Dooley PTA's Science Fair Planning Guide

Just follow these fun and exciting steps and you too can create a great award winning science project, thought up entirely by you!!!

VERY IMPORTANT: Before you turn this page, recruit an adult to help you. They come in very handy, especially if you are nice to them and tell them you won't blow up anything….

My name is _____

My adult's name is _____

I am in _____ grade

From this point forward you are now… A SCIENTIST!!

***Use this packet to help you during your experiment and fill it out! Have it ready to give to the judges during your presentation it will be part of your score!!**

Science Fair Rules and Regulations
"The Legal Stuff"

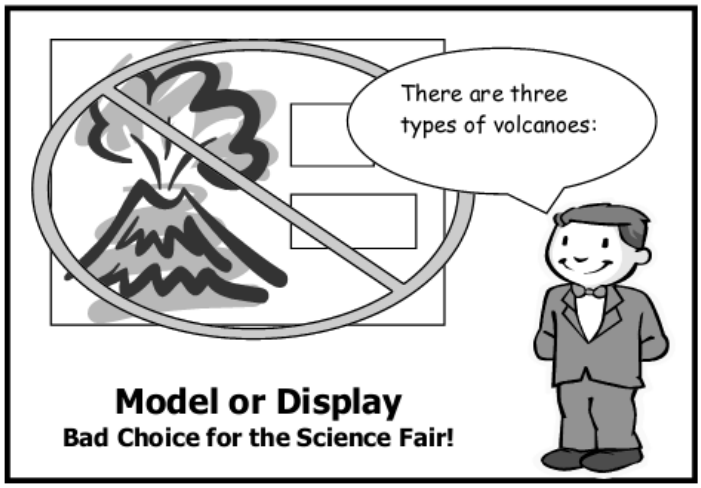
Aw! You mean there are rules? Of course silly, this is made by adults!

1. Number one rule…think safety first before you start. Make sure you have recruited your adult to help you.
2. Never eat or drink during an experiment and always keep your work area clean.
3. Wear protective goggles when doing any experiment that could lead to eye injury.
4. Do not touch, taste or inhale chemicals or chemical solutions.
5. Respect all life forms. Do not perform an experiment that will harm an animal.
6. All experiments should be supervised by an adult!!!!
7. Always wash your hands after doing the experiment, especially if you have been handling chemicals or animals.
8. Dispose of waste properly.
9. Any project that involves drugs, weapons, or explosives is not permitted.
10. Any project that breaks district policy and/or local, state or federal laws are not permitted.
11. Use safety on the internet! Never write to anyone without an adult knowing about it. Be sure to let an adult know about what websites you will be visiting, or have them help you search.
12. If there are dangerous aspects of your experiment, like using sharp tools or experimenting with electricity, please have an adult help you or have them do the dangerous parts. That's what adults are for, so use them correctly. (Besides, it makes them feel important!)
13. No peanuts, nut products or products from a facility that contains peanuts allowed in the gym.

Types of Science Projects:

There are two types of science projects: Models and Experiments. Here is the difference between the two:

NOT what we are looking for…..



A Model, Display or Collection:

Shows how something works in the real world, but doesn't really test anything

Examples of display or collection projects can be: "The Solar System", "Types of Dinosaurs" , "Types of Rocks", "My gum collection…" Examples of models might be: "The solar system" or "How an Electric Motor Works", "Tornado in a Bottle"

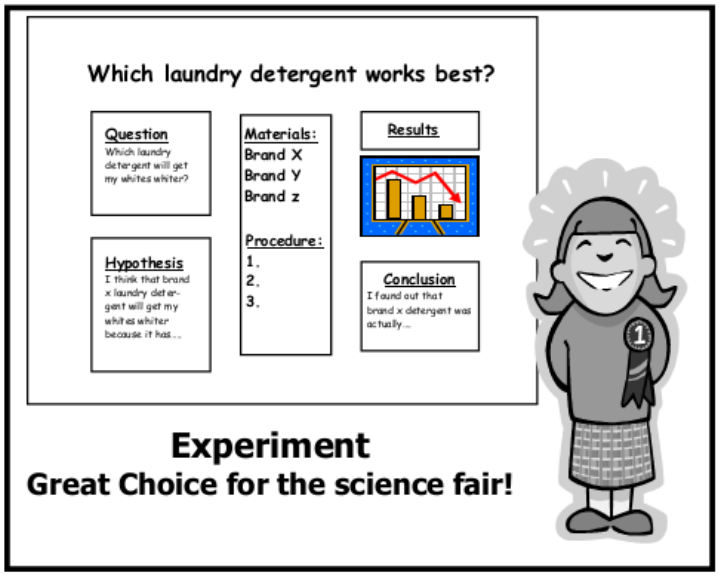
What we are looking for….

