


Types of Science Fair Projects: The Good and the Bad

Demonstrations, experiments,
engineering projects, and
computer science projects

A decorative graphic consisting of several horizontal lines of varying lengths and colors (teal, white, and light blue) extending from the right side of the text area towards the right edge of the slide.

Science Fair Projects

Experiments

Math projects

Engineering

Computer Science

Demonstrations

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

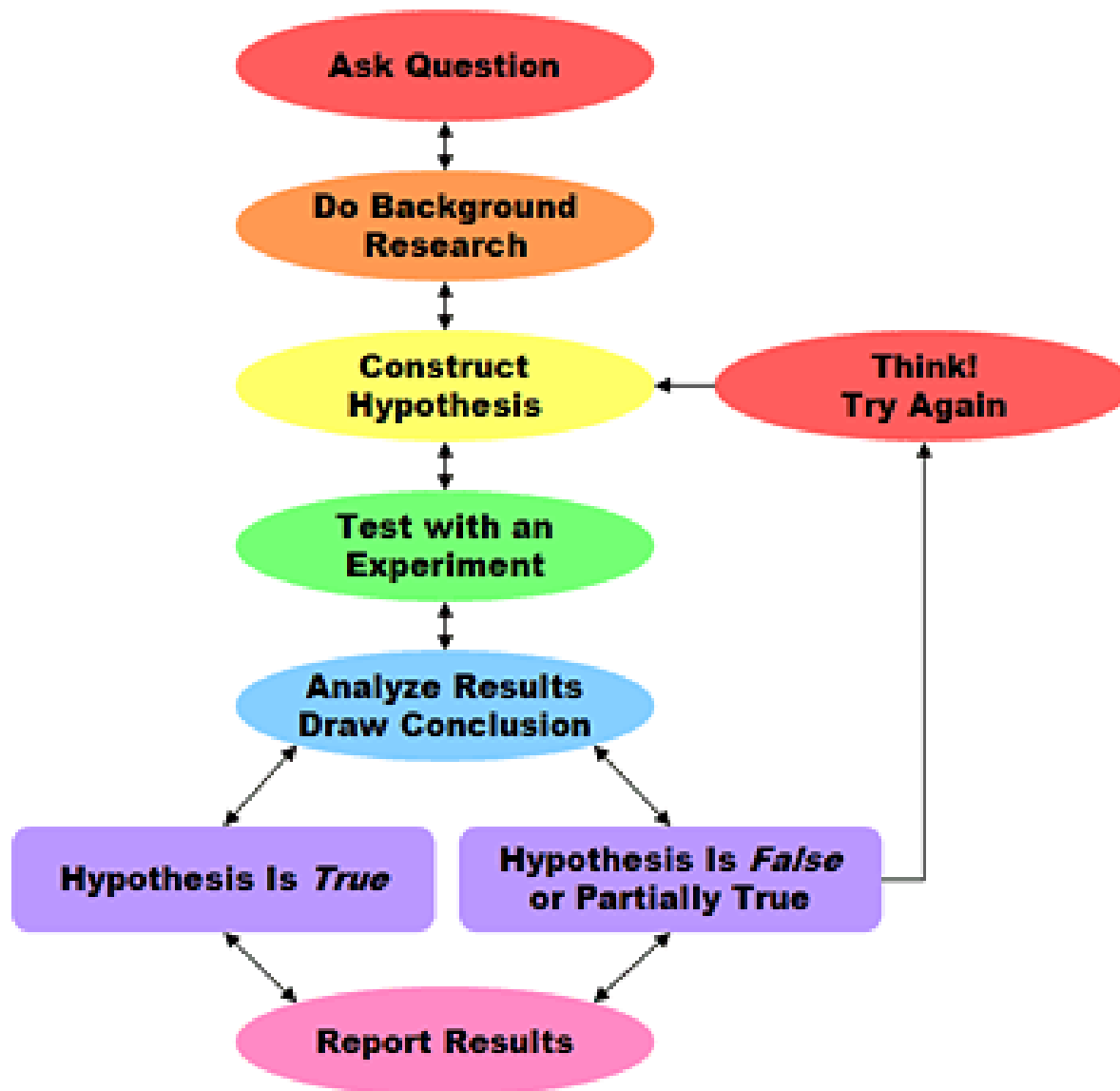
Math projects

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.



Computer Programming

Math Projects

Engineering Process

Scientific Method

Mathematical Reasoning/Proof

Define a need	State your question	Define what is known
Do background research	Do background research	Research & define all terminology
Establish design criteria	Formulate your hypothesis, identify variables	Make a conjecture/assumption based on what you know
Prepare preliminary designs	Design experiment, establish procedure	Perform calculations
Build & test prototype	Test your hypothesis by doing an experiment	Look for counter examples
Test & redesign as necessary	Analyze your results and draw conclusions	Recalculate and write up steps to the conclusion
Present results	Present results	Present Results

Scientific Method & Engineering Process Comparison used with permission from Science Buddies.

Computer Science Projects

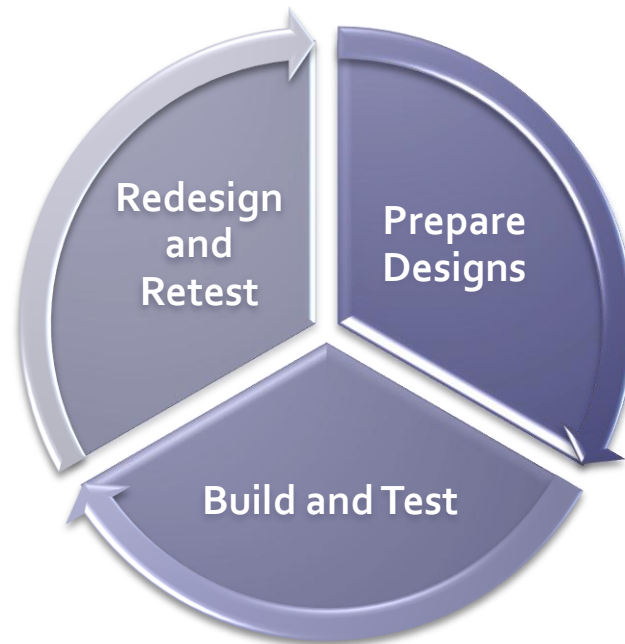
- Computer science projects are a special type of engineering projects and therefore follow the engineering design process.
- Improve existing things and create new ones.

Engineering

Computer Science

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 design 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.