***Scientific Method Steps from Meridian School District***

1. State the Problem or Question

2. Form a Hypothesis

3. Design an Experiment

4. Collect & Analyze Data

5. Draw Conclusions

6. Communicate Results

***Scientific Method Details & Vocabulary***

1. **State the Problem or Question**

* The terms problem and question are often used interchangeably. It’s a good idea to use both as we teach. We usually begin the sentences with question words.

**Ex.** **How** will the number of windmill blades affect the amount of electricity generated?

1. **Form a Hypothesis**

* This is the testable prediction to a problem/question.
* Typically goes in the format of If……………………. then…………………. because….
* We will spend most of our time with the If…then… segments.
* We usually list the variable we’re going to test/change after the word “If” and then the variable that we are going to measure.
* After the word “then” we write our prediction.
* Our research/support for our prediction goes after the word “because”.

**Ex.** **If** the **number of windmill blades** affects the **amount of electricity** generated

**(variables)**

**then** the greater the number of blades the less electricity generated **because………**

**(prediction)** **(support)**

1. **Design an Experiment**

* **Procedure**-steps for the investigation/experiment. Steps should be numbered, short, concise and replicable.
* **Constants**- all the things that must be kept the same each time the experiment is done. In the windmill experiment if we are testing the number of blades, then the size, angle, material must all be the same.
* **Independent Variable**- what we are changing or testing.
* **Dependent Variable**- what we are measuring.
* **Control**- the standard that we are comparing our results to.

1. **Collect & Analyze Data**

**Data Tables**

Regardless of how many changes we ask them to make to their variables if we can keep the data table formats similar it will help later in middle/high school.

The **independent** variable (the one we are changing/testing) goes on the **left** and the **dependent** variable (the one we are measuring) goes on the **right**.

**Problem: How will the number of windmill blades affect the amount of electricity generated?**

**Independent Variable** (what we’re testing/changing)

**Dependent Variable** (what we’re measuring)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of Windmill Blades** | **Amount of Electricity (amperes)** | | | |
| Trial 1 | Trial 2 | Trial 3 | Averages |
| 2 Blades |  |  |  |  |
| 4 Blades |  |  |  |  |
| 6 Blades |  |  |  |  |

**Problem: What is the weather like today?**

**Independent Variable** (what we’re testing/changing) **Dependent Variable** (what we’re measuring)

|  |  |
| --- | --- |
| **Day of the Week** | **Weather/Temperature** |
| Monday | Cloudy-67o |
| Tuesday | Sunny-75o |
| Wednesday | Sunny-79o |

**Graphs:**

There are lots of different data representations we can do but for the most part the traditional bar/line graph will have the independent variable on the x-axis and the dependent variable on the y-axis. All graphs should have a title, the x/y axis should be labeled with what was tested, measured and any units that apply. The key usually goes along the side.

1. **Draw Conclusions**

* This is our W.I.S.E. Way “sharing” and “extend” components.
* In the upper grades (4th & 5th) I’ll be modeling and asking the kids to write down their predictions, problems/questions, hypotheses and conclusions without pronouns. Science technical writing doesn’t encourage them and it’s a form of writing that takes a lot of practice.
* Here is where we’ll be asking them to articulate their observations and try to understand the differences between direct observations and inferences.
* Can they use their observations and data to make predictions about new investigations and questions?

1. **Communicate Results**

* This is also our W.I.S.E. Way “sharing” and “extend” components.

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**Observations** - the information that we collect using our 5 senses. It may be in numerical (quantitative) or word (qualitative) form.

**Predictions-** guesses/ideas using observations

**Problem/Question**- something about our world that we’d like to create an experiment/investigation to answer.

**Hypothesis-** a testable prediction

**Investigate**- to examine, study or inquire

**Experiment**- to try or test

**Data**- information gathered through the senses or instruments.