Lake County Schools

Elementary Science and Engineering Fair

Student Handbook

2017 – 2018

Science and Engineering Fair General Information

Each project must be related to an area of science or engineering.

All projects must be approved by your teacher before you begin and must reflect this year's learning.

All projects submitted must be from one of the following categories:

- Earth Space Science
- Physical Science
- Life Science
- Engineering

Projects should be free-standing and all should include a display board. Plan to make a neat and attractive display board for the viewers/judges to easily understand your project and all the hard work you did.

All projects should have neat (preferably type-written), colorful headings, charts and graphs to present your project. Please include pictures of important phases or parts of your project.

Students should make every effort to use correct spelling and grammar.

Your project should have a Laboratory Journal with entries that will provide background information to anyone looking at your project. Students who wish to advance to the District Science and Engineering Fair, must have a completed Laboratory Journal.

The following items are not allowed: live animals (unless approved by a veterinarian and no harm to the animal is done), controlled substances, bodily fluid samples, dangerous chemicals, mold, bacteria (no petri dishes involved in experiments), alcohol, firearms, open flames and/or explosives.

Each display board must have a Student Project Form (provided in this handbook) attached on the back.

You may ask family members for assistance in getting materials and taking pictures, but they should not build or do the project for you. This is your work; be proud to do it independently!

If you are being judged at a school level and/or district level, all decisions are final.

District Elementary Science and Engineering Fair

This will be offered to 3rd – 5th grade students, first place winners in each of the four categories from each school. The District Fair will be held February 5-6, 2018. If the first place winner cannot attend, schools may elect to send their second place winner.

Science and Engineering Fair Safety Guidelines

Parents and supervising teachers should use his or her best judgment to ensure the safety of the student and any subjects involved in testing.

Students should include photographs on projects rather than displaying breakable, valuable or potentially harmful objects. Photographs may include the student's face.

Eye Protection: Safety glasses should be used for any experiments that any kind of splash may come in contact with your eyes.

Allergies: Remember human subjects may be allergic to different substances. Always ask about allergies before you test.

Fire: Projects are not allowed that involve fire or burning of objects.

Bacteria: Due to the potential for inhaling or coming in contact with harmful bacteria, students should avoid projects where they collect bacteria and then grow bacteria cultures. While this can be done safely, the potential exists for a very harmful pathogen to be inhaled or come in contact with the student. Any project involving growth on petri dishes is prohibited.

Other: NO experiments should be done using firearms. Experiments cannot include prescription drugs, solid or liquid waste, illegal drugs or alcohol.

Science and Engineering Fair Project Display Guidelines

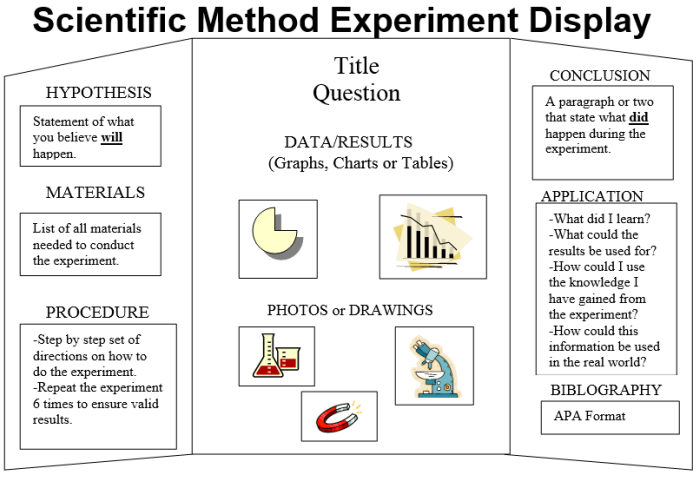
Whether you are doing a traditional science fair project, using the Scientific Method or doing an engineering project, following the Engineering Design Process, you will need to do a display board and Laboratory Journal.

Experiments using the Scientific Method

If you choose to follow the Scientific Method your display board should have the following headings:

- Title
- Question/Purpose
- Hypothesis
- Materials
- Procedure
- Data and Pictures - Graph, Table, Chart, etc.
- Results
- Conclusion
- Application
- Bibliography- In APA Format

Sample board:

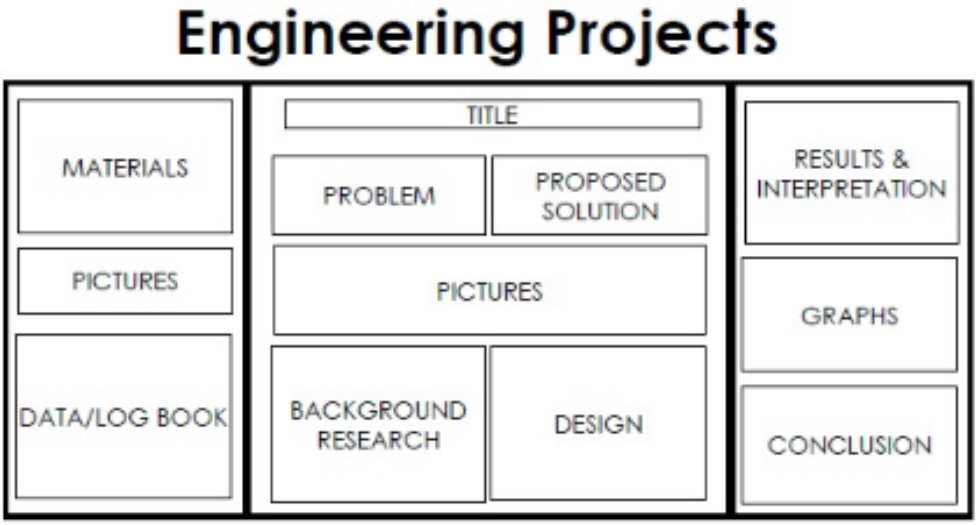


Engineering Design Process

If you choose to follow the Engineering Design Process your display board should have the following headings:

- Title
- Problem
- Proposed Solution
- Pictures
- Background Research
- Student Design
- Materials
- Results and Interpretation
- Conclusion
- Evidence of the Engineering Design Process – Flow Map

Sample Board:

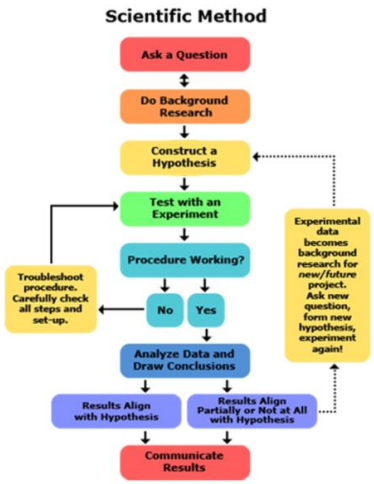


Science and Engineering Fair Laboratory Journal Guidelines

- Grades 3-5 are encouraged to complete a Laboratory Journal.
- Students wanting to be considered for the District Science and Engineering Fair must complete a successful Laboratory Journal or the project will not be allowed entrance to the district fair.
- The notebook should be a composition notebook, a folder, or three-ring binder.
- Your Laboratory Notebook should have **DAILY** and/or weekly descriptions of your project, including all data collected.
- It should include background research collected for your experiment.
- It should have each heading from your display board with all of your thinking, work, ideas, problems, drawings, testing, data, etc.
- All of the work for your project should be kept in this journal before the final information is gathered and put on your display board.
- Hint: Tape a large envelope on the back of your display board and keep your journal in it until it is time to display all your hard work at your fair.

The Scientific Method vs The Engineering Design Process

The Scientific Method:



Scientists use The Scientific Method to study the world around them. You can use the Scientific Method to study a spider, a flower, candy, a river, the Sun and much more. You can use the Scientific Method to test predictions about the world around you. It is a process for experimentation that is used to explore observations and answer questions. Scientists use this method to search for cause and effect relationships. In other words; will changing one item cause something else to vary or change in a predictable manner? Projects involving the scientific method should include collection and comparison of data.

Steps of the Scientific Method:

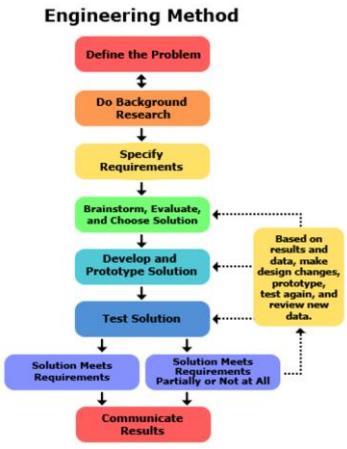
1. Ask a Question – The Scientific Method starts with a question about something you have observed. It could be something you have wondered about: how, what, where, when, who, which, why, when? Your question must be something that is measurable and should be something you are interested in but don't already know the answer to.

2. Do Background Research – Find information from a reliable source on the internet and at your school or local library to help you find information to best support the question you are asking. The more you know about your topic, the more successful your project will be.
3. Construct a Hypothesis (What do you think the answer to your question is) – A hypothesis is an educated guess that can be tested. For example, If_____, then _____ will happen because _____. Your hypothesis must be stated in a way that you can easily measure and should be constructed in a way that will assist you in answering your original question. It should not include personal words like "I think" or "I predict". Your hypothesis may end up being correct or incorrect. That's ok. NEVER change your hypothesis to match your results.
4. Test with an Experiment (Test your Hypothesis) – Your experiment tests whether your hypothesis is supported or not. You should repeat your experiment at least 3-5 times to make sure your results were not an accident. For a fair test, make sure you only change one variable at a time.
    - First, write your experimental procedure. This is like a recipe. It should be step-by-step so another scientist could repeat the exact same experiment. Your procedures will also include what materials you used and how you used them. When conducting your experiment follow your procedures exactly, make observations, and record all of your collected data in your Laboratory Notebook.
        - Your experiment will have three variables:
            - Control Variable – What does not change
            - Independent Variable – What is changed by the scientist (that's you ☺)
            - Dependent Variable – The outcome or results of your experiment
5. Analyze your Data and Draw a Conclusion (What happened? What were your results?) – Once your testing is complete, collect your data and analyze it to see if it supports your hypothesis or not. Scientists often find their hypothesis is

not supported. In such cases, they construct a new hypothesis and start the process over. Scientists may also start the process over when their hypothesis was supported just to find another way. Keep in mind, if you have successfully gone through the steps of the Scientific Method to this point, you are on your way to a successful science project regardless of whether your hypothesis was supported or not. ☺ In your conclusion, state what you think the "Real World Value" is to your investigation and why it is important information to share.

6. Communicate Results (Share what you have learned) – Lastly, you will communicate your results with a display board, showcasing the work you have done and all you have learned. All projects utilizing the scientific method should include graphs illustrating their data and results. Remember to make the final entries in your Laboratory Notebooks to display with your project.
7. Identify an Application- How does this project have real-world application. What did I learn and how does this apply to me?

The Engineering Design Process:



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, creates a solution that meets the need.

Steps to the Engineering Design Process:

1. Define the Problem – Ask yourself the following questions about problems you observe:
    - What is the problem or need?
    - Who has the problem or need?
    - Why is it important to solve?
2. Do Background Research and Brainstorm Solutions - Find information from a reliable source on the internet and at your school or local library to help you find information to find the best solution to your problem or need. The more you know about your topic the more successful your project will be. Try to generate as many possible solutions as you can, that way you don't overlook the best one. Remember, your best solution may not be your first solution.
3. Decide on a Solution and Develop a Plan – Your Plan is like a recipe. It should be step-by-step so another engineer could repeat the exact same experiment or you can focus on areas of improvement later in your design. Your plan will also include what materials you will need and how you will use them. When you create your prototype follow your plan exactly, make observations, and record all of your collected data in your Laboratory Notebook.
4. Build/Create your Prototype and Test – A prototype is a working version of your solution. It is often made of different materials than the final version, this is usually to save time and money during the testing phase. Prototypes are a key step in the development of a final solution. This will allow you to test your solution, find new problems, make changes and test new solutions before deciding on a final design. Make sure you record all prototype testing in your Laboratory Notebook.
5. Improve and Redesign – Think about your design, what worked and didn't work. What do you think you could have done differently with the knowledge you now have from making your prototype? If you feel like you have come to a better solution, make those improvements, redesign and create your final product.

6. Communicate Your Results (Share what you have learned) – Lastly, you will communicate your results with a display board and final product, showcasing the work you have done and all you have learned. Remember to make the final entries in your Laboratory Notebook to display with your project.

How do you know which process to choose for your project?

If the objective of your project is to answer testable questions or observe cause and effect relationship between two things then the Scientific Method would best fit your needs.

If the objective of your project is to solve a problem you have observed by building or creating a new product, then it makes sense to use the Engineering Design Process.

If you are not sure which process would best fit your particular project please talk with your teacher for advice.

How to Write a Bibliography- APA Format

Book:

Format -

- Author's last name, first initial. (Publication date). *Book title*. Additional information. City of publication: Publishing company.

Example:

- Nicol, A. M., & Pexman, P. M. (1999). *Presenting your findings: A practical guide for creating tables*. Washington, DC: American Psychological Association.

Encyclopedia or Dictionary:

Format -

- Author's last name, first initial. (Date). Title of Article. *Title of Encyclopedia* (Volume, pages). City of publication: Publishing company.

Examples:

- Bergmann, P. G. (1993). Relativity. In *The new encyclopedia britannica* (Vol. 26, pp. 501-508). Chicago: Encyclopedia Britannica.
- *Merriam-Webster's collegiate dictionary* (10th ed.). (1993). Springfield, MA: Merriam-Webster.

Magazine and Newspaper Article:

Format -

- Author's last name, first initial. (Publication date). Article title. *Periodical title, volume number(issue number if available)*, inclusive pages

Example:

- Harlow, H. F. (1983). Fundamentals for preparing psychology journal articles. *Journal of Comparative and Physiological Psychology, 55*, 893-896.

Website or Webpage:

Format –

- **Online periodical:**
  Author's name. (Date of publication). Title of article. *Title of Periodical*, volume number, Retrieved month day, year, from full URL

- **Online document:**
  Author's name. (Date of publication). *Title of work*. Retrieved from full URL

Example: Devitt, T. (2001, August 2). Lightning injures four at music festival. *The Why? Files*. Retrieved from http://whyfiles.org/137lightning/index.htm.

Student Project Form

Fold or cut at the line and glue/tape to the back of your display board.

Student(s) Name _____

_____

_____

_____

Grade _____

School_____

Teacher_____

Project Category _____

Project Title_____

Science Fair Project Ideas by Grade Level

	K- 2	3-4	5th
Life Science	Senses Living and Non-living Plants Animals	Habitats and Environments Invertebrates Life Cycles Plant Life	Adaptations Food Chains Inside Living Things
Earth and Space Science	Earth's Surface Earth, Moon, Sun, Weather	Clouds, Wind, and Storms Minerals, Rocks, and Soil The Solar System	Atmosphere and Climate Changing Landforms Outside the Solar System
Physical Science	Energy Things move Properties Light Magnets	Heat Energy Machines Solids, Liquids and Gases Sound	Force and Motion Electricity and Magnetism Mixing Matter Energy Resources
Engineering	Any real world problem that they can design and build a solution to.		

Internet Resources:

Science Buddies – www.sciencebuddies.org

Science Projects – http://www.scienceprojects.com