It's Time for the

Wasatch STEM Fair!

Wasatch STEM Fair will be held

November 22, 2019

ALL Students only need to complete the
Wasatch Science Fair Registration Papers.
Papers are due in the Wasatch Main Office by
Friday, November 15th.

<u>Important information:</u>

The Wasatch Science Fair is open to all 4th, 5th, and 6th grade students.

ALL Projects MUST have a LAB BOOK, a JOURNAL, and a DISPLAY BOARD.

Students may NOT have any other objects to display.

Projects must follow the Scientific Method or Engineering Design Method.

No Teams! All Projects are individual!

All Judging will take place at the Science Fair, November 22nd.
(Students need to be present for their projects to be judged.)

5th and 6th grade winners will advance to the Provo District Fair.

If you have questions, please contact Mrs. Isom (betsym@provo.edu) or
go to the "Science Fair" Link on the Wasatch School Website (wasatch.provo.edu).

Rules!

ALL Projects must have a Lab Book, Journal, and Display Board.
NO OTHER DISPLAY MATERIALS WILL BE ALLOWED!
Please do not include any food or living materials on the display.
Boards and journals should contain only written or printed materials.

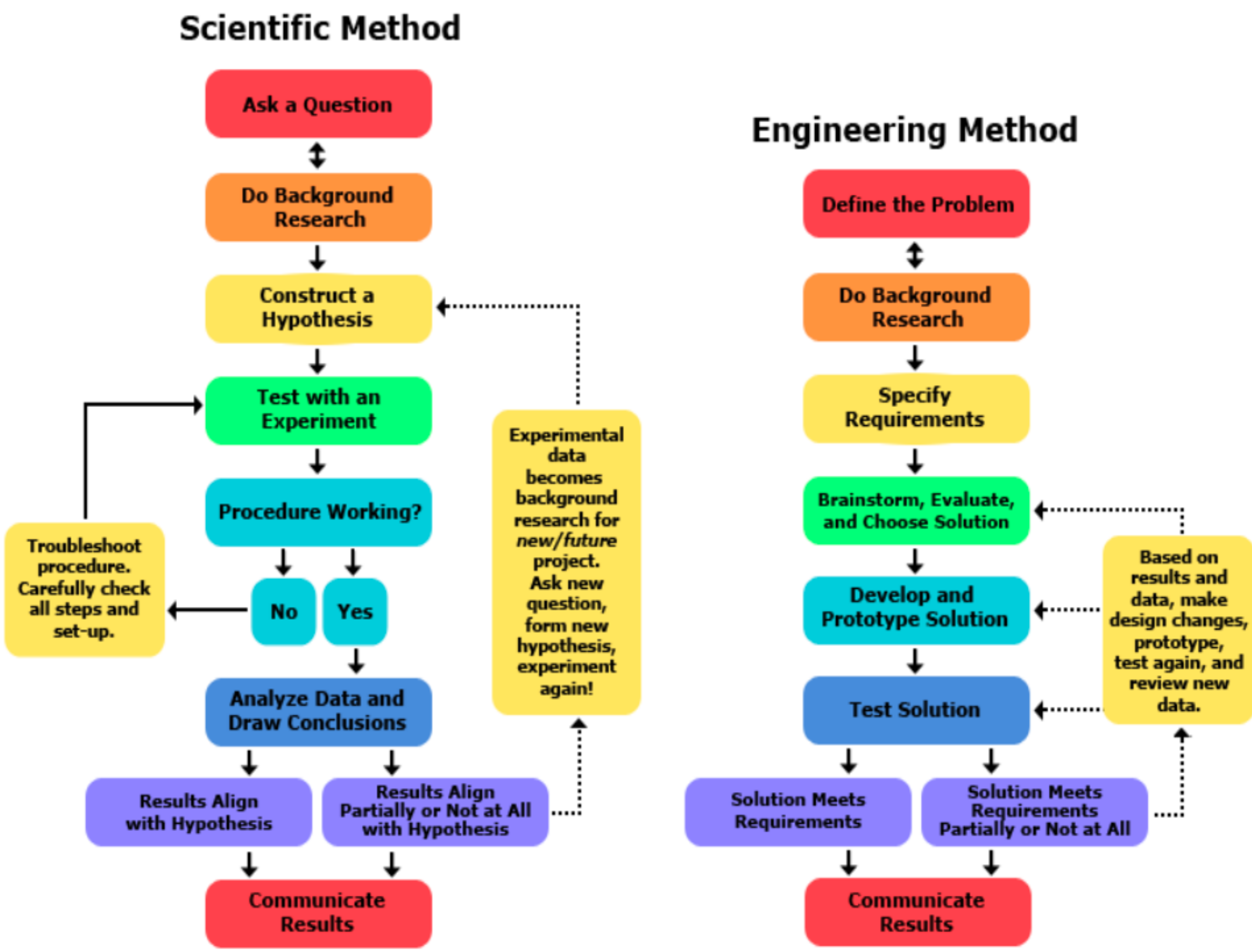
Please read through the following rules.
If your experiment includes ANY of the following situations, you MUST complete the signature page in the Science Fair Application. Projects that do not have appropriate signatures will not be allowed to participate in the Fair.
This applies to ALL students 4th – 6th grade.

