

Chapter 1: Getting Started

So your teacher has asked you to do a science project...**NOW WHAT?**



There's no need to panic! The instructions you will receive will break down the steps to doing a science fair project into manageable parts.

This chapter will help you to identify the differences between a science research project and an experiment. You will need to know this information in order to meet the requirements of the science fair.

**Fourth Graders will be expected to complete a research project.
Fifth & Sixth Graders will be expected to complete an experiment.**

This chapter will also describe the three main parts of a science fair project; the display board, the report and the exhibit materials.

Finally, this chapter will help you to select a science topic for your project. You will explore your interests and take a short survey to determine what science topic you might want to choose for your science fair project.

Read on to learn about the differences between a research project and an experiment!



So what is the difference between a research project and an experiment?



Research Project

Includes a written report, display board and can also include any or all of the following: demonstrations, collections or other display materials. This type of project shows how something works or explains a science concept but you don't test or experiment with anything.

Experiment

Includes a written report, a display board and **MIGHT** include other display materials. This type of project includes variables, something that can be changed and measured. This type of project uses the steps of the Scientific Method.



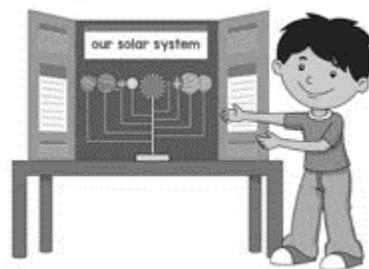
So, let's learn a little bit more about research projects!

A **research project** means that you have chosen a science, technology or engineering topic which you would like to learn more about. You will be gathering information about this topic from various sources and writing a report about what you've learned. Then, you will create a display board to highlight the important information you learned. Finally, you will decide if you are also going to include a demonstration, collection or other display materials on the table in front of your display board.

What is a demonstration?

In a demonstration, you create a model that illustrates a science principle or fact. For example, you might build a model to show the location of the planets in our solar system. If you research electricity, you might choose to build a model of an electric circuit. If you chose to research bees, you could create a model to show what the inside of a beehive looks like.

Sometimes, it is easy to get demonstrations confused with experiments. Just remember a demonstration shows how something works, but it is NOT a true experiment where you are changing or testing something.



Can you think of any other examples of demonstrations?

What is a collection?

In a collection, you assemble a group of items that have to do with the topic of your research report. For example, if you did your research report on birds in Pennsylvania, you might assemble a collection of birds' nests. Other collections you might put together could include seashells, rocks, minerals, fossils, feathers, leaves, seeds or crystals.



Can you think of any other examples of collections?

What are other display materials?

If you used any scientific equipment you can include this as part of your display. This might include thermometers, barometers, petri dishes, beakers, etc... Remember to think about safety and don't display anything that could injure someone!



Now that you know a little more about research projects, let's learn something about experiments!



An experiment is different from a research project in one **main** way.

AN EXPERIMENT ANSWERS A QUESTION!

In an experiment, you will ask a question or pose a problem. You will then design an experiment to find possible answers for this question. During your experiment, you will record data and at the end of the experiment you will use that data to make conclusions.

Will I have to look for any research?

The answer to this question is yes! When you do an experiment for a science fair, you will still include a section in your report that is similar to the written report that you would prepare for a research project. This section is called the literature review. In a literature review, you read research information about the topic of your experiment and you share this background information in your report.

How do I know if my topic is an experiment?

In order for something to be an experiment, there must be a something that can be *changed* and something that can be *measured*.

We call these the variables. These two kinds of variables are called independent (*what is changed*) and dependent (*what is measured*).

Be careful! Many books that are designed to help you do science fair projects will call all projects experiments. In these instructions, a project will only be called an experiment if it has something that can be changed (independent variable) and something that can be measured (dependent variable). Any project that does not have something that can be changed or measured is a research project!!

Let's see if you've been paying attention!

Go to the next page and test your knowledge of the difference between science fair research projects and experiments.

Read these examples of science fair topics and decide if they are experiments or research projects. Write E for experiment or RP for Research Project.

(Answers can be found at the bottom of the next page.)

