Canutillo Independent School District

Science Fair
Student Handbook

Grade Level Requirements

Grades K - 2 - *Project only -- participation encouraged.
Eligible for School fair only

Grades 3 - 5 - *Project and daily log. Eligible for school and district fair.

Grade 6-12 - *Project, daily log, and research paper including bibliography

*Mandatory Project consists of: Problem statement, hypothesis, materials, procedure, research, results and observations, (graphs, charts or photos), conclusion, acknowledgements and bibliography.

Divisions

Life Science –Projects that deal with the vital processes of living organisms, plants, microorganisms, and animals (including humans), and how these processes are affected as a result of a controlling variable. Processes may include but not be limited to such functions as growth, maintenance, breathing rate, pulse, learning, memory, vision, etc. Animals/insects must be treated humanely. (Project may require a Qualified Scientist Form and/or a Designated Supervisor Form.)

PHYSICS- Projects that study the nature and properties of nonliving matter, various forms of energy and/or force and motion.

CHEMISTRY-Projects that examine chemical reactions and properties of matter such as solubility, density, heat capacity, etc.

EARTH SCIENCE- Projects related to investigating principles of geology and processes that shape the earth (for example, weathering and erosion).

Checklist to Select a Project

_____Does your topic question something that you can investigate?
_____Can you find background information and research about your topic?
_____Is your title in question form?
_____Can you make a hypothesis or prediction about what will happen in your experiment?

Guidelines

1. Exhibits will be limited to those projects that can be classified under Life Science, Physics, Chemistry, or Earth Science.
2. Each elementary school fair may send their top 8 scorers for each grade level (3-5) for a maximum total of twenty-four students to participate in the district fair
3. Only exhibits prepared during the present school year may be entered.
   Exhibits must be constructed and developed by the students entering them.
4. Exhibits must be confined to table space with limits of 4 feet in height,
   2 ft in width, and 12 inches deep (the front-to-back measurements of the exhibit table).
5. Projects may be individual or group, with no more than three per group.
6. Anything which could be hazardous to the public or facility is prohibited from the display. This includes:
   - Live or once living animals, preserved vertebrate animals or parts.

   Research involving these should be displayed through the use of drawings, charts, photographs, graphs or original models. No harm should come to any animal or insect from the research conducted.
   - Sharp objects, syringes, or similar objects
   - Explosives, matches, or flames
   - Dangerous chemicals such as acids and bases, combusible fluids or gases.
7. Student and school identification must be removed from the project for the district fair.
8. Participants will be interviewed by a judge. Students must be present on judging day.
   NO tapes, videos, etc…
9. Microbial Experimentation done by elementary students is potentially dangerous.
   * A Note of Caution: Organisms collected, isolated and/or cultured from any environment during student research projects should be considered potentially pathogenic.

Important information regarding presentation on the day of the fair:

- Students may display their materials but may **not** perform the experiment live. Students will be judged only on the presentation and board.
- No recording or transmitting devices are permitted. (No tape recorders, cell phones or other similar technology)
- Students should be respectful of judges and other participants. This includes not talking to nearby participants during judging.
- The rubric used for judging is found on the district website under the "parents" link. All decisions of the judges and science fair committee are final.

The Scientific Method

The scientific method consists of a series of steps that must be followed to ensure an effectively designed experiment. If a project is to yield scientific data that will expand a student's understanding, each of the following 9 steps is essential. Check off each one as you complete the step.

☐ **1. Identifying the Problem**: Write a two or three sentence statement that explains what is expected to be discovered by investigating the chosen topic. Write two or three sentences to also state the reason why the subject was chosen.

☐ **2. Conducting Research:** Long before scientists begin to set up their experiments, they conduct research in their chosen area. This means reading books, magazine articles, pamphlets, brochures, or any other printed information concerning the topic. It also means talking with or obtaining information from experts in the field.

☐ **3. Asking an Appropriate Questions:** To develop an effective scientific experiment, a very specific question needs to be formulated about the chosen area of interest. For example, a project about how plant growth is affected by light could be stated as follows. "Do colored lights or white lights produce the best plant growth?"

Examples:

- How does_____affect_____?
- How does the type of fertilizer affect an ivy's growth?
- What is the effect of_____on_____?
- What is the effect of air temperature on the bounce of a basketball?
- What happens to the drag and stability of a boat when the pontoon design is changed?
- Is there a relationship between the light color and the growth of bean plants?
- Which of the tested materials provides the best insulation?

Hint: The word effect is a synonym for result. If you can use the word result in the question, and it makes sense, then use the word effect. If not, use the word affect.

☐ **4. Developing a Hypothesis:** After a question is formulated it must be turned into a hypothesis. A hypothesis is a statement in the form of a complete sentence. It explains how you think the experiment will turn out. It is a prediction based on the best available information of what you think will happen at the conclusion of the experiment.

