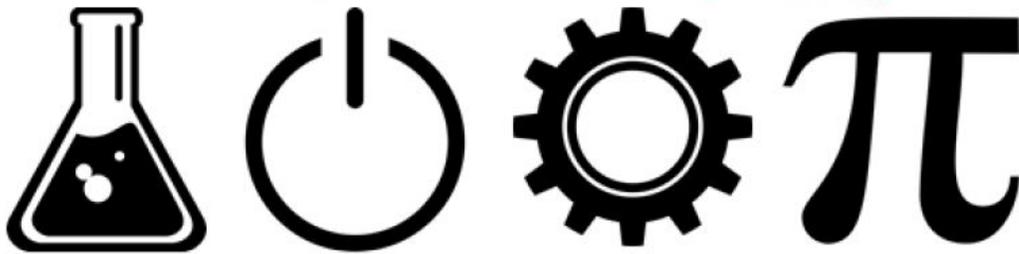


FOREST HEIGHTS  
**STEM**  
ACADEMY



**Elementary STEM Fair  
Information Packet  
2019-2020**

**Name:** \_\_\_\_\_

**Teacher:** \_\_\_\_\_

**Grade:** \_\_\_\_\_

## **PURPOSE**

This guide is designed to help you while working on your project at home. This guide along with your teacher's guidance, parent's support, and your hard work will help you successfully complete a STEM fair project.

## **HOW TO HELP AS A PARENT**

Developing a STEM investigation will provide students the opportunity to use knowledge and skills just as scientists and engineers do in the real world. This project is designed for students to communicate information correctly, write clearly, collect and interpret data, use evidence to justify their thinking, manage time, and ask "WHY" leading to the development of an experiment or designing a solution/innovation.

While we recognize that younger students will need some assistance in developing their ideas and supervision as they do their experiments, 95% of the work is to be done by the students. This packet is provided to help students and parents understand the process students are to follow in preparation for the science fair.

It is up to the student to decide what to study. You can help by motivating your child and listening to his or her ideas. However, it is critical that you remember it is up to your child to design and execute the entire project. You may find it helpful to do some research outside of school. Expect your child to spend time brainstorming, researching, planning, experimenting, analyzing data, writing a report, and constructing a display. You can also encourage your child to record everything in his or her science fair log notebook (composition notebook). Notes from brainstorming, sources from research, notes, and observations made during data collection should all be added to the notebook. Please supervise the experimental phase for safety purposes. Remember this project is a learning experience for your child!

## RULES AND RESTRICTIONS

1. Your brainstorming, notes, daily log, summary, and any other research/data for your project have to be in a composition notebook. NO LOOSE PAPERS will be accepted!
2. Take pictures to show the parts of your project and experiment. Pictures may be glued on your board and/or put in your binder with your log and summary.
3. Objects and pieces of your experiment will NOT be permitted to be shown with your project or glued to the board (per county regulations).
4. You may paint/decorate your board, but please remember that no three-dimensional objects are allowed on the board.
5. ALL measurements have to be in METRIC UNITS!
6. Projects involving mold are not permitted.
7. Daily notes need to be recorded in your science fair log notebook. Think of this as a science fair “diary or journal”. You are responsible for daily entries. Please note that some projects can be tested and retested several times in one or two days. The term “daily” log may not mean many days. However, your log should include details of what you did to research and all parts of the science fair process

