

# BFCCPS

# Science Fair Packet

# 8th Grade

# 2015-2016



Name \_\_\_\_\_

Section \_\_\_\_\_

## Welcome Page

Hello 8th grade scientist and welcome to your official science fair packet!

In this packet you will find all of the necessary deadlines and important information to make your science fair project a success!

Please see the following pages for the overview and science fair timeline for each science fair project pathway (Pathway 1 and Pathway 2.)

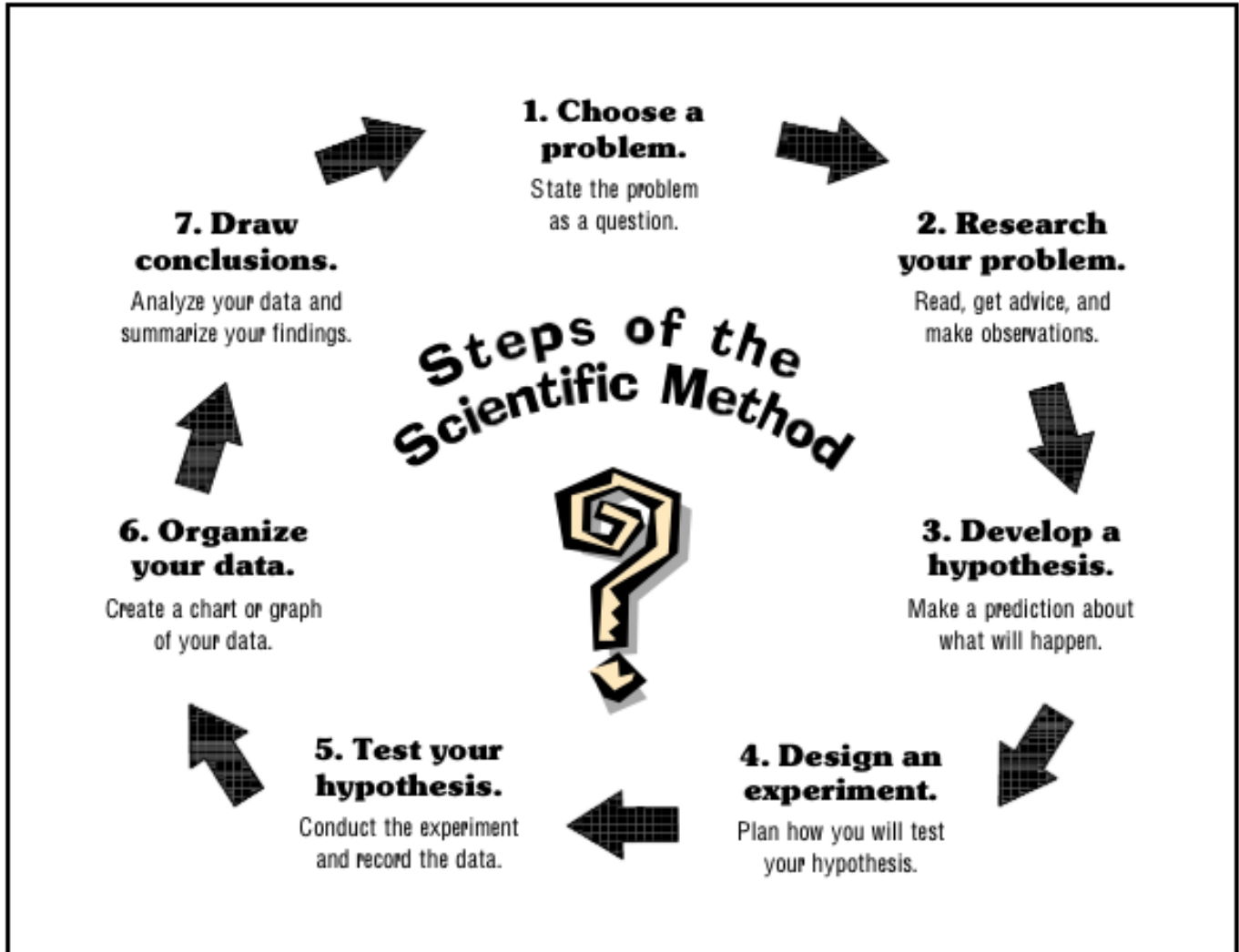
I did my best to match up deadlines for each pathway to keep things simple. However, students following Pathway 2 may need additional time with Ms. H. after school to help clarify parts of the engineering design process and receive extra assistance. Pathway 2 may take extra commitment from the scientist.

Students who want to follow Pathway 2 will also need special approval from Ms. H. prior to the start of their project.

**Also, if you have been approved to test human subjects or your project requires an adult supervisor, you must also submit all necessary paperwork by November 17th!**

Please see Ms. H. with any questions. Best wishes and good luck!  
HAVE FUN!

# Pathway 1: The Scientific Process



# Science-Fair Timeline and Checklist: Pathway 1

Assignment	Draft Due	✓	Final Draft Due	✓	Possible Points	Points Earned
<b>1.) Brainstorm at least two project ideas in bound (composition) notebook:</b> Use the internet, books, and other library resources. You could also visit museums, colleges, talk to a local expert, and so on for project ideas. Keep bibliographic notes on all sources in notebook.	October 15/16		N/A		10	
<b>2.) Investigative (experimental) question (final draft)</b>	Oct 22/23		N/A		10	
<b>3.) Bibliography</b> (correctly formatted) with 4 potential <b>reliable</b> sources for your research section	Oct 29 / 30		Nov. 19/20 (with research section)		10	
<b>4.) Research Organizers (4-6)</b> Glued into science fair notebook!	Nov 12/13		N/A		20	
<b><u>FORM DEADLINE:</u></b>  <b>PLEASE NOTE-</b> anyone using human test subjects or requiring an adult supervisor- <b>MUST HAVE ALL NECESSARY FORMS COMPLETED BY NOVEMBER 17TH</b>	Nov 17		N/A			
<b>5.) Background Research Section and Bibliography</b> (5 paragraphs with 4 sources in bibliography)	Nov 19/20		Jan. 21		20	
<b>6.) Lab Report Sections:</b> investigative question, purpose, general knowledge, hypothesis, and variables	Dec 3/4		Jan. 21		20	
<b>7.) Material List and Procedure (first draft)</b> sections of lab report.	Dec 10/11		Jan. 21		20	

Assignment	Draft Due	✓	Final Draft Due	✓	Possible Points	Points Earned
<b>8.) Regional Science Fair Forms</b>	Dec 10/11		N/A		10	
<b>9.) Receive final approval</b> of your project from Ms. H. (meet with Ms. H. as needed)	Dec 17 / 18		N/A		10	
<b>10.) Begin Experiment- observations of experiment and record data</b> in notebook (if approved by Ms. H.)	Dec. 17 to Jan. 17		N/A		10	
<b>10.) Material List and Procedure</b>	Jan. 19		Jan. 21/22		10	
<b>11.) Data Table</b>	Jan. 19		Jan. 21/22		10	
<b>12.) Graph</b>	Jan. 19		Jan. 21/22		10	
<b>13.) Peer Editing- Conclusion</b>	Jan. 19/20		Jan. 21/22		10	
<b>14.) Conclusion Final Draft</b>	N/A		Jan. 21/22		10	
<b>15.) Peer Editing- Final Draft of Lab Report (including bibliography)</b>	N/A		Jan. 21/22		30	
<b>16.) Peer Editing- Project Notebook</b>	Jan. 21/22		TBD		30	
<b>17.) Display Board, Oral Report, Lab Report, Notebook and Presentation</b>  Bring project display board, oral report, notebook, and lab report to class	N/A		TBD		100	
<b>18.) Peer Review of projects</b>	N/A		TBD		100	

Assignment	Draft Due	✓	Final Draft Due	✓	Possible Points	Points Earned
20.) BFCCPS Science Fair!  (please wear professional dress)	N/A		TBD		Exam Grade	

Project Requirements: Pathway 1			
Requirement	Description	Due Date	Grade Weight
Science Fair Board Presentation	A tri-fold display board that graphically displays all steps of the scientific or engineering design process.	TBD	Exam Grade
Lab Report	The final lab report is a complete description of your project written for a general audience. It will be written with proper scientific formatting and includes a works cited page.	TBD	TBD
Lab Notebook	The lab notebook includes your data and observations from your experiment. Each entry includes the date and time. Measurements use the metric system.	TBD	Part of Presentation Exam Grade
Oral Presentation	A verbal presentation that explains and interprets your display.	TBD	Part of Presentation Exam Grade

## Steps to the Scientific Method:

(Taken from <http://www.masscifair.com>)

A good science-fair project question is testable and measurable. For example: Which brand of bubble gum keeps its flavor longest? You can test this by chewing different brands of gum and measuring how long the flavor lasts for each brand. The best questions are usually ones that you have a genuine interest in answering.

### **Identify the variables and controls:**

A science-fair project involves *variables*, or things that change or could be changed. There are three types of variables: **independent, dependent, and standardizing variables.**

An **independent variable** is one that you change on purpose. For instance, if you were experimenting to find out how much water a sunflower plant requires for optimum growth, you would water four plants a different amount of additional water.

The **dependent variable**, or the factor that is measured as a response to the independent variable, would be the height of the sunflower plant.

You'll also want to identify your constants, or things that will stay unchanged, also known as **standardizing variables**. For instance, you would want to use the same soil, climate, type of water, type of plant, location, etc.

Lastly, you want to include a **control group**, or the "normal" or baseline of the experiment that is used for comparison. Most experiments have a control group, such as the sunflower plant that does not receive any extra water.

### **Research your topic to learn more about it:**

Research comes in many forms. You can research a topic by going to the library, performing internet research, interviewing a scientist, or even speaking with experts at museums, zoos, hospitals, and so on. For our example, you might interview a spokesperson or scientist from a bubble gum company.

### **Develop a hypothesis, or a possible answer to your question:**

Your hypothesis should be based on your research. It is important to remember that it is okay if your hypothesis turns out to be wrong. You can learn a lot from any hypothesis- whether it is right or wrong. Your science fair project will help you test your hypothesis.

Your hypothesis or prediction might look something like this:

If I provide extra water to a sunflower plant, then it will reach a greater height.

You should try to set up the hypothesis in a If\_\_\_\_\_, then\_\_\_\_\_ statement.

### **Design an experiment that will help you answer your research question:**

Come up with an experiment procedure. This list of steps should be detailed enough so that anyone could read it and repeat the experiment exactly as you performed it.

You will want to run several trials. That means that you'll want to repeat your experiment several times. The more times you repeat the experiment, the more reliable your results will be. Record your experiment results in a journal. The more notes you take, the easier it will be to type up your report. Also, take photos to document your work as you go.

### **Draw conclusions from your results and type up a report that explains your project, results, and conclusions:**

The report should be typed or written neatly and include neat and colorful charts and graphs.

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# Writing a Lab Report:

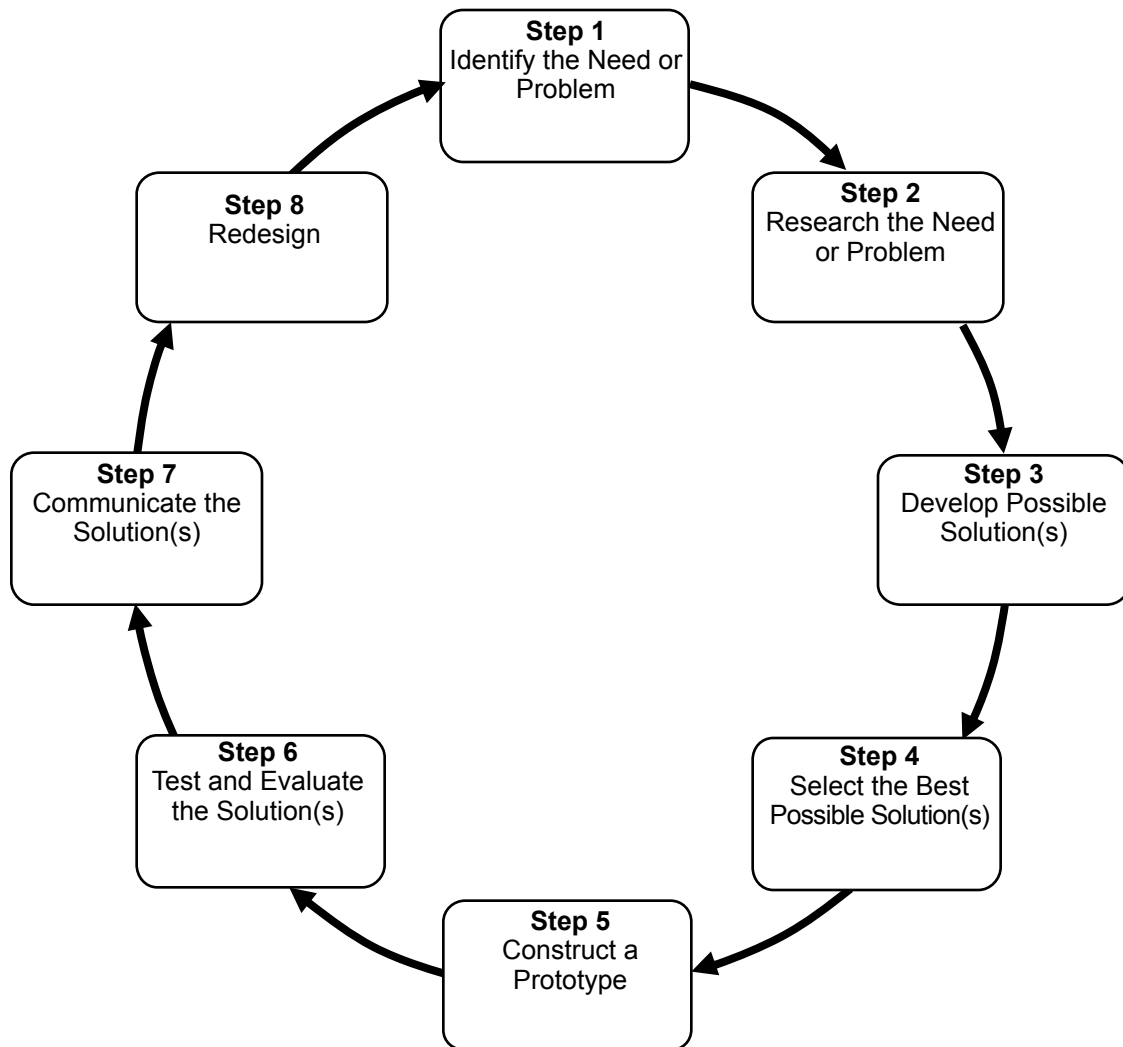
(Taken from <http://www.masscifair.com>)

Your science-fair lab report should contain the following:

- 1. A title page.** This page is your report's cover. It should contain a snappy title that reflects the subject matter of your project. This text should be centered in the middle of the page. You should also include on the lower right hand corner your name, date, teachers name, section number
- 2. A table of contents.** The table of contents lists every major section of your report. It should include the page on which each of the major sections can be found.
- 3. A statement of purpose.** The purpose should clearly explain the goal of your project.
- 4. A statement of hypothesis.** Your hypothesis should be a possible answer to your research question based on the background research that you performed.
- 5. An experiment section.** The experiment section of your report should clearly outline your purpose, your variables and controls, your full materials list, your procedures, and your data collection methods. Remember: Your procedure is a detailed list of the steps that you performed throughout your experiment. A well-written procedure is so detailed that anyone who reads your steps should be able to follow them and perform the experiment exactly as you did it.
- 6. A data section.** The data section of your report should show all of the data that you gathered during your experiment in an organized way All of your data should appear in colorful, neatly labeled tables, graphs, and charts.
- 7. A conclusions section.** The conclusions section of your report summarized what you discovered based on your experiment results. It should restate your hypothesis and tell whether or not your data supports it. This is also a good place to write any questions that arose from your experimentation and any project extensions that you would like to do in the future. You should keep your conclusion to one page.
- 8. A works cited page or bibliography.** A bibliography or works cited page is a complete list of sources that you used during your research.



# Pathway 2: The Engineering Design Process



# Science-Fair Timeline and Checklist: Pathway 2

Assignment	Draft Due	✓	Final Draft Due	✓	Possible Points	Points Earned
<b>1.) Brainstorm at least two project needs or problems in bound (composition) notebook:</b> Use the internet, books, and other library resources. You could also visit museums, colleges, talk to a local expert, and so on for project ideas. Keep bibliographic notes on all sources in notebook.	Oct. 15/16		Oct. 15/16		10	
<b>2.) Step One: Official Problem Statement Final Draft</b>	Oct. 22/23		Oct. 22/23		10	
<b>3.) Bibliography</b> (correctly formatted) with 4 potential <b>reliable</b> sources for your research section	Oct. 29/30		Oct. 29/30		10	
<b>4.) 4-5 Research Organizers: glued into notebook!</b>	Nov. 12/13		N/A		20	
<b><u>FORM DEADLINE:</u></b>  <b>PLEASE NOTE-</b> Anyone using human test subjects or requiring adult supervision- <b>MUST HAVE ALL NECESSARY FORMS COMPLETED BY NOVEMBER 17TH</b>	Nov. 17		N/A			
<b>5.) Background Research Section and Bibliography</b> (5 paragraphs with 4 sources in bibliography)	Nov. 19/20		Jan. 21/22			
<b>6.) Design report introduction:</b> Steps 1-3 (stay tuned for info about 3-D CAD program and due date)	Dec. 3/4		Jan. 21/22		20	
<b>7.) Procedure for building and testing your product:</b> Steps 4-5 (purchase or order any needed materials asap)!	Dec. 10/11		Jan. 21/22			

Assignment	Draft Due	✓	Final Draft Due	✓	Possible Points	Points Earned
<b>8.) Regional Science Fair Forms</b>	Dec. 10/11		N/A			
<b>9.) Receive final approval</b> of your project from Ms. H. (meet with Ms. H. as needed)  *Have parent signature sheet filled out and signed. *Complete personal goal calendar.	Dec. 17/18		N/A		10	
<b>10.)</b> <b>a.) Build Prototype: observations of design process and record data</b> in notebook (if approved by Ms. H.)  <b>b.) Step 6: Test and Evaluate the Solution (redesign as needed)</b> a.) develop and write procedure for testing in notebook b.) test the product and record data in table in notebook	Dec. 17 to Jan. 17		N/A		20	
<b>11.) Peer Editing- Steps 6 and 8</b>	Jan. 19/20		Jan. 21/22			
<b>12.) Finish design report:</b>  a.) type testing procedure b.) include data in table and/or graph c.) write Step 8: Redesign	N/A		Jan. 21/22		20	
<b>13.) Peer Editing- Final Draft of Design Report (including bibliography)</b>	N/A		Jan. 21/22		10	
<b>14.) Peer Editing- Project Notebook</b>	Jan. 21/22		TBD			

Assignment	Draft Due	✓	Final Draft Due	✓	Possible Points	Points Earned
<p><b>15.) Step 7: Communicate the Solution (Display Board)</b></p> <p>Bring display board, notebook, advertisement, sketch, oral presentation, and design report to school</p> <p>a.) Design tri-fold display board b.) Use EDP as template c.) create advertisement</p>	N/A		TBD		20	
<p><b>16.) Peer Review of Projects</b></p>	N/A		TBD		100	
<p><b>17.) BFCCPS Science Fair!</b></p> <p>(please wear professional dress)</p>	N/A		TBD		Exam Grade	

