Types of Science Fair Projects: The Good and the Bad

Demonstrations, experiments, engineering projects, and computer science projects
What is a demonstration?

• Demonstration projects are not permitted.

• A *demonstration* shows how something works.

• An *experiment* involves an independent and dependent variable.
Demo → Experiment

• The difference between a demonstration and an experiment is the manipulation of variables.

• To change a demonstration to an experiment, modify the project to include an independent and a dependent variable.

• Examples: Volcano, Motor
Science Fair Projects

Experiments

Math projects

Engineering

Computer Science
The Process is the Key

• Science, engineering, and mathematics each have their own process for coming to new knowledge.

• No matter what kind of project you are doing, you must follow the process appropriate to your discipline.
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<td>Establish design criteria</td>
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<td>Build &amp; test prototype</td>
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<td>Test &amp; redesign as necessary</td>
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*Scientific Method & Engineering Process Comparison used with permission from Science Buddies.*
Computer Science Projects

- Computer science projects are a special type of engineering projects and therefore follow the engineering design process.

- Improve existing things and create new ones.
Iteration!

• The engineering design process is iterative—a process of repeating a sequence of steps multiple times, each time coming closer to your goal.
Step-by-Step

1. Define a need.
   - Engineers/computer scientists define a need express it as a goal.
   - Clearly define the problem you are going to solve or situation you are going to improve.

2. Do background research.

   - Identify keywords
   - Generate questions
   - Define a target user
   - Evaluate alternate designs
   - Research design criteria

Iterate!
More Steps

3. Establish designs criteria.
   - Design criteria are requirements you specify that will be used to make decisions about how you build/program the product.
   - Keep your target user/customer in mind.

4. Make preliminary designs.
   - A written-down first iteration of your approach to meeting your design goal.
   - Consider and explore alternatives to your approach.
A Few More Steps

5. Build and test.
   - Build and test a prototype/test your first iteration of your program.
   - Use a “test plan” and analyze your data.

6. Redesign and retest.
   - Modify, redesign, debug, etc. until you have achieved your design goal.
   - A technical approach to your analysis is essential. Learn from your failures.
The Finish

7. Present your work.
   - Outline the engineering design process that you used.
   - Highlight the final product, its merit, originality, and usefulness.

Mistakes to avoid

- No need, no project.
- Gadgeteering is not engineering.
- Testing without asking the user.
- No analysis of prototype and redesign test results.
Summary

• Turn a demonstration into an experiment by adding variables.

• Science experiments, engineering projects, computer science projects, and math projects are all valid science fair projects.

• One size doesn’t fit all: use the process that is specific to the type of project you are doing.