



Step Four: Create & Evaluate

At this point you have planned some ideas out and know where you're headed. It is during this next phase that you create a prototype. A **prototype** is an original model, the first full-scale form of a new type or design. It is your solution made physical instead of only in your logbook.

1. **Safety First!**
 - a. Make sure you have an adult supervising you as you do the prototype.
 - b. Wear protective safety gear--an apron, goggles, and/or gloves!
 - c. Consider the location, storage, cleaning surfaces where you will perform the prototype.
 - d. Consider how to dispose, sanitize, and recycle materials used in the prototype.
 - e. Only do the prototype your adult or teacher approved!
2. Make sure your work space is **clean and clear** before you start your prototype. You do not want the prototype to mess up your family dining table or your mom's favorite book or sweater.
3. Set up your prototype where no one will bother it. Cats and other critters are really curious. So are little brothers and sisters!

Record your Safety Precautions in Your Logbook

Make a Safety List

You will need a minimum of 2-3 safety precautions specific to your project.

In your logbook, set-up an entry for your safety precautions. Below is an example for building a prototype:

9/23/2020	Safety Precautions <ol style="list-style-type: none">1. Wear gloves and apron to protect hands and body.2. Remove all items from the table and place newspaper on it to protect the surface.3. Label all materials and keep out of reach of others in my house.4. Dispose all waste materials in the trashcan and not down the sink drain.5. Clean and disinfect the table when finished.6. Wash hands.
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Creating and Evaluating a Prototype

A prototype can be the actual working device or program you designed or it can be a 3-D visual model of what it would like. During Step Three of the design process, you should have decided which one you were creating. As you work on your prototype, be sure to record what you are doing in your logbook. Take pictures to document your work and add them to your logbook entries.

You will also need to test and evaluate your prototype. Refer back to your criteria from Step Two of the design process. As you test your prototype, record the results to determine if it meets the established criteria. This will be the data for your prototype.

Make sure you do enough trials to collect enough data. The more data you have, the more accurate the results will be. **Trials** are the number of times that you test a prototype. As a general rule, 3-5 trials, minimum.

Your data must be recorded in a data table. If it is possible to make a graph of that data, then you must have a graph of your results. Your data table and/or graph will be one of the first things people will look at when they see your display boards at the STEM EXPO. (We will discuss that in more detail later.)

Sample Data Table for Engineering Design Projects

Date & Trial	Prototype features and/or pictures/sketch	Results (Use your criteria for success.)	Modification that needs made due to results

You should take pictures to document the changes you make for each trial.

Organizing Your Results

Once you have your data collected, think of what type of graph would best fit your data (i.e., a line graph, bar graph, pie chart, etc.). As you test your prototype, record the results to determine if it meets the established criteria. This will be the data for your prototype.

If a graph will not work, then a neat and organized data table will be appropriate.



Engineering Design Projects can vary, so the type of data will also vary. The most important item to remember is that you need to record all changes, thoughts, and results that occur in the design process. EXPO judges want to see your thought process.

Sample Data Table for Engineering Design Projects

Record Your Data and Results

Your data must be recorded in a data table.

Remember, a good data table and graph always have the following items:

- Title
- Variables clearly labeled
- Units of measurement
- Readable data

