

**Elite Scholars Academy**

 **STEM Fair 2018-2019**

Greetings, Parents and Students,

It’s already time to begin your 2018-2019 STEM fair project! Enclosed is a schedule outlining due dates and other important information and documents that will be helpful in completing this project. We are beginning early this school year so that students have ample time to complete the work at a comfortable pace.

Developing a S.T.E.M (Science, Technology, Engineering, and Mathematics) Fair investigation will provide students the opportunity to use science knowledge and skills just as scientists, engineers and mathematicians do in the real world. The STEM Fair will provide opportunities to engage in connecting these college, career, and life skills in many ways such as writing clearly, communicating information effectively, collecting and interpreting data, using evidence to justify their thinking, managing time, and providing opportunities to ask “why” leading to the development of an experiment or designing of a solution/innovation.

For more information, please contact your scholars’ science instructor.

Sincerely,

Dr. Spurley

Science Department Chair

# Question I am Answering OR Problem I am Trying to Solve

**STEP 1 –** Scientific Question OR Define the Engineering Problem

### Once a category has been chosen begin to think about what type of question you are going to answer OR type of problem you are going to solve.

Example(s):

* + *Science Question I am going to answer:* “Which brand of diaper is the most absorbent?” This is a good question which would allow students to go through the scientific process manipulating only one variable; the type of diaper.
	+ *Engineering Problem I am going to solve:* “How can I prevent children from getting into cabinets where there are chemicals? This problem would allow the student to design a solution and test its effectiveness.

### My question I am going to answer OR problem I am going to solve:

**Research to Help Support Your Investigation**

**STEP 2 –** Do Background Research

After choosing your investigation category and asking a question or defining the problem, it is important to complete some research to better understand what your investigation is about. How do you complete research? You need to read! The information you gather while completing your research will assist in developing your prediction, designing your experiment or prototype (if applicable), collecting data, drawing conclusions, and communicating like a real scientist or engineer. Make sure to include at least the title, author, and date published or accessed.

Books or Articles about my topic: Internet Websites about my topic:

People I talked to about my topic:

**STEP 3 –** Scientific Prediction (Identify Variables & Materials) OR Specify Engineering Requirements

The purpose of creating your prediction is to identify what you think will happen based on research that was collected. The prediction needs to be worded as an “If… then…because” statement explaining the cause and effect relationship that is being investigated. Evidence from your research needs to be used to support and justify your thinking.

* *Science question I am going to answer:* **If** I put 30mL of water in the Huggies diaper, **then** it will absorb the most water **because** Huggies diapers have an extra layer of polyfiber material.
* *Engineering problem I am trying to solve:* ***If*** *I create a cabinet lock,* ***then*** *kids won’t get into dangerous chemicals,*

***because*** *cabinets will be secured with my invention.*

If \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because . ***Variables:*** *A variable is a fancy word for things that you will be changing or keeping the same throughout your*

*investigation. There are 3 types of variables:*

* *Independent: This is the variable that will be changed in your investigation.*
* *Dependent: This is the measured variable that will show an effect in your investigation.*
* *Constants: These are all the things that will be kept the same throughout your investigation to make sure it is valid.*

***Example(s):***

*Question I am going to answer:* ***If*** *I put 30mL of water in the Huggies diaper,* ***then*** *it will absorb the most water*

***because*** *Huggies diapers have an extra layer of polyfiber material.*

* + *Independent variable: The different brands of diapers that are being tested (Huggies, Pampers, Luvs)*
	+ *Dependent variable: The amount of water absorbed (measured using mL) by each brand of diaper.*
	+ *Constant: temperature of the water, location in the diaper in which water is poured Problem I am trying to solve:* ***If*** *I create a cabinet lock,* ***then*** *kids won’t get into dangerous chemicals* ***because*** *the cabinets will be secure with my invention.*
* *Independent variable: Invention prototypes*
* *Dependent variable: Time it takes to open secure cabinet.*
* *Constant: cabinet door*

The **Independent (or manipulated) Variable** that I will change in my investigation will be:

The **Dependent (or measured) Variable** that will show an effect on my investigation will be:

The **Constant (or controlled) Variable** in my investigation are:

**Science Materials OR Engineering Materials:** What types of materials will be used to conduct your investigation? Make a list of them here using either words or pictures.


# Testing My Prediction

**STEP 4 –** Procedure OR Create Alternative Solutions. Choose the best one and develop it.

**Science Procedure/Engineering Design:** What steps will I use to carry out my investigation? It is very important that the steps in developing/designing your investigation are recorded precisely so another student can replicate the investigation. Are there safety concerns? In designing a solution, create alternatives and choose the best one to develop based on your criteria for success from Step 3 – Specify Requirements.

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If I am *answering a question* do I need to draw a picture of how I will set up my experiment? If I am *solving a problem,* a labeled diagram of the proposed solution needs to be sketched here.


# Do the Experiment OR Build a Prototype

**STEP 5 –** Test your Prediction by doing the experiment OR Build a Prototype

Do the experiment! This is like a recipe; step by step instructions for what you will do to test your prediction. It should be so thorough that even a person, who knows nothing about science, could duplicate the experiment.

# Scientific Data and Results

**STEP 6 –** Analyze your results and draw Conclusions OR Test and redesign

When conducting your investigation it is important to collect data (information) to help either prove or disprove your prediction. When you are collecting data please make sure to be as precise as possible in using labels, dates, and even pictures. Once you finish collecting your data it is important to record your data/results into a table and then organize it into a chart or graph to easily communicate your findings. Please use additional pages or a journal to record your data and organize it into charts, tables, and graphs.

# Conclusion

**STEP 7 –** Communicate Results

During your investigation you have learned many new things including whether or not you were able to prove or disprove your hypothesis. Your conclusion should be a summary of your results and state whether or not your investigation supported your hypothesis. Use the questions below to help guide you in sharing what you learned.

* Did your results support your hypothesis? Identify and explain the types of data you used to prove or disprove your hypothesis.
* What did you learn from the trials you conducted in your investigation?
* What types of problems did you encounter throughout your investigation?
* If you conducted this investigation again, what would you do differently?
* How does your investigation make connections to real life?

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**\*Project Timeline**

**\*This is a suggested timeline. Please work with your teacher if your project requires more time at any of listed phases.**

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| **Assignment** | Assignment Description | **Due Date** |
| **Topic Selection:** | * The best topics/research questions stem from your experiences and interests.
* Come up with a few topics/interests and work with your teacher to refine your ideas.
 | July 30th-August 17th, 2018 |
| **Research Question(s):**  | * The specific question you will be investigating in the science research project.
 | August 20th, 2018 |
| **Research Plan & Annotated Bibliography:**  | * The Research Plan is a roadmap of the research questions that need to be answered. The Bibliography is a list of the sources that will be used to answer the research questions.
* **Source Requirement: at least 5 offline sources including one encyclopedia.**
 | September 3rd, 2018 |
| **Research Paper:** | * The purpose of the Research Paper is to provide information to help understand why the experiment turns out the way it does. It should include:
* The **history** of similar experiments or inventions.
* **Definitions** of all important words and concepts that describe the experiment.
* **Answers** to all the background research plan questions.
* **Mathematical formulas**, if any, that are needed to describe the results of the experiment.
 | September 21st, 2018 |
| **Variables and Hypothesis:** | * An explanation of which factors will be changed while conducting the experiment and a hypothesis on the resulting impact of the change.
 | September 21st, 2018 |
| **Materials and Procedures:**  | * A detailed list of the materials that will be used to conduct the experiment and the detailed steps that will be followed while conduct the experiment
 | September 21st, 2018 |
| **Conducting the Experiment:**  | * **Minimum Trials: 5 runs of experiment.** If students are working with plants, they should have 5 plants for each variable tested.
 | September 22nd-November 9th, 2018 |
| **Data Analysis and Graphs:**  | * The analysis of the experimental data. A summary of the findings of the experiment.
 | November 16th, 2018 |
| **Conclusions:** | * An explanation of the results of the experiment.
 | November 16th, 2018 |
| **Final Report and Classroom Science Fair PowerPoint:** | * A report that collects all the above written assignments in one place plus a short abstract of the project.
* You will use the template provided to summarize your research for the classroom science fair.
 | December 7th, 2018 |
| **Classroom Science Fair:** | * You will present your research in your science classes.
 | December 10th-14th, 2018 |
| **School Science Fair/ Visit the Fair::** | * Parents may visit the science fair at this date and time.
 | TBA |
| **District Science Fair:** |  | TBA, February, 2019 |