An Experiment:

Lots of information is given, **but it also has a project that shows testing being done and the gathering of data.**

Examples of experiments can be: "The Effects of Detergent on the Growth of Plants", "Which Paper Towel is more Absorbant" or "What Structure can Withstand the Most Amount of Weight"

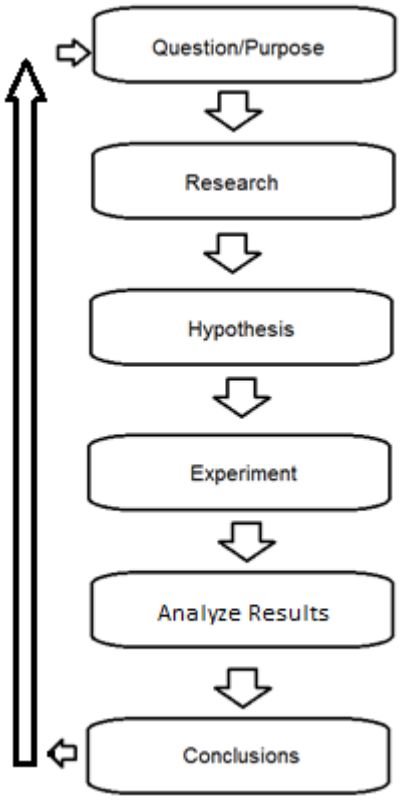
You can tell you have an experiment if you are testing something several times and changing a variable to see what will happens. We'll talk about variables later….



So What Type of Project Should You Do?

Even though you can learn a lot from building a model or display, we recommend that you do an **Experiment!!!** Why? Well, they are fun, they are more interesting and most of all, they take you through the **SCIENTIFIC METHOD,** which is the way real scientists investigate in real science labs. Besides that, the **scientific method** is what the judges are looking for!!

So what is the SCIENTIFIC METHOD?



Choosing a category that interests you…

All great projects start with great questions but before you get started on a great question you need to pick a subject or topic that you like. There are three different categories of the science fair to choose from. They are:

Life Science: This category deals with all living things—plants, animals, the human body, bacteria, fungus, etc. Remember that it is against science fair rules to intentionally hurt an animal during an experiment. Make sure to get an adult's permission and assistance before experimenting on any living things!

Physical Science: This category includes topics about matter and structure, as well as electricity, magnetism, sound, light, the composition of matter and how it reacts to each other. These are the science experiments that may have bubbling and oozing going on. It is a perfect category to try to mix things together to see what will happen. Again, if you are experimenting with possibly dangerous things, you need to recruit an adult to help you out.

Earth and Space Sciences: This category covers all sorts of topics that deal with the Earth or objects in space. This includes studying weather, geology (which is the study of everything that makes up the Earth, like rocks, fossils, volcanoes, etc.), and the study of all that is in space, including the stars, our sun and our planets. Unfortunately this topic is also where most kids mess up and do a collection or model project instead of an experiment, so be careful!!!

Now It's Your Turn:

Write down your favorite Science Fair Category and what it is you want to learn more about:

My category is Life Science / Physical Science / Earth and Space Science (circle one)

Topic: I want to do an experiment involving_____

_____

Doing the Research and Forming a Hypothesis

So you've picked your category and you've chosen a topic. Now it is time to research your topic as much as possible. Becoming an expert at your topic is what real scientists do in real labs.

So how do you become an expert?

YOU READ!!!!

READ about your topic. READ encyclopedias. READ magazine articles and books from the library. READ articles from the internet. Take note of any new science words you learn and use them. It makes you sound more like a real scientist. Keep track of all the books and articles you read. You'll need that list for later.

YOU DISCUSS!!

Talk about it with your parents. Talk about it with your teachers. Talk about it with experts like veterinarians, doctors, weathermen or others who work with the things you are studying. Sometimes websites will give you e-mail addresses to experts who can answer questions…. But again, do not write to anyone on the internet without letting an adult supervise it. (*hint: take pictures of yourself interviewing people)

Now it's your turn:

Research: Find information about your problem. During your research you are looking for background information about your topic and refining what you specifically what to test in your experiment.

