Introduction:

Working on and completing a science fair project does not have to be the mind numbing, stressful task that some students and parents perceive it to be. Science fair provides an opportunity for students to select a topic of interest and let their own curiosity motivate them to successful completion. In the following pages I have included some ideas and tips that can be taught to help students understand the process of using the scientific method to help solve a problem.

This year's science fair project is due on **Monday February 26, 2018**. Students will be assessed on their work during an in-class fair. From this point, students will be selected to move on to the school wide science fair, and potentially the AVRSB regional fair in April.

Proposal: Students should fill this out, providing a brief explanation as to what they will be doing as a project.

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Parent Signature Teacher Signature

Part A: Scientific Method

1. Purpose:

The purpose is the reason a study, experiment is being conducted. In younger grades, the purpose is commonly referred to as the 'question'. Throughout the science fair process it is important to refer back to the purpose as often as possible to ensure experimentation and research is on target.

Example: Steven was curious if the amount of sunlight affected how tall his bean plants grew.

Stevens purpose might be:

PURPOSE: To determine if the amount of sunlight affects how tall bean plants will grow.

2. Hypothesis:

The next step along the way would be to make an educated prediction as to what the results of experimentation will be. To validate a hypothesis, some initial research is recommended to help direct student predictions. The hypothesis should be written as a testable statement, (if...then… statements).

Example: Steven's hypothesis might look like this:

HYPOTHESIS: Based on the fact that plants require water for survival (James, 2012), it is believed that an increase in the amount of water added to a bean plant will also lead to an increase in the height that a bean plant will grow.

3. Experimentation:

Once a purpose has been identified, and an hypothesis made, it is time to devise a plan moving forward.

Experimentation involves three major aspects:

a. Identifying Variables
b. Gathering Materials
c. Creating a workable procedure.

When designing an experiment it is important that students produce something feasible. It is also important for the experimental design to be safe. All experiments should be approved by

the course instructor prior to a student beginning this phase. This allows for teacher feedback that should indicate any safety concerns as well as any possible changes that need to be made.

a. Identifying Variables

Variables are aspects of the experiment that will be measured. It is important for students to limit the number of variables they are testing. Successful experiments possess two main variables in addition to a control.

In the above example, we are comparing the amount of water and how it affects the growth of a plant.

Independent Variable: This is the variable that is controlled by the experimenter. In the example provided, the independent variable is the amount of water added to the bean plants.

Dependent Variable: This is the variable that 'depends' on the changes of the independent variable. It is the variable that the experimenter can't control. In the example above, the height of the plant is what 'depends' on the amount of water and can not be controlled by the experimenter.

Control: A control is often used to determine whether or not it is the independent variable that is causing the dependent variable to change. Example: Steven will have a sample that is not watered. If those bean plants grow tall, it can be determined that the water was not the source of the plant growth. This will force Steven to reevaluate his hypothesis and reinvestigate his purpose.

b. Materials

Generally this is a list of ALL materials required to complete this experiment. Do not include materials such as writing utensils and notebooks as these are not specific to the actual experiment itself.

Example:

Materials:

- ***25 small flower pots.***
- ***25 bean seeds***
- ***250 mL Measuring cup***
- ***Fresh water***
- ***2 Gallons of potting soil***
- ***Ruler***

c. Procedure

The procedure is basically the recipe for an experiment. It should be written in enough detail that it can be recreated by others in the future. Commonly, a procedure is written in paragraph form. For middle school, it is often easier to read and easier to follow if the student method is written in 'step-by-step' format.

Procedure:

1. Twenty-Five small flower pots were filled to ¾ capacity with potting soil.
2. One seed was placed on top of the soil and pressed down approximately one half inch and then covered with soil.
3. The flower pots were divided into five equal groups of five and each group was numbered off from one to five.
4. Plants were all placed on a table, each receiving the same amount of light.
5. Each day, water was added to each of groups one through four in the following amounts.
    a. Group One - 2 oz
    b. Group Two - 4 oz
    c. Group Three - 6 oz
    d. Group Four - 8 oz
6. Group five did not receive water. This group is the control group.
7. This process was recorded over the course of a twenty-one day period.
8. Each day, the height of each plant was recorded.

4. Observations and Results:

This is an important part of the scientific process. Often it is an area students struggle with. Practicing observation skills on a regular basis will help build student success when the time for their own analysis arrives. Observations can be both qualitative and quantitative. A descriptor of both has been identified below. This is the section of the scientific process where data is displayed in charts, tables, pictures and graphs.

Qualitative Observations: From the root word QUALITY, these observations are descriptive statements made using the five senses (touch, taste, smell, hear, see).

Examples:

- The beaker was hot to touch.
- The reaction gave off a smell much like rotten eggs.
- A yellow solid formed when the two liquids were mixed.

Quantitative Observations: From the root word QUANTITY, these observations are measurable and generally include description using numbers.

Examples:

- The boy is 153 inches tall.
- The mass of the rock was 1.3 pounds.
- He consumed 2 pints of grapefruit juice.

This section will display any charts, graphs, pictures or other pertinent information collected during experimentation.

5. *Conclusion*

This is a summary and analysis of the results. It should always be directly linked back to the original hypothesis. The hypothesis DOES NOT have to be correct for your experiment to be successful. In instances where the hypothesis is not correct, create a new hypothesis, alter your test and work through the process again.

Sample Backboard: