Science Fair Timeline

Item	Competed to keep on track	Details
Topics & Questions	October 28, 2024	Provide a source from which the topic was selected and why they chose the topic.
Hypothesis, Variables, & Materials list	October 31, 2024	Hypothesis should be formatted with the "if then... because..." statement. A complete list of materials. Provide dependent, independent, and controlled variables.
Procedures/Steps	Nov. 12, 2024	Students must present specific steps with details.
Reference List (if applicable)	Nov. 14, 2024	References to include with the final lab report
Science Experiment work period	Nov. 19-25th, 2024	Students should be conducting their actual experiment.
Data Analysis, (Graphs, Tables, and or charts)	Nov. 26-29th, 2024	Students will present written copies of graphs and tables on science board
Results/Findings	Nov. 30-Dec.4, 2024	Students will provide a minimum of one paragraph to describe/discuss the findings displayed on their graphs, tables and/or charts
Conclusion	Dec.5th-8, 2024	Student will provide a summary (minimum of one paragraph of their full experiment
Completed Experiment due	Due to Ms. R. Smith on between Dec.9-12, 2024	Students will turn in experiments with board and log book or formal report, Final presentation must include photos of the student conducting the experiment

Following is a list of questions that may offer ideas for experimental science projects. You can make your own list of variables for many of these questions.

BIOLOGY

- What affects the speed of germination (the time it takes a seed to sprout)?
- What affects your heart rate?
- Which saliva has more bacteria, a human's saliva or a dog's saliva?
- What eats away the enamel on your teeth?
- What affects your body temperature?
- What affects your blood pressure?
- What is lung capacity related to or affected by?
- Do women blink faster than men?
- How does the temperature affect the water uptake of celery plants?
- Is soil necessary for plant growth? Doe soil chemistry affect plant growth?
- What factors affect the growth of mold?
- Do different kind of plants grow on north or south slopes?

ASTRONOMY

- How does the time of day affect a shadow's length?
- Is there a relationship between the phases of the moon and our weather?
- Does the sun set at the same point each night?
- Does the moon rise and set in the same place at the same time?
- In what direction does the moon move?

CHEMISTRY

- Which antacid is best at neutralizing stomach acid?
- What liquid causes iron to rust the fastest?
- Do all metals rust at the same rate?
- What liquid or solution will shine a penny in the least amount of time?
- Does the temperature of the water affect the speed at which something dissolves?
- What combination of vinegar and baking soda makes a bottle rocket go the highest?
- What affects the speed at which effervescent antacids (like Alka Seltzer) dissolve?

EARTH SCIENCE

- Does the volume of a stream affect it flow rate?
- What is the best method for slowing down erosion?
- Do both sides of a curved stream erode at an equal rate?
- What influences crystal growth?
- How fast do stalactites form?

ENVIRONMENTAL SCIENCE

- What is the best material for soaking up oil from an oil spill?
- What influences the speed of decomposition?
- Do paper and plastic grocery bags decompose at the same rate?
- What is the best method of composting?

PHYSICS - ELECTRICITY AND MAGNETISM

- What influences static electricity?
- Is static electricity affected by humidity?
- What foods (ex. potato) conduct electricity?
- What influences the operation of a solar cell?
- What influences the strength of an electromagnet? (number of wire wraps, wire gauge, diameter of nail)

PHYSICS - FLUIDS

- Does wind speed remain constant as it goes over a flat area, between houses, and between tall buildings? (make a model and use a fan for wind)

SCIENCE PROJECT IDEAS - LEVEL 3

1. What type of line carries sound waves best?	21. Which way does the wind blow most frequently?
2. Can the sun's energy be used to clean water?	22. Does the size of a light bulb affect its energy use?
3. Does a green plant add oxygen to its environment?	23. For how long a distance can speech be transmitted through a tube?
4. Which metal conducts heat best?	24. Which grows mold faster — moist bread or dry bread?
5. What percentage of corn seeds in a package will germinate?	25. What type of soil filters water best?
6. Does an earthworm react to light and darkness?	26. Does the color of a material affect its absorption of heat?
7. Does the human tongue have definite areas for certain tastes?	27. Does sound travel best through solids, liquids, or gases?
8. Can same-type balloons withstand the same amount of pressure?	28. Do sugar crystals grow faster in tap water or distilled water?
9. Does the viscosity of a liquid affect its boiling point?	29. Can you see better if you limit the light that gets to your eye?
10. Does surrounding color affect an insect's eating habits?	30. How much of an apple is water?
11. Do children's heart rates increase as they get older?	31. What common liquids are acid, base, or neutral?
12. Can you use a strand of human hair to measure air moisture?	32. Do taller people run faster than shorter people?
13. What materials provide the best insulation?	33. Does the length of a vibrating object affect sound?
14. Is using two eyes to judge distance more accurate than using one eye?	34. Does a plant need some darkness to grow?
15. Do different kinds of caterpillars eat different amounts of food?	35. Who can balance better on the balls of their feet — boys or girls?
16. What plant foods contain starch?	36. Does exercise affect heart rate?
17. What keeps things colder — plastic wrap or aluminum foil?	37. Which dish soap makes the longest lasting suds?
18. Does heart rate increase with increasing sound volume?	38. What are the effects of chlorine on plant growth?
19. Do boys or girls have a higher resting heart rate?	39. Which type of oil has the greatest density?
20. Do liquids cool as they evaporate?	40. How accurately do people judge temperatures?

Parts of a Science Fair Project

TESTABLE QUESTION

A science fair project begins with a good testable question. For many students, the hardest part of a science fair project is selecting a good question. Select a question that is interesting to you. The question should lead to an experiment where something is changed and the result is measured.

A good question:

- Must lead to an investigation (experiment) not a report, demonstration or model. The question may ask about the effect of one thing on another.
- Is one from which you can collect measurable data or direct observations rather than opinions.
- Should be very narrow and specific, not broad.
- Is one in which the materials needed to experiment are easy to find.

To come up with a testable question, begin by thinking about something you've OBSERVED. For example, have you ever played with a parachute? Think about what VARIABLES may affect the speed at which the parachute falls (size, shape, weight, material, length of strings, number of strings, etc.). Select one variable to test and formulate your testable question. Example: How does the type of material of the parachute's canopy affect the rate at which it falls?

Examples of good questions (See the last section of this handbook for more good questions):

- How does temperature affect the bounce of a ball?
- What shape container will allow water to evaporate the quickest?
- Does the drop height of an object affect the size crater it will make?

Examples of poor questions:

- How do volcanoes erupt? This question is poor because it is a model not an experiment, is too vague/broad, and will not involve data collection.
- Why are there craters on the moon? The question is not an experiment and would require only research, not experimentation to answer.
- How do bean plants grow? This question is too broad and would require research rather than experimentation and collecting data.

HYPOTHESIS

The hypothesis is an attempt to answer the question being investigated. The hypothesis makes a reasonable guess about the outcome of the experiment and suggests a possible reason for this outcome. The hypothesis should be based on prior knowledge, observations, or research. The results of the investigation will either support or reject your hypothesis.

MATERIALS

Materials include the equipment and supplies that are used to conduct the experiment. Materials need to be listed in specific amounts and sizes. Metric units should be used. The materials list allows other people to repeat the experiment exactly to see if they get the same results.

Examples:

One 100 mL beaker, 50 mL of water, three plastic cups, 30 grams of salt, one hand lens.

PROCEDURE

The procedure includes all the steps that are followed in setting up the experiment and collecting the data. The procedure is written in a clear, sequential manner so that someone else could follow the same steps to complete the experiment. Numbering the steps is helpful to someone who is reading the procedure. Factors that can affect the outcome of the experiment, called variables, must be identified and controlled as part of the procedure. The variables (discussed on the next page), should be identified and listed.

There are three types of variables that must be considered when determining the procedure to be followed:

- Independent variable - the factor that you will change on purpose during the experiment to find out what effect it has on something else. An example of an independent variable is using different types of materials (silk, felt, canvas, paper, tissues, etc.) to construct a parachute to observe the effect the type of material has on the drop time of the parachute.
- Dependent variable - the factor that is observed and measured to see if it is affected by the change made in the independent variable. The dependent variable in the parachute investigation would be the time the parachute took to drop.
- Control variables - the factors in the experiment that must be kept exactly the same to make sure that they are not having any effect on the dependent variable. They ensure that you are conducting a fair test. Variables that would need to be controlled in the parachute experiment would be the size of each parachute made, the same mass tied to the parachute, and the height the parachute were dropped from.

The procedure should reflect that you collected enough data to support your conclusion. Therefore, make sure you use a large sample or conduct multiple trials for your experiment. The larger your sample size or the more trials you conduct, the more conclusive and better your results will be. For example, when working with plants, do not just plant one seed in the light and one seed in the dark and use the results from those two plants as your data. Planting twenty or more seeds in the light and twenty or more seeds in the dark would provide a large sample size. In the parachute experiment, drop the parachute 6 times to test how fast it drops rather than just dropping it one time.

One is NOT an adequate sample size.

Use a large sample size to obtain more conclusive results.

RESULTS

TABLES: Data are best organized in a table. Use the independent (what you are changing on purpose) and the dependent (what you will measure) variables to help organize the table. They will often be the headings for columns or rows. When constructing a data table, remember that data from repeated trials of an experiment must be included and the average (mean, median, or mode) of the data should be calculated. The data table should include a title and should state the units of measurement used. A good data table is shown below:

Effect of parachute material on drop time

Drop Time (in seconds)

Type of material	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Average
Silk							
Felt							
Canvas							
Paper							
Tissue							

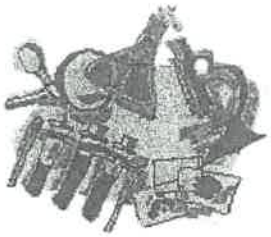
GRAPHS: Data should be graphed so that the data can be easily interpreted. The two most commonly used types of graphs for science experiments are *bar graphs* and *line graphs*. However, other types of graphs or displays may also be appropriate. On your graph, remember to include titles, labels, and an evenly numbered scale.

WRITTEN: Your written results should analyze and summarize the data. Describe any patterns or trends in the data. Compute the mean, median, mode, and range of the data.

CONCLUSION

A well-written conclusion:

- Restates and answers the testable question.
- Restates your hypothesis.
- Tells whether your hypothesis was supported or rejected by the data.
- Includes data to support your answer.
- Explains any problems you had during the investigation.
- Explains what you would do differently next time.
- Explains questions you could explore in the future related to this project.



References & Your Science Fair Research

One thing that is important is the proper citation of references in your research report. Below are a few basic rules for references. For additional information, please consult the APA website: www.apa.org

How do you reference a book review?

Schatz, B. R. (2000). Learning by text or context? [Review of the book *The social life of information*]. Science, 290, 1304.

How do you cite a reference to a book that doesn't have any author or an editor?

Example:
Merriam-Webster's collegiate dictionary (10th ed.). (1993). Springfield, MA: Merriam-Webster.

- Place the title in the author position.
- Alphabetize books with no author or editor by the first significant word in the title (*Merriam* in this case).
- In text, use a few words of the title, or the whole title if it is short, in place of an author name in the citation: (Merriam-Webster's Collegiate Dictionary, 1993).

How do you cite a newspaper article when there is no author?

Example:
New drug appears to sharply cut risk of death from heart failure. (1993, July 15) The Washington Post, p. A12.

- Alphabetize works with no author by the first significant word in the title.
- In text, use a short title for the parenthetical citation: ("New Drug," 1993).

Nonperiodical documents on the Internet

Stand-alone document, no author identified, no date

GVU's 8th WWW user survey. (n.d.). Retrieved August 8, 2000, from http://www.cc.gatech.edu/gvu/usersurveys/survey1997-10/

- If the author of a document is not identified, begin the reference with the title of the document.

Document available on university program or department Web site

Chou, L., McClintock, R., Moretti, F., Nix, D. H. (1993). *Technology and education: New wine in new bottles: Choosing pasts and imagining educational futures.* Retrieved August 24, 2000, from Columbia University, Institute for Learning Technologies Web site: http://www.ilt.columbia.edu/publications/papers/newwine1.html

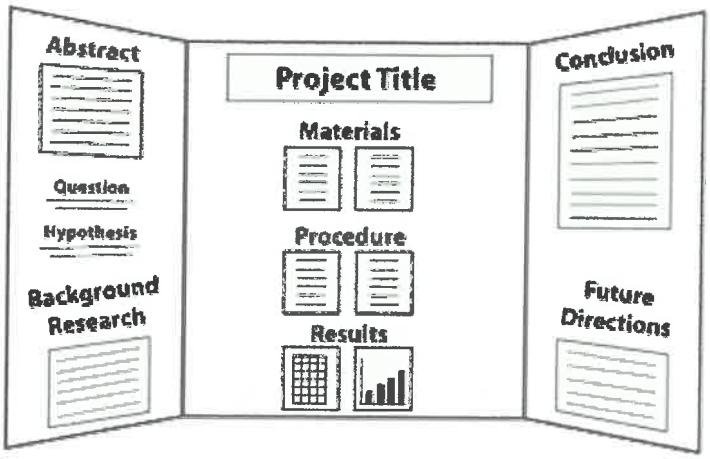
- If a document is contained within a large and complex Web site (such as that for a university or a government agency), identify the host organization and the relevant program or department before giving the URL for the document itself. Precede the URL with a colon.

Encyclopedia or dictionary

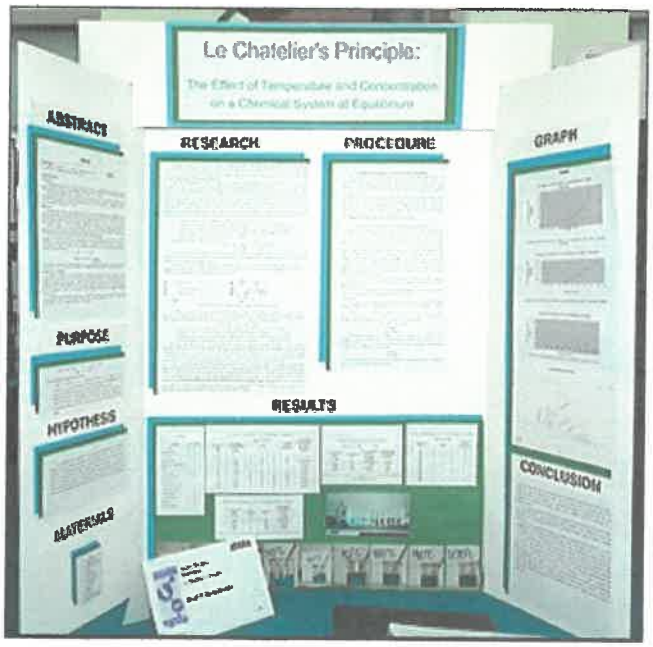
Sadie, S. (Ed.). (1980). *The new Grove dictionary of music and musicians* (6th ed., Volc. 1-20). London: Macmillian.

Magazine Article

Kandel, E.R., & Squire, L.R. (2000, November 10). Neuroscience: Breaking down scientific barriers to the study of the brain and mind. *Science, 290*, 1113-1120



- **Organize your information like a newspaper** so that your audience can quickly follow the thread of your experiment by reading from top to bottom, then left to right. Include each step of your science fair project: Abstract, question, hypothesis, variables, background research, and so on.



- **Use a font size of at least 16 points** for the text on your display board, so that it is easy to read from a few feet away. It's OK to use slightly smaller fonts for captions on picture and tables. For more details see: Everything You Need to Know About Fonts for Display Boards

- **The title should be big and easily read from across the room**. Choose one that accurately describes your work, but also grabs peoples' attention.
- **A picture speaks a thousand words!** Use photos or draw diagrams to present non-numerical data, to propose models that explain your results, or just to show your experimental setup. But, don't put text on top of photographs or images. It can be very difficult to read.

This sample shows how difficult it can be to read text when you print it on top of an image. Don't do it!

- **Check the rules for your science fair.** Here is a list of items that some science fairs allow (or even require) and some science fairs don't require (or even prohibit):
    - Your name on the display board
    - Pictures of yourself
    - Captions that include the source for every picture or image
    - Acknowledgements of people who helped you
    - Your laboratory notebook (some science fairs want you to have it only during judging)
    - Equipment such as your laboratory apparatus or your invention

Materials and Construction Techniques

- Use a self-standing display board like these. Display boards in black or white-colored "foam core" (a sandwich made up of two pieces of smooth surface paper with a polystyrene (plastic) middle) or corrugated cardboard are readily available at many retailers ranging between $4 to $14 per board depending on the material.

- Print out or write your information on white paper that you will attach to your display board. Be sure to proofread each sheet before you attach it.
    - Instead of regular paper, use cover stock (67#) or card stock (110#). These heavier papers will wrinkle less when you attach it to your display board.
    - Matte paper is preferable to glossy because it won't show as much glare- glare makes your display board difficult to read.
- Glue sticks (use plenty) or rubber cement work well for attaching sheets of paper to your display board. Use double-sided tape for items like photographs that may not stick to glue.
- Add **simple** visual accents to your board. *Do not* make the board too busy or it becomes difficult to read. Try these simple techniques instead:
    - Use color construction paper to add accents to your display board. A common technique is to put sheets of construction paper behind the white paper containing your text.
    - Use borders to draw the audience's attention.

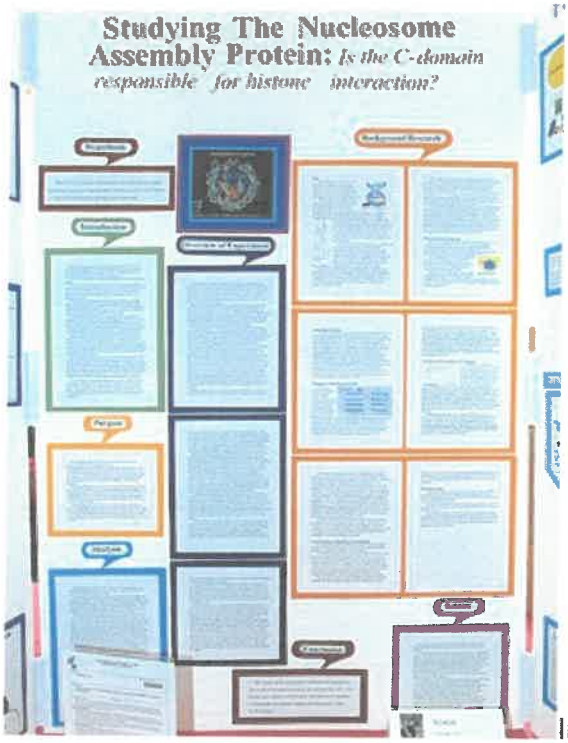


Image Credit: Science Buddies

Color construction paper can accent your board