Welcome to Stoneleigh’s STEM Fair Parent Night!

http://stoneleighes.bcps.org/
What is STEM?

STEM stands for Science, Technology, Engineering, and Math, but it is a much bigger idea than just a name!
A Sample STEM Project

What's for Breakfast?

PROBLEM

What is the effect of the type of cereal on how much sugar can be collected?

HYPOTHESIS

The cereal with the lowest sugar content will be the most successful in this experiment.

MATERIALS

Cereals of different types

DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Breakfast 1</th>
<th>Breakfast 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-Wheats</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Cheerios</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

PROCEDURE

1. Obtain breakfast cereal from the kitchen.
2. Measure the amount of sugar using a food scale.
3. Repeat for each type of cereal.

RESULTS

The total amount of sugar collected for each type of cereal:

- Mini-Wheats: 8 grams
- Cheerios: 5 grams

CONCLUSION

The Mini-Wheats cereal had the highest sugar content, while the Cheerios cereal had the lowest sugar content.
Problem Question

The question should be one that can lead to an experiment or observations, which will yield data.
A good question asks an experimental based question and not a research based one.

- Questions show a clear cause and effect.
- How does _______ affect _______?
- How does the size of a magnet affect how many paper clips it picks up?
Writing Titles

- The Effect of Sunlight on the Height of Plants
- The Effect of Temperature on Honey Bee Activity
Searching, collecting, and studying information from a variety of sources.

- minimum of 3 sources
- Helps make an informed claim (hypothesis) and helps with procedures

4th and 5th Grade:
- typed and in a folder.
- information about books and other research materials used
- done before the experiment to help make a hypothesis.
- bibliography is recommended.
Hypothesis

• attempts to predict the outcome of the experiment and suggests a possible reason(s) for this outcome.

• The hypothesis must relate to the cause and effect in the question.

• If _______ then _______ because _______ ?
Writing Hypotheses
Examples:

- If the amount of sunlight increases, then the height of the plants will increase because they will photosynthesize more compounds necessary for growth.

- If temperature increases, then the activity of the honey bee population will increase since they are cold-blooded animals whose metabolism is determined by the temperature of their environment.
2 types of Observations

- **Quantitative** – uses measurements (in metric units as appropriate)
- **Qualitative** – uses your five senses

Both are recorded on a table
Experiment

A test of the hypothesis performed under controlled conditions

There are variables for every project
Parts of an Experiment:

**Independent (Manipulated) Variable**

the factor intentionally changed during the experimental procedure in order to find out what effect it has on something else.

Graphed on the x-axis.
Parts of an Experiment:

**Dependent (Responding) Variable**

what will be observed and measured to see if it is affected by the change in the independent variable.

Graphed on the y-axis.
Parts of an Experiment:

Constants (controlled variables)

factors that remain the same or constant throughout the investigation to make sure that they are not having any effect on the dependent variable.

EX: Same size and type of paper clips.
Parts of an Experiment: Experimental vs. Control Group

- Control group: does not receive the experimental treatment

- serves as a comparison to see if the independent variable caused a change.

Ex: Plants w/o fertilizer
Parts of an Experiment: Repeated Trials

Performing the experiment several (3 or more) times

<table>
<thead>
<tr>
<th>Data Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is chart of the numerical data collected in my experiment...</td>
</tr>
<tr>
<td>Independent Variable</td>
</tr>
<tr>
<td>(This is the one thing I changed in my experiment.)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Parts of an Experiment: Sample Size

- The average for each trial should be graphed.
- A large sample size is recommended.

10 pennies, not 1, for experimental and control groups.
Parts of an Experiment:

**Materials**

- Need to be **listed** in specific amounts and sizes
Parts of an Experiment: Procedure

- A step by step recipe for your experiment.
- so detailed and complete that someone else can duplicate your experiment exactly!
- First step is “gather all materials”.
- Last step is “record observations”.
1. Gather the materials
2. Measure one serving of each cereal
3. Put each serving into its own quart size zipper-lock bag
4. Fill each bag with warm water – 500ml
5. Carefully seal each bag, leaving an air pocket inside
6. Mix the cereal and the warm water by gently squeezing the bag until the contents become a brown, soupy mixture
7. Let all bags sit for one hour so the cereal softens completely
8. Place a super-strong magnet on top of the first bag
9. Flip the magnet so it is on the bottom of the bag
10. Slowly slosh the contents of the bag in the circular motion for 15 to 20 seconds
11. Use both hands again and flip the bag and the magnet over so the magnet is on top
12. Gently squeeze the bag to lift the magnet a little above the cereal soup
13. Make sure one end of the magnet keeps touching the bag and draw little circles. As you do, the iron will gather into bigger clumps and much easier to see
14. Carefully remove the clumps and place it on a paper towel to dry
15. Mass the iron on a digital scale***
16. Compare the mass to the amount listed on the cereal box
17. Repeat steps 8-16 for the rest of your bags

***I was unable to measure the mass because the digital scale did not measure in milligrams. Instead, I observed the iron that I collected on the paper towel and decided which cereal I got the most iron from.
Data Collection & Analysis

- Data is represented in both a data table and a graph.
- Data tables should be labeled with both independent and dependent variables.
- Bar graphs compare two or more sets of data.
  - Line graphs show change over time.
  - All graphs should have a title, labels, and units of measure.
### Plant Growth: Week 2

<table>
<thead>
<tr>
<th>Light Amount</th>
<th>Water Amount</th>
<th>Growth Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 hours</td>
<td>0 ml</td>
<td>0 in</td>
</tr>
<tr>
<td>8 hours</td>
<td>2 ml</td>
<td>2 in</td>
</tr>
<tr>
<td>8 hours</td>
<td>5 ml</td>
<td>3 in</td>
</tr>
<tr>
<td>8 hours</td>
<td>7 ml</td>
<td>6 in</td>
</tr>
<tr>
<td>8 hours</td>
<td>10 ml</td>
<td>3.5 in</td>
</tr>
</tbody>
</table>

#### Dissolving Alka-Seltzer tablets

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Water</th>
<th>Hydrochloric acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>15°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Tomato Plant Height

![Graph showing the growth of three tomato plants over 26 days after sprouting.](image)
Written Results

Results are shared in a paragraph
Should be at least 5 sentences

1. Summary of your investigation. What did you do? What were you trying to find out? What were you testing?

2. Results of your investigation. State the numbers you came up with.

3. Include the mean for each trial

4. Note the trends in the data. Were the numbers going up? Were the numbers going down? When did they change? How much did they change?

5. State any inferences you can make from your data. What happened? How do you know?
Conclusion

• The conclusion wraps up the project and should clearly show what the student has learned
  • Should be at least 5 sentences

1. Tell whether your hypothesis was supported by the data.

2. Answer the original question. Think what question you wanted the answer to and give an answer based on your observations.

3. Include specific data (numbers) from your investigation to support your ideas.

4. Include inferences about your topic. How did it work? Why did it work? Think back to your research.

5. Include at least one additional question you might investigate based on your investigation. What other experiment could you do? What else might you want to know about the topic that you didn’t answer?
A Typical STEM Project

Several Parts of a STEM Project:

1. Question
2. Research Project
3. Hypothesis
4. Variables
5. Materials
6. Procedure
7. Data Tables/Graph
8. Written Results
9. Conclusion
10. Log Book
Science Fair Project Display Model

Problem or Question

Hypothesis

Procedure

1. 
2. 
3. 
4. 
5. 
6. 

Photos, Diagrams, Data Charts, or Graphics

Materials

Log Book

Research Report

Project Title

Independent, Dependent, and Controlled Variables

Results

Written Explanation of the Results

Conclusion

Identification of independent, dependent, and controlled variables

A graphic representation of the data from the investigation

A paragraph that analyzes and interprets the data collected

Briefly answers the question asked in the problem; states the hypothesis to be supported or not supported

A question to be tested

A list of the steps followed to perform the investigation

The predicted answer to the question

A list of supplies, or equipment used

Photos, drawings, or data charts illustrating the progress of the investigation

Day-by-day notes and data collected during the investigation

Short report and bibliography of sources read to form hypothesis
Thanks for coming!

- [http://stoneleighes.bcps.org/]
- Go to Parent’s Page
- Go to STEM Fair Information

- **Science Buddies** - Contains project ideas (check to make sure selected projects comply with county guidelines)
Any Questions?

Thanks for Coming!
Resources
- Project samples
- Books
- Website

One Stop Shopping
- STEM board bargain

THS Student Stations