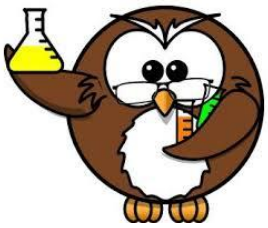
OAKWOOD ELEMENTARY 2019 STEM Fair

General Information – Grades 3rd-6th



STEM Fair Overview

A STEM Fair is fun and exciting way for Elementary School students to gain exposure to science, technology, engineering, mathematics, and the Scientific Method. STEM Projects should be experiments or design projects that MUST answer a question. They are **NOT** demonstrations or a report. The best projects are those that 1) answer a simple question, 2) use only one variable (don't try to test the answer to more than one question), and 3) involve multiple trials.

Oakwood Elementary will observe Granite District STEM Fair guidelines and rules as outlined in the Granite STEM Fair Handbook 2019. A link to the handbook is located at the GSD STEM Fair website, http://www.graniteschools.org/curriculuminstruction/science-k-12/science-fair/. Highlights from the handbook and information relevant to elementary school fairs are covered in the following text. The website also has helpful suggestions under the "Extra Ideas on Being Successful at STEM Fair" heading.

Judging, Outstanding Projects, and Advancing to Further Competition

At Oakwood's Fair, all individual and small group projects will be judged. We will acknowledge outstanding projects in the 3rd-6th grades. *K-3rd grade **class projects** are not judged, but each student will be recognized for their participation. Classes will also have the opportunity to present to peers in their grade*. Judges will select up to 15 qualified projects from the 5th and 6th grades to participate in the Granite District STEM Fair. ***(A detailed handout has been prepared for 5th and 6th grade students because it is important that they follow specified criteria if their project is chosen to advance. This handout is provided by your student's teacher either as a hard copy or via email. Hard copies will also be available from Oakwood's Main Office, if needed.)*** The students selected to advance will first submit their work as PowerPoint or Google Slides to the District "Virtual" Fair. Virtual Fair entries will be narrowed by District judges for advancement to the District "In-Person" Fair, and then to the Salt Lake Valley Science and Engineering Fair.

TOPIC categories

(Projects must fit within one of the following categories):

Behavioral & Social Sciences	Engineering: Electrical and Computer Science*
Biology & Biochemistry	Engineering: Materials and Biomedical*
Chemistry	Engineering: Mechanical*
Earth and Environmental Sciences	Medicine and Health Sciences
Energy: Chemical and Physical	Physics, Astronomy, and Math
Engineering: Civil and Environmental*	Plant Sciences

*Engineering projects can follow a different process than science experiments. **Guidelines are listed on page 5**.

For more detailed information about categories visit https://usef.utah.edu/resource-center/research-categories.

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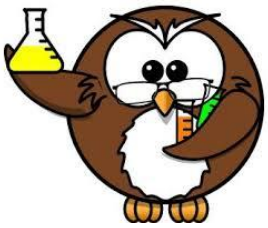
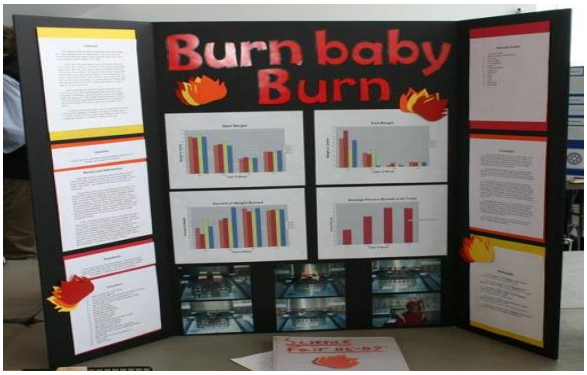


Display Board Contents

An example of a display board is shown. The following are components that should be included.



- Title
- Your Name and Grade
- Question or Problem
- Hypothesis or Design Goal
- Research
- Experiment or Engineering Process
- Data, Graphs, Diagrams and Pictures
- Conclusion
- Works Cited

Feel free to rearrange the elements, but each concept should be included. "The Process of a Research Experiment" (pg. 4) or "The Process for an Engineering Project" (pg. 5), will also help you to know what type of ideas you should include. Don't forget to pay attention to neatness and spelling--typewritten boards are not required, but are easier for your classmates and judges to read.

Project Data Book (REQUIRED for all projects)

Each project MUST have a project data book on display. It should contain detailed notes about the project, recorded as the project progresses (***not after it has been completed***). There should be lots of information included--ideas, amounts, steps, errors, results, drawings, formulas, etc. Data tables, information collected, and observations should all be recorded here. Make sure entries in the data book are dated. This is also where students should place Informed Consent Forms (pg. 23 of the Granite STEM Fair Handbook 2019) for human test subjects. The book may be handwritten, but needs to be legible! Students may use a notebook, paper placed in a binder or folder, or the Elementary STEM Fair notebook found through a link on the GSD STEM Fair website.

Safety

Proper attention to safety is expected of all science fair participants. ***No*** portion of your experiment should be brought into the school; non-adherence means disqualification. ONLY your display board and logbook should be brought to school. If needed, a laptop with a video of some part of your project may also be present. (The battery for the laptop should be charged as there are not power outlets available.)

Pathogens, including Bacteria

Bacteria/Fungus may NOT be grown at home or at an elementary classroom. Pathogenic bacteria experimentation is prohibited. Other bacteria experiments must have sealed Petri dishes. As part of the project, the student should have a plan for disposal, and must be done in a BSL 1 or 2 lab (the Granite Technical Institute offers its lab as a location for growing bacteria). **Projects not following this guideline will be disqualified. Please observe this District requirement!**

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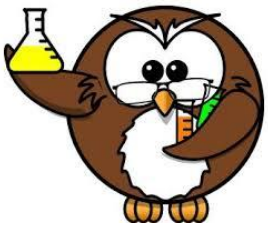

Animal Experimentation

Student projects that use living organisms (excluding plants) must follow these guidelines: Behavior observation studies or supplemental nutritional studies involving pets may be done at home. Any other experiments involving laboratory animals (rats, mice, hamsters, gerbils, rabbits, etc.) CANNOT be conducted in a student's home and MUST be done in a lab. Proper animal care must be provided daily, including weekends, holidays, and vacations. Experimental procedures that cause unnecessary pain or discomfort are prohibited. Experiments designed to kill vertebrate animals are not permitted. Experiments with a death rate of 30 percent or higher are not permitted. A veterinarian's signature is required of all projects with vertebrate animals (except behavior observations of pets).

Human Experimentation

Experimentation on humans must conform to the same guidelines as animals. Human studies (including surveys, taste testing, and physical exertion) **must have prior approval** from the mentor teacher or district science specialist **and an Informed Consent Form signed** by the participant and parent/guardian. One form should be completed for each participant. This form is on page 23 of the District STEM Fair Handbook. Hard copies are also available in the main office.

Institutional Review Board (IRB) approval is required for projects using Informed Consent Forms. The IRB will be the STEM Fair coordinator, the classroom teacher, and perhaps an administrator. Emily Harward or Megan Black at the District Office may be contacted with questions.

Online Resources

Below are a number of different websites which offer great ideas and information for science/STEM Fair projects. Check out the different sites and find an idea that sparks your curiosity. Remember, some of these projects are done commonly--if you choose one of these, make sure you do a clear, complete job, with multiple trials and thorough explanation. Even better, find a way to change the research question to make it more unique!

--**District STEM Fair:** http://www.graniteschools.org/curriculuminstruction/science-k-12/science-fair/
--**Regional STEM Fair:** https://usef.utah.edu/ (includes links to help find local labs and experts)
--**Additional Resources:**

- http://www.sciencebuddies.org
- https://sciencebob.com
- http://www.education.com/science-fair/
- http://faculty.washington.edu/chudler/fair.html
- http://sciencefair.math.iit.edu/
- @wonder_kids_stem on Instagram

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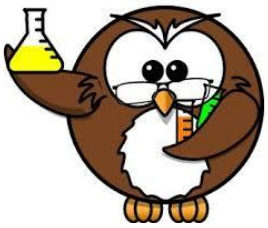

The Process of a Research Experiment

1. Identify your hypothesis
2. What is it that the experiment is about? What are you investigating and why? (what are your goals for the research experiment?)
3. Explain how you went about investigating it
    a. Discuss the steps you followed in designing and conducting the experiment, including your setup, the equipment and tools you used and how you used them.
    b. Use drawings or pictures as well as words to illustrate your work
4. List the data you collected
    a. Use tables, graphs, or any other charts that help organize and present your data.
5. Analyze the data you collected
    a. Does the data address your goals?
    b. Justify your results using the data
6. Conclusions and Results
    a. What exactly did you do?
    b. What observations did you make?
    c. What are your findings?
    d. How do they meet or not meet your goals?
    e. Are the findings what you expected?
    f. Discuss the strategies you attempted in setting and carrying out your work (and how successful they were). Show your analysis, any unexpected results, errors, possible alternative findings, and explanation.
    g. Discuss any revisions that you think may be necessary to your methods and findings.
7. Reflections (included in your Discussion section)
    a. What did you think of this experience?
    b. What did you learn?
    c. How did this activity help you (or not?)
    d. What were some of the issues and how did you address them?
8. Suggestions
    a. How could your results help someone? (What group might be interested in knowing more about your results or could benefit from your research?)
    b. What will you try next?

Adapted from NSTA Science Scope Magazine, "Tried and True: Teaching the practice of science, unteaching the scientific method", Summer, Volume 33, 2010.

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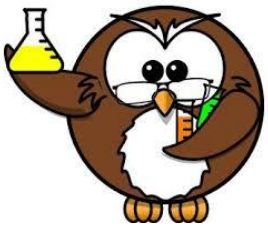

The Process for an Engineering Project

1. Select a Topic
   Read magazines, make observations, ask people about challenges or problems that they have to gather ideas for an engineering project.

2. Purpose
   Define the need or the problem that you want to address in the project. What or who will benefit from your project?

3. Research
   After you have chosen a problem or a need research more about your topic. Come up with some questions related to your topic and search for the answers. Then write a paragraph about what you learned. Why is your idea needed? Why is your version better than others you researched?

4. Design Goal
   Use what you learned from research to develop a possible solution to your need or problem. Describe your design idea in detail, including materials you will need and costs.

5. Build, Test, Revise
   Start by following your design goal, then make adjustments to your prototype after you have tested it. You will probably have to go through several cycles of building, testing, and redesigning. Be sure to record all of this process.

6. Design Solution
   Once you have a prototype that addresses your need or problem, you need to develop a materials list and procedures for creating the final prototype.

7. Conclusion
   Share what you learned from your experiment in your conclusion. Be sure to explain how your design effectively solves the problem, or meets the need.

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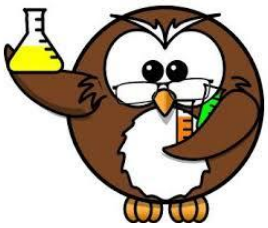

General Information – Grades 3rd-6th

Student Planning Guide (5 Week Plan)

Week 1 **(Week of December 3, 2018)**

- ✓ Identify topics that interest you
- ✓ Start a project notebook (logbook) to record your ideas and research
- ✓ Review the Scientific Method (see pages 7 and 8)
- ✓ Gather Information (research) books, experts, interviews

Week 2 **(Week of December 10, 2018)**

- ✓ Choose a topic and record your hypothesis in your logbook
- ✓ Organize and plan the experiment—record this information in your logbook
- ✓ Think about how you will display your work

Week 3 **(Week of December 17, 2018)**

- ✓ Turn in your pre-approval form (for 5th and 6th grades only)
- ✓ Conduct experiment
- ✓ Take pictures of your project
- ✓ Do more than one trial of experiment – Keep track of data
- ✓ Continue to write in project notebook
- ✓ Have fun!

Week 4 **(Week of December 31, 2018)**

- ✓ Remember, if your results aren't what you expected, it isn't failure.
- ✓ Look at your results and figure out what happened
- ✓ Make adjustments and try again, if needed
- ✓ Analyze results and make conclusions
- ✓ Write in your project notebook
- ✓ Complete your project, record and write up your results

Week 6 **(Week of January 7, 2019):**

- ✓ Make graphs, charts and heading for display (computers help a lot with this info)
- ✓ Set up your display
- ✓ Review your work – Practice your presentation to answer judge's questions
- ✓ **Be sure to put your name on your project** – you can be proud of your effort and work.
- ✓ Acknowledge those people who helped you!

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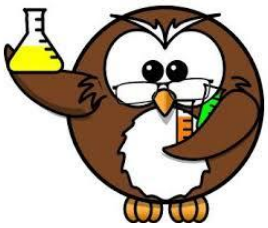


The Scientific Method

Identify the Problem

This is an important step in the scientific process. Topics can be very large and often need to be narrowed down to something that is easier to study.

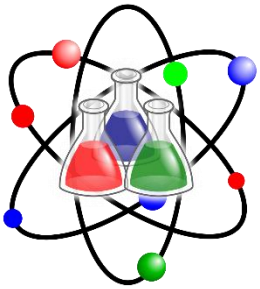
Refer to Authoritative Sources

Reading books, magazine articles, and reputable websites will help the student learn about their topic of interest. All good scientists will first learn basic facts about their subject before conducting their research. A visit to the local library, a trip to the Zoo or Aviary, or visiting a local garden shop may help the student learn new information about the topic.

Ask an Appropriate Question

If a student is interested in plants, asking various questions related to plants may help the student to choose a topic. How do plants grow? What nutrients are needed? How much water do they need? Can they grow using different liquids?

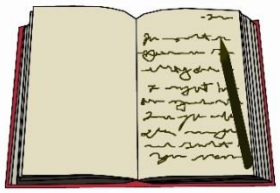
Develop a Hypothesis



A hypothesis is an educated guess--a statement of how the scientist thinks the experiment will turn out. It is a prediction, based on the best available information of what the scientist believes will happen at the end of the experiment. Examples include: "Plants will not grow without sunlight" or "clothes will be cleaner using the hot water cycle of the washing machine rather than the cold water cycle."

Conduct An Experiment

This involves testing your hypothesis. A student will learn what happens when a condition is created or changed. Whether plants will grow without sunlight can be tested by planting two groups of plants and then allowing one to have sunlight and the other to have no contact with light of any kind. What happens to the plants? Can your question be answered?



Keep Detailed Records of Methods and Results

In order to come to a conclusion, students should keep a log or record of their work. Observations and summaries of the “events” of the experiment will help the student find the answer to their questions. They will then be able to analyze the results of their experiment.

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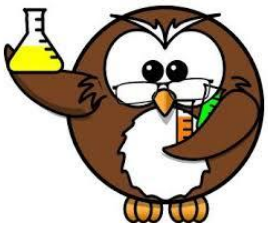

The Scientific Method (cont.)

Analyze the Results

What facts or numbers were produced as a result of the experiment? Analyzing the results allows the student to look at the information from the experiment and develop a conclusion or answer to the questions that were originally asked. It is often helpful to summarize findings in a graph or table of information.

Develop a Conclusion

The conclusion should provide some answer to the original question. For example, if your hypothesis was that clothes get cleaner using the hot water cycle and if, in fact, through your experiments, you discover that this is true, then you conclusion would be that clothes do become the most clean using hot water. It is often most interesting when the hypothesis is found to be incorrect, and the experiment proved something unexpected to be true. A conclusion can also tell why information is important, or what future action should be taken as a result of the results of the experiment.