Introducing: The Most Fabulous, Scientific, All Helpful, Kid Friendly and Most Excellent Science Fair Project Planner Known to Kid Kind:

Foothills Elementary Science Fair Planning Guide 3-5

Okay, now get to work on your project!!

What's that? You still need help getting started?

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

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

My adult's name is ________________________________

From this point forward you are now... A SCIENTIST!!
The Foothills Elementary
Science Fair Planning Guide

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-Or-

What is inside this packet in case you are impatient and you want to jump around?

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Types of Science Projects:

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

**A Model, Demonstration, or Collection**

- Shows how something works in the real world, but doesn’t really test anything.

**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 Absorbent”, or “Which Structure can Withstand the Most Amount of Weight”.

- You can tell you have an experiment if you are testing 3 or more times and changing only one variable to see what will happen. We’ll talk about variables later….


deadline

COOL!!!! DO THIS

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 a demonstration, **we require 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 scientist investigate in real science labs. Besides that, the **scientific method** is what the judges are looking for!
What is the Scientific Method?

Find a problem
Ask a "How does" question

Research the problem
and find out all you can.

Make a Hypothesis
Predict what might happen
based on what you know.

Conduct the experiment
to find out if you were right.

Write about what you learned
and how it applies to the real world.
Maybe come up with another problem...

Form a conclusion
Check your hypothesis against the results...
Were you right?

Organize your data in tables and graphs
So that it's easy to see the results.

Compile proof by recording data
from doing your experiment several times.
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 in our Science Fair. They are:

**Life Science:** This category deals with all animal, plant, and human body questions that you might have and want to do an experiment about. Remember that it is against Science Fair Rules to intentionally hurt an animal during an experiment. If you are dealing with animals, please let an adult assist you. It is okay to do experiment on plants, as long as they don’t belong to someone else, like don’t do an experiment on your mom’s rose bushes unless you ask her first… Life science also includes studying behaviors, so it’s a perfect category to try taste tests, opinion surveys, animal behavior training.

**Physical Science:** If you like trying to figure out how things work, then this is the category for you! It includes topics about matter and structure, as well as electricity, magnetism, sound, light, or anything else that you might question, “How does it work and what if I do this to it, will it still work?” But remember, you always need to ask an adult first (and always make sure there is an adult with you when you try it).

Physical Science also includes the composition of matter and how it reacts to each other. These are the science experiments that test how different balls bounce, how far different projectiles fly, the speed that toy cars go down a ramp, how do different angles of ramps affect the speed of an object, etc… Remember these experiments require you to record a measured variable (speed, time, temperature, etc…). 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 is really awesome because it 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 shapes the Earth, like erosion, weather, chemical, 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!!!

My favorite category is ________________________________________________________________

(Life Science, Physical Science, or Earth and Space Science)

I want to do an experiment involving ____________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
Step 1: Question…

Now that you have picked out a topic that you like and that you are interested in, it’s time to write a question or identify a problem within that topic. To give you an idea of what we mean you can start off by filling in the question blanks with the following list of words:

The Effect Question:
What is the effect of ___________ on ___________?
- sunlight
- eye color
- brands of soda
- temperature
- oil
- the growth of plants
- pupil dilation
- a piece of meat
- the size of a balloon
- a ramp

The How Does Affect Question:
How does the ___________ affect ___________?
- color of light
- humidity
- color of a material
- the growth of plants
- the growth of fungi
- its absorption of heat

The Which/What and Verb Question:
Which/What ___________ (verb) ___________?
- paper towel is most absorbent
- foods do meal worms prefer
- detergent makes the most bubbles
- paper towel is strongest
- peanut butter tastes the best

Question: ____________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Page 5
Step 2: Research

So you’ve picked your category and you’ve chosen a topic. You even wrote a question using our cool fill in the blank template. Now it is time to research your problem as much as possible. Becoming an expert at your topic is what real scientists do in real labs.

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. For Internet sites see the Website Resource page located on the last page of this packet.

(Sample topics could be magnetism, electricity, buoyancy, absorbency, taste, plant growth, simple machines or other scientific topics that relate to your problem. If you are having problems finding out what the topic is, ask your teacher or an adult to help you on this one….)