## Project Requirements: Pathway 2

Requirement	Description	Final Draft Due Date	Grade Weight
<b>Design Report</b>	The final design report is a complete description of your project written for a general audience. It will be written with proper scientific formatting and works cited page. It also includes the research paper completed prior to our brainstorming sessions.		TBD
<b>Science Fair Board Presentation</b>	A tri-fold display board that graphically displays all steps of the engineering design process.		Exam Grade for Board Presentation
<b>Prototype</b>	Functional prototype is on view at the fair (if able to easily transport).		Part of Board Presentation Exam Grade
<b>Advertisement</b>	An advertisement to promote your final product. Further details of the advertisement are forthcoming.		Part of Board Presentation Exam Grade
<b>3-D Blueprint or Sketch</b>	Create an orthographic sketch or use Google SketchUp (or similar program) to complete a 3-D blueprint of your product. Further info to be provided in class.		Part of Board Presentation Exam Grade
<b>Notebook</b>	The lab notebook includes your data and observations from your design process. Each entry includes the date and time and uses ink. Measurements use the metric system.		Part of Board Presentation Exam Grade
<b>Oral Presentation</b>	A verbal presentation that explains and interprets your display.		Part of Board Presentation Exam Grade

## **Pathway 2: Engineering Design Process:**

Step 1: Identify the need or problem

- a. Explain a need or problem that you would like to address with a new product.

Step 2: Research the need or problem

- a. Write a 375-500 word research paper on your chosen problem (i.e. its scope, costs, consequences, history, etc.).
- b. Write a Works Cited page that cites at least three sources in MLA format.

Step 3: Develop possible solutions

- a. Brainstorm three general possible solutions to the problem.

Step 4: Select the best possible solution(s)

- a. Name your product.
- b. Why did you choose the solution that you did? What made it “better” than the other two?
- c. What materials will you use to make your product? What properties (e.g. strength, flexibility, transparency, etc.) of these materials make them well-suited for the use you have in mind?
- d. What tools will you use to build your product? What properties of these tools make them well-suited for the use you have in mind? What safety precautions must you take while using each tool?
- e. Use a CAD program like Google SketchUp to draw a 3-D plan of your product.

Step 5: Construct a prototype

- a. Write a procedure for building your product.
- b. Build a prototype of your project

Step 6: Test and evaluate the solution

- a. Develop and write a procedure for testing the effectiveness of your product.
- b. Test the product using your procedure and record your data using an organized table.
- c. Draw conclusions about effectiveness of your product based upon the results of your testing.

Step 7: Communicate the solution(s)

- a. Design a poster that charts the development of your product through an engineering design process flowchart. The title of your poster should be your product name.

Step 8: Redesign

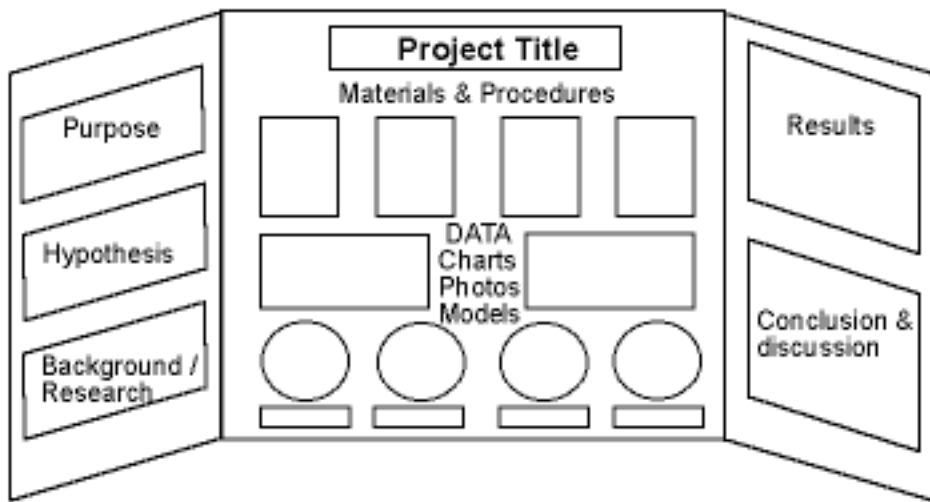
- a. How would you improve your project based on your testing? If your testing allowed you to conclude that your product was effective, how would you improve your product if you had more time, money, and access to better resources?

