Engineering Project

Name _____

1. What Interests YOU in the ***built world***? What phenomenon do you notice?

Phenomena of Interest	**Why this topic interests me/ Research**

2. Choose one topic from above and write it in the box below. Also, record what problem you are trying to solve. (Ex: We need a bridge that can support a heavier load).

My Topic	
Problem I want to solve	

3. **Conduct Background Research on you topic/problem**.

Questions I have	What I found out

Include more boxes if needed.

Establish Design Criteria

<u>Step ONE</u>: Your design will solve your problem. Write your problem here:

MY PROBLEM (What I am trying to solve or improve)

<u>Step TWO</u>: Now, **list constraints** on your design. Think: What limitations are there? These might include things like cost, size, weight, ease of use, environmental impact, etc.

Examples:

a. Our rain catchment system needs to be strong enough to hold 50 gallons, drainable, leak proof, and fit in a 2'x2' footprint.

b. Our roof design needs to keep the building cool in the summer, warm in the winter, hold up to 3' of snow, and not exceed 125% the cost of a traditional roof.

CONSTRAINTS (What are the limitations?)

<u>Step THREE</u>: Propose a possible solution to your question/need. This is like a hypothesis. Think about HOW you will solve the problem. What will you need to accomplish this? Drawings help here. Use more paper as needed.

DESIGN CRITERIA (My possible solution to the problem)

Preliminary Design/Prototype

Name _____ Project # _____

Design: Your design procedure must be a numbered list of each step you will take to complete your experiment. It ***MUST include***:

1. ____ Clear, concise sentences.
2. ____ Each step executed MUST be listed and in order.
3. ____ A drawing of your idea (protype).
4. ____The procedure/prototype are repeatable.
5. ____Data is collected in quantitative units.
6. ___ A materials list is included.

Draw It/Write It Out!

Preliminary Design/List of Materials

BUILD your PROTOTYPE!

Here's where the fun starts. As you start building, you will immediately begin to discover things that work, and things that don't. Record these findings – this is part of your data. When you get a workable prototype, test it formally using your procedure as outlined above.

Test 1

What worked: _____ What did not work: _____

We plan to change: _____

Make the changes to you design, as outlined above. Test your new prototype again.

Test 2

What worked: _____ What did not work: _____

We plan to change: _____

Test 3

What worked: _____ What did not work: _____

We plan to change: _____

Repeat this process of iterative designs until you get a design that meets all the needs defined by your problem. Three iterations is the minimum; there are usually many attempts/iterations. Add more tests as needed. Keep recording your changes.

****Be sure to document your work and collect data: take pictures, draw new designs,**

Selecting Data Types and Graphs Types for Your Project

Data I will collect	Type of Data and Units (Qualitative of quantitative)	Graph Type Needed	Reasoning

Results, Data and Conclusions

Analyzing and Interpreting Data (NGSS Practices #3, #5)

1. Find a **relationship** (what is the same or seems to be caused by something):
   When I changed ⟶ What happened to?

What I changed	*What was the outcome?*

2. Write a **sentence** about the relationship:_____

   _____

3. What **patterns** or **trends** do I notice in my data and/or my graph (line slope, repeating values, similarities to other data, etc.)_____

   _____

   _____

4. What does your **data mean**? Tell whether the **data give evidence of meeting** your need. Be sure to tell ***why*** by quoting your data in the explanation. Use the sentences below to help you get started.

   a. My results showed that (report your data) _____

   _____.

   b. This data shows that I met the needs of the design because

   _____

   _____.

Communicate Findings (NGSS Practice #8)

Summarize what you learned and figured out through the design engineering process. Use the sentence stems to help you. In addition, pictures/drawings of your iterations are a great way to get the message across!

The problem I focused on is _____. The constraints I had were _____. My design criteria included _____.

In my first iteration I learned (report your data) _____ _____.

I found that I needed to change _____.

In my second iteration I learned (report your data) _____ _____.

I found that I needed to change _____.

In my third iteration I learned (report your data) _____ _____.

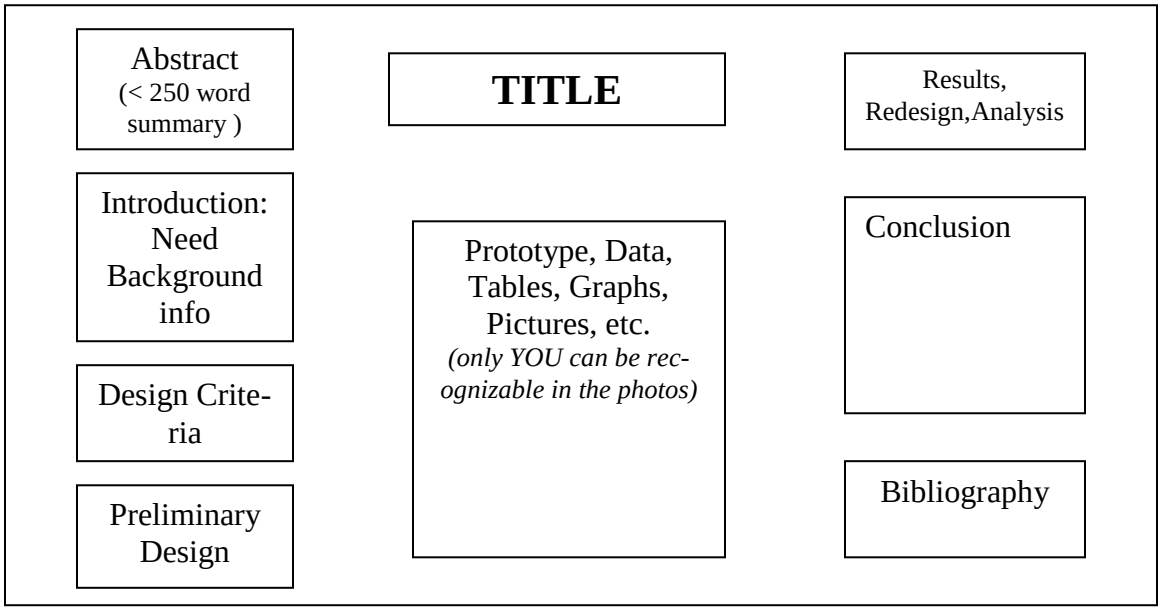
A pattern I noticed was that _____. (I also noticed that _____.)

I was/was not able to engineer a solution to the problem _____ because _____.

I found that _____.

A new problem I could investigate is _____?

What Should Be Displayed on Your Engineering Project Board (A typical board layout)



Project and Display Do's and Don'ts

Display Board:
Tri-fold boards work well but you are not limited to them. You could also creatively make your own board. Tri-fold boards can be found at office supply stores or perhaps your teacher has one that you can use. **Boards should be self-supporting with a maximum size of:**

- 30 inches (76 cm) Deep
- 48 inches (122 cm) Wide
- 108 inches (273 cm) High (including table, if used). Fair-provided tables are @ 36 inches (91 cm) tall

***The displays <u>may not</u> contain:**

- Plant or animal matter
- Microbes
- Food (human or animal)
- Soil or waste
- Poisons
- Drugs, including over-the-counter medication
- Water or chemicals
- Highly flammable materials
- Sharp or dangerous material, including glassware
- Copyrighted material or information copied from the internet