Book I found on my topic

Title Author

_____ _____

Important information I gathered from this book:

_____
_____
_____
_____
_____

Book I found on my topic

Title Author

_____ _____

Important information I gathered from this book:

_____
_____
_____
_____
_____

Internet Site I found on my topic

Address

_____

Important information I gathered from this website:

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Internet Site I found on my topic

Address

_____

Important information I gathered from this website:

_____
_____
_____
_____
_____

Person I talked to about my topic

Name Title

_____ _____

Important information I gathered from this person:

_____
_____
_____
_____
_____

Whew……

Then when you think you can't possibly learn anymore and the information just keeps repeating itself. You are ready to….

Write a Hypothesis

Now it is the time to PREDICT what you think will happen if you test your problem. This type of PREDICTION is what real scientists call A HYPOTHESIS. Using this fancy word will amaze your friends and will have you thinking like a full-fledged scientist.

So how do you begin? Well, just answer this very simple question:

What do you think will happen?

Example Topic: Which Paper Towel is more absorbent?
Example Hypothesis: Brand X will be more absorbent because it's a more popular brand, it is thicker and the people interviewed said that the more expensive brands would work better.

(This hypothesis not only predicts what will happen in the experiment, but also shows that the scientist used research to back up his prediction.)

Now it's your turn:

Hypothesis: Your prediction _____ _____

(will happen) because (my research shows…)_____
_____

Testing your hypothesis by doing an experiment

Now we've come to the good part. The part that all scientists can't wait to get their grubby little hands on… you guessed it… The EXPERIMENT!

Designing an experiment is really cool because you get to use your imagination to come up with a test for your problem, and most of all, you get to support (or disprove) your hypothesis.

First: Gather up your materials: What will you need to perform your experiment? Don't forget to take pictures for your poster!

Now it's Your Turn:

Materials: List everything you used in your experiment.

1._____ 6._____

2._____ 7._____

3._____ 8._____

4._____ 9._____

5._____ 10._____

Second: Identify your variables (what is changing and what is staying the same). The variables are any factors that can change in an experiment. There are 3 types of variables that you need to define in your experiment

1. Independent Variable: the factor you are testing. When you are testing your experiment you should only test **ONE** thing at a time in order to get accurate results.
2. Controlled Variables: everything else in the experiment should be kept exactly the same. There should be lots of these!
3. Dependent Variables: what happens as a result of your test? The thing that you are measuring.

In other words, if you want to test the affect that water has on plant growth (dependent variable) then all the plants you test should be in the same conditions (controlled variables): same type of dirt, same type of plant, same type of location, same amount of sunlight, etc. The only variable you should change from plant to plant would be the amount of water it received (independent variable). Knowing what your variables are is very important because if you don't know them you won't be able to collect your data or read your results.

Now it's Your Turn:

Variables: What are you changing and what are you keeping the same throughout the experiment?

INDEPENDENT VARIABLE: The thing that I am changing is: _____
_____ _____

CONTROLLED VARIABLES: I will keep these things the same: _____
_____
_____

DEPENDENT VARIABLES: The thing I am measuring: _____
_____

Third: Write a PROCEDURE. The recipe for your experiment. Make sure that someone else could follow the steps to repeat your experiment exactly! Don't forget to take pictures!

Now it's Your Turn:

Procedure: The list of steps that you did to perform an experiment.

1st _____

2nd _____

3rd _____

4th _____

5th _____

6th _____

7th _____

8th _____

9th _____

Fourth: TEST, TEST, TEST. Your experiment needs to be accurate, so make sure you repeat it at least once! Don't forget to take pictures of the science project being done and the results. Write down or record the results of the experiment every time you test it.

Now it's Your Turn:

Data Collection. Report your data as neatly and organized as possible. If appropriate for your results, a data table would be a good idea!

Time Out: How Do You Collect Data?

- **Keep a science journal**: A science journal is a type of science diary that you can keep. We suggest you do that if your experiment is over a period of a week or more. In your journal you can record observations, collect research, draw and diagram pictures and jot down any additional questions you might have for later.

- **Have the right tools to do the job**: make sure you have the stuff you need to take accurate measurements like rulers, thermometers, graduated cylinders or measuring cups. The recommended standard of measurement in science is metric so if you can keep your measurements in meters, liters, Celsius, grams, etc.

- **Tables, charts, and diagrams** are generally the way a good scientist like you would keep track of your experiment trails. Remember you are testing more than once. A table is organized in columns and rows and ALWAYS has labels or headings telling what the columns and rows mean. You will probably need a row for every time you did the experiment and a column telling what you tested and what happened.

Plant	Amount of water per day	Size it grew in two weeks
(controlled variable)	(independent variable)	(responding variable)
Plant A	none	.5 cm
Plant B	5 ml	2 cm
Plant C	10 ml	5 cm
Plant D	20 ml	7 cm

- **Be accurate and neat!** When you are writing your tables and charts please make sure that you record your data in the correct column or row, that you write neatly, and most of all that you record your data as soon as you collect it **SO YOU DON'T FORGET WHAT HAPPENED!!!!** Sometimes an experiment might be hard to explain with just a table, so if you need to draw and label a diagram to explain what happened.

Fifth: Analyze your results:If appropriate, graph your results. Make sure it is easy to read! Most scientists use tables, graphs and other organizers to show their results. Organizing makes the results easy to read, and much easier to recognize patterns that might be occurring in your results.

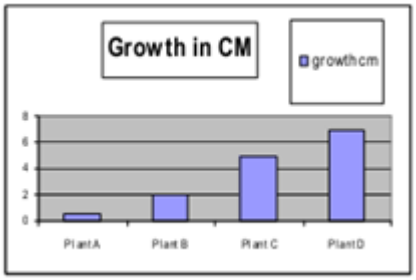
Now it's Your Turn:

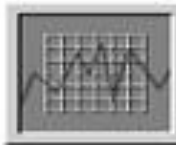
Analyze your results: Attach a graph of your results.

Use the right graph or experiment. There is nothing worse than a bad graph. There are all types of graph designs

Pie Graphs are good for showing percentages of groups. Your pie pieces have to add up to 100%!

Bar Graphs are good for comparing amounts of things that you have counted. The x axis (horizontal) is what you are measuring and the Y axis (vertical) is the unit being measured.





Line Graphs are good for showing continuous change over a period of time. The X axis is shows the time increments (minutes, hours, days) and the Y axis shows what you are measuring.

Sixth: Write a Conclusion: Tell us what happened. Was your hypothesis right or wrong? Why? (It is completely fine for a hypothesis to be wrong. You still learn a lot even if your prediction was not the same as your results. This happens all of the time in science!) What did you learn from your experiment? Would you change anything about the experiment or are you curious about something else now that you've completed your experiment.

Now it's Your Turn:

Conclusion: What did you learn from your experiment?

Seventh: Understand its Application. Write about how this experiment can be used in a real life situation. Why was it important to know about it?

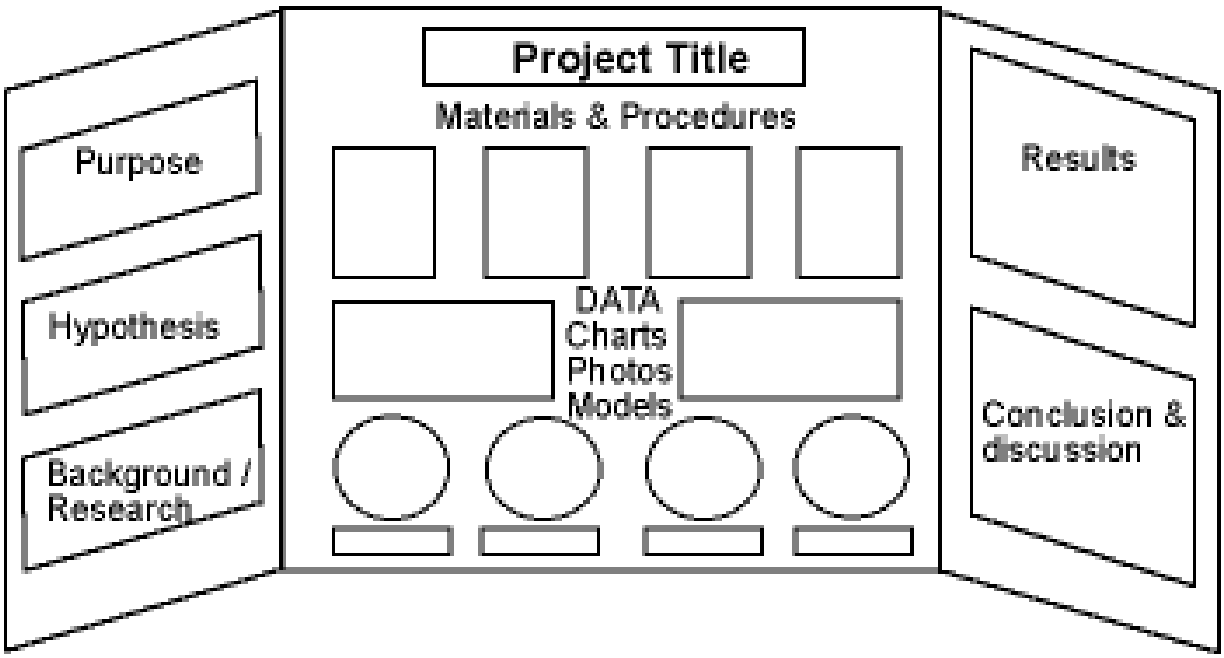
Now it's Your Turn:

