How to do a Science Fair Project (Mrs. Seager style)

1) **Investigative Question** (aka: topic)

   a) All science fair projects must be based on an experiment that has **measurable** results. Your child may be interested in a topic that is very difficult or impossible to measure – such as the effect of a person’s mood on their ability to take a test. How do you measure a person’s mood? A questionnaire could be created, but this is still fairly subjective. There are many resources and ideas on this website to help your child design a science fair project.

   b) Choose a project that has an **independent and dependent variable**. The independent variable is what will be manipulated (ex: the amount of air pressure in a soccer ball, the design of a paper airplane). The dependent variable is what happens (how far does the soccer ball travel, how long does the paper airplane stay in the air). Measurable, dependent variables are related to distance, speed, time, height, number, size, and weight.

   c) Choose **only one** independent and dependent variable. An experiment that tries to test for how air pressure affects how high a basketball can bounce, along with the size of the ball, along with how you shoot the ball is actually 3 separate experiments and cannot be completed in that way. Choose **one independent variable** and measure the resulting dependent variable.

1.5) **Introduction**

   This section is the part that should "grab" the reader and make them want to read more about your topic. The "Introduction" should be a simple paragraph that states what the project is all about. Remember, the whole idea behind doing a science fair project is to learn and practice the **scientific method**! Make sure you explain how you are using the scientific method to solve a problem. Imagine this is a book you wrote and this is your opportunity to "sell" the book to someone who is interested in it.

2) **Background Research**

   a) **Background research should relate to your experiment**. If your child is experimenting with soccer balls and pressure, then the background research should be on soccer balls, air pressure, force (action and reaction), what makes a ball bounce, etc. Please see the attachment for research recommendations relating to other projects.

   b) What do I search for? Start by looking up all the **nouns and/or verbs** in the investigative question.

      **Example:** Does the air pressure in a bicycle tire affect the distance it can travel?

      The nouns: air pressure, bicycle/tires    The verbs: distance, travel

   c) Look up all the scientific principles associated with the topic:
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Example: Motion - Newton’s Laws of Motion

Gravity - the force that pulls the bike down the hill

Energy - potential & kinetic energy, elastic potential energy

d) Find and take notes on all the important information about your topic. Using the example from above, you would need to write all about motion, gravity, energy and all other topics that may have to do with that project.

e) Summarize all the notes you took by writing one FULL page of background research, in your own words. This means write an essay in typical paragraph form using the facts you gathered earlier.

3) The Experiment

a) The experiment must be repeated at least 5 times for each variation of the independent variable. For example, if you are testing the air pressure of a soccer ball, pick 3 different pressures and test each of them at least 5 times (we call them trials) to determine how high the ball bounces. If you are testing the design of a paper airplane, you would make three different types of airplanes and throw them each at least five times (but the more trials you do, the better). Don’t forget to take pictures and record observations in addition to measurements during each trial! This will make your job a lot easier when it is time to write your conclusion, and future research sections, not to mention create a beautiful backboard display.

b) The experiment must be controlled for everything. If you are testing the air pressure of a soccer ball and how that might affect how high it bounces, every other factor must be the same. You must control the way it is dropped so that it is done the same way each time. You must control for the soccer ball by using the same soccer ball each time. You must measure and manipulate the air pressure inside that ball with the same air pressure gauge. You must conduct the experiment under the same conditions every time: same wind, same ground surface (grass, asphalt, concrete). In other words, if you are testing a particular air pressure and how high a soccer ball can bounce, then there should be no wind during the test – wind direction and speed could make the experiment invalid – since another variable has been added to the mix. The only things that have changed are the 3 different air pressures that you are testing.

4) Data Tables & Graphs

Example Data Table:

<table>
<thead>
<tr>
<th>Trial #</th>
<th>6 p.s.i.</th>
<th>8 p.s.i.</th>
<th>10 p.s.i.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 ft</td>
<td>5ft 8in</td>
<td>6ft</td>
</tr>
<tr>
<td>2</td>
<td>5ft 2in</td>
<td>5ft 9in</td>
<td>6ft</td>
</tr>
<tr>
<td>3</td>
<td>5ft 1in</td>
<td>5ft 7in</td>
<td>6ft 1in</td>
</tr>
<tr>
<td>4</td>
<td>5ft 4in</td>
<td>5ft 9in</td>
<td>6ft</td>
</tr>
<tr>
<td>5</td>
<td>5ft 3in</td>
<td>5ft 6in</td>
<td>5ft 11in</td>
</tr>
</tbody>
</table>

Totals: 25ft 10in  28ft 3in  30ft

Averages: 5ft 3in  5ft 7in  6ft
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***Most projects call for a bar graph, but a line graph should be used to show changes over time check: [http://nces.ed.gov/nceskids/createagraph/default.aspx](http://nces.ed.gov/nceskids/createagraph/default.aspx) for a "How to" for graph making.***

5) **Conclusion**

This is the finale of the project! The conclusion needs to answer the Investigative Question! The conclusion is the written explanation of everything that happened during the experiment. Explain if your hypothesis was correct or incorrect. Make sure you include data from the data table. Use background research to explain the science behind the results you got.

6 - 8) **Other Sections:**

**APPLICATIONS:** How does this project apply to your life or others?

**FUTURE RESEARCH:** What do you want to learn more about? What would you change about your experiment if you did it over again.

**ACKNOWLEDGEMENTS.** Explain who helped you and what they did - Your "Oscar Speech”

9. **Turn in Final Notebook**

The final notebook should be bound using something that will not fall apart. In my opinion, you have spent so much time and effort on this, you might as well respect that with a nice, presentable binding.

10. **Backboard**

The backboard is just an advertisement for the notebook. It should be neat, colorful, and include pictures, but it should not be the main focus of the entire project. The backboard is simply the notebook, reprinted, and displayed using color and pictures.
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Other things to consider

a) Experiments using human subjects under the age of 18 and/or animals must have a parent’s signature and teacher permission on special forms prior to beginning the tests.

b) Experiments using animals must meet certain standards before testing on "Fido" may begin. The animal must be checked by a veterinarian and the experiment must be approved by the vet and me.

c) Plants are very difficult to use for a science fair experiment. I am not saying you can’t use them, but sometimes they don’t grow for unknown reasons, and sometimes they die for unknown reasons. Needless to say, watching plants grow is not very exciting!

Please don’t hesitate to email me (Mrs. Seager) with questions.

I can help you figure out how to measure or quantify your results. Grids are helpful for counting molds and bacteria. If you need petri dishes for growing bacteria, or any other scientific supplies check out: www.enasco.com/science/
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Lastly, if this all sounds overwhelming and complicated, it’s because I just condensed over two months of instruction onto one sheet of paper. Just e-mail me, we can meet after school and I will simplify it for you. If you are still reading this at this point, thank you, and I’m sure your child will do great. I am providing this information to hopefully reduce stress.

**Students who stay on schedule (see attachment) and use our class time effectively won’t become overwhelmed.**

**Students who choose a question they are truly interested in, will find this a wonderful learning experience which will be fun!**