Research: My problem is about this subject: ____________________________________________

Books I found in the library on my subject are:

Title: ____________________________________________

Author: ____________________________________________

Internet sites that I found on my subject are:

____________________________________________________________________________________

____________________________________________________________________________________

People I talked to about my subject are:

____________________________________________________________________________________

____________________________________________________________________________________

Some important points that I learned about my subject are

• ____________________________________________

• ____________________________________________

• ____________________________________________

• ____________________________________________
Step 3: Hypothesis/Prediction

Now it is the time to PREDICT what you think will happen if you test your problem. This type of “SMART GUESS” is what real scientists call A HYPOTHESIS. How do you begin? Well, just answer this very simple question: What do you think will happen, (even before you start your experiment)?

Example Problem: Which type of paper towel is more absorbent?

Example Hypothesis: If using the same size sample of 2 brands of 2-ply paper towels, then I predict that Foothills Brand will absorb up to 50 milliliters of water because the thickness of the layers compared to the other two brands.

(This hypothesis not only predicts what will happen in the experiment, but also shows that the “Scientist” used research to back up his prediction/hypothesis. Tips: Make sure that your Hypothesis only predicts one outcome. That way you will clearly know whether your hypothesis is right or not).

Hypothesis: If ____________________________________________,
then ________________________________________________________
because (my research shows…) ____________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Step 4: Materials

Gather up your materials: What will you need to perform your experiment? The safest way to do this is get that adult you recruited to help you get the stuff you need. Oh, did we mention to take pictures or draw pictures of your materials. This will come in handy when you are making your display board.

Materials: List the Materials that you will need for your science experiment here:

1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________
6. ____________________________
7. ____________________________
8. ____________________________
9. ____________________________
10. ____________________________
Step 5: Variables

Identify your variables. They are things that will remain the same and the things that will change during your experiment. By listing the variables, you better understand your experiment. There are three different types of variables

Variables Kept the Same (Controlled) – For example in the experiment question, “Do plants grow better in red or white light?” The controlled variables are: beginning size of plant, type of plant, amount of dirt, amount of water, how often watered, length of time light is on, etc…

The variables kept the same (controlled) variables are…

____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

Changed (Manipulated) – What is the one thing that is being changed? This is the part of the experiment you will be testing. Remember that when you are testing your experiment you should only test one variable in order to get accurate results. For example, the manipulated variable would be the color of the light.

The changed (manipulated) variable is…

____________________________________________________
____________________________________________________

Measured (Responding) – What will you be measuring? The responding variable is what happens as a result of your test. Use a standard unit of measure – centimeters, meters, seconds, minutes, milliliter, liters, grams, etc… For example, the responding variable would be the plant growth during the experiment measured at the end of 5 days. (Hint – think metric)

The measured (responding) variable is…

____________________________________________________
____________________________________________________
Step 6: Safety Statement (if needed)

Write a SAFETY STATEMENT. This statement will identify any potentially dangerous materials or actions (not limited to chemicals, flame or other physical changes) and the necessary procedure that must be followed to protect the scientist or others. Students should follow proper safety standards depending on their area of study.

Make sure you have adult supervision when...

________________________________________________________________________________________

________________________________________________________________________________________

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________________________________________________________________________________________

________________________________________________________________________________________

Step 7: Procedures

Write a PROCEDURE. A procedure is a list of steps that you did to perform an experiment. Why do you need to write it down? Well it’s like giving someone a recipe to your favorite dish. If they want to try it, they can follow your steps to test it to see if it is true. Scientists do this so that people will believe that they did the experiment and also to let other people test what they found out. Did we mention to take pictures of you doing the steps? (Don’t forget to explain that you repeated these steps three or more times.)

Procedure: List the steps that you have to do in order to perform the experiment

_1st....__________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________
NOW THAT YOU HAVE COMPLETED STEPS 1-7, IT IS TIME TO DO YOUR EXPERIMENT. MAKE SURE THAT YOU HAVE YOUR FAMILY’S PERMISSION BEFORE CONDUCTING ANY TYPE OF SCIENCE EXPERIMENT!

Step 8: Data/Analysis

TEST, TEST, TEST! Remember your results need to be consistent in order to be a good experiment; in other words, when you cook from a recipe you expect the outcomes to be the same if you followed the directions (or procedure) step-by-step. So that means you need to do the experiment more than once in order to test it properly. We recommend three or more times. More is better! Don’t forget to take pictures of the science project being done and the results.

