**SCIENCE AND ENGINEERING FAIR – January 30, 2019**

**Register on the Parley's Park Website Science Fair Link by Jan. 23, 2019**

Parley's Park is pleased to invite all K-5th graders to participate in this year's SCIENCE AND ENGINEERING FAIR! Students have the opportunity to create their own personalized investigations that go beyond the classroom. It is our hope that in offering this opportunity students will further foster an appreciation for science and engineering.

Let the investigating, questioning, experimenting, and analyzing begin!

## SCIENCE AND ENGINEERING FAIR RULES

1. Students may enter a project individually or as a part of a group of **no more than 2 students.** If students are from different grade levels, they will compete at the age of the oldest student.
2. No open flames, dangerous or illegal chemicals, liquids, explosives, or live animals permitted on the display tables.
3. You may take pictures of your project if they include something you may not display at school.
4. No growing bacteria of any kind at home, it must be grown in a lab.
5. Experiments that harm animals are not permitted.
6. Exhibits must be self standing and no larger than 36" wide/high x 24" deep.
7. Students are responsible for supplying all items needed for their display—including extension cords, etc. The school supplies tables only.

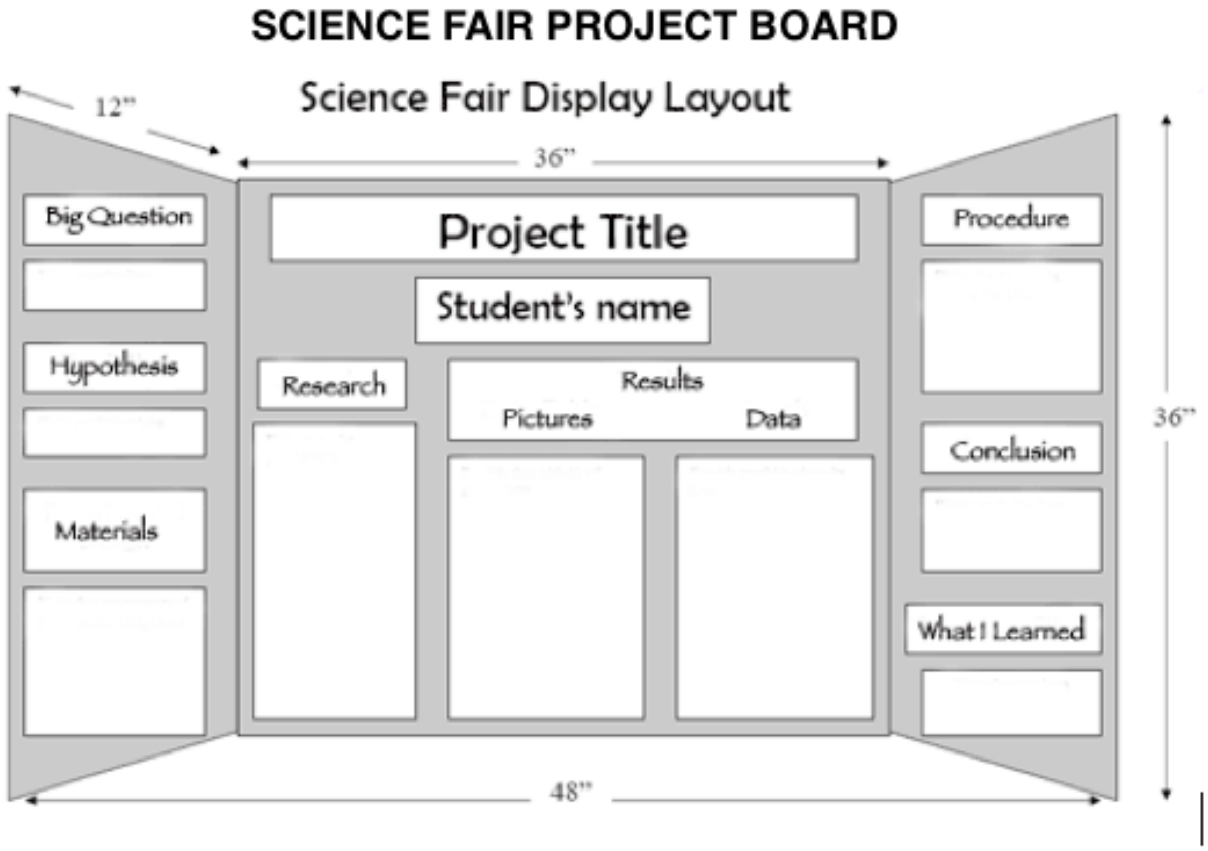
**NEW!!! Grades K-2 are welcome to do a COLLECTION**
Scientific Collections are examples of materials that are gathered and organized by specific characteristics of the objects in the collection. These types of projects involve the identification, sorting, and classifying of materials based on characteristics such as patterns, size, shape, texture, etc. Many samples of the collection are needed for a successful project. Some examples of this type of project are: leaves, flowers, fossils, bark, insects, shells, footprints, switches, gears, rocks, soils, star constellations, shapes in nature, etc. The collection should include a display board with the following elements: TITLE, PURPOSE, DESCRIPTION, SCIENTIFIC ORGANIZATION, CONCLUSIONS

**Grades K-4 may choose to do a SCIENTIFIC EXPERIMENT or an ENGINEERING DESIGN PROJECT.**
Both scientists and engineers contribute to the world of human knowledge, but in different ways.

- Scientists use the scientific method to make testable explanations and predictions about the world. A scientist asks a question and develops an experiment, or set of experiments, to answer that question.
- Engineers use the engineering design process to create solutions to problems. An engineer identifies a specific need: **Who** need(s) **what** because **why**? And then, he or she creates a solution that meets the need.

**Presentation or display board**: All students need to create a display for your project so your ideas can be shown at the fair. The display should have these things or qualities:

- It should be physically sound and durably constructed, and able to stand by itself
- It should show all the steps (1-6) of the scientific method or engineering design process.
- It should be neat, edited and easy to follow.
- A journal recording your thinking, process, and data is to be in the front of the display.
- The items you used and the results of the experiment may be placed in front of the board as long as they follow the fair guidelines.




**Oral Presentation**: Since it is likely that you will be discussing your project with a judge, practice a short oral presentation before going to the fair. Know these things:

- What scientific information you learned in your research
- What you did at each step in the scientific problem-solving process
- What you learned from your project
- What new questions you have
- What you would change if you did the experiment again

## TIPS FOR A GREAT PROJECT

1. **Work on something you are interested in.** You don't need to know all about your topic when you start. That is the whole idea of doing research. Good projects are ones that you have fun with.
2. **Start early.** This gives you more time for research and to polish your presentation.
3. **Get lots of help.** There are many people that can help you with your project: teachers, mentors and parents. They can't do your project for you but they can teach you about all sorts of things including how to use tools needed for your research. Visit Science Buddies website at www.sciencebuddies.com
4. **Make a plan.** It takes time to learn and do research. Your teachers plan out the entire year for courses you take. You need to meet deadlines too but you can keep your schedule simple. Keep track of things you need to do like creating an abstract, doing research and writing a research paper (suggested for junior and senior division).
5. **Project Journal.** A journal is your most treasured piece of work. Accurate and detailed notes make a logical and winning project. Good notes show consistency and thoroughness to the judges, and will help you when writing your research paper.
6. **Visual Display.** You want to attract and inform. Make it easy for interested spectators and judges to assess your study and the results you have obtained. Make the most of your space using clear and concise displays. Make headings stand out, and draw graphs and diagrams clearly and label them correctly. But any display you assemble must follow our Safety and Display guidelines.
    - **A Good Title.** Your title is an extremely important attention-grabber. A good title should simply and accurately present your research. The title should make the casual observer want to know more.
    - **Take Photographs.** Many projects involve elements that may not be safely exhibited at the fair, but are an important part of the project. You might want to take photographs of important parts/phases of your experiment to use in your display. Photographs or other visual images of human test subjects must have informed consent.
    - **Be Organized.** Make sure your display is logically presented and easy to read. A glance should permit anyone (particularly the judges) to locate quickly the title, experiments, results, and conclusions. When you arrange your display, imagine that you are seeing it for the first time.
    - **Eye-Catching.** Make your display stand out. Use neat, colorful headings, charts, and graphs to present your project. Home-built equipment, construction paper, and colored markers are excellent for project displays. Pay special attention to the labeling of graphs, charts, diagrams, and tables. Each item must have a descriptive title. Anyone should be able to understand the visuals without further explanation.
    - **Correctly Presented & Well Constructed.** Be sure to adhere to size limitations and safety rules when preparing your display. Display all required forms for your project. Make sure your display is sturdy, as it must remain intact for quite a while.

**Do your best on all project aspects.** Great research does not make a great project if you do not present it well.

**Judging Projects:** SAMPLE rubric

## K-2 Grade Scoring Rubric

**Student(s):**_____ **Grade:**_____

**Project #:**_____ **Judge:**_____ **Total Score:**_____

### Scientific Method/Engineering Design Project

| Criteria | None<br>0 | Beginning<br>1 | Developing<br>2 | Accomplished<br>3 | Score |
|---|---|---|---|---|---|
| Testable | Project does not pose a question or problem to investigate | Project lacks some clarity about the question or problem | Project has a real question or problem to investigate | Project has a specific measurable question or problem and shows a clear purpose | |
| Procedure | No procedure given | Procedure is vague and difficult to understand | Procedure is clear and could be easily repeated | The scientific method or engineering design process was clearly followed | |
| Data/ Conclusion | No Data or conclusion present | Data not clear or unlabeled with vague conclusion | Explanation of conclusion with data but does not include a graph or data table. | Data presented in a highly organized manner using a graph or data table with logical conclusion | |
| Display | Messy and Incomplete | Little attention to detail or neatness | All items are clearly labeled and neatly displayed | All items are clearly labeled and neatly displayed in a creative manner | |
| Interview | Student is unable to explain information learned | Student is able to briefly explain something learned | Student is able to explain the project and can share something learned. | Student is able to clearly explain the ideas learned while doing the project | |

### Collection

| Criteria | None<br>0 | Beginning<br>1 | Developing<br>2 | Accomplished<br>3 | Score |
|---|---|---|---|---|---|
| Purpose/ Description | No purpose or description | Project description or purpose is unclear | Project description and purpose present | Project is well described and meets a purpose | |
| Scientific Organization | Collection not sorted | Collection sorted in categories | Collection sorted into a few categories with characteristics | Collection sorted into multiple categories with detailed characteristics | |
| Conclusion | No conclusion made | Conclusion not related to collection | Conclusion is related to the collection but not clear | Logical conclusions are made about the collection | |
| Display | Messy and incomplete | Little attention to detail or neatness | All items are clearly labeled or neatly displayed | All items are clearly labeled and neatly displayed in a creative manner | |
| Interview | Student is unable to explain information learned | Student is able to briefly explain something learned | Student is able to explain the project and can share something learned. | Student is able to clearly explain the ideas learned while doing the project | |

# THE SCIENTIFIC METHOD

**The scientific method is a way to ask and answer scientific questions by making observations and doing experiments.**

**Area of Science**: To begin, you need to pick an area of science in which you are interested. These include: biological, physical, earth, chemical, behavioral/health and environmental.

**Scientific Problem Solving Process**: After deciding on an area of interest, use the following scientific problem solving process (steps 1-6 below) that will prepare you and guide you through your experiment and project preparation. **Be sure to log or record everything that you do into a journal or bound notebook.**

**1. Purpose, Problem or Question**: The purpose shows that the project intends to solve some problem from which others can learn or benefit. The problem statement or question should be clearly written and easy to understand.

**2. Research or Background Information**: Once the purpose has been stated, begin researching the topic. Be through and record all information in your journal. Check out library sources such as science books and magazines. Learn from past studies on some experiments that have already been done. Seek out experts and technology sources on your project subject.

**3. Hypothesis**: The hypothesis is your prediction as to what will happen as a result of the experiment. Predicting the expected results of this scientific study is based on consistent conditions, exact measurements and thorough research.

**4. Experiment or Procedure**: The experiment is to test the hypothesis for correctness. There are four parts to the experiment:

- Write a materials and equipment list you will need
- Write a step-by-step process you are going to follow
- Identify the experimental variable that is going to change and the control variables (or unchanged variables)
- Conduct the experiment

As you do the experiment, collect the data you observe by writing them in your journal or notebook. Pay attention to correctness in measuring and observations. Do the experiment at least 3 times, always keeping the conditions of the experiment the same.

**5. Analysis or Results**: The analysis is deciding what the data means. This can be done by asking the following questions:

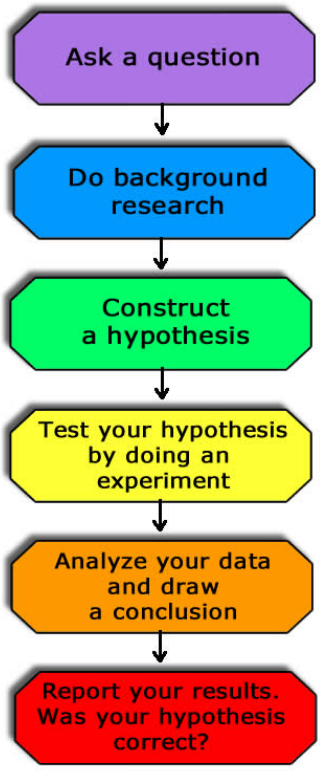
- What happened?
- What steps were important?
- How do the outcomes compare to the hypothesis?
- What observations during the experiment were expected or unexpected?
- What does the data mean?
- What are the first-thought conclusions?

The best way to display the data is to put it as a graph or a chart. A graph is a "picture" of your results. In a scientific investigation the experimental variable is always written at the bottom of the graph (horizontal axis). The information that you collected by measuring, weighing, or timing is recorded up and down on the left side of the graph (vertical axis).

**6. Conclusion**: The conclusion is the summary of your experiment. It would answer questions such as:

- Did the results confirm or conflict with the hypothesis
- What was learned form the experiment?
- Are there any suggestions or new questions to investigate?
- In what way was this investigation important?
- Is there anything that could be changed to make it a better experiment next time?

# The Scientific Method



# ENGINEERING DESIGN PROJECT

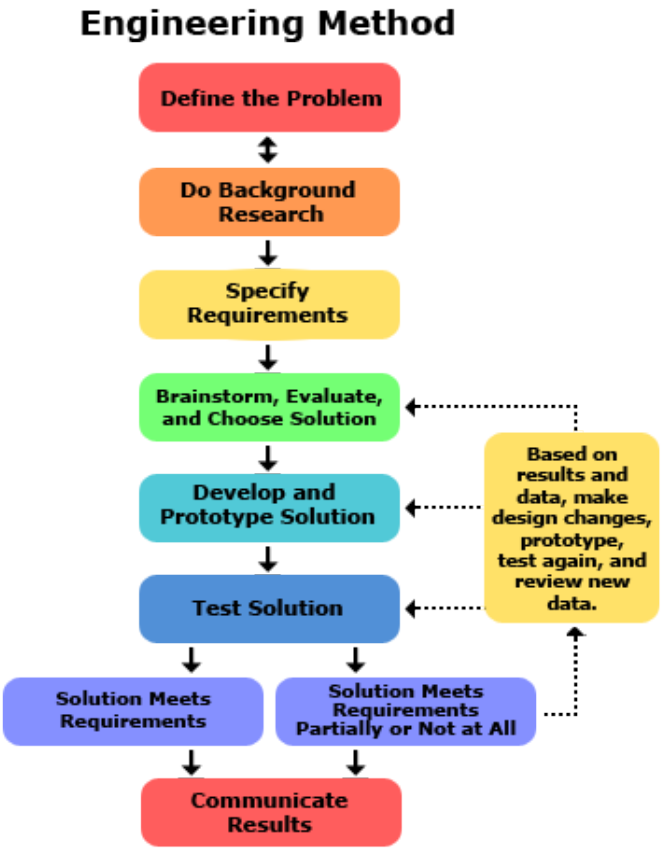
The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Often the solution involves designing a product (like a machine or computer code) that meets certain criteria and/or accomplishes a certain task.

This process is different from the scientific method. If your project involves making observations and doing experiments, you should probably follow the Scientific Method. If your project involves designing, building, and testing something, you should probably follow the Engineering Design Process.

**The steps of the engineering design process are to:**

- Define the Problem
- Do Background Research
- Specify Requirements
- Brainstorm Solutions
- Choose the Best Solution
- Do Development Work
- Build a Prototype
- Test and Redesign

**Be sure to log or record everything that you do into a journal or bound notebook.**



# RESOURCES

The Salt Lake Valley Science and Engineering Fair is Park City's regional fair. The SLVSEF provides many tools to assist students in preparing their projects. Please visit their website http://slvsef.org

Determining the project often requires the most time. Often the best projects stem from a student's personal interests. Review the scientific method and begin looking for the questions that may be investigated scientifically.

The library has many books on project ideas.

Helpful websites:

http://school.discovery.com/sciencefaircentral/
sciencebuddies.org (Has helpful questionnaire for students)
http://www.ipl.org/div/projectguide/
http://www.stemnet.nf.ca/sciencefairs/
http://www.exploratorium.edu/snacks/
http:///www.education.com