## Checkpoint Dates

Date	Student Tasks	Teacher Tasks
<b>Oct. 1</b>	Packets taken home and read	Pass out packets & answer questions
<b>Oct. 7</b>	Have 3 topics chosen	Approve students’ topics
<b>Oct 8-18</b>	Begin collecting background info on your topic	Check in with students regarding their research
<b>Oct 21-24</b>	Work on hypothesis, materials, procedure	Approve H, M, & P
<b>Oct 24-31</b>	Once approved begin experimentation	Check students’ log books for experimentation info
<b>Oct 29</b>	HELP Session, 2:25-3:30, room 330	
<b>Nov 1-11</b>	Complete experiment, collect, and analyze data	Provide info into data collection and analysis
<b>Nov 12-30</b>	Data analysis, typing of report & board components	Allow class time for questions, help, & typing as possible with class schedule
<b>Nov 19</b>	HELP Session, 2:25-3:30, room 330	
<b>Dec 2</b>	HELP Session, 2:25-3:30, room 330	
<b>Dec 13</b>	Final Report & Display Board Due	Collect Reports & Boards
<b>January TBA</b>	STEM Fair Judging & STEM Fair Awards*	

\*Please note the dates are subject to change based on the weather

Scientists study how nature works and engineers solve problems by creating new things such as products, websites, environments, or experiences. Scientists perform experiments using the **scientific method**. Engineers use the engineering design process.



## Categories

- |                                 |                               |
|---------------------------------|-------------------------------|
| 1. Animal Sciences/Zoology      | 7. Environmental Sciences     |
| 2. Behavioral & Social Sciences | 8. Food & Consumer Science    |
| 3. Chemistry                    | 9. Health & Medicine Sciences |
| 4. Earth & Planetary Sciences   | 10. Math & Computer Sciences  |
| 5. Energy & Transportation      | 11. Physics                   |
| 6. Engineering                  | 12. Plant Sciences            |

## DAILY LOG & OBSERVATIONS

Your Daily Log will be kept in a notebook and each part of your project will be recorded as though it were a “science fair diary”.

Your daily log should begin from the very 1<sup>st</sup> day of your project. It will include all of the information (question, title, materials, procedures, data tables, graphs, results, conclusion, and any pictures you want to include) from the beginning to the end of your project. Remember to date each entry. This part of the project should be several pages and include many details. It will be displayed in your three-ring binder with the final project, so be neat!

### Example:

- 10/20/07     *Today I thought of my Science Fair question. It is..... My title is.....*
- 10/21/07     *I went to the library and found some books on my topic. I've been thinking about my project and I learned a couple of interesting things.....*
- 10/26/07     *I came up with my hypothesis for my experiment. It is.....*
- 10/28/07     *The materials I need to begin my project include three Marigolds plants, 1000mL of soil, and 1000mL of tap water,.....*
- 11/2/07        *My procedures are as follows:*  
*Step 1: Gather materials – 3 Marigold plants, 1000mL soil, .....*  
*Step 2: Measure each plant in mm and record in the log.*
- 11/5/07        *Today I measured both the 3 plants growing on the window sill and the 3 plants growing in my closet. I noticed some interesting things....*

### **\*\* YOU ARE RESPONSIBLE FOR DAILY ENTRIES\*\***

**NOTE: SOME PROJECTS CAN BE TESTED AND RETESTED SEVERAL TIMES IN ONE OR TWO DAYS. THE TERM “DAILY” LOG MAY NOT MEAN MANY DAYS. HOWEVER, YOUR LOG SHOULD INCLUDE WHAT YOU DID TO RESEARCH AND ALL PARTS OF YOUR PROJECT IN DETAIL.**

# 1. TITLE & QUESTION

## 1. Guiding Question/Problem

State the **specific question** you are going to investigate or state the **specific problem** you are going to solve. Ask yourself: *What do I want to know? What problem am I trying to solve?*

**Engineering Projects:** What is the need or want that we are trying to fulfill? What will make the solution successful? What constraints will impact the solution?

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Why do you want to investigate this question or solve this problem? What is your purpose? What led you to wonder about this topic or attempt to solve this problem?

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### 3. Hypothesis

You will try to predict what might happen as a result of your investigation or design solution. Your hypothesis should be based on your previous knowledge and research you have already compiled. You must:

- Identify the subject(s) of the investigation
- State what is being measured
- State the variables/condition of the investigation
- State the results expected
- ***If I*** (tell what you are going to do or test in your project) ***then I think*** (what you think will happen) ***because*** (tell a reason you think this will happen based on your research).