5. **Conducting the Experiment:** Testing the hypothesis is the heart of the scientific method. This is where an investigation is conducted to examine the effects of changes during certain experimental conditions. The investigation must include a method to measure the effects of the experiment. It could include a specific period of time, a variety of sample types, or measurements of height, weight, growth rate, or heartbeat. Identify the variables.
    - **Variables:** All factors that affect your experiment should be identified (controlled, manipulated, and responding variables).
    - **Controlled Variable:** everything that must be kept the same so that the experiment will be fair or valid
    - **Independent Variable:** the thing you change on purpose to test it - always written on the bottom (horizontal axis) of your graph
    - **Dependent Variable:** measurable changes in response to what you changed on purpose—always written on the left side (vertical axis) of your graph

☐ **Materials:** List your equipment, chemicals, foods, and other materials used during your experiment.

☐ **Procedure**: Write a list of steps followed during the experiment.

6. **Keeping Records:** Scientists always maintain records of everything they do during the course of an experiment. Good records should include an Observations and results section on your display board and a separate daily log:

☐
- **Observations and results:** A summary of what was learned from the project (include any graphs, charts, or other visual data).

☐
- **Daily Log:** A handwritten diary or journal of what was done and observed each time you worked on your experiment (includes: dated entries, research notes, measurements, observations, test results). Note: Not necessary for K-2nd

☐ 7. **Repeating the experiment:** Conducting the experiment once does not provide sufficient data upon which to base a conclusion. It is important to plan adequate time to conduct the experiment more than once, (a minimum of 3 times).

☐ 8. **Analyzing the Results:** After the experiment has been conducted and all the necessary data has been collected, it is time to analyze the information. It is possible that the results will not confirm the original hypothesis since it was simply an educated guess based upon information at the beginning of the experiment.

☐ 9. **Developing a Conclusion:** The conclusion represents what was actually learned by conducting the experiment. It is your interpretation of the data and how it relates to the hypothesis. is also an opportunity to suggest needed improvement for future attempts of the experiment.

You should also include the following in your display:

☐ 1. **Acknowledgements:** All individuals can be mentioned or thanked who assisted in the research of development of the project (including Mom and Dad), everyone that was interviewed, including teachers, scientists, and other experts.
2. **Bibliography**: A list of all resources used for research. A minimum of at least 3 grade appropriate resources should be used. – (Not necessary for K-2nd)

Data Collection

Three Ways to Observe and Record:

Throughout your experiment you will have many observations to make. Always be sure to make and record your observations in a scientifically controlled manner (same time, same method, etc.). All observations should be kept in your Daily Log. These observations usually fall into three categories: MEASURING, COUNTING, and DESCRIBING (using your senses). During your experiment, you may need to use only one or all three kinds of observations.

MEASURING - When you observe by measuring, use the metric system. It is a good idea to only be concerned with measuring one or two things. You might be measuring things like temperature, height, weight, distance, speed or time. These are examples of responding variables. Your measurements should be recorded in your daily log in an easy to read chart called a data chart. Your chart of numerical data is your method of recording your responding variable as you experiment. Later you will turn your data chart into a picture of your data by graphing it.

COUNTING - Another kind of observation is counting. You might be counting the number of times something happens, or the number of kinds of something in a particular place. You might find it easier to use a scatter plot or tally sheet for these observations. Later you will graph this data.

DESCRIBING - A third kind of observation is one where you use your senses to describe what you see, hear, feel, smell or taste as it related to your experiment. These observations tend to be word descriptions rather than numerical and should also be recorded in your daily log. Since you are writing words/sentences rather than numerical data, you may want to use a journal or diary entry to record them. Be sure to date your entries and be consistent in the way you write the entries.

Daily Log

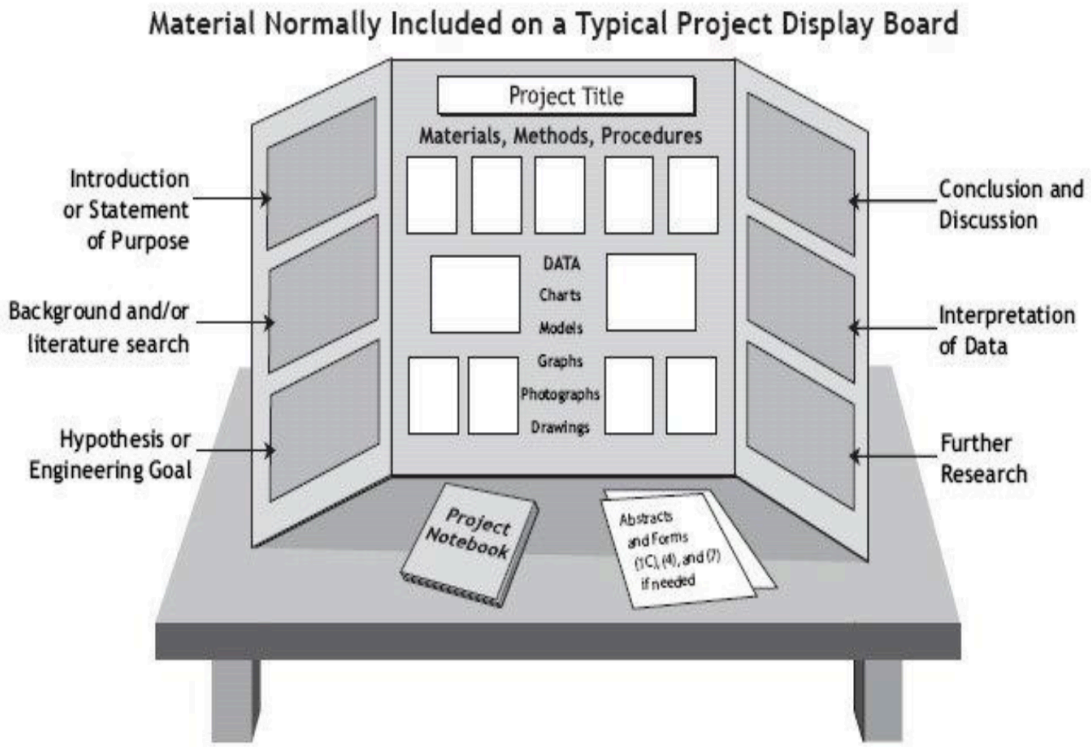
The daily log is the notebook where all results or data are recorded while experimenting. You MUST display one with your project. All dates, times and measurements that are made, as well as other general observations, are written down as they are made. Use a composition book, a single subject spiral notebook, or a binder as your daily log. Do not recopy. Pride yourself on being observant --you can never have too many results. Even if something you observe seems unimportant-- record it. It may turn out to be significant.

Since your daily log will contain much data, it is important to keep it organized and neat. Divide the log into two sections. The first section needs a title page that says "Data". The second section will be labeled "Daily Work".

DATA SECTION: On the first page of this section write the date that testing was started. Each day's data should include: date of testing, the time testing or measuring was done, and the name of each subject or trial. Beside each subject write the measurements including units (cm, sec, mm, etc.) and record other observations.

DAILY WORK: In this section you will write day-by-day notes about your work on the project. In this way it's like a diary. In your entry tell: what you did, any problems you ran into, and any changes you made in your testing. Sometimes you must change your plan when you see it isn't working, but it must be documented. Do not erase original data--just continue and document changes, etc.

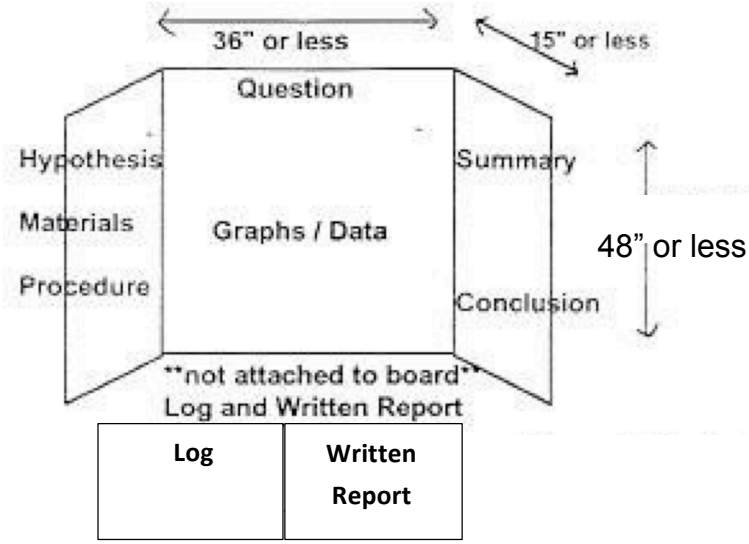
****IMPORTANT:** There is no "draft" copy of a daily log. There is one copy and one copy only. **Do not rewrite your daily log to make it look better**. The purpose of a daily log is to give others a precise account of what took place while you worked, experimented, and measured.



Display of the Project

DIMENSIONS

EXHIBITS will be confined to a table space and must not exceed 3 feet from side to side, 4 feet high, and 15 inches from front to back. Exhibits should be durably constructed. Exhibits must be self-supporting.



Grade Level Requirements

Daily Log (on table in front of display) – Grades 3- 12

Written Report & Bibliography (on table in front of display) – Grades 6-12

Title of the Project: The title must be in question form and must describe the focus of the experiment. It should be short (10 words or less is best) and neatly lettered so it is easy to read.

Visual Aids: Use of photographs, charts, surveys, graphs, data, drawings, paintings, diagrams, or other illustrative materials enhance the project and provide a better understanding of the project.

Lettering: The signs and lettering used on the display should be neat and of proper size. The title should have the largest letters but all labels over a supplemental section should be readable from a short distance. If available, computer graphics programs can be used to create labels, titles, and signs. All spelling and punctuation should be checked by several people.