Collect your DATA. This means record your results from each trial you conduct. You also need to organize your results in a way that is easy to read. Most scientists use tables or graphs to show their results. Organizing makes the results easy to read, and much easier to recognize patterns that might be occurring in your results.

Time out: How Do You Collect Data?!!?

• **Keep a science journal or a Scientific Method Notebook:** 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, meter tapes, scales, thermometers, graduated cylinders or measuring cups that measure volume. The recommended standard of measurement in science is metric. So if you can keep your measurements in centimeters, meters, liters, Celsius, grams, etc…, you are doing great!

• **Tables, charts and diagrams** are generally the way a good scientist like you would keep track of your experiment trials. Remember you are testing at least 3 times or more. A table is organized in columns and rows and **ALWAYS** has labels or headings telling what the columns or rows mean. You will probably need a row for every time you did the experiment and a column telling what the manipulated variable was (what you tested) and the responding variable (the result that happened because of the manipulated variable).

<table>
<thead>
<tr>
<th>DATA TABLE</th>
<th>Responding (Measured) Variable</th>
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<tbody>
<tr>
<td>Variable kept the same (Controlled)</td>
<td>Trial One</td>
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<tr>
<td>Changed (Manipulated) Variable</td>
<td>Trial One</td>
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</tbody>
</table>
• **Use the right graph for your experiment.** There is nothing worse than a bad graph. There are all types of graph designs, but these seem to be easy to use for science fair experiments.

• **Bar graphs** are good to use if you are comparing amounts of things because the bars show those amounts in an easy to read way. This way everyone will be able to tell your results at a glance. Usually the bars go up and down. The X-axis (or horizontal axis) is where you label what is being measured, (like plant A, B, C and D) and the Y-axis (or vertical axis) is labeled to show the unit being measured (in this case it would be centimeters that the plant grew.)

• **Line graphs** are good to use if you are showing how changes occurred in your experiments over time. In this particular case you would be using the X-axis to show the time increments (minutes, hours, days, weeks, months) and then you would use the Y-axis to show what you were measuring at that point in time.

**Design a table or chart here to collect your information**
(Don’t forget to include a good, clear title)

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I observed the following…

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Step 9: Conclusion

Write a Conclusion: Tell us what happened. Was your hypothesis right or wrong? Were you successful, did it turn out okay? Would you change anything about the experiment or are you curious about something else now that you’ve completed your experiment? Most of all, TELL WHAT YOU LEARNED FROM DOING THIS.

Write one paragraph that explains the results of your investigation –
First Sentence – must answer the problem statement/question of the investigation
Second Sentence – tells whether you accept or reject your hypothesis/prediction
Third Sentence – identify the control or manipulated variable as having the highest average
Fourth Sentence – identify the control or manipulated variable as having the lowest average
Fifth Sentence – find the difference between the high and low averages
Sixth Sentence – explain how the difference proves your answer to your question

Example Conclusion: Brand Foothills was more absorbent than brand Elkridge paper towels. I accept my hypothesis because brand Foothills did absorb more water. Brand Foothills average absorption was 45 milliliters of water. Brand Elkridge average absorption was 35 milliliters of water. The difference between brand Foothills and brand Elkridge was 10 milliliters of water. Therefore, the thickness of the paper towels contributed to the difference in the data.

Tips: To decide whether you should accept or reject your hypothesis, you will need to compare it to your Data/Analysis section. If what you thought was going to happen really did happen, you should write: “I accept my hypothesis.” However, if what you thought would happen did not really happen, you should write, “I reject my hypothesis.” Many more scientist end up rejecting their hypothesis than accepting it, so don’t feel bad if you end up rejecting yours.

Write another paragraph telling what you would do differently to make this experiment better.
Step 10: The Presentation

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 have a different layout. Just make sure it is neat!

#1 Title (name of project)
#2 Question: Reason for the project…your question, what do you want to find out.
#3 Hypothesis: A prediction that you make of the results before conducting the experiment.
#4 Research: A report of your research on the subject (facts).
#5 Materials: A list of the supplies needed for the experiment.
#6 Safety Procedure: (if needed) Include any precautions needed to be taken to keep you safe.
#7 Procedure: The steps or directions that you used to conduct the experiment.
#8 Variables: The parts of the experiment that are kept the same (controlled) and what will be changed (manipulated) to get the results. Don't forget the measured (responding) variable too.
#9 Data/Analysis: Graphs or charts showing what happened after you conducted your experiment.
#10 Conclusion: Telling what happened … Did it work, were you right about the hypothesis.
#11 Pictures, pictures, and more pictures.

Display Beauty Secrets:

- Tri-fold boards should not exceed 48 inches wide open (24 inches closed) by 36 inches tall with 12 inch deep side panels.
- Use a computer to type out your information, but if you can’t, write out your information in your best writing (using a ruler to make guidelines). Printing the title is usually best. If you are using a computer, make sure the fonts are readable and only use one or two type faces.
- Use spray adhesive or a glue stick. (No scotch tape should be showing, if used)
- Mount white paper, pictures, graphs and tables on colored papers (making sure the colored paper is larger so it creates a boarder for the white paper.) Use only one or two colors.
- Name, grade, and classroom teacher goes on back of the board.
Preparing for the Science Fair Judging

- If you can communicate your science fair project well, you maximize your chances of winning.
- Write up a short "speech" (about 2–5 minutes long) summarizing your science fair project. Do not restate your abstract word by word. You will give this speech (from memory) when you meet the judges. Include in the speech:
  - How you got the idea.
  - How you did the experiment (explain any relevant terms along the way).
  - Your results and conclusions.
  - Why your science fair project is important in today's society (how will it help people today?). You don't have to cure cancer. Perhaps your work will help a small group of people, but it's still important.
  - Demonstrate that you understand the theory behind why your project turns out the way it does.
- Organize a list of questions you think the judges will ask you and prepare/practice answers for them. A few common questions are listed below.
  - How much help did you receive from others?
  - What does your data tell you?
  - Why is this research important? (Who cares if a rocket flies well?)
  - What do your graphs represent?
  - What does your data tell you?
  - What problems did you run into while doing your experiment and how did you fix them?
  - What are the three most interesting things you learned when doing this science fair project?
  - What further research do you plan on doing, or would do, to this science fair project? (Your future study)
- Study your background research as you would for a test. In some ways, presenting your science fair project is like taking an exam. The better you know your background research, the higher the chance you have of winning.
- Practice explaining your science fair project in simple terms so anyone can understand it.
  - Practice explaining all graphs, tables, your short speech, answers to possible questions asked, etc.
  - Videotaping yourself during practice can also be very helpful. Although it can be painful to watch the video, you will see the mistakes you made and be able to fix them the next time you speak.

Presenting Yourself — Be Professional!

- Always dress up nicely for the science fair judging period-NO JEANS! Everyone will take you more seriously if you look professional.
- Make good use of your display board. Point to diagrams and graphs when you are discussing them.
- Always be positive and enthusiastic!
  - Show the judges you are interested in your research and they will be more likely to remember you.
  - Do not be negative unless you are emphasizing a frustrating problem you ran into.
- Be confident with your answers. Do not mumble and say "Ummmmm...I think maybe this is happening?"
- Emphasize how you were creative/unique/innovative with your science fair project.
  - One of the major criteria on a judges' list is creativity and originality.
- If you have no idea what the judge is asking, or do not know the answer, it is okay to say "I do not know."
  - This is better than making something up that probably is not correct.
  - It's better to get on to the next question for which you probably do know the answer.
- Treat each person who visits you like a judge, even nonscientists.
- Always ask for feedback from the judges after the science fair. Ask them how you can improve.
Grade ___________ Project Number ____________________

Title ________________________________________________

<table>
<thead>
<tr>
<th>Scientific Method Notebook</th>
<th>Meets Standard</th>
<th>Doesn't Meet Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question:</strong> Category and Question/Problem clearly stated</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Research:</strong> Adequate background research information</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hypothesis:</strong> Clearly stated with an explanation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Materials:</strong> Accurately listed</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Variables:</strong> Kept the same and Changed clearly stated</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Variables:</strong> Selected an appropriate Measured variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Procedure:</strong> Written concisely so another student-scientist could repeat</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Table:</strong> A complete record of multiple trials were run</td>
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</tr>
<tr>
<td><strong>Data Analysis:</strong> Analyzed data using an appropriate titled graph</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A <strong>Conclusion</strong> was drawn and includes an accepted or rejected hypothesis that is supported by the measured data collected</td>
<td></td>
<td></td>
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<tr>
<td>Proper <strong>spelling and grammar</strong></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Display Board</th>
<th>Meets Standard</th>
<th>Doesn't Meet Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neat and sturdy board, with an attractive and colorful <strong>layout</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contains a <strong>title</strong> and <strong>states the question or problem</strong> being investigated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>List the <strong>procedures</strong> and <strong>materials</strong> with multiple trials</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Variables</strong> (Kept the same, changed, and measured) are clearly stated</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data</strong> was accurately collected and analyzed using a titled <strong>graph</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All <strong>safety</strong> issues are addressed</td>
<td></td>
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<tr>
<td>A <strong>conclusion</strong> was drawn and includes an accepted or rejected hypothesis that is supported by the measured data collected</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Creative/Unique/Innovative</strong> project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper <strong>spelling and grammar</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Presentation</th>
<th>Meets Standard</th>
<th>Doesn't Meet Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses appropriate speed, volume, and expression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stands and maintains eye contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem interested to student and significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thoroughly explains the process and results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answers questions pertaining to their project</td>
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<td></td>
</tr>
</tbody>
</table>

Total Number of Meets _____________

<table>
<thead>
<tr>
<th>Rubric</th>
<th>25 Meets = Score of 4</th>
<th>20-24 Meets = Score of 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15-19 Meets = Score of 2</td>
<td>14 or fewer Meets = Score of 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strengths of this Project:</th>
<th>Areas for Improvement:</th>
</tr>
</thead>
</table>

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Display Item Rules:
1. Display items are not necessary. Except for your Scientific Method Notebook.
2. The following items may not be used as display materials or attached to the project board.
   - Liquids, chemicals, water, substances with mold growth.
   - Food or wrapped food products
   - Animals
   - Dangerous, sharp objects (nails, hammers, etc…)
   - Flame producing products
   - Glass – this includes items made of glass such as thermometers, light bulbs, mirrors, or other breakable items.

Websites

Internet Public Library http://www.ipl.org/div/projectguide/
Are you looking for some help with a science fair project? If so, then you have come to the right place. The IPL will guide you to a variety of web site resources, leading you through the necessary steps to successfully complete a science experiment.

Discovery.com: Science Fair Central http://school.discoveryeducation.com/sciencefaircentral/
"Creative investigations into the real world." This site provides a complete guide to science fair projects. Check out the 'Handbook' which features information from Janice VanCleave, a popular author who provides everything you need to know for success. You can even send her a question about your project.

Science Fair Idea Exchange http://scienceclub.org/scifair.html
This site has lists of science fair project ideas and a chance to share your ideas with others on the web!

Try Science http://tryscience.com/
Science resource for home that gives you labs to try and 400 helpful links all related to science.

The Yuckiest Site in the Internet http://yucky.discovery.com/flash/
Brought to you by Discovery Kids, this site gives you lots of ideas on how to do the messiest yuckiest experiments.

The Gateway to Educational Materials provides an extensive and detailed step-by-step guide to doing a science fair project.

Science Fair Primer http://users.rcn.com/tedrowan/primer.html
A site to help students get started and run a science fair project.

The State of South Carolina publishes a K-12 science fair guidebook. It can be viewed using Adobe Acrobat Reader.

Science Buddies http://www.sciencebuddies.org/
This site has it all! Find a project idea by doing a short survey. They also have a project guide that breaks down the steps for a successful science fair project.

Neuroscience for Kids: Successful Science Fair Projects http://faculty.washington.edu/chudler/affair.html
Site made by Lynne Bleeker a former science teacher, science fair organizer, and judge. She gives a thorough and detailed description of the steps to a successful science fair project.

Science Fair Sanity http://www.sciencefairsanity.com/home/sci/listitems_9_0
Contains Free Downloadable Science Fair Projects. Examples: “Video Games with a Beat,” “Flowering Bulbs,” and “50% More Absorbent.”