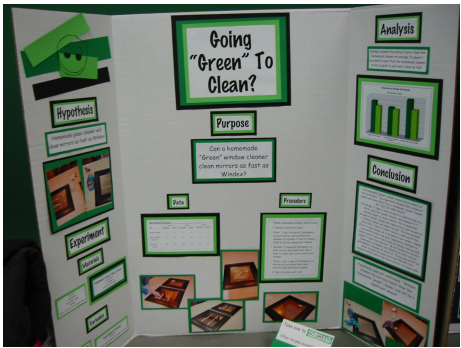


# **Student Science Fair Project Packet (S-SFP)** **For 5<sup>th</sup> and 6<sup>th</sup> Grade Students**



## **“How Does a Student Do a Meaningful Science Fair Project?”**

**In this packet is information for students showing the steps on how to complete a meaningful science fair project. This packet tells what is recommended and required when students do a science fair project for the school science fair.**

**Enclosed is the following:**

	<b><u>Page</u></b>
• <b>Choosing a Topic of Interest</b>	<b>S-SFP 1</b>
• <b>Directions For Filling Out The Registration Form</b>	<b>S-SFP 2</b>
• <b>Three Process Methods</b>	<b>S-SFP 3</b>
• <b>The Scientific Process, the Journal, Display Board, and Judging Sheet</b>	<b>S-SFP 4</b>
• <b>The Interview</b>	<b>S-SFP 5</b>
• <b>Student Science Fair Resources and What a Science Fair Project “Is” and “Is Not”</b>	<b>S-SFP 6</b>

**If you have any questions about anything, ask your teacher or call Paul Nance, the Jordan District Elementary Science Teacher Specialist, at 801-244-6479 or email him at [paul.nance@jordan.k12.ut.us](mailto:paul.nance@jordan.k12.ut.us).**

# Choosing a Topic of Interest for Your Science Fair Project



Choosing an area of interest is the hardest part of the science fair project. For ideas as where to start, look at these elementary science fair categories and what they entail.

## Earth Science

Earth science is the study of volcanoes, earthquakes, weathering, erosion, and deposition; soils, rocks, minerals, crystals; ocean water, fresh water, and the

water cycle; weather, weather instruments, air, water, wind, clouds, humidity, cold, and heat.

## Life Science

Life science is the study of human, animal, plant, insect, and microorganism behavior; forest, desert, tropical, grassland, wetland and other environments; and food chains, plant cycles, life cycles, and ecosystems.

## Chemical Science

Chemical science is the study of solids, liquids, gases, and the mixture and uses of chemicals.

## Physics Science

Physics is the study of simple machines, gravity, forces (push and pull), and weight, magnets, electricity, speed, flight (lift), motion, heat, light, and sound.

## Consumer Science and Product Testing

Consumer science is the study of testing new invented products, testing products we use and eat everyday--shampoo, detergents, soaps, diapers, stain removers, popcorn, cereals, gum, soda pop, potato chips, paper towels, bandages, etc. This makes the public aware of products that might not perform the way companies say they will perform.

## Engineering

Engineering is the designing, building, and testing of a made-at-home product. It is the invention category of the science fair. It is built according to the requirements set up by the student. After it is built it needs to be tested to see if it works. If it doesn't work the student needs to go back, make adjustments, and retest. Adjustments need to be made until it works according to the stated requirements. The product results have to be useful, and it connects to real world understanding. **The prototype cannot be made from a kit.**

## **Computer Science**

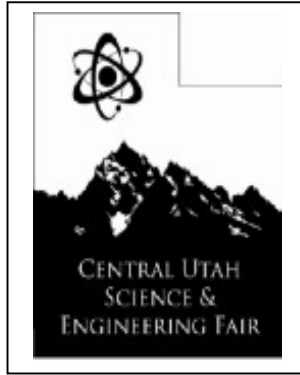
Computer science is the designing and writing a program code for a computer. The program code is written according to the requirements set up by the student. After the program code is written, it needs to be tested to see if it works properly on the computer. If it doesn't work properly, the student needs to go back and make adjustments and retest. Adjustments need to be made until it works properly. The results have to be useful, and it applies the value of the program to real world situations.