Application: How is this important for the real world? What can your experiment teach us?

The Presentation (why you needed all those pictures)

How To Make An Eye Catching Display

This is an example of a neat looking science fair display board. It is just an example. Depending on your information and the amount of pictures, tables and graphs, you may choose a different layout. Just make sure that it is neat!



Score Sheet: What the judges are looking for:

Is this:
Model, Display or Collection?
OR
Experiment? (Look for control and experimental groups)

Research 0 1 2 3 4 5 6
Scoring suggestions: 2 points for each unique piece of good research.1 point for each piece of ok research.

Hypothesis 0 1 2 3 4 5
Scoring suggestions: 0= no hypothesis, 3= misses the point or prediction cannot be tested, 5=clearly makes a testable prediction

Variables

Independent Variable 0 1 2 3
Scoring suggestion: 0=not identified, more than 1 identified, 1=incorrect variable identified, 3=correct variable identified (The thing that is changed)

Dependent Variable 0 1 2 3
Scoring suggestion: 0=not identified, 1=incorrect variable identified, 3=correct variable identified (The thing that is measured)

Controlled Variables 0 1 2 3
Scoring suggestion: 0=not identified, incorrect variable identified, 1 point each for every correct controlled variable identified (The things in both the control group and the experimental group that stay the same)

Procedure 0 1 2 3 4 5
Scoring suggestions: 0= no procedure, 3= complete but hard to follow, 5=clear, detailed and can be followed step by step

Data 0 1 2 3 4 5
Scoring suggestions: 0= no data, 3= hard to read and understand, 5=clear and well organized graph or data table

Conclusion 0 1 2 3 4 5
Scoring suggestions: 0= no conclusion, 1= does not relate to hypothesis, 2= addresses hypothesis but is illogical 3= adequately addresses hypothesis 5= conclusion logically addresses hypothesis based on data collected

☐ Application 0 1 2 3 4 5
Scoring suggestions: 0=no application, 3=some relation to the real world, 5=clearly relates to the real world.

☐ Project Board 0 1 2 3 4 5 6 7 8 9 10
Scoring suggestions: 0= no project board, 3= limited visual appeal, hard to read, poorly organized, 7= easily readable from 2 feet away and is organized, understandable, moderately appealing, 10= very appealing, very well organized, and contains very good visual aids such as photos or illustrations

☐ Oral Presentation 0 1 2 3 4 5
Scoring suggestions: 0= no one showed up?!?, 1=student showed up but cannot explain project, 3= student presentation is very brief and must be prodded by questions to explain subject matter, 5=clear presentation that includes an introduction and shows good understanding of the entire project

☐ Individual or Group projects 0 thru 6
Scoring suggestions: 0=4 or more participants 2= 3 participants-both participate equally in presentation, 4= 2 participants-both participate equally in presentation, 6=1 participant

☐ Is there clear use and understanding of the Scientific Method?
Yes (5 points) No (0 points)

☐ Is the Dooley PTA's Science Fair Planning Guide Packet present during the presentation AND FILLED OUT BY THE STUDENT? Yes (14points) No (0 points)

Final Score

/80

Judge's notes and/ or suggestions: