

# New Haven Public Schools Science Fair Planning Guide

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# District Science Fair Timeline Invention Convention and Science Projects

**Purpose: To Involve all schools in a District Science Fair - Dates: May 20, 21, 22**

## **May 20 – Projects dropped off**

Projects dropped off by Schools/Teachers – 9:00 AM – 4:00 PM

Preliminary Judging Starts - 4:30 PM - 8:00 PM

## **May 21 – Student Day**

Judging with Students - 9:30-12:15 PM

Public Viewing – 1:00 PM – 7:00 PM

Judging Decisions to Mr. McCain by 4:00 PM

## **May 22 – Awards Night**

Project pick-up - 4:00 PM - 9:00 PM - Remind that all projects will be throw away if not picked up

PreK-5 Awards Ceremony *Auditorium, Hillhouse High* - 6:30 PM- 7:30 PM

Grades 6-12 Awards Ceremony *Auditorium, Hillhouse High* - 7:30 PM -8:30 PM

## **Timeline:**

Anytime	Deadline to hold school-based Science Fairs/Invention Conventions	If you need help, reach out to Bob
February 16	Request a Mentor – Sign Up	<a href="https://forms.gle/sKVNzPujswdiGhUdA">https://forms.gle/sKVNzPujswdiGhUdA</a>
February 16	Schools to Sign Up	<a href="https://forms.gle/Wq7LjFssv6Gdnose8">https://forms.gle/Wq7LjFssv6Gdnose8</a>
February 16	Judges List Begins	Committee will do
February 16	Marketing Plan	Committee will do
By March 22	Project Board request for Schools	<a href="https://forms.gle/3k6MGCREUvJutUve6">https://forms.gle/3k6MGCREUvJutUve6</a>
March 22	Order tables and chairs/Trophies/Medals	Committee will do
March 22	Planning for Food	Committee will do
April 22	Register Students for the New Haven City Fair - student name and project name	<a href="https://forms.gle/pIVXiAjTskFVPTsPA">https://forms.gle/pIVXiAjTskFVPTsPA</a>
May 3	Submission for materials reimbursements	Submit approved materials to Bob McCain
May 3	Bus schedules finalized	Bob will send out



# Types of Science Projects:

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

## 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".



COOL!!! DO THIS

## An Experiment:

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

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

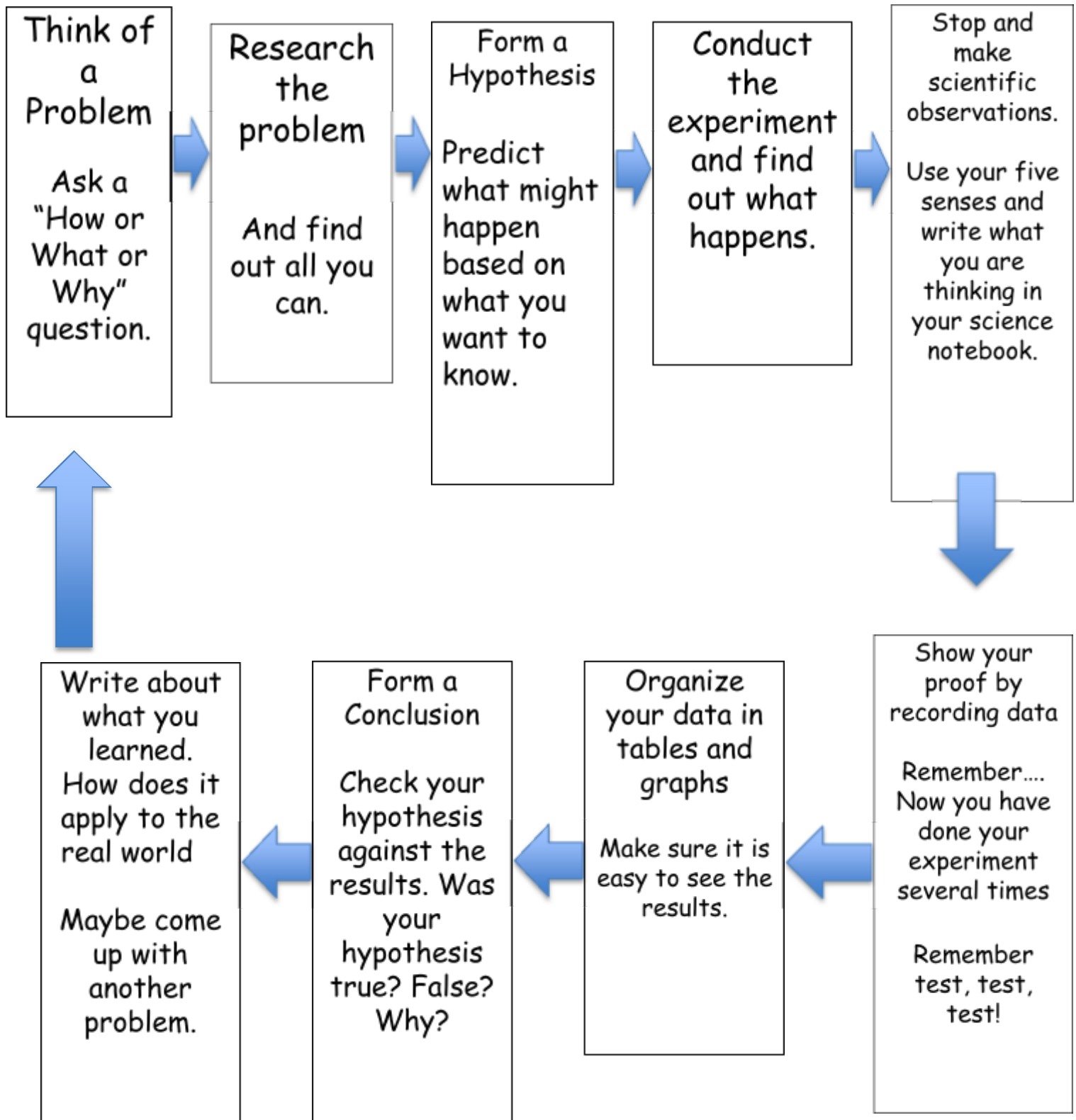
You can tell you have an experiment if you are testing something several times and changing a variable to see what will happen. We'll talk about variables later...



So What Types of Project Should I Do?

Even though you can learn a lot from building a model or display, we recommend that you do an Experiment or Investigation!!! 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.

# What is the Scientific Method???







# Step #1: Coming up with a good 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 the problem of your topic. To give you an idea of what we mean you can start off by filling in the question blanks:

## *The effect Question:*

What is the effect of \_\_\_\_\_ on \_\_\_\_\_?

\*Examples:

sunlight  
plant eye color  
brands of soda  
temperature  
oil

the growth of  
pupil dilation  
a piece of meat  
the size of a balloon  
a ramp



## *The how does affect question:*

How does the \_\_\_\_\_ affect \_\_\_\_\_?

\*Examples:

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) \_\_\_\_\_?

\*Examples

paper towel  
foods  
detergent

is  
do  
makes

most absorbent  
meal worms prefer  
the most bubbles

## *Engineering or Technology Question:*

What interests me \_\_\_\_\_ (noun) \_\_\_\_\_?

\* Example: How can I make it work (faster or better, at a lower cost or in a new way)

**Create your Science fair question using one of the three options above!**



## Step #2: Doing the Research and forming a Hypothesis...

You have picked your category and you have chosen a topic. You also wrote a question and now its time to do some **RESEARCH!!!!** You will do so much that you will become an expert at your topic just like real scientist do in real labs.

*How do you become an expert?*



### You READ!!!!

It is important that you read about your topic. You can read encyclopedias, magazines articles and books from the library. Also, read articles from the Internet. Don't forget to take notes of any new things you learn including words so you can use them. It will make you sound like a real scientist!! Keep track of all the books and articles you read, you will need them later.

### You DISCUSS!!



It is important to talk about your topic with your parents, teachers, and experts in the field like veterans, doctors, weathermen or others who work in the things you are studying. Sometimes websites will give you an email addresses to experts who can answer questions... **But don't forget to ask an adult to supervise** before you write to anyone on the Internet. Also, take pictures of any interviews you do with people.

*Finally...*

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

*Form a HYPOTHESIS...*

Now it is time to predict what you think will happen if you test your problem... This type of "Educated Guess" or PREDICTION is what real scientist calls a HYPOTHESIS. This will have you thinking like scientist.

How do you begin? Well, just answer the following question...

*What do you think will happen? (Before you start your experiment)*

**Example of problem:** Which paper towel is more absorbent?

**Example of Hypothesis:** I think Brand X will be more absorbent because it's a more popular brand. It is thicker and the people I 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 their predictions.)

## Now it's your turn:

Write down the problem and form your Hypothesis based on your research.

**Problem:** \_\_\_\_\_

**Research:** My problem is about this subject: \_\_\_\_\_

(Sample topics could be magnetism, electricity, buoyancy, absorbency, taste, plant growth, simple machines, building and testing a contraption, creating a set of instructions for a computer or robot that can be tested, 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 . . .)

**Books I found in the library on my topic are:**

Title:

Author:

**Internet sites that I found on my topic are:**

**People I talked to about my topic are:**

**Some important points that I learned about my topic are:**

\*

\_\_\_\_\_

\*

\_\_\_\_\_

\*

\_\_\_\_\_

\*

\_\_\_\_\_

**Hypothesis:** I think that

\_\_\_\_\_

(will happen) because ( my research shows . . . )

### Step 3: 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 great because you get to use your imagination to come up with a test for your problem, and most of all, you get to prove (or disprove) your Hypothesis. **Now Science Fair Rules state that you cannot perform your experiment live, so you'll have to take plenty of pictures as you go through these seven very simple steps.**

**First: 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 board display.

**Second: 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 if it's 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 yourself.

**Third: Identify your variables:** The variables are any factors that can change in an experiment. Remember that when you are testing your experiment you should only **test one variable at a time** in order to get accurate results. In other words, if you want to test the affect that water has on plant growth, then all the plants you test should be in the same conditions, these are called **controlled variables**: same type of dirt, same type of plant, same type of location, same amount of sunlight, etc. The only variable you would change from plant to plant would be the amount of water it received. This is called the **independent or manipulated variable**. The independent variable is the factor you are testing. The results of the test that you do are called the **dependent or responding variables**. The responding variable is what happens as a result of your test. 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 it.

**Fourth: TEST, TEST, TEST:** Remember that the judges expect your results 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 five times or more. More is better! Don't forget to take pictures of the science project being done and the results.

Observation is a **very important part of this step!** Remember to use your five senses to gather information as you conduct your investigation. Then record the information in careful detail. Don't forget to record everything! See Science Journal below.

**Fifth: Collect your DATA:** This means write down or record the results of the experiment every time you test it. Be sure to organize it in a way that it is easy to read the results. 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. (And, don't forget, it impresses the judges when you use them.) But don't make a graph or table because we asked you to, use it to benefit your project and to help you make sense of the results. There is nothing worse than having graphs and tables that have nothing to do with answering the question of a science projec

**Sixth: Write a conclusion:** Tell us what happened. Was your hypothesis right, wrong, or neither? Would you change anything about the experiment or are you curious about something else now that you've completed your experiment? TELL WHAT YOU LEARNED FROM DOING THIS.

**Seventh: UNDERSTAND ITS APPLICATION.** Write about how this experiment can be used in real life. How will this help in the future? Why was it important to know about this?

## Hold on...How do you collect Data?

### Science Journal:

Is a type of science diary that you can keep, especially if your experiment is taking place over a long period of time (should be a week or more).

- Observations
- Collect research
- Draw/diagram pictures
- Question

### Tools:

Make sure you have the things you need to take accurate measurements. Metric is the recommended standard of measurement in science. (meters, liters, Celsius, grams, etc.)

- Rulers
- Meter tapes
- Thermometers,
- Graduated cylinders
- Measuring cup

### Tables, Charts and Diagrams:

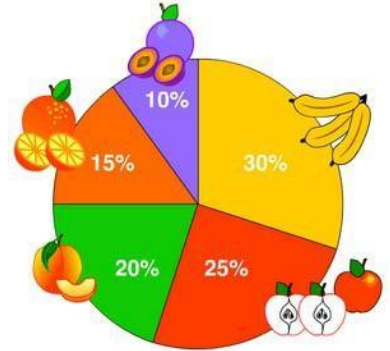
The way a scientist keeps track of experiment trials.

- At least 5 trials
- Organized in columns and rows
- Must use labels or headings
- Shows Independent variable (what was tested)
- Responding variable (result)

# Types of Graphs to Use to Display Your Data:

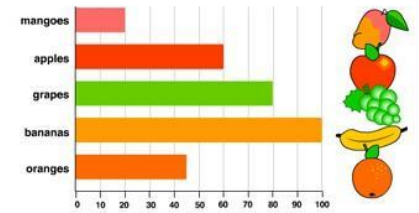
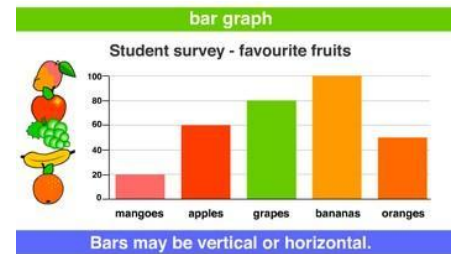
## Pie Graph

- Percentages of groups
- Pieces add up to 100
- Great for surveys



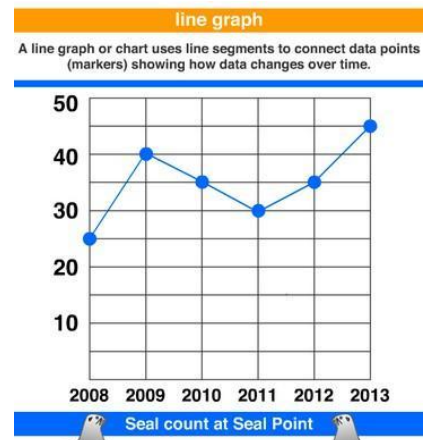
## Bar Graphs:

- Comparing amounts
- Results at a glance
- X axis (Horizontal)
- Y axis (Vertical)



## Line Graph

### Shows change over



## ***Now It's Your Turn!***

### **Materials:**

List the materials that you will need for your science experiment here:  
(TAKE PICTURES!)

- |          |           |
|----------|-----------|
| 1. _____ | 6. _____  |
| 2. _____ | 7. _____  |
| 3. _____ | 8. _____  |
| 4. _____ | 9. _____  |
| 5. _____ | 10. _____ |

### **Variables:**

List the variables that you will control, the variable that you will change and the variables that will be the results of you experiment:

My controlled variables are (the things that will always stay the same):

---

My independent variable is (the things(s) that change(s) from one experiment to the next; or what you are testing):

---

My responding variables might be (the results of the experiment):

---

**Procedure:**

List the steps that you have to do in order to perform the experiments here  
(Don't forget to take pictures at each step):

1<sup>st</sup>. \_\_\_\_\_

\_\_\_\_\_

2<sup>nd</sup>. \_\_\_\_\_

\_\_\_\_\_

3<sup>rd</sup>. \_\_\_\_\_

\_\_\_\_\_

4<sup>th</sup>. \_\_\_\_\_

\_\_\_\_\_

5<sup>th</sup>. \_\_\_\_\_

\_\_\_\_\_

**Design a table or chart here to collect your information**

(Don't forget pictures!)

Use graph paper if you need to make a graph of your results from your table.



**Conclusion:**

- What did you learn?
- Did it work? Why or why not?
- Did you confirm your hypothesis?
- What did the results tell you?
- What did you prove?

Sometimes not being able to prove a hypothesis is important because you still proved something.

**Application:**

How does this apply to real life?

It is important to know about this experiment because...

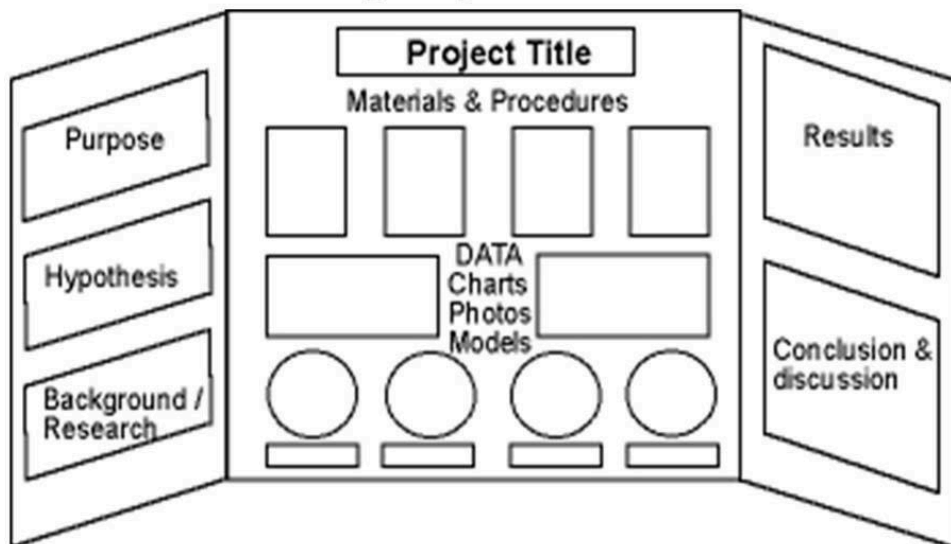
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**Science Board must be 48" by 36"**

# Display Board



**Arrange information so that it is easy to read and flows in a logical order.**

**Top to bottom and left to right.**

Display Secrets:


- Type information or use best writing
  - Use glue sticks or spray ad
- o Use readable fonts (no more than two)
- Place information colored paper to make it stand out

## *Presenting your Project*

RELAX, SMILE AND HAVE FUN! Remember you are the expert and you had fun doing the project. Dress nice that day, be polite and speak clearly and you will show the judges that you have confidence. Don't forget to look them in the eyes; they are very interested in what you have to say. Remember practicing helps a lot.

What are the judges looking for?

What should you do the day of the science fair?

Clearly stated title, purpose and a reasonable hypothesis	Introduce yourself, point out the title of the display and tell the judge why you chose to study this. State your problem (your question) and tell them about your hypotheses (what you thought might happen).
Abstract	Talk about what you learned while researching your topic
3 or more resources	Talk about the sources (books, websites and interviews) that helped you understand your topic (remember at least 3)
Thoroughly stated procedures and materials	Tell about your experiment, the steps you took to do it. Be sure to mention all the materials involved and point out all of those lovely pictures.
Clearly stated variables and controls	Point out the controlled, independent and responding variables to the experiment ( the things you kept the same, the thing you tested and the results)
Measurable data that includes 3 or more trials or when testing human subjects- 10 people or more	Hand a copy of your report to the judge so that they can review your data. Show them all of the graphic organizers you made, like your tables and charts. Remember to point out the labeled parts of your graph or tables to show that you know what it represents.
Effective analysis of data- clearly stated results using graphs and tables	Be sure and explain what your data means. Make sure you can read your graphs and tables. Let them know if were surprised by the results or if you knew what would happen because you studied it.
In- depth knowledge base of topic with use of related vocabulary at grade level	Make sure you sound like an expert at your topic. Always use academic vocabulary especially by using works from the Scientific method like: Problem, Hypothesis, Procedure, Variables, Results and Conclusion
Well elaborated conclusion based on results	Let the judge know if you were right about your hypothesis. What did you conclude about your problem to investigate based on what you have learned? The conclusion is all about what you learned from doing this.
How does this apply to real life?	Judges love this one, because it gives a real world purpose to your topic. It makes you sound like a real scientist - which you are! For example "my experiment about paper towel absorbency could help people save money by buying the right type of paper towels" see how useful that sounds?
Effective closure of presentation 	If you get nervous, lost or forget where you are, take a deep breath and look at your display and follow it piece by piece. It Is better to discuss everything than to forget to tell the judge something. When you are done, shake hands with the judge and thank them for their time, remember that they are volunteers who want you to do your best!!!

# Science Fair Project Evaluation (Grades PreK-4)

1 **Scientific Thought (30 Points): Is it a good scientific experiment?** *\*Assign up to 5 points per item*

1	Uses observation skills -seeing, hearing touching	
2.	Comparisons made. (sensory, linear, weight, capacity, quantity) (consider both qualitative and quantitative measurement)	
3.	Hypothesis shows cause and effect	
4.	Experiment well designed? (changes one thing at a time, controlled)	
5.	Data gathered and organized into a table or graph appropriate analysis	
6.	Conclusions supported by data, has science explanation	
<b>SECTION ONE TOTAL</b>		

2 **Creativity (15 Points): Is it a creative experiment?** *\*Assign up to 5 points per item*

1	Originality, uniqueness, use of materials	
2.	Poses an interesting question	
3.	Creative applications to everyday life	
<b>SECTION TWO TOTAL</b>		

3 **Display and Components (25 Points): Is it presented well?** *\*Assign up to 5 points per item*

1	Parts are complete (abstract, display, lab notebook)	
2.	Shows good workmanship, orderliness, neatness	
3.	Has good visuals: drawings and photos.	
4.	Shows evidence of outside research	
5.	Experiment procedure clear and understandable	
<b>SECTION THREE TOTAL</b>		

4 **Student Oral Presentation (30 Points): Is it explained well?** *\*Assign up to 5 points per item*

1	Project within student's level of understanding	
2.	Student understands science of project	
3.	Student can explain why it is a good experiment	
4.	Oral presentation is in a logical order	
5.	Student can explain research behind project, scientific explanation	
6.	Student can explain importance, connections to real life	
<b>SECTION FOUR TOTAL</b>		

\* Please assign a value from 1 (lowest) to 5 (highest) for each item

**GRAND TOTAL:**

*Out of 100 possible points*

# Science Fair Project Evaluation (Grades 5-12)

**1 Scientific Thought (30 Points):**      **Is it a good scientific experiment?**      *\*Assign up to 5 points per item*

1	Purpose of project and hypothesis clearly stated, identifies independent/dependent variables (cause and effect)	
2.	Experiment well designed (changes one variable at a time, constant variables, control group)	
3.	Procedure, including materials, explained and repeatable	
4.	Data gathered and organized into a table or graph, appropriate analysis.	
5.	Conclusions supported by data, science explanation directly related to hypothesis and discuss validity	
6.	Discussion shows implications for future study	
<b>SECTION ONE TOTAL</b>		

**2 Creativity/Skill (15 Points):**      **Is it a creative/skillful experiment?**      *\*Assign up to 5 points per item*

1	Originality, uniqueness, use of materials	
2.	Measurements and data in data table and graph format, with appropriate mathematical analysis	
3.	Real world implications showing creative applications to everyday life.	
<b>SECTION TWO TOTAL</b>		

**3 Display and Components (25 Points):**      **Is it presented well?**      *\*Assign up to 5 points per item*

1	Parts are complete (abstract, display, lab notebook, research paper/report)	
2.	Lab notebook clearly lists dates and discusses pre-experiment work and shows all experimental data	
3.	Display is well organized, neat, legible, and understandable	
4.	Research paper discusses outside research, with appropriate bibliography	
5.	Experiment procedure clear and understandable, has good visuals: drawings and photos	
<b>SECTION THREE TOTAL</b>		

**4 Student Oral Presentation (30 Points):**      **Is it explained well?**      *\*Assign up to 5 points per item*

1	Project within student's level of understanding, appropriate level of difficulty	
2.	Student understands science of project, can provide logical solutions to "what if" questions related to project	
3.	Student can explain why it is a valid experiment, explain conclusions in relationship to independent and dependent variables, science explanation.	
4.	Student has logical order and structure to oral presentation	
5.	Student can explain research behind project, originality of idea and experiment	
6.	Student can explain importance, connections to real life, and implications for society	
<b>SECTION FOUR TOTAL</b>		

\* Please assign a value from 1 (lowest) to 5 (highest) for each item

**GRANDTOTAL (    )**

*Out of 100 possible points*

# Engineering/Invention Project Evaluation (all Grades)

**1 Invention Process (30 Points):**      **Is it a good engineering design process?**      *\*Assign up to 5 points per item*

1.	<u>Identifying and understanding stage (Part 1)</u> : Evidence that the student sought out a <b>problem</b> to solve and identified who or what experiences the problem	
2.	<u>Identifying and understanding stage (Part 2)</u> : Evidence that the student researched any <b>existing solutions</b> to the problem	
3.	<u>Ideating stage</u> : Student brainstormed to generate original ideas and developed their solution idea according to specific needs (based on the problem)	
4.	<u>Designing and building stage</u> : A visualization (2D drawing or 3D prototype) was constructed for all or part of the invention, and the purpose(s) of each part of the invention is described	
5.	<u>Testing and refining stage (Part 1)</u> : The prototype or part of it (or invention concept if no 3D model is created) was <b>tested</b>	
6.	<u>Testing and refining stage (Part 2)</u> : The prototype or part of it (or invention concept if no 3D model is created) was <b>improved</b> upon based on experimental testing or other means	
<b>SECTION ONE TOTAL</b>		

**2 Invention Impact (15 Points):**      **Does the invention have market potential and value?**      *\*Assign up to 5 points per item*

1.	<u>Market potential</u> : Refers to the scope and likelihood the invention gains users considering how large/viable the potential market is with evidence of market research	
2.	<u>Value proposition &amp; social value</u> : Summary of why the consumer/user should buy or use the invention based on how it (better) solves a problem; how the invention addresses environmental, societal, or other impacts and minimizes adverse effects	
3.	<u>Originality</u> : Invention is unique, novel, or creative and distinguishable from prior inventions	
<b>SECTION TWO TOTAL</b>		

**3 Display and Components (25 Points):**      **Is it presented well?**      *\*Assign up to 5 points per item*

1	Parts are complete (abstract, display, lab notebook/Invention Log, research paper/report)	
2.	Invention Log documents each stage of the engineering design process.	
3.	Display is well organized, neat, legible, and understandable	
4.	Shows evidence of outside research ( <b>*If Gr. 5-12:</b> Research paper/report summarizes process and relevant outside research, with appropriate bibliography)	
5.	Good and clear visuals (e.g., drawings, photos, 3D model)	
<b>SECTION THREE TOTAL</b>		

**4 Student Oral Presentation (30 Points):**      **Is it explained well?**      *\*Assign up to 5 points per item*

1	Project is within student's level of understanding and at appropriate level of difficulty	
2.	Student understands each stage of the project; if student is older, can provide logical answers to questions raised about parts of the project/invention	
3.	Can explain why the project is a valid use of the engineering design process, stages proceeding from prior stages	
4.	Oral presentation has a logical order and structure	
5.	Student can explain research behind the invention and its originality	
6.	Student can explain its implications or potential for impact and social value	
<b>SECTION FOUR TOTAL</b>		

**GRANDTOTAL:**



## **Abstract Guidelines**

*This is a short version of your research report. It should be about 250 words, fit on one page, and contain a short summary of the following eight items:*

1. **Question or purpose:** What was your question or why did you conduct this experiment.
2. **Research:** one sentence about your main research selection.
3. **Hypothesis:** what is your educational guess about how you experiment will turn out.
4. **Materials:** brief list of materials used in your experiment.
5. **Methods/Procedure:** about two sentences on how you conducted your experiment.
6. **Observations/Results:** a short summary (2-4 sentences) about what you observed in your experiment and what happened at the end.
7. **Analysis:** explanation of how you thought about what happened during your experiment.
8. **Conclusion:** a one sentences summary of what happened in your experiment.

*\*If the Abstract is typed, be sure to double space. If it is handwritten, please skip lines. Please keep it one sided only.*

# High School Research Paper Guidelines

**Content:** *Your abstract is a summary, an overview of your project, but your Research Paper will go into more detail about your research project. Your research paper should include eight paragraphs, which will be about 2-3 pages, including the bibliography, and have the following information:*

1. **Question/Purpose:** Why did you do your project? What was the question you wanted to answer? What was the problem you tried to solve?
2. **Research:** Briefly explain your research plan. How did you gain information about your project? Who did you talk with? Who helped you find other ways to look for information? What did you find that you did not use in your project and why? This section explains all the work you did to learn more about your topic?
3. **Hypothesis:** This is a “best guess” explanation of what your experiment would prove. Explain why you formed the hypothesis.
4. **Methods/Procedure:** What did you “do” in your experiment? For example, I placed two jars of water in the freezer.
5. **Materials:** A list of what you used in your experiment. You may want to describe anything unique or different about the materials you used, or explain why you used these materials
6. **Experiment:** Mention the goal and outcome of any experiments. Did they prove or disapprove your hypothesis?
7. **Observations & Results:** What were the most important facts learned for the project? List how many times you conducted your experiment. What did you discover when you conducted each experiment. You might want to refer or re-read your science notebook to write this part of your paper. Make sure you include what worked and what did not work. Sometimes the most important part of an experiment is what you did that worked.
8. **Conclusion:** What did your result mean? Could you compare the result to anything else you know? Do your results give you any ideas for the future research?

*\*Grammar, Spelling, and Style: Have someone check your spelling and grammar. If your paper is handwritten, be extra neat. Be sure your thoughts are clear. Please see the details for all the above items in the definitions section.*

# Scientific Method

## Definitions and Requirements

This is the method, or steps scientist follow to answer a question. All steps required!

1. Form a Question/ Find a Problem:
2. Conduct Research:
3. Develop a Hypothesis:
4. Gather and list Materials:
5. Use a specific Method/Procedure to test the hypothesis:
6. Record Observations and Results:
7. Analyze the Results:
8. Accept or reject the hypothesis in a written sentence.

# **Science Fair Vocabulary**

## **Variables:**

Variables are conditions that change. You must discuss any variables that affect or could affect the results of your investigation. Scientists use variables on purpose to see if they can change the results. For example, if I am trying to grow carrots in 90 days, I might try watering some carrot seeds once a week, while watering other carrots seeds 3 times per week so that I can observe and record which works best. The amount of water is the variable. Other variables are changes that you did not expect, for example the weather. You would need to record the changes in the weather, because they affect your investigation.

## **Observations:**

Scientific observation has two parts:  
First, use your five senses to gather information as you conduct your investigation;  
Second, record that information in careful detail.

## **Journal/ Science Notebook:**

A binder, spiral notebook or composition book where you record every aspect of your investigation. Your journal is where you record everything listed on these pages. You can also record your thinking, new questions that come up, and problems that you have. You should date every entry. Enter data neatly and label everything, so that it is readable when you need to create charts, tables or graphs for your display/ presentation.

## **Results:**

The detailed information you record as you observe during your experiment or investigation in the form of data, photos, drawings, recordings, etc. In your display, your data must be presented in a way that helps the reader understand how your results prove or disprove your hypothesis. Sometimes a chart is adequate, but often a graph helps the reader understand faster. What you use depends on the type of investigation you conducted.

**Analysis:**

An analysis is a paragraph in your display, which explains the results of your investigation in detail. It includes a discussion of how the variables influenced the results.

**Conclusion:**

A Conclusion is a paragraph in your display in which you interpret, or explain your results as they relate to your hypothesis. Did your investigation prove or disprove your hypothesis? Do you think you need to conduct more experiments to find out? Do you need to change your investigation in some way to get the results you were hoping for? What new questions popped into your head during this investigation? What can you infer from your investigation?

**Display:**

It is the visual presentation of your investigation. Your presentation should display what you did for each step of the Scientific Method during your investigation. Your display should make sense and relate directly to your hypothesis. You should follow accepted rules for writing such as correct capitalization, punctuation and grammar.

**Written Report:**

(Required for 5<sup>th</sup> grade, optional for 3<sup>rd</sup> and 4<sup>th</sup> grade) 1 to 2 pages reviewing what you learned from the research you did before you began your investigation and summarizing each step of the Scientific Method for your investigation. Also it can include other information, such as why you chose your question, difficulties you had, changes you made or might make next time, such as using different variables, and whether you think your investigation was useful. You need to edit your report for correct capitalization, punctuation and grammar.

**Bibliography:**

(Required for 5<sup>th</sup> grade) Fifth graders must include a third page at the end of their written report on which they list their sources for their research. Sources must be listed alphabetically according to the author or experts' last name, and include the title, full website or "Interview", and the copyright, website use date, or interview date.

## **Student Interview:**

A judge will ask each student questions about their investigation. If you put off doing your investigation until the last days before they are due, you may have a difficult time during your interview. If you have taken the time to research your question and follow each step of the Scientific Method, you will be well prepared and confident. You will enjoy talking with the judge.

## **Originality:**

An investigation might be judged unique if you investigate a common problem from an uncommon point of view, if you come up with an unusual solution that works, or if your hypothesis addresses an important question most people don't think about.

## **Safety**

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.

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