**Example:** If I plant three marigold plants and water one with tap water, one with distilled water, and one with well water, **then** I think the one with well water will grow the most over a three-week time frame **because** of all the minerals in well water.

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**\*\*Your hypothesis does not change once it is made\*\***

## 4. Procedure

Think about:

- What will change or be affected as a result of your investigation?
- What variables do you need to control?
- How big should your sample size be?
- How will you measure your results? (This should be numbered in metric units-millimeters, centimeters, meters, etc.)
- How many times will you need to repeat the experiment to be sure the results are accurate?
- What materials will you need to gather?

### **4a. Independent Variable:**

Your experiment has one variable that you will change to see if it results from support or refute your hypothesis. *Example from marigold experiment- type of water is the IV.*

What is the one variable you will change during the experiment?

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### **4b. Controlled Variable(s):**

Which variables will you control or keep the same during the experiment? *Example from marigold experiment- amount of water given to each plant is the same. All plants are the same. Environment in which the plants are kept are the same.*

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### **4c. Dependent Variable:**

The dependent variable is the change that occurs as a result of doing the experiment. This variable is a measure of change. How will you measure the change? Remember your measurements must be in numbers that can be put into a graph? *Example from marigold experiment-I will measure the plant heights with a measuring tape each day. I will record this information into a table in my notebook.*

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**4d. Materials**

Include all the items you will use from home and items that you will need to purchase.

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What tool(s) will you need to measure the change of your experiment?

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**4e Sample Size:**

What will your sample size consist of? Example 3 plants x 3 experiments= 9 plants

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**4f. Repeated Investigation:**

How many times will you repeat the experiment for accuracy? Remember your experiment needs to be done at least 3 times.

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#### 4. Procedure

Use this space to create a FLOW MAP showing the step-by-step procedures that one would follow to complete this experiment. Think about how to best give the steps to someone who has never seen your experiment so that it could be easily repeated without questions. BE SPECIFIC AND DETAILED.

## 5. Plan for Data Collection

Collect and analyze your data:

- Keep a record of results in your daily log book.
- Decide how you will share your data (the type of graph), charts, or diagrams.
- Decide how often to collect data. (Remember to repeat at least 3 times).
- Keep a record of any changes that you needed to make due to problems that may have occurred with the experiment.

5. How will you collect your data?

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2. How often will you collect your data?

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3. How will you share your data on your display board?

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4. What type of graph is best for your information? (Bar, Line, Pie) Use this link to help create a digital graph.

<http://nces.ed.gov/nceskids/createagraph/default.aspx>

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5. What other type of visual aids will you use to help others see the process of your experiment?

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## 6. Claim and Evidence



Interpret results and make a claim.

- Data collected and observations are used as evidence to make a claim or answer your question.
- A claim is a deduction, pattern, or finding as a result of completing the experiment.

The evidence is what supports the claim.

- State why the data counts as evidence to support the claim.

1. Claim: I claim...

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2. Evidence: I know this because...

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3. Reasoning: Why did this happen?

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## 7. CONCLUSION & WRITTEN RESULTS

1. What was learned from the evidence? ( a summary statement)

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2. Does your conclusion agree with your hypothesis?

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If so, explain how it does.

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If not, how are they different?

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## **8. REFLECTION**

1. What does your investigation leave you wondering?

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2. What are the two questions you have now that you might like to investigate?

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## BIBLIOGRAPHY

This is an alphabetical listing of all books, articles, people, interviews, websites, etc. used as resources during the investigation. Take note of the formats for each specific source below (ALL punctuation is an important part of the bibliography!)

Use this site for citations: [www.easybib.com](http://www.easybib.com)

## SCIENCE FAIR FINAL REPORT CHECKLIST

Your teacher will provide a digital outline of the report. Use this checklist to ensure you have all the required components.

