is displayed in a way that shows why my design does, or does not work.

Data Table(s): Label columns, rows and give the units. Use a straight edge to draw your table. If measurements are not used, observations, a rating-scale, and/or pictures of before and after could be included. (Add additional pages if needed.)

Graph(s): Choose the type of graph that best shows patterns or trends in your data. Give each graph a descriptive title, label axes and indicate units.

4. Analyzing

Learning Target: Use your data to explain the results of testing your prototype, and explain what you would do to make it better next time.

Results Scoring Guide

Nearly Meets	Meets	Exceeds
I need to use my data to support my claim, even if it works just fine.	I can use data to show why the data does, or does not support the claim.	I can highlight patterns or trends in my data and use them to evaluate my design. I can clearly show why the data does, or does not support the claim.

Explain Patterns and Trends: Write a short description of what your graph(s) show, or describe the patterns or trends in the data.

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Results of Prototype Test: Restate the claim, and discuss the claim based on whether the data supports, or does not support it.

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Evaluation of Solution Scoring Guide

Nearly Meets	Meets	Exceeds
I need to explain why I made the changes that I did in the process of designing, building and testing my prototype.	I can list the changes that I made in the process of designing, building and testing my prototypes.	I can list the changes that I made in the process of designing, building and testing my prototypes. I can clearly explain why I made the changes I did.

Evaluation of Solution: Describe the tradeoffs that had to be made in the process of designing, building and testing the prototype.

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Improving the Design Scoring Guide

Nearly Meets	Meets	Exceeds
I need to explain how to improve my design using either the results of testing the prototype or scientific principles.	I can describe how to improve my design using the results from testing the prototype.	I can describe how to improve my design using the results from testing the prototype and scientific principles.

Improving the Design: Be very specific about how your design could be improved. Use the results from testing your prototype, and what you have learned about science, to support your ideas. Be specific about the criteria and constraints to be more closely matched.

(Add additional pages as needed)

Figure 3: Illustration of New Design Idea