Experimental Rules for Human Subjects
Based upon the Code of Federal Regulations (45 CFR 46), the definition of a human subject is a living individual about whom an investigator conducting research obtains (1) data or samples through intervention or interaction with individual(s), or (2) identifiable private information. These projects require IRB review and pre-approval and may also require documentation of written informed consent/assent/parental permission.
Experimental Rules for Vertebrate Animals
Vertebrate animals, as covered by these rules, are defined as live, non-human mammalian embryos or fetuses, tadpoles, bird and reptile eggs within three days (72 hours) of hatching, and all other non-human vertebrates (including fish) at hatching or birth.
Experimental Rules for Hazardous Chemicals, Activities or Devices
These rules apply to research that involves the use of hazardous chemicals, devices and activities. The rules include substances and devices that are regulated by local, state, country, or international law, most often with restrictions of their use by minors such as DEA-controlled substances, prescription drugs, alcohol and tobacco and firearms andexplosives. Hazardous activities are those that involve a level of risk above and beyond that encountered in the student's everyday life.
These rules are intended to protect the student researcher by ensuring that the proper supervision is provided and that all potential risks are considered so that the appropriate safety precautions are taken. Before beginning research involving hazardous chemicals, activities or devices, be sure to check with your school, local, or regional fair as more strict rules and guidelines may be in effect.
Experimental Rules for Potentially Hazardous Biological Agents
The use of potentially hazardous microorganisms (including bacteria, viruses, viroids, prions, rickettsia, fungi, and parasites), recombinant DNA (rDNA) technologies or human or animal fresh/frozen tissues, blood, or body fluids is allowable under the conditions set forth by the rules. All of these areas of research may involve potentially hazardous biological agents and require special precautions.
Experimentation involving culturing of potentially hazardous biological agents, even BSL-1 organisms is prohibited in a home environment. However, specimens are allowed to be collected at home as long as they are immediately transported to a laboratory with the appropriate level of biosafety containment.

Scientific Method or Engineering Design Method?

How do I know if I need to follow the Scientific Method or the Engineering Design Method in my project?

While scientists study how nature works, engineers create new things, such as products, websites, environments, and experiences. Because engineers and scientists have different objectives, they follow different processes in their work. Scientists perform experiments using the scientific method; whereas, engineers follow the creativity-based engineering design process.



Scientific and Engineering projects will be judged based on the methods above. For more information about the judging process, please visit the “Science Fair” link on the Wasatch homepage (wasatch.provo.edu).

