

Natrona County School District Science Fair

Parent Handbook

The Value of a Science Fair Project

What makes a science fair project such a great learning experience is that it involves so much more than science? If the student is in middle school, the research report will most likely be the longest paper the student has ever written. The bibliography for the report will also be the first ever for some students. And, while library research is still important, these reports are a great way to hone computer research skills as well as learn the ins and outs of common office programs such as word processors and spreadsheets. Most projects involve a good deal of math, and all students get an opportunity to enhance their presentation skills when they prepare their display board and discuss the project with judges.

A science fair project will also have a longer duration than any other assignment a student has done. In contrast to the typical school homework due the next day or perhaps a week hence, a science fair project requires a student to learn to plan over two or three months, a skill of immense importance in adulthood. Procrastination is definitely not rewarded.

A science fair project provides an opportunity for the discussion of ethical issues such as plagiarism and falsification of data. Indeed, such a discussion is highly recommended. The ease of copying information from the Internet is hard to resist, and many students are far ahead of their teachers in understanding what is possible.

Our society relies more on science every day, and science fairs are a great way for students to become more knowledgeable about how the world around them works. Every citizen needs sufficient science literacy to make educated decisions about what they see or read in the media, about their own health care, and about other every-day problems.

Preparing a science fair project is an excellent example of what education experts call active learning or inquiry (also "hands-on" learning). It is a very effective instructional method; indeed, it is recommended as a cornerstone of successful science teaching. Yet, according to the National Research Council, active learning is not employed often enough in the classroom and its absence is seen as one of the key factors behind kids losing interest in science and not performing to their potential.

This is an excerpt from: The Value of A Science Fair Project found at:
<http://www.sciencebuddies.org>

Adult Guide

Science fairs give students the opportunity to model the work of professional research scientists. Students who develop science projects can learn or improve:

- Scientific method and experimentation skills
- Logical thinking and problem-solving skills
- Writing and public speaking abilities
- Advanced library research skills
- Understanding and appreciation of the discipline of science and careers in science

Winning is not the main goal of a science fair project. Success should be measured by the following criteria: The student worked hard, increased in knowledge, improved their organizational skills, enhanced their thinking skills and had fun along the way.

While you can assist and support the student, they must do the actual work. Above all, remember it is the student's project.

How can you help?

- Familiarize yourself with the student handbook.
- Help students budget their time. A good project takes time.
- Guide students to find a topic. This is one of the hardest steps in the process. See student handbook for ideas.
- Students may need help locating literature for their independent research.
- Supervise the student's organization of their outline.
- Insure they follow proper safety procedures.
- Advise about what must be done if studying live organisms.
- Provide transportation for research.
- Help with expenses.
- Be encouraging.

Finding a Topic

Science fairs are meant to give students the opportunity to explore a scientific topic in depth the same way a true researcher would. They do this by designing a research project that will produce measurable data through experimentation. From the analysis of the data, they draw conclusions and communicate their findings in a written paper and oral presentation.

When looking at possible projects, be sure to keep these things in mind:

- The project should be:
- Measurable (in numeric terms)
- Reproducible (others can get the same result)
- Affordable and practical: remember that several trials will be necessary!

Where to guide student to find an idea:

- The student's school and public library often have collections of books with science project ideas. Have the student talk to the librarian for help finding them.
- The Internet is loaded with sites for ideas about science projects. Science Buddies is a good place to start. <http://www.sciencebuddies.org>

- Talk to adults who are experts in their field.

The following projects are not appropriate for science fairs.

- Library research/informational
- Explanation model
- Demonstrations
- Kit building

Before Proceeding

The following are some ideas that may help to guide the students through a science project.

- Can this experiment be performed in the time allotted?
- Has the student addressed all of the safety issues?
- Do they know how to handle all chemicals properly?
- Will special permits be required to obtain any substances?
- Will local, state, or federal authorities need to be contacted?
- Will special protective gear be needed to work with any substances?
- All rules and regulations are followed.
 - Human subjects: <http://sciserv.org/isef/rules/rules7.pdf>
 - Potentially hazardous biological substances: <http://sciserv.org/isef/rules/rules11.pdf>
 - Hazardous chemicals: <http://sciserv.org/isef/rules/rules9.pdf>
 - Vertebrate animals: <http://sciserv.org/isef/rules/rules10.pdf>
 - Required forms: <http://sciserv.org/isef/document/index.asp>
- No hazardous materials

Research Methods

Once a student has a topic they need to do some research. Encourage students to read widely from many resources. Locating materials can be done from the library or the Internet. Students may need help in finding appropriate books in the library. Often if a local library does not have a book on a topic of interest, one can be ordered through an interlibrary loan. Students should also be encouraged to seek information through letters and interviews with knowledgeable people in the community and beyond.

IMPORTANT! Finding a science activity in a book and following a written procedure is not research.

Students may need guidance in how to take notes and record information they will need to build their bibliography. There are several web sites that have information on this subject.

How to make a bibliography:

- <http://lps.lexingtonma.org/Libdept/elem.lib./ebib.html>
- <http://intranet.dalton.org/MSLIB/citation.html>

Sometimes students get so interested in a topic that they need help deciding when they have enough information.

If the student's organizational skills are limited, you may want to show them how to construct an outline. This will make it easier for them when they begin writing their research paper. The

following is an example:

- I. Main topic I
 - A. Subtopic A
 - B. Subtopic B
 - 1. Under-subtopic 1
 - 2. Under-subtopic 2
 - a. Sub-under-subtopic a
 - b. Sub-under-subtopic b
 - II. Main topic II
 - A. Subtopic A
- ...and so on...

IMPORTANT! An effective science fair project cannot be based on a question that can be answered with research alone.

Designing the investigation

A good science project has a well thought out experimental **purpose**. Once a student has done some research and written their paper, they can focus on writing a testable question.

A **testable question** identifies exactly what will be tested, lists the subjects to be tested, and then describes the results to be measured.

After the testable question is written, the **hypothesis** can be formulated. The hypothesis is a predicted outcome based on the information that was gathered during the research. A hypothesis should mention:

- The subject of the experiment
- The variable to be changed
- The variable to be measured
- The expected results

The procedure

Formulating a plan for investigation will keep the student on track. This is done by creating a step-by-step set of directions, numbered and sequenced so that someone else could do the experiment exactly as the student performed it. The written procedure should contain precise information about the sizes and amounts of materials to be used, describe a fair test that controls the variables, indicates the number of times the experiment will be repeated to obtain reliable results, and explain the methods of measurement and tools that will be used to find out if the hypothesis is true or false.

The experiment

The purpose of a science fair experiment is to determine if there is a relationship between the independent and dependent variables tested in the experiment. It is important that the student conducts their experiment under controlled conditions. They should also keep careful records of measurements and observations in their logbook. Sketches and photographs may be included to

help others to understand what the student observed. This information should be represented later in charts, graphs, and data tables.

The results

Once the experiment is completed and the data is collected, the student needs to summarize their findings and report them in a results and analysis section.

The conclusion

This is where the student provides evidence from the data they collected to clearly accept or reject their hypothesis. The student should identify possible experimental errors and how they may have affected the results. Finally, they pose new questions they may have thought of during the project.

The display

- No open flames
- Electrical devices must be safe
- No wet cell batteries
- No containers of mold – photos/drawings are acceptable
- No live animals – photos/drawings are acceptable
- Display board

Remember that the purpose of the display board is to visually summarize the project. The board should be neat and well organized.

The interview

The interview is where the student can explain the procedures and conclusions in their project. It is important to be concise and businesslike during the process. Students should practice what they want to say before the fair so they will be relaxed during the interview. You can be their practice audience and offer suggestions about public speaking.