## **Can you think of a science project for one of these subjects?**

### **Here are some more ideas to get you thinking about a topic.**

<b>airplane wings</b>	<b>erosion</b>	<b>pollution</b>
<b>air quality</b>	<b>evaporation</b>	<b>smelling</b>
<b>alarms</b>	<b>feeling</b>	<b>snowboarding</b>
<b>animal tricks</b>	<b>food nutrition</b>	<b>soaps</b>
<b>blindfolding</b>	<b>habits</b>	<b>soil</b>
<b>bugs</b>	<b>heat</b>	<b>soil quality</b>
<b>chemical reactions</b>	<b>heredity</b>	<b>solar power</b>
<b>cleaning</b>	<b>inventions</b>	<b>sounds</b>
<b>clouds</b>	<b>light</b>	<b>sports</b>
<b>color</b>	<b>listening</b>	<b>stress</b>
<b>computer</b>	<b>magnets</b>	<b>tasting</b>
<b>concentration</b>	<b>music</b>	<b>temperature</b>
<b>conservation</b>	<b>memory</b>	<b>video games</b>
<b>coordination</b>	<b>noises</b>	<b>voices</b>
<b>different age skills</b>	<b>optical illusions</b>	<b>water</b>
<b>dissolving</b>	<b>pH</b>	<b>waterpower</b>
<b>ecology</b>	<b>puzzles</b>	<b>water quality</b>
<b>electricity</b>	<b>recycling</b>	<b>weathering</b>
<b>energy</b>	<b>rockets</b>	<b>weight</b>
<b>environments</b>	<b>rocks</b>	<b>wind</b>

## Directions for Filling out the 2012 Central Utah Science & Engineering Fair Registration Form For 5<sup>th</sup> and 6<sup>th</sup> Grades



All 5<sup>th</sup> and 6<sup>th</sup> grade students entering their respective school science fairs in Jordan District must fill out the 2012 Central Utah Science and Engineering Fair (CUSEF) Registration form for 5<sup>th</sup> and 6<sup>th</sup> grades to give to their teachers prior to beginning their science fair projects. There are certain rules that students must follow in doing a science fair project. If these rules are not followed the project can be disqualified at the district and regional levels. Filling out this form correctly and completely will guarantee admittance to all levels of competition.

After you have chosen a topic and prior to beginning your project, the next step is to fill out **completely** the Central Utah Science and Fair (CUSEF) Registration Form for 5<sup>th</sup> and 6<sup>th</sup> Grades. Your teacher will give you the CUSEF Registration Form when you receive this student packet. Below are the directions on how to fill out the CUSEF Registration Form. Completion of this form does not guarantee advancement to CUSEF but it will show that you have followed all the science fair rules for all competition levels.

Once you have filled it out, give it to your teacher for approval. If it is not complete he/she will give it back for you to complete. If you change your science fair research plan, then you must submit a new plan to your teacher. **If you are doing this project as a group (maximum of three students per project) you will only need to fill out one form.**

## Directions To Filling Out the Four-Page CUSEF Registration Form

### Page One—Student and Project Information

#### 1. Student Information

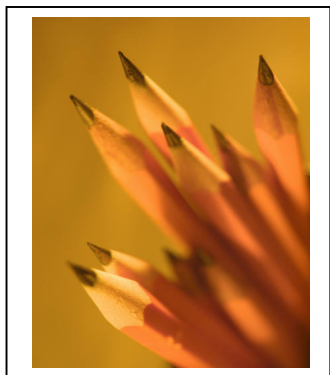
- This is to be filled out by you and anyone else who are doing this project with you. You can have up to three per project.
- All the information needs to be filled in just in case you need to be contacted either by phone or mail.