### What Makes a Good Science Fair Project Final Report

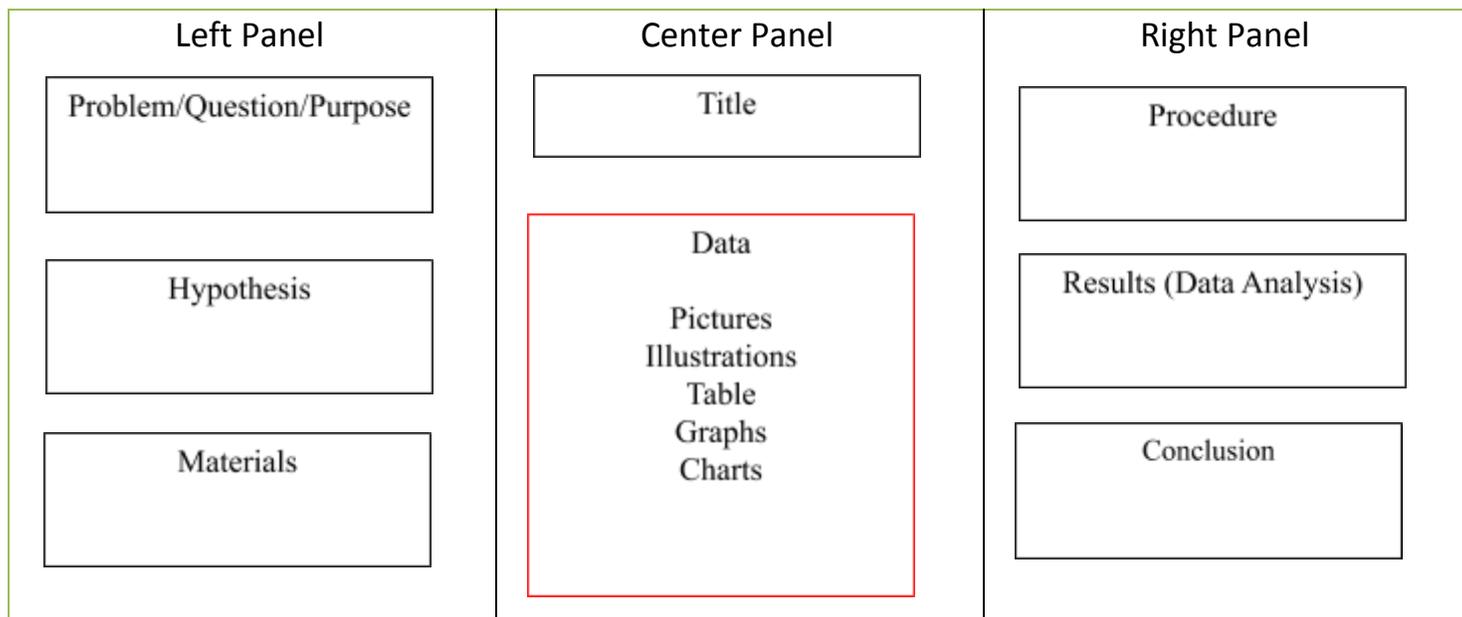
Does your abstract include a short summary of the hypothesis, materials & procedures, results, and conclusion? If you did an engineering or programming project, did you state whether you met your design criteria?

Does your final report include:

- Title page.
- Table of contents.
- Question, variables, and hypothesis.
- Background research (your Research Paper).
- Materials list.
- Experimental procedure.
- Data analysis and discussion (including data table and graph(s)).
- Conclusions.
- Ideas for future research (for some fairs only).
- Acknowledgments.
- Bibliography.

## SCIENCE FAIR DISPLAY BOARD

The science fair display is a visual way to communicate to others what you have learned from the investigation. The display should be neat, attractive, easy-to-read, colorful, and arranged in an orderly manner.