# Display Board:

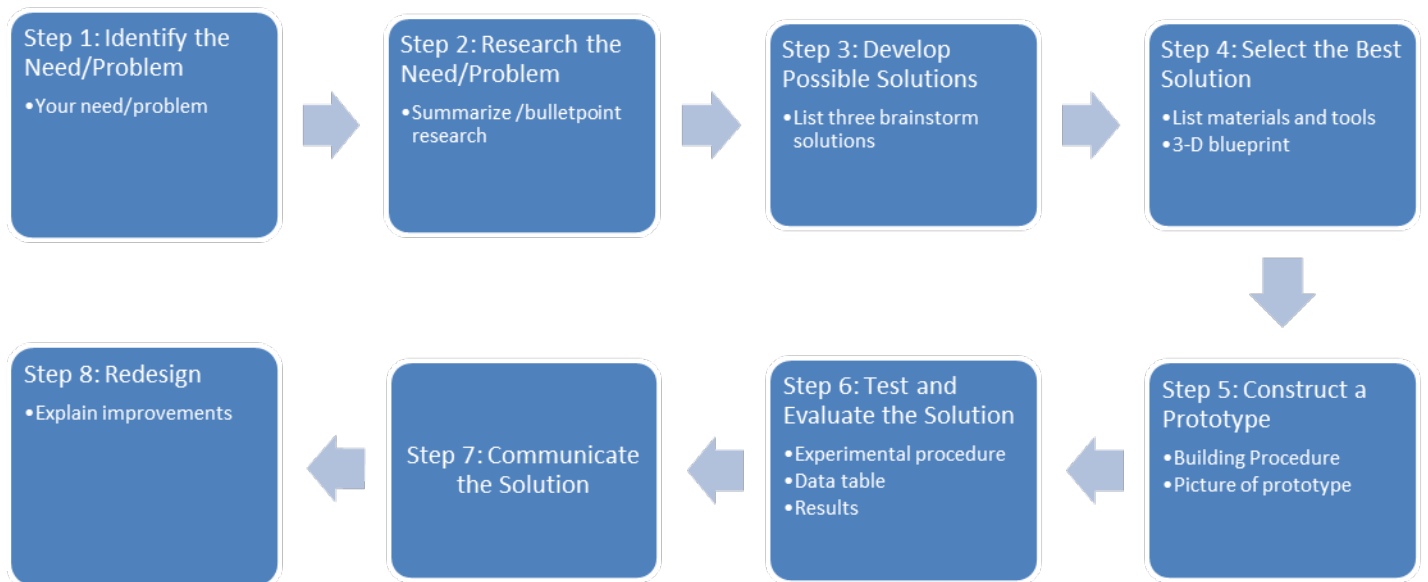
(Taken from <http://www.massscifair.com>)

This is how your display will look when you bring it in for the annual BFCCPS Science Fair!

## Pathway 1



## Pathway 2





## **Oral Report:**

Complete and write out answers on index cards! Practice!

(Taken from <http://www.masscifair.com>)

An exciting part of any science fair is the interview. During this question and answer session, a judge will ask you all about your project. It is important to practice your interviewing skills so that you can impress the judges!

Questions you should answer in your oral report!

1. What is your project about?
2. Why did you choose this project?
3. How did you come up with the idea for your project? Mention your general knowledge here as well.
4. What was the purpose of your experiment or design? Mention your hypothesis and background research here as well.
5. Did your experiment or design answer the main questions or solve the problem that you had before you began your project?
6. What was your experimental procedure or design process/testing procedure? You must mention your variables and controls as well.
7. How did you gather data? This is your data collection methods.
8. Can you explain the data that you gathered? What does your data tell you?
9. What conclusions have you drawn from your project? Re-state your hypothesis.
10. What new questions arose from your project? How could you extend your project to answer them?
11. What is the real-world application of your project? How can it be used in the real-world?