The Scientific Method

1. Select a Topic: Find something that is interesting to you. You might think about earth science, life science, computer science, engineering, physical science, consumer science, or product testing. (Just a hint: product testing isn't winning awards at the next level.)
2. Form a Question: Your question should state what you want to find out as a result of your experiment. DO NOT try to answer more than one question.
3. Do Research: Gather information about your project so you can state an informed hypothesis. Books, magazines, the Internet, people, companies, and products are all great resources.
4. State Your Hypothesis: The hypothesis is your prediction of what will happen as a result of your experiment. So, state your hypothesis before you begin your experimentation. Make your best guess, but base your answer on the information you gathered. Remember that a hypothesis does not have to be right. More scientists are WRONG in their hypotheses than are right. A wrong hypothesis can lead to further experimentation.
5. Gather Materials for Experimentation: Gather all the materials that you will need to do your experiment and make a list of EVERYTHING you use.
6. Write Your Procedure: Write a detailed description of how you will conduct our experiment. Check to make sure you will be controlling ALL variables (making everything the same) except the ONE thing in the experiment that will change or be different – the variable that you are testing.
7. Conduct the Experiment: Be sure to conduct your experiment at least TWO TIMES to make sure your results are accurate. This can be done at the same time or separately, whichever works best for your experiment.
8. Gather Data: While you are conducting your experiment, be sure to write down everything that is happening. IT IS A GREAT IDEA TO TAKE PICTURES OF YOUR EXPERIMENT. Pictures can be added to Display Board as well as Lab Books and Journals. When you have concluded your experiment, put your data into a chart. Then show the information in a graph. The chart and graph will make it easier to analyze your data.
9. Analyze the Data: Explain in word form the results of your experiment using the data you have collected. Be sure not to state your conclusion here.
10. Come to a Conclusion: The conclusion is stating whether your hypothesis was correct or not.

The Engineering Design Process

1. Define the Problem – The engineering design process starts when you ask the following questions about problems that you observe: What is the problem or need? Who has the problem or need? Why is it important to solve? [Who] need(s) [what] because [why].
2. Do Background Research – Learn from the experiences of others – this can help you find out about existing solutions to similar problems, and avoid mistakes that were made in the past. So, for an engineering design project, do background research in two major areas: Users or customers and existing solutions.
3. Specify Requirements– Design requirements state the important characteristics that your solution must meet to succeed. One of the best ways to identify the design requirements for your solution is to analyze the concrete example of a similar, existing product, noting each of its key features.
4. Brainstorm Solutions – There are always many good possibilities for solving design problems. If you focus on just one before looking at the alternatives, it is almost certain that you are overlooking a better solution. Good designers try to generate as many possible solutions as they can.
5. Choose the Best Solution – Look at whether each possible solution meets your design requirements. Some solutions probably meet more requirements than others. Reject solutions that do not meet requirements.
6. Develop the Solution – This is the time to build your prototype! Development involves the refinement and improvement of the solution, and it continues throughout the design process, often even after a product ships to customers.
7. Test and Redesign – The design process involves multiple duplications and redesigns of your final solution. You will likely test your solution, find new problems, make changes, and test new solutions before settling on a final design. At this point, you may find yourself going back through steps 4-7.
8. Communicate Results – To complete your project, communicate your results to others in a final report and/or display board (this is the STEM Fair Journal and Display Board). Professional engineers always do the same, thoroughly documenting their solutions so that they can be manufactured and supported.

(http://www.sciencebuddies.org/engineering-design-process/engineering-design-process-steps.shtml#theengineeringdesignprocess)

Helpful Links:
http://www.eie.org/overview/engineering-design-process
http://stemactivitiesforkids.com/2016/02/25/690/
https://www.teachengineering.org/k12engineering/designprocess

How to Keep a Lab Book

It is suggested that a composition notebook be used – this way the pages won't fall out. However, you can use any notebook.

Make sure to write all entries in PEN.

Write the DATE on every entry. Make sure entries are to the point and explain what you did that day. Be specific (use measurements and exact details as much as possible)

Don't be too worried about the neatness, it is your personal record and should not be perfect. Also, do not scribble out incorrect information or entries; one line through the mistake is adequate.

You should use your notebook through your ENTIRE project and write down ideas, thoughts, sources, sketches, calculations, brainstorming, notes, and anything else that could be important. Remember that this is how you will show ALL THE WORK you put into your project.

At the end of each entry you may want to REFLECT on what went right or wrong as well as what you may want to do next time or do differently.

Make sure you write down any changes you make to your procedure. We all make mistakes and it is good to note these as you learn from them.

Be sure to write down ALL observations that you make during your experiment and throughout your project.

Your notebook will NOT be judged at the Science Fair, but it may help you answer questions from the judges about your project.

Journal

Journals are created after the experiment or design process is complete. The information included should come from your Lab Book. The Journal format is slightly different for Scientific versus Engineering Projects. Please read the following information to make sure your Journal is put together correctly.

SCIENTIFIC EXPERIMENT JOURNAL

The science journal should have a cover. The contents can be typed or handwritten (neatly). This is a final product to show the evidence of your experiment and conclusion. Students should do their own work! Parents and teachers should only help in an advisory capacity. Each of the following components of the journal should be found on a separate page and in this order:

1. Title Page: The title page should include the title of the science fair project, student's name and grade, and the date of the science fair.
2. Table of Contents: List the components of your report and what page they can be found on in your journal. All pages need to be numbered.
3. Introduction: The introduction should tell why you decided to do this experiment.
4. Question: This part should include the one question that you hope to answer by doing your experiment. It can also include information that helped you form the question and/or why you want to know the answer.
5. Research: Tell about the research you did that helped you form your hypothesis.
6. Hypothesis: State your hypothesis and explain why you think your prediction is valid.
7. Materials List: Include a complete materials list. Don't leave anything out. If you used it, list it.
8. Procedure: This should be a very detailed explanation of EVERYTHING you did to conduct your experiment.
9. Data: This is where the information you gathered in your experiment is placed on a chart and then graphed for easier analysis.
10. Analysis: This will be the written description of your data and what it means. What happened? What steps were most important: You can also include any additional information that you found interesting as a result of your experiment such as what observations were expected or unexpected.
11. Conclusion: State whether your hypothesis was correct or not and then include what you learned, what you would do differently next time, or any suggestions or additional questions to investigate.

ENGINEERING JOURNAL

The Engineering Journal should have a cover. The contents can be typed or handwritten (neatly). This is a final product to show the evidence of your design process and conclusion. Students should do their own work! Parents and teachers should only help in an advisory capacity. Each of the following components of the journal should be found on a separate page and in this order:

1. Title Page: The title page should include the title of the science fair project, student's name and grade, and the date of the science fair.

2. Table of Contents: List the components of your report and what page they can be found on in your journal. All pages need to be numbered.

3. Introduction: The introduction should tell why you decided to solve this problem.

4. Problem: Describe the problem or need that your design will solve.

5. Research: Describe how other engineers have tried to solve this problem. Show evidence that you have researched and looked at what has been done before.

6. Requirements: List the specific requirements or characteristics your design must have to succeed.

7. Brainstorm: Desribe or list some of the ideas you had as you were brainstorming your design.

8. Solution: Describe the design that you have decided to test.

9. Develop the Solution: Explain the process you used to make your prototype. Be specific about materials, amounts, and the tools you used to create the prototype. (Remember, it needs to be specific enough that someone else could use this to create the same prototype!)

10. Test and Redesign: Explain how you tested your prototype (again, be VERY specific). Describe what worked and what needs to be changed. Describe changes made.

NOTE: You will have several pages that include the steps 8-10. Make sure you have detailed descriptions of each prototype and each test and its results.

11. Conclusion: Describe the final prototype you developed and how that best meets the requirements and solves the problem.

Display Board Requirements

The science display board should be sturdy and able to stand by itself. (An example board will be in the main hall after the Christmas break.) Each display board should include a PROJECT TITLE and Subtitles for each section listed below (question, hypothesis, etc.). Pictures are nice (especially when you are doing an experiment with items that you can't display i.e. mold or acid), but are not required. You should do your OWN work! Parents and teachers should only help in an advisory capacity.

Note that some things that should be in your journal are NOT included on the display board!

1. Title: Use a "catchy" title that will draw attention to your board. Make it large enough that it can be read from a distance. Subtitles: (should be smaller than the main title)
2. Question: State just the question.
3. Hypothesis: State just your hypothesis.
4. Material List: Include your complete materials list.
5. Procedure: This should be a shortened version of what you did for your experiment.
6. Data: This should be the chart and graph that show the information you collected as you conducted your experiment.
7. Results /Analysis: State briefly the results of your data.
8. Conclusion: State whether your hypothesis was right or wrong.
9. Name and Grade Level: Please make this only large enough to be seen easily while standing right in front of your project.

Display Board Sample Layout

Question State your question here. Hypothesis State your hypothesis here. (Remember to do this BEFORE your experiment takes place.) Materials List List all materials you needed to complete the experiment. If you used it, put it.	"Catchy" Title Procedure Explain what you did for your experiment in such a way that someone else could recreate the experiment again. (include pictures) Boards available in the Main Office White Boards: $3.00 – Colored Boards: $4.00	Data This includes a table where information is recorded during the experiment and an appropriate graph that shows the data in a visual form. Analysis Briefly tell what the data shows, and what you found out. Conclusion State whether your hypothesis was right or wrong.