- ✓ Each section needs to be included on the display board in the designated location as shown above.
- ✓ Use headings to label each section.
- ✓ Use a legible font. NO SCRIPT (*Science, science, science, SCIENCE*)
- ✓ The font should be large enough to read from a distance of 6 feet.
- ✓ All sections of the board must be typed.
- ✓ Add a border or colored paper behind the printed information.
- ✓ Place your name, category, teacher's name, & grade level on the board. Any photographs showing faces of students must be covered. This can be done with a simple sticker.

Science Fair Board Rubric		
Exceeding	Ready	Close
Science fair board is very neat and attractive. All required components are present in the correct location.	Science fair board is somewhat neat. All required components are viable.	Science fair board is not neat. Or student is missing required components.

## Topics to Avoid

<b>Topics to Avoid</b>	<b>Why</b>
Any topic that boils down to a simple preference or taste comparison. For example, “Which tastes better: Coke or Pepsi?”	Such experiments don’t involve the kinds of numerical measurements we want in a science fair project. They are more of a survey.
Most consumer product testing of the “Which is best?” type. This includes comparisons of popcorn, bubble gum, make-up, detergents, and paper towels.	These projects only have scientific validity if the investigator fully understands the science behind why the product works and applies that understanding to the experiment.
Any topic that requires people to recall things they did in the past.	The data tends to be unreliable.
Effect of colored light on plants.	Several people do this project at almost every science fair. You can be more creative!
Effect of running, music, video games, or almost anything on blood pressure.	The result is either obvious or difficult to measure with proper controls.
Effect of color on memory, emotion, mood, taste, strength, etc.	Highly subjective and difficult to measure.
Any topic that requires dangerous, hard to find, expensive, or illegal materials.	We care about your safety and your parents’ pocketbook.
Any topic that requires measurements that will be extremely difficult to make or repeat, given your equipment.	Without measurement, you can’t do science.
Graphology or handwriting analysis	Questionable scientific validity.
Astrology or ESP	No scientific validity.
Which material will melt ice the fastest?	Hmm...
What happens if I don’t water a plant?	It will die
Which solution cleans a penny the best?	Best is not a numerical measurement. Also, you can be more creative.
Which toothpaste whitens the stained egg?	Several people do this project at almost every science fair. Be more creative!

## RESOURCES

<https://student.societyforscience.org/resources-0>

The Kids' Guide to Science Projects <http://www.ipl.org/div/projectguide/>

Thinking Fountain <http://www.thinkingfountain.org/>

Graph Maker <https://nces.ed.gov/nceskids/createagraph/>

<http://www.accessexcellence.org/RC/scifair.html>

<https://www.sciencebuddies.org/>

<http://www.all-science-fair-projects.com/>

<https://www.sciencefaircentral.com/>

<http://www.bibme.org/>

## SCIENCE FAIR JUDGES SCORING SHEET

Science Fair Board Number \_\_\_\_\_ Category \_\_\_\_\_

Title: \_\_\_\_\_

Criteria	Exceeding	Ready	Close	Absent
Topic is original and/or creative.	10 9 8	7 6 5 4	3 2 1	0
Project demonstrates the use of the scientific method	10 9 8	7 6 5 4	3 2 1	0
Display includes all elements of the scientific method. (Title, question, hypothesis, materials, procedure, data, results, conclusion.	10 9 8	7 6 5 4	3 2 1	0
Quantifiable data is presented in an organized manner.	10 9 8	7 6 5 4	3 2 1	0
Conclusion is supported by data.	10 9 8	7 6 5 4	3 2 1	0
Display board is free of spelling, punctuation, and grammar mistakes.	10 9 8	7 6 5 4	3 2 1	0
Display is visually appealing and neat.	10 9 8	7 6 5 4	3 2 1	0
Book entries are dates, legible, and organized.	10 9 8	7 6 5 4	3 2 1	0
Report shows evidence of experimentation and analysis.	10 9 8	7 6 5 4	3 2 1	0

Judge # \_\_\_\_\_

Total Points: \_\_\_\_\_

Comments: