Natrona County
District and Regional Science Fair

Student Handbook

GETTING STARTED

Categories for **district science fair** are:

- **Life Science**: zoology, botany, behavioral science, and ecology.
- **Physical Science**: chemistry, electricity, light, sound, energy, and mechanics.
- **Earth Science**: geology, space science, astronomy, oceanography, and meteorology
- **Team Projects** (2-3 students in the same grade level forming a team) Team Projects can cover any of the above categories and will be judged with the rest of projects in the same category.

Categories for **regional science fair** are:

- **Behavioral and Social Science**: the science of human activities (economics, anthropology, psychology, sociology, archaeology)
- **Biochemistry**: the science of the chemical processes of living things.
- **Botony**: the science of plants (agriculture, horticulture, forestry, floriculture, arboriculture)
- **Chemistry**: the science of the properties, compositions, and reactions of matter (organic chemistry, inorganic chemistry, physical chemistry, metallurgy)
- **Computer Science**: the study of computers including their use, operation, and design (software development, computer engineering, artificial intelligence, simulations, graphics)

The first step in beginning a science project is to choose a topic.

If your question involves animals you must have special permission from your teacher before you may proceed.You will also need to fill out required forms before you do any experimentation.

If your question involves humans, you must get special permission from your teacher, fill out special forms, and get approval from the IRB to conduct your investigation.

Here are the steps for developing a science project.

IF YOU FOLLOW THE SUGGESTIONS IN THIS GUIDE YOU SHOULD HAVE A SUCCESSFUL SCIENCE PROJECT.

Choose a Topic

- Start with some brainstorming. Remember when you brainstorm, NO idea is a bad idea.
- Go to the Library and look at the magazines there about topics that interest you.
- Don't hesitate to read all you can in order to find something you can focus on for your project. Browsing the Internet is another way to generate ideas. Pull up a search and type things you like. You never know where surfing the Internet will get you when it comes to ideas for a project.
- Talk to people. You never know whom you might bump into that has an interesting background. Ask them what they remembered about their science classes when they were in school. Was there ever anything funny when it came to experiments? What comes to mind when they think of the word science? Remember, ideas are not only generated from the printed word, but also the spoken word!

-Sometimes it's difficult to select a project. Try this:

1. Make a chart with 5 columns.
2. Think of 5 things you like to do or want to learn about and use those for the headers of each column. Think about things you always wanted to know about the subject. List as many things about each subject as you can.
3. The longest list may be where you concentrate on for an idea for your project.

-If you don't have an idea yet, try this:

- Think of 4 Nouns, 4 verbs and 4 more nouns.
- Think of some odd things that you wouldn't normally put together.
  For example:

Noun	**Verb**	**Noun**
Ball	Plant	Fan
Plant	Grow	Ants
Fan	Hang	Flowers
Stapler	Roll	Box

Now put the words together in a sentence like: What would happen if a ball rolled through a line of marching ants? Or, what would happen if a tea bag were planted around flowers while they are growing?

If you still don't have an idea, try this web site: http://www.sciencebuddies.org and look for "Science Fair Project Ideas."

CHECKPOINT SHEET FOR A GOOD TOPIC

1. Are you interested in learning more about this topic? _____
2. Is the topic interesting enough for you to read about before you start? _____
3. Can you find at least 3 sources of written information on the subject? _____
4. Can you find information at your reading level? _____
5. Can you write a testable question about this topic? _____
6. Can you set up a testing situation on this topic? _____
7. Can you get all the materials needed for the testing? _____
8. Can the testing be done in your time frame (4-5 weeks)? _____
9. Can you find information at your reading level? _____

Write your topic in the space below.

**If your question involves animals you must have special permission from your teacher before you may continue with your project. You will also need to fill out required forms before you do any experimentation.

**If your question involves humans, you must get special permission from your teacher as well as the IRB to conduct your investigation.

Parent or Teacher's signature _____Date_____

Research

Before you go any further, you need to do some research on your topic. Background research is important to help you understand what will be taking place in your experiment. After you have done some research, you should understand something about the things you will be testing and should be able to make an educated prediction about the future results of your experiment.