#### 2. Project Information

- Fill out all information including teacher's name and his/her email. Your teacher's email will be the first and last name with a period between the first and last names ending with "@jordan.k12.ut.us".
- Mark the box of which category your project is under. If you have problems knowing, look on pages "1a" and "1b" of the student packet, ask your teachers, or call Paul Nance at 801-244-6479 or email him at paul.nance@jordan.k12.ut.us.
- Mark the boxes on the right if you are going to be experimenting on any of the things listed. If you are, you need to get some signatures before starting your experimentation found on page two of the registration form. If not, mark "none of these".
- Answer the "yes" or "no" questions at the bottom.

## Page Two—Science Fair Project Rules\*

(This page is for the those projects that need Special Signatures)



Some projects require special signatures from professionals before you can begin them. These experiments may cause harm to humans and vertebrate animals without being screened. Laws have been set up to protect humans and animals from being hurt, disgraced, or diseased.

The following projects need special signatures from certain professional people listed below with the date they signed it.

- **If you are working with humans as subjects**, you must get **prior approval** from a science teacher, a school administrator, and one of the following: a psychologist (could be from your school), psychiatrist, medical doctor, physician's assistant, or registered nurse. Have each sign on the lines provided on the form. **Also, if any of your subjects are under 18, you need to get written permission from a parent of each child.**
- **If you are working with non-human vertebrate animals as subjects**, you must get **prior approval** from two science teachers and a veterinarian. Have each sign on the lines provided on the form. Proper animal care must be provided daily and there cannot be any pain or discomfort.
- **If you are working with controlled substances**, you must get **prior approval** from two science teachers and a school administrator. Have each sign on the lines provided on the form. All laws in handling the controlled substances must be followed. An adult must be present and supervise the experiment.
- **If you are working with hazardous substance or devices**, you must get **prior approval** from two science teachers and a school administrator. Have each sign on the lines provided on the form. Students must follow the laws in handling these substances or devices. An adult must be present and supervise the experiment.
- **If you are working with potentially hazardous biological agents (bacteria, mold, fungi, viruses, parasites, fresh human or animal tissues)**, you must get **prior approval** from two science teachers and a biomedical scientist (usually found at a university or lab office). Have each sign on the lines provided on the form. Growing of unknown microorganisms must be grown in a sealed, unbreakable container such as a Petri dish and stayed sealed during the whole experiment. **The containers must be kept in a lab for observation and not in the home. If this experiment is done at home the project will be disqualified.**

If you have questions about these signatures ask your teacher or call Paul Nance at 801-244-6479 or email him at [paul.nance@jordan.k12.ut.us](mailto:paul.nance@jordan.k12.ut.us).

**\*It is important to get these signatures before the experimentation begins. Otherwise, it may cause the project to be disqualified for further competition.**

## Page Three—The Science Fair Project Research Plan



After you have chosen a topic, the next step is to write up the research plan for your teacher. There are a couple of reasons a research plan needs to be written.

- There is pre-work that needs to be done before the actual experimentation. Knowing the steps you need to take to complete a science fair project will help you do a completed project.
- Your teacher can look at it and know that your project will be a safe and meaningful project.

Filling out the Science Fair Project Research Plan includes the following:

1. Coming up with a question that can be answered by science experimentation.
  2. Doing research on your topic.
  3. Writing a hypothesis using the “**If....then**” phrase using background knowledge acquired during the research.
  4. Writing a list of supplies needed for the experimentation.
  5. Telling where your experiment will be conducted.
  6. The name of your adult supervisor.
  7. Writing up the actual procedure, in detail, how you plan to do your experiment.
- **Be sure to be complete when you write up your plan so you, your teacher, parents, supervisor and those who may need to sign it know exactly what you will be doing.**
  - **If you change your science fair research plan, then you must submit a new plan to your teacher.**

## Page Four—Display and Safety Rules and Student and Parent/Guardian Signatures

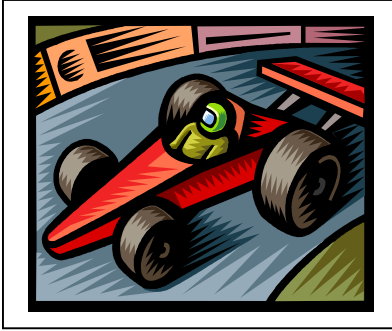
### **1. Display and Safety Rules**

- Be sure to read and know all the display and safety rules. They must be followed when displaying your project.

### **2. Student and Parent Signatures**

- All student and parent/guardian signature must be acquired before entering the school, district and CUSEF fairs. Please read the statement above the signature lines so you know what are signing. It is important that you know the rules and what is expected when you enter the different science fairs.
- There is also a place for parent signatures if child and project information can be appropriately used for publicity purposed.
- Your teacher also needs to sign and date that your project complies with the rules.
- You don't need to have the “CUSEF Approval for Completion” at this time.

## Three Science Processes To Choose From For A Science Fair Project



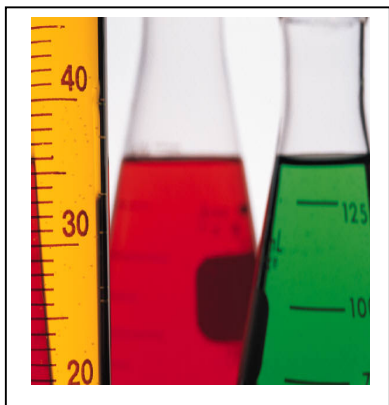
One of the major objectives of students doing a science fair project is to acquire more knowledge about the world around them. Students are able to choose from three processes, namely, the scientific process, the engineering design process, and the computer design process for their projects.

1. **The scientific process:** Using this process you will: write a question; forms a hypothesis; plan an experiment; gather the materials needed; perform the experiment; examine the results; write up a conclusion showing what you learned and can apply the knowledge to real world situations.
2. **The engineering design process:** Using this process you will: define a need for the product; connect the need to a design goal; establish the requirements needed for product development; write up a procedure with preliminary designs; gather the materials needed; build a prototype (a model of the product) according to the designs; test the prototype; redesign, if necessary, to meet the stated design goal; and connect or apply the value of the prototype to real world situations.
3. **The computer design process:** Using this process you will: define a program need; connect the need with a design goal; establish the requirements needed for program development; writes up a series of operations for the program code; develops the program with a test plan; conduct several tests according to the test plan for debugging, rewriting, and optimizing the code; and connect or apply the value of the program to real world situations.

**How much work that is put into each step of one of these processes will result in a higher score on the judging sheet.**

**In this packet the Scientific Process will be only be presented to you. If you want any information on how to do a project using the engineering or computer design processes, see your teacher.**

# The Scientific Process



The scientific process is used to investigate a scientific question. It is a natural process scientists use to find an answer to their science questions. You will follow the steps outlined below. As you perform each step, you will write what you do or the results you discover. Finally, you will analyze the results and come up with a conclusion. **All of your writing is to be written down in your journal. Everything that is in the journal can be questioned by the interviewer.**

## 1. Purpose:

Begin by writing a specific question about a science concept that can be answered by following the scientific method. It is a question where the results can be obtained by using your five senses and can be measured using math skills. Be sure to write it so it is clearly understood what you desire to find out. **Remember, it has to be in the form of a question.**

## 2. Research:

You need to research your topic using library materials, Internet sites, magazines, textbooks, encyclopedias, experts, and other available and reliable sources. **At least three sources must be used for the research.** Fairly lengthy paragraphs should be written about each source telling what you learned. Therefore, there will be three separate paragraphs, one for each source used. Cite each paragraph where the information was found. Copying a page from a book or Internet and placing it in the journal is not research. **The research needs to be hand or type written in your own words. All that is written in the journal can be questioned by the interviewer.**

## 3. Hypothesis:

This is your prediction of what you think the results of the experiment will be, based on your research. **Write the hypothesis in a way that will help answer the purpose (question) using the “if...then” phrase. “If I fill up a playground ball with more air each time before I bounce it, then it will bounce higher each time.”** You need to write a couple of sentences telling why this could be the result of the experiment using the knowledge received from your research.

## 4. Experiment:

The experiment tests the hypothesis. The experiment is broken up into four parts as listed below. **The experiment needs to be done at least twice to verify the information. Three or more times are better.**

### ➤ List of materials

Make a list of all the materials and equipment you will need for the experiment. Using descriptive words to describe the materials and equipment is important. All liquid and dry measurements and their quantities need to be shown.

- **Step-by-step procedure**  
Write a step-by-step procedure you will follow to perform the experiment. Write it in the order you want to follow. Be very descriptive in your writing.
- **Variables—Controlled and Experimental**  
You need to identify your **controlled variables** (the things being kept the same) and your **experimental variable** (the thing being changed) by writing them down in your journal. The experimental variable is what is being tested. It is important to keep the test fair by changing only one variable at a time (experimental variable) and keeping all the other variables the same (controlled variables).
- **Observing, measuring, recording, and organizing data**
  1. **Observing**—Observing is what you notice happening during an experiment. It is done by using your five senses to notice change in an experiment.
  2. **Measuring**—Measuring is counting, tallying, and/or using math equipment and skills to see how much something has changed during an experiment.
  3. **Recording**—Recording is writing down these observations and measurements that gives you data to look at. You need to write down the data (information) of what is actually happening during the experiment from beginning to end using the skills of observation and measurement.
  4. **Organizing**—Organizing is putting the data in a special form so it can be looked at and studied easily. Therefore, there are two steps to this part of the experiment.
    1. **Gathering raw data**  
This is the information you first written down in the journal.
    2. **Organizing the raw data into a table**  
After all raw data has been recorded, you must organize it into a table of some sorts so it can be analyzed.

## 5. Analysis:

To analyze is to try to understand what happened during the experiment and what the data means. The easiest way to answer these questions is to graph the data. Graphs show patterns of growth and/or patterns of change. They can also be used to compare one set of data to another set of data.

1. **Draw a graph in your journal.**  
From your table make a graph in your journal. It should include a title, labeling of the axes, plotted data information, and a drawn graph.
2. **Write a paragraph about your graph.**  
Write a paragraph in your journal explaining what the graph is telling you.

**The graph and the explanation of what the graph means need to be shown in the journal.**

## 6. Conclusion:

The conclusion shows evidences of what you learned. It summarizes your learning by answering some of these questions: Did the results confirm or conflict with the hypothesis? What was learned from the experiment? Are there any suggestions or new questions to investigate? Were there any surprises in the results? Why was this investigation important? What does this experiment tell about the real world? How can this information be applied to real life? What new insights were discovered that weren't known before?

# The Scientific Process

## “The Journal”

All students entering the school science fair must have a journal. The journal is the literacy area that connects the writing, thinking, research, planning, analysis and conclusion to science fair project. **Everything that is written in the journal can be questioned by the interviewer.**

**The journal will consist of four main parts:**

- Title page
- Table of Contents page
- The Scientific Process pages
- The Bibliography page

### **1. Title Page**

Make a title page that consists of the project title, student name, school, and date.

### **2. Table of Contents**

Make a table of contents that shows where pages the Scientific Process steps are found.

- Purpose (question)
- Research
- Hypothesis (prediction)
- Experiment
  - List of materials
  - Step by step Procedure
  - Variables—controlled and experimental
  - Recorded data (raw and table)
- Analysis (graph and statement)
- Conclusion

### **3. Scientific Process**

In this section you will write what you did or discovered by following each part of the Scientific Process. See the Scientific Process pages (4a and 4b) to know what should be written on each page.

- Purpose page
- Research pages
- Hypothesis page
- List of Materials page
- Procedural page
- Variables page
- Data pages
- Analysis page
- Conclusion page

### **4. Bibliography**

Write a list of the three or more sources you used for research by telling the type of source, title, and page numbers (if applicable).

# **The Scientific Process**

## **“The Display Board”**

Create a display board so your findings can be shown at the science fair. It is a summary of your project and reflects your journal. This is your showcase. Make it creative and colorful. Below are ideas for a good display board.

- Physically sound and durably constructed, and able to stand by itself.
- Title of your project at the top.
- Show all the steps of the scientific process (except the research) with a brief explanation of each: question, hypothesis, experiment (materials, procedure, variables, and data gathered), analysis (graph and graph explanation), and conclusion. The research will be in the journal.
- Well-organized and easy to follow from one idea to the next.
- Neat, edited, and without scribbles and misspelled words.
- Creative, pleasing to look at, colorful, with different font sizes to show emphasis.
- Photos of the developing experiment. (Only the students doing the experiment and family members can be displayed on the board. Others need parent permission if under 18 years of age.)
- Drawn pictures, artwork, and icons that bring out the ideas of the experiment.
- The journal should be in front of the display.

**Students like to display items they used when doing their experiments. For reasons of safety the following items cannot be displayed at the school and district fairs. This is also found on the last page of the Central Utah Science and Engineering Fair (CUSEF) Registration Form.**

- Living organisms
- Plant material (living, dead, or preserved)
- Taxidermy specimens or parts
- Preserved animals including embryos
- Human or animal food including seeds
- Human or animal parts or body fluids
- Soil, sand, or waste samples
- Laboratory/household chemicals including water
- Poisons, drugs, hazardous substances or devices
- Sharp items, scissors, glass, syringes, needles
- Dry ice or other sublimating solids
- Flames or high flammable materials
- Empty tanks that previously contained combustible liquids or gases
- Batteries with open top cells
- Photographs of children under 18 other than yourself or your family without parental written permission
- Photographs or other visual presentations depicting vertebrate animals in surgical techniques, dissection, necropsies, other lab techniques, improper handling methods, improper housing conditions, etc.

**Pictures of these items can be placed on the board except the last bullet.**

**Schools and Jordan District have the right to remove these things above and anything else that may be dangerous to the public.**

# 5<sup>TH</sup> AND 6<sup>TH</sup> GRADES SCHOOL SCIENCE FAIR SCIENTIFIC JUDGING SHEET

Name(s) \_\_\_\_\_ School \_\_\_\_\_

Project Title \_\_\_\_\_

<u>Category</u>	<u>Comments</u>	Excellent 5	Good 3-4	Fair 1-2
<b>I. Journal/Log (Scientific Thought)</b>				
<b>Title Page/Table of Contents:</b> Title, name, school, date, and the table of contents				
<b>Purpose:</b> Problem stated clearly and as a question				
<b>Research:</b> Three different sources cited with well-written notes				
<b>Hypothesis:</b> Well thought out, educated guess with explanation of why				
<b>Experiment:</b>				
○ List of materials and step-by-step instructions clearly written				
○ Controlled and Experimental Variables clearly identified				
○ Sufficient data gathered and organized				
<b>Analysis:</b> Graph accurately made showing the data and comparisons with a written explanation				
<b>Conclusion:</b> Reveals evidence of learning				
<b>II. Display</b>				
○ Neat, edited, and physically sound				
○ Scientific method displayed, easy to follow, and self-explanatory				
○ Journal and display showed a close relationship				
○ Creative Board Design				
<b>III. Interview</b>				
○ Student shows a basic knowledge of field studied and able to elaborate				
○ Student is able to explain how the scientific method was used				
○ Student shows interest, enthusiasm, and a passion toward the project and could tell how it was personalized				
<b>IV. Project Design</b>				
○ Creative, procedural approach with ingenious use of materials and equipment to solve the problem				
○ Project shows in-depth thought and work to solve the problem				
○ Results show a well, thought out, reasonable conclusion showing a useful connection to the world				
○ Overall great follow through from the purpose to the conclusion				

Score                      Ex. 5    Gd. 3-4    Fair 1-2

<b>Sub scores</b>				<b>Total Score</b>	<b>/100</b>
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## The Interview



The judge's interview gives you the opportunity to explain your project. The judge wants to know how much you know about your project.

- How you received the idea
- How you personalized it to make it unique
- How you prepared it
- How you set it up
- What information you discovered
- What the information means
- What your conclusion is

The judge also wants to know your background knowledge about the subject you chose. Some of the judges' questions may not be about your project. He/she may ask questions related to your topic. For example, if you did an experiment about bacteria growth found in different places, it would be well to know about the different kinds of bacteria that exist, the bacteria that do and don't cause diseases, and the substances that have been discovered to fight against bacteria growth. Even though this information is not entirely what your project is about, it shows you have done research about bacteria.

Some questions that might be asked:

- Explain where you got your idea for the project.
- What did you do to personalize it and make it unique?
- Explain the project method you used.
- Why did you choose this subject?
- What are your controls?
- What are your variables?
- Explain your results.
- Describe your graph.
- Explain your conclusion.
- How does the result relate to your background knowledge?
- How does the result help you in understanding the world better?
- Does your project have practical applications?
- Specific background knowledge about your subject.
- What problems did you run into?
- How could you have improved your project?
- If you did it again, what would you change?
- What questions do you have now?
- Tell some ideas you learned from your research.
- How did the research help you with your project?
- How much time did you spend on your project?
- How did others help you or give you ideas?

Be excited about your project when you speak. Don't talk too fast. Elaborate on your answers. Help the judge understand your project by speaking clearly in an organized manner so it's not confusing.

**You need to show evidences of learning.**

**Judges do not want you to redo your experiment for them. Their interest lies in your knowledge of the scientific process, the project design, the display board, the results, and the knowledge you acquired.**

# Science Fair Resources

## **Online Resources for Science Projects Ideas**

- <http://cusef.byu/edu>
- [www.sciencebuddies.org](http://www.sciencebuddies.org)
- <http://www.stevespanglerscience.com/content/experiment/science-fair-survival>
- [www.sciencebob.com](http://www.sciencebob.com)

## **Online Resources for Environmental Science Projects**

- <http://www.isd77.k12.mn.us/resources/cf/SciProjIntro.html>
- [www.isd77.k12.mn.us/resources/cf/SciProjIntro.html](http://www.isd77.k12.mn.us/resources/cf/SciProjIntro.html)
- [www.detroit.lib.mi.us/is/science\\_fair.htm](http://www.detroit.lib.mi.us/is/science_fair.htm)
- <http://faculty.washington.edu/chudler/fair.html>

## What a Science Fair Project Is and Is Not

### A Science Fair Project Is Not:

- Just an experiment, just building a product, or doing something on the computer
- A report about a science, engineering, or computer topic
- A simulation or demonstration to show how something works
- A survey of what people think or feel about something
- An experiment that shows common knowledge that everyone knows
- An experiment that is copied from of a book or off the Internet
- Gathering statistics from a news source and reporting on the daily changes

### A Science Fair Project is:

- Thinking of a question or problem to investigate and solving it by means of:
  - the scientific process
  - the engineering design process
  - or the computer design process
- Planning:
  - an investigation to answer a science question using strategies
  - by design to construct a prototype
  - by design to write a computer program
- Follow through with:
  - conducting an experiment and gathering measurable data
  - constructing something that works
  - programming a code for a computer
- Analyzing data to gain knowledge
- Using the knowledge learned to make a connection to higher-level ideas and to understand those new ideas to see how to apply them to the real natural world