- 1. A look at the planet Jupiter
- 2. Which kind of liquid causes plants to grow faster?
- 3. What is a honeybee?
- 4. Electric circuits in your home
- 5. Do different brands of popcorn have different amounts of unpopped kernels?
- 6. Explain the tilt of the Earth
- 7. Does the number of turns in the wire on an electromagnet affect its strength?
- 8. Dolphins
- 9. Using a model to show how earthquakes occur
- 10. Is colored or black and white text easier to remember?

**Okay, now I know the difference between a research project and an experiment, and I know which one I am doing.
What are the parts of my science fair project?**

Most science fair projects will have three parts: The written report the display board and exhibit or display materials.

PART ONE: THE WRITTEN REPORT

This is a summary of all of the research you found on your topic. If you are doing a research project, your report will summarize all of the important information you learned.

If you are doing an experiment, your written report will include information found through **both** research and from your experiment.

Your written report needs to be in your own words! If you copy information directly from another source this is plagiarism. Plagiarism is stealing another person's work!

A works cited page will be included at the end of the written report. This shows all of the resources you used to write the report.
(A chapter later in these instructions will help you to write your written report!)

PART TWO: THE DISPLAY BOARD

This is a three sided sturdy board on which you will display your report as well as information about your research project or your experiment.

The display board is usually made of a sturdy cardboard or foam material.

These display boards can be purchased at craft and office supply stores. The standard size is 36"x48".

Some students ask for parent help and create their own display board out of wood or other sturdy material. Using a material such as poster board or light card board will not work. Your display will collapse and all of your hard work will be lost!

The display includes information about your topic, pictures, graphs, drawings and any other visual aids you feel show your audience the important information you have learned.

(A chapter later in these instructions will show you how to set up your display.)

PART THREE: EXHIBIT/DISPLAY MATERIALS

Usually, science research projects will include materials that sit on the table in front of the display board. These materials may include models you have built or scientific instruments or tools you have used. Experiments **MAY** have exhibit materials but sometimes they only have a written report and display board.

GUESS WHAT?????

Now that you've read all of this information about the differences between science fair projects, and you know the three main parts of a science fair project, you are ready to decide what topic you will do for either your research project or experiment.

*Answers to questions from page 5. RP= Research project E=Experiment
1.RP 2.E 3.RP 4.RP 5.E 6.RP 7.E 8.RP 9.RP 10.E*

How should I choose a topic?

First think about the science topics that you are interested in. You will be working on your science fair project for many weeks so you want your topic to be something that will interest you.

Read the following statements. Place a check mark next to any statements that are true for you.

1. ___ I like learning about plants.
2. ___ I like learning about animals or insects.
3. ___ I like learning about the weather.
4. ___ I like learning about rocks and minerals or the Earth.
5. ___ I like learning about chemical reactions.
6. ___ I like learning about the human body and its functions.
7. ___ I like finding out more about how machines work.
8. ___ I like learning about bacteria.
9. ___ I like learning about the environment.
10. ___ I like learning about animals that live in the ocean.
11. ___ I like to learn about electricity or magnets.
12. ___ I like to learn about the quality of things people purchase.

Now that you've taken this short survey to find out what your interest areas are, read below to find out the fields of science that you are interested in.

If you checked #1 you are interested in botany, the study of plants. You might want to pick a topic that deals with types of plants, plant processes or plant growth.

If you checked #2, #6, #8 or #10 you are interested in biology, entomology, anatomy, psychology, microbiology and marine biology. You might want to pick a topic that deals with an animal or a function of human body.

If you checked #3, #4 or #9 you are interested in meteorology, Earth Science, geology, or ecology. You might want to pick a topic that involves the weather, rocks, minerals, or the environment.

If you checked #5 you are interested in chemistry. You might want to pick a topic that deals with matter, physical or chemical changes or how matter reacts to other types of matter.

If you checked #7 or #11 you may be interested in physical science. You might want to pick a topic related to electricity, forces, or motion.

If you checked #12 you are interested in consumer science. You might want to pick a topic that includes information about how science is used to make products that people purchase.

Okay, I know what science fields I'm interested in what do I need to do next?

Now that you have determined some of the science fields you are interested in, you can begin to look at possible topics for your science

fair project. Read over the examples on the next few pages. Remember that this is only a very small list of the science fair projects you could do.

BE CREATIVE!

Think of a new idea for a research project or experiment that no one has thought of yet!

***RESEARCH PROJECTS WILL BE MARKED WITH AN (RP)
EXPERIMENTS WILL BE MARKED WITH AN (E)***

Botany Projects

Monocot and Dicot Seeds and Flowers (RP)

Desert Plants (RP)

Plants of Pennsylvania (RP)

Coniferous and Deciduous Trees (RP)

Will vitamins affect the growth of a plant? (E)

Does the amount of light a plant receives affect its growth? (E)

What color light makes plants grow faster? (E)

In what kind of material (sand, clay etc...) do seeds germinate fastest? (E)

Will plants grow faster in soil or water? (E)

Does the pH of water affect plant growth? (E)

What is the effect of ultraviolet light on the germination of a seed? (E)

What is the effect of caffeine on plant growth? (E)

Biology/Zoology Projects

The Bottle-Nosed Dolphin (RP)

Animals of the Rainforest (RP)

The Human Eye (RP)

Ants (RP)

Animal Adaptations (RP)

Biology/Zoology Projects continued..

The Digestive System (RP)

Spiders (RP)

Animal Communities (RP)

The Human Heart (RP)

Hamsters (RP)

The Senses (RP)

Does the temperature of the water affect a fish's breathing rate? (E)

What is the effect of background music on memory? (E)

Does gender affect reaction times? (E)

Does the color of the text improve memory? (E)

How does music affect a student's math performance? (E)

What is the effect of music on a person's heart rate? (E)

What is the effect of video games on a person's respiration rate? (E)

Do video games affect an adult or a child's heart rate more? (E)

Do women have better peripheral vision than men? (E)

Earth Science Projects

The Earth's Layers (RP)

Model the ocean floor (RP)

Formation of Coal (RP)

Rocks and Minerals (RP)

Constellations (RP)

Wastewater Treatment Plants (RP)

Acid Rain (RP)

Life Cycle of a Star (RP)

The Solar System (RP)

Hurricanes (RP)

Snow (RP)

Biomes (RP)

Fossil Formation (RP)

The Seasons (RP)

Earth Science Projects continued

- Is rainwater absorbed at the same rate in different kinds of soil? (E)
- Does freshwater hold heat longer than salt water? (E)
- What is the effect of temperature on evaporation? (E)
- What affects evaporation most, air temperature or water temperature? (E)

Physical Science Projects

- Magnets (RP)
 - Electricity and Electric Circuits (RP)
 - Simple Machines (RP)
 - Electromagnets (RP)
 - Sources of energy (RP)
 - Light (RP)
 - Sound (RP)
 - Electric Motors (RP)
-
- What is the effect of heat when dissolving substances? (E)
 - How does the weight of a pendulum affect its swing? (E)
 - On what type of surface will a ball roll the fastest? (E)
 - What materials provide the best insulation? (E)
 - Does the design of a paper airplane affect the distance it will fly? (E)
 - What factors affect the height of the bounce of a dropped ball? (E)
 - What materials make the best insulators? (E)
 - How does the air pressure inside a basketball affect how high it will bounce? (E)
 - Which liquids evaporate fastest? (E)
 - Does the temperature of the water affect the buoyancy of objects floating in it?
(E)
 - Does the color of a candle affect how fast it will burn? (E)
 - Which type of string will stretch the most? (E)
 - Does the size of a rubber band affect its elasticity? (E)
 - Does the amount of salt in water affect the temperature at which it boils? (E)
 - What is the best packaging material? (E)
 - Does the temperature of water affect the freezing rate? (E)
 - Does the kind of paper affect how far a paper airplane will fly? (E)

Consumer Science Projects

Biodegradable and Non-biodegradable materials (RP)
Recycling (RP)

Which brand of popcorn has the highest amount of un-popped kernels? (E)

Which brand of battery lasts the longest? (E)

Which additive makes cut flowers last longer? (E)

Which candy bar melts faster? (E)

Which paper towel is strongest when wet? (E)

***Remember there are thousands of ideas out there!
Look for other ideas in books or on the Internet.***



I'm pretty sure I've chosen the topic I want to use for my science fair project. What should I do now?

Now that you've decided on a topic for your research project or your experiment, it is time to ask yourself a few important questions!

Think about the topic you've chosen.

1. Is it a topic that you will be able to understand?
2. Will you be able to work on a project using this topic for at least the next twelve weeks without losing interest?
3. Do you need any special tools or equipment to do this project?
Will you be able to get these items?
4. Can your parents afford to purchase the materials needed to do your project or can you borrow them?
5. Will you be able to do most of the work for this project yourself? (With parent help of course!)
6. Are any of the tools, equipment or materials you are planning to use dangerous? Will you have proper supervision to ensure your safety?
7. Is there time for you to gather all of the materials you need for your project?
8. Can you find enough resources about this topic so that you can write the literature review section of your report?
9. Are you willing to put forth effort to do this project well?
10. Will this topic meet the requirements of the school science fair?

*If you answered yes to all of these questions
then you have selected a good topic for your science fair
project!*

How do I let my teacher know that I've chosen a topic?
Fill in the topic approval form on the next page and give it to your
teacher. Once you receive approval, you are ready to begin the next
step in completing your science fair project!

TOPIC APPROVAL FORM

Name _____ Grade level _____

Fourth Graders for your research projects, please fill in this section!

The topic of my research project is _____

I chose this topic because _____

Fifth & Sixth Graders for your experiment, please fill in this section!

My experimental question/problem is _____

The independent variable (what will be changed or manipulated) is _____.

The dependent variable (what will be measured) is _____.

Due date for this topic approval form is _____.

Your signature _____

Parent Signature _____

(Please remember that your teacher may ask you to make changes to your topic or experiment!)

Chapter 2: Researching Your Topic

Now that you've chosen a topic and you've had it approved by your teacher it's time to begin the real work on your science fair project!



Wait...don't look so worried. You will receive detailed instructions that will explain how to do each step of your science fair research project.

This chapter will help you locate information on your topic as well as take notes and keep them organized. This chapter will also explain how to make a works cited card for each source. This information will be used later to create your works cited page.

(A chapter later in the book will tell you how to write the works cited page!)

I'm ready to start researching my topic, what should I do first?

A large part of your science fair written report is the literature review. In the literature review you share with your 'audience' what you have learned about your topic. You give your reader important background information about your topic.

To write a good literature review, you want to find as much information on your topic as you can. Be sure to look for a variety of resources such as books, magazines, newspaper articles, videos, materials found online etc... You can also interview people who are knowledgeable about your topic.

Start by going to your local library and looking for information that relates to your topic.

Let's say that you are doing a research project on Bats.

When you go to the library look for books on bats. Ask the librarian to help you find books and articles about your topic.

Next you want to search online for information about your topic. **Be very careful!** A lot of information online is incorrect!

The best sites to use are those that end in 'edu', 'org' or 'gov'. These are websites that are sponsored by an educational institution, an organization or a government agency.

For example, if you were researching bats you would want to be careful about using websites that someone put together simply because they love bats.

Okay, I went to the library and I got books and magazine articles about my topic. Then I looked online and I found a few good sites to use.

What should I do now?

Now that you have found some reading materials it is time to select one that you would like to start reading. As you read you will be taking notes on the important facts and ideas that you find.

First think about what material might be important for you to use as part of your literature review. Think about what background information would be helpful to the people who are reading your report. The literature review helps them to understand your project but it also shows them that you spent time learning about your topic!

Make sure that you understand what you are reading! As you take notes, remember to put all of the information in your own words. Your teacher and the judges will know if you've just copied information

directly from a resource. You should never copy information directly from a resource because this is against the law. It is called plagiarism and it is a form of stealing!



Don't let this be you!!! Rewrite all notes in your own words!

I've started reading my first resource, but I don't know how to take notes. What should I do?

Don't panic! The rest of this chapter will help you learn how to take notes and organize them. It will also show you how to set up your works cited cards so that you can keep track of the resources you have used. You will need this information later to write the works cited page.

So Many Sources So Little Time...

Now that you've started to read some information from one of your resources, you want to start taking notes.

On page fifteen you read about the importance of making sure that all notes are in your own words. Remember this as you read about how to take notes from your resources.

While you are reading information and taking notes, you need to do two very important things.

First you need to organize your notes so that it will be easier for you to use them to write your literature review.

Second you need to keep track of some important information about your resources so that when your literature review is finished you can write your works cited page. This page will list all the resources you used to gather information in order to write your literature review.

Let's start by talking about organizing your notes. We are going to discuss one possible way for you to organize your notes. If you think of your own way to organize your notes, that's wonderful! Just make sure that you have some system of organization. If you don't, you may end up feeling a little stressed!



NOTE ORGANIZATION

NOTECARDS

If you choose this option you will need to purchase index cards of any size

Step 1: Choose a resource.

Choose a resource (book, article, website etc...) that you would like to start with. Before you begin reading it and taking notes, you need to set up a works cited card for this resource.

The works cited card will help you keep your notes for this resource organized and will help you when you write your works cited page.

Step 2: Set up a works cited card.

Begin with a blank note card. In the upper right hand corner label this card with the letter 'A'. All of the cards that contain notes from this particular resource will be labeled with an A.

	A

Now you will write the works cited information for this resource on the card. Look at the example below to see how to set up information for a book.

	A
<hr/>	
<i>The Amazing World of Electricity</i>	
<hr/>	
<i>By Shannon Hallisey</i>	
<hr/>	
<i>Smith Inc. Publishers</i>	
<hr/>	
<i>New York, Copyright 1998</i>	
<hr/>	
<hr/>	
<hr/>	
<hr/>	

Step 3: Taking Notes

After you have set up your works cited card put it aside and begin with a second blank index card. Write the letter 'A' in the upper right corner of this index card. Use this card to write the notes from your first resource. If you run out of room on this index card label a new card with the letter 'A' and continue with your notes.

*****REMEMBER TO PUT YOUR NOTES IN YOUR OWN WORDS!!!**

A

Electricity is the flowing motion of electric charges.

Voltage is a way of using numbers to describe an electric field.

There are two types of electric charges positive and negative.

Continue taking notes from your first resource until you are satisfied that you have gotten all the information you need from that source. Then go on to Step 4.

Step 4: Choose another resource.

After you have finished the notes for your first resource, choose a new resource. Complete Steps 1-3 for this resource. This means you will set up a new works cited card. The index cards for your second resource will be labeled with the letter 'B'.)

Other Ideas for Organizing Your Notecards

Instead of using letters to label your cards, you could use numbers, colors or even shapes.

The important thing is that you keep them organized!

Instead of using note cards you could use a piece of loose leaf paper or you could type your notes.

Just be sure to put the works cited information at the top of the page and keep the pages for each resource organized!

Works Cited Information

More information on writing the works cited page will be presented later!

This information is what you need to write on your works cited card (or sheet) before you take notes from each resource!

For books:

Write the author or authors name, the title of the book, the publisher, where it was published and the copyright date.

**If no author is listed write the name of the first editor.

Ex: Snakes By: Shannon Hallisey Smith Publishing Inc. New York
1996

For Magazines:

Write the title of the magazine, the name of the article and the name of the author. Also write the date of the magazine and the volume and/or issue number (if there is one).

Ex: Time "The Plight of the Sea Lion" By James Brown Dec. 2001 Vol.
#3

For Internet Sites:

Write down the name of the complete site and the title of the article or page you used. List the author of the page if known. Also write down the full URL address and the date that you visited the website.

Ex: American Heart Association. "Heart Association Guidelines for CPR"

www.americanheart.org January 1, 2006

For Videos, computer CD-ROM's etc...

Write the title of software, the company that produced it, the city of publication and the copyright/publication date.

Ex: The Magic School Bus Human Body CD-ROM, Scholastic Inc, Chicago, 1995

For Interviews:

Write the name of the person you interviewed, their position and the date you interviewed them. Be sure to tell if it was a telephone or a personal interview.

Ex: Becky Jones, Biologist, December 20, 2005. Telephone Interview.

Pamphlets:

These usually don't have an author! Tell who publishes, distributes or edits the pamphlet. Give the title of the pamphlet.



Go ahead...start taking notes!