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2019-2020 Science Summer Assignment

Elementary students, as part of your summer science assignment we want you to follow the steps below to develop a unique and meaningful topic for science fair project. You will submit the last two pages of this packet.

1. **Find current events** – Use current newspapers, magazines, journals, or other reliable on-line sources to find current events that are of your interest.
2. **Identify problems** – Read the current events and to find at least 5 ideas/problems that interest you.
3. **Make questions** - Come up with questions about these ideas/problems. Keep them meaningful. Think about things that are beneficial to society.
4. **Make testable questions** - Turn your questions into **testable questions**. See the guideline below:

Question: A single sentence stated as a testable question that describes what you want to solve.

The question sets up the investigation and it should be a testable question. Testable questions are those that can be answered through hands-on investigation. Testable questions are always about ***changing one thing to see what its effect is on another thing***. A good testable question includes: the (a) independent variable/test variable and (b) the dependent variable/responding variable.

There is standard form for expressing the question:

- What is the effect of (a) _____ on (b) _____?
- How does (a) _____ affect (b) _____?
- A Study of the Effect of (a) _____ on (b) _____.

Make sure that your Problem Statement is testing only one thing/variable.

5. **Select two topics** - Now that you have developed some testable questions. Select two of your questions. These two questions will count as a potential topic for your science fair project.

6. **Research on your topics** - Find at least 2 sources of information that relate to your two topics. Write at least two paragraphs per topic.

You should research information about what scientists think about your topic; what do they already know about the topic? What are the processes involved and how do they work? How can your question be tested? What materials and steps are necessary to test your question/hypothesis? How is your question meaningful/beneficial to society?

Gathering Background Research:

- Helps gain in depth knowledge about the topic and processes you will be observing during the investigation.
- Sparks ideas about different variables to test when setting up the investigation.
- Provides the basis for predicting what will happen in the investigation when making a hypothesis.

7. Form a Hypothesis - Follow the guidelines below to develop hypothesis

After gathering background research, you will be better prepared to formulate a hypothesis. More than a random guess, a hypothesis is a testable statement based on background knowledge, research, or scientific reason.

- A good hypothesis will have a cause and effect relationship.
- If (a) _____ then (b) _____.
- Be sure to include the **independent and dependent variable** identified in your problem statement

Here are a few examples:

- *If mint plants are given water, tea, apple juice and soda over a five week period, then the mint plant being fed water will grow the fastest.*
- *If mint plants are grown in a garage, a closet, a greenhouse, and outdoors, then the mint plant grown in a greenhouse will grow the tallest.*

Remember, it's not important whether or not your hypothesis turns out to be right or wrong; either way new knowledge is gained.

8. Variables, Constants, and Control Test - Follow the guidelines below to identify the variables.

A well-designed investigation contains procedures that take into account all of the factors that could impact the results of the investigation. These factors are called variables and they are things or conditions that may affect the outcome of the experiment.

Identifying Variables – There are three types of variables to consider when designing an experiment plan:

- The **test variable (independent variable)**, this is the variable that you are changing in your experiment. This is the cause. This is part (a) of the problem statement (see Problem Statement section).
- The **outcome variable (dependent variable)**, this is the variable that reacts or changes in response to the independent variable. This variable should be measurable. This is what you will be observing and recording throughout the experiment and will go in the data section. This is part (b) of the problem statement (see Problem Statement section).
- The **constants or controlled variables** are the factors in your experiment that you have control of and keep constant (keep the same) in order to observe the effects of the one variable that you **do** change (the independent variable).

Control Group (Control Test) – To validate the results of an investigation, a control test or control group should be included. A control experiment is the group that does not receive the test variable (the factor that you are testing). The control group serves as a standard to which compare your results. The control experiment has what is usually considered “normal” conditions, i.e., room temperature, normal amount of water, normal amount of sunlight. A control experiment or group helps you to be sure that what you are testing for is a result of what YOU DID in the experiment. For example if you are testing two different types of soap on a shirt, the control experiment would be comparing the shirts that were washed with the different soaps to a shirt that was washed with water only. This control test was missing soap which is what you were testing.

You must turn in the following, you may use the forms provided in the back of this document.

I. Topics (2 different topics) in the form of testable questions

II. Research - Write at least two paragraphs per topic from two different sources for each topic

III. Hypotheses for each topic

IV. Variables and Control Group

Control Group: _____