Your research should cover:

General Information:

- Background information about your problem
- Definition and/or explanation of the topic or problem
- Definition and/or explanation of terms and vocabulary found in the problem
- Information about topics that relate to the problem
- Explanation of why it is important to know about this problem

Specific Information:

- Results from other experiments similar to yours
- Information from interviews with experts
- Studies done by companies or consumer groups that relate to your problem
- Information necessary to experiment safely

As you find information that is related to your problem, you need to write down where you got the information from as well as the information itself. There are several ways to keep this information, but the most organized way would be to use bibliography cards and note cards. The information may be stored using real note cards or in an electronic format on the computer.

Develop a Testable Question

Now that you have a topic and have done some research, you must design a question that will guide your investigation. From your background research, think of something that you learned.

- Write a statement about what you learned:
  - (Example: Wing design seems to affect the quality of airplane flight.)

_____

_____

- Find in your statement, something you can change. This will become the independent variable.
  - (Example: the surface area of the wings)
  - Write your independent variable:

_____

_____

- Next decide from your statement what may be affected by the independent variable. This will become the dependent variable.
  - (Example: the distance a plane flies)
  - Write your dependent variable:

_____

_____

- Rewrite your statement as a problem with the independent variable in the first blank and the dependent variable in the second blank.
  - What is the effect of _____ on _____?
  - (Example: What is the effect of *wing surface area* on *the distance a model airplane flies*?
  - My problem:

_____

_____

- Determine how you are going to change the independent variable in a way you can measure.
  - (Example: increase surface area of wings in square centimeters.)
  - How you will change the independent variable:

_____

_____

- Predict how you think what you changed will affect the dependent variable in a way you can measure.
  - (Example: the plane will fly farther in centimeters)
  - Your prediction:

_____

_____

Research Plan

After you have written your problem in cause and effect terms, you are ready to write your Research Plan.

The plan should help you see the overall "picture" of what you are going to try to do in order to answer your science project question.

List the main materials you will need for your experiment and where you will get them.

As you perform your investigation, conditions must be kept the same throughout all the testing. If these are not kept constant, you cannot be sure that the independent variable is what caused the dependent variable to change.

- Things that must be kept the same (controls):
- What will you use to measure your results?
- Describe your expected results. This is called your hypothesis. Your hypothesis is really a prediction based on your research. It should say exactly what you think will happen.
- What did you learn in your research that helped you make your prediction?

Procedure

Describe in detail the procedures you will follow. Include all steps. Someone not familiar with your experiment should be able to do exactly what you plan to do. Also, if your experiment does not work, your detailed procedure might help you decide how to improve it. Use another page if you need more space.

Here are some helpful hints for writing your detailed procedure

- Divide your procedure into sections.
- Number your steps and begin each one on a new line.
- Put in plain words your dependent and independent variables.
- Give details on how you will control your variables.
- Tell how many subjects you will be testing or how many trials you will do.
- Tell how much time you think is needed for testing.
- Explain how you will measure your results.

Remember your procedure is like a recipe. Make it detailed so if your experiment is duplicated the same results would occur.

Logbook

Your logbook is where all your results or data is recorded while you are conducting your experiment. You should display your book with your project. Your logbook should contain lots of important information. It is important to keep it organized and neat.

Helpful hints.

- Write your problem on the first page.
- Divide the rest of the log into two sections: Data and Daily work.

Data Section

- Use charts to organize your information.
- Separate your trials onto separate pages.
- All dates, times, measurements*, should be written down as they are made.
  *Use metric measurements whenever possible.

Daily work Section

- Write the date for each entry.
- Tell what you did, any problems, and all changes that you make in your testing.
- You may want to include some information from your research in this section.
- Do not worry about rewriting your log to make it look better. This is a record of what took place while it was happening.

Results

This section includes all observations that were made during your testing. Your results are all the things you measured or counted as part of your data. This also includes the general observations that you made. Your job now is to summarize all the results you wrote in your logbook. This is also where you describe your conclusions.

Hints for reporting your results:

- Describe what happened when you did your testing.
- Describe what happened to your control group and to each experimental group.
- Figure up totals and averages for each group and compare the results for one group to another.
- Only include what happened **not** why it happened.
- Pictures that help show what was happening during testing can be included here.
- You should try to summarize your results in a graph form.
    - Line graphs are good for charting change over time.
    - Bar graphs are good for comparing things between groups
- IMPORTANT: You are **not** allowed to include pictures of people's faces in your results if they were part of your study.

Conclusions

A conclusion shows what you learned by doing your experiment. You will draw your conclusions from your observations and measurements. Conclusions also explain why something happened during the experiment. You should have more than one conclusion.

Hints for you conclusion page:

- Include at least one paragraph with data to support each of your conclusions.
- Draw conclusions only from the data you collected.
- Tell whether or not you solved your problem. Explain why or why not.
- Accept or reject your hypotheses. Give data from your tests to support your decision.
- If you reject your hypotheses do not feel bad. Testing does not always give us the results we expect. Tell why you think your testing turned out the way it did.
- Explain what you learned from the problems that occurred during your testing.
- Write about any errors you may have made during your testing. Often mistakes are how we learn to improve our testing.
- Explain why this topic is important to be studied and tested.
- Talk about how your project could be applied on a large scale to do some good.

Report

This is a great time to practice your writing skills! The report is best if it is done on a word processor but if you do not access to one it can be handwritten in black or blue ink. Check with your teacher for the format he/she prefers.

Report hints:

- Start with a title page.
- Include an abstract which is a summary of your entire project.
- Include the background information you collected. Remember to use your own words.
- Include a bibliography. This is an organized list of sources that you used to do your research.

Display

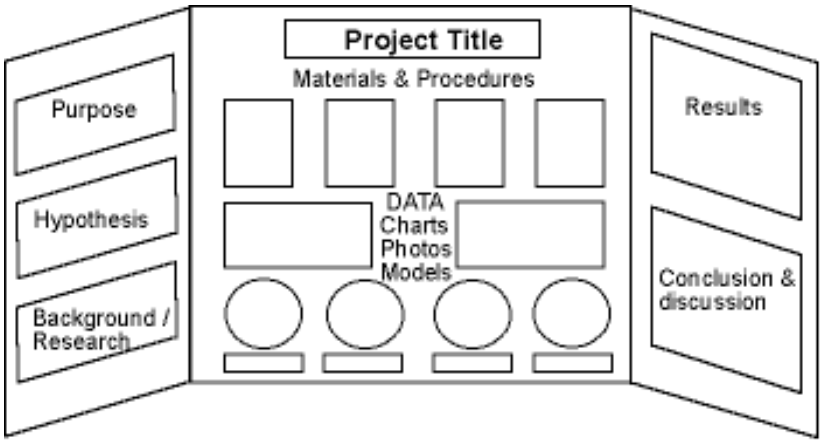
The display is an important way to report your work to others. The most important part of the display is the backboard.

The backboard should include:

- Title of the project
- Hypotheses
- Procedure
- Results
- Conclusion

Hints for backboard:

- Plan ahead. Do not attach anything until you know exactly what you want on the board. Lay things out in different places until you can find out what works best.
- Headings printed on a computer make a polished look.
- Be neat. Avoid writing on the backboard.
- Proofread carefully before you glue anything to the board.
- With your backboard, you will also display your report, daily logbook, and some of the materials used in your testing.
- Check with your teacher about what materials are permitted to be displayed.
- For more information visit this site: http://www.sciencebuddies.org and look under "Student Resources."
- Here is a picture of what a board may look like:



Presentation

A well-prepared and rehearsed presentation can impress judges who may evaluate your project.

Plan ahead by making an outline of what you want to share with the judges.

Judges usually ask questions such as:

- What were the steps of the investigation?
- What kind of background research did you do?
- What were your sources for the research?
- What were the variables in the experiment?
- Did the data support the conclusions?
- Was the problem original?
- How did you come up with the question?
- How much skill was needed to do the project?
- How much work did you do?
- How much help did you need from an adult?
- Were there repeated trials?
- Does the logbook have daily entries and measurements?
- How much time was spent on testing?

When you meet the judge:

- Smile
- Use good posture
- Introduce yourself
- Make eye contact
- Speak loudly and clearly
- Be honest and answer the judges' questions
- Thank the judges for their time and interest