The Scientific Method (part 3)

Collecting and Organizing Data

- As you work on your experiment, you are making observations that will become your experimental data.
- Data can be collected in a variety of ways: observing changes, measuring items, or weighing items.

Collecting and Organizing Data

- You must collect data as you conduct your experiment.
- Usually, the best way to record most kinds of data is to use a data table.

Rules for making data tables:

- Every table MUST have a title. The title must have the two variables of the experiment in it.
- Every column or row should be labeled with a heading.
- The unit of measurement that you're using is written in the heading ONLY.

Rules for making data tables:

- You must record your data in order.
- You must box in your table. The title of the table is the only item not boxed in.

Number of Crickets Chirps for Each Day of the Week

Day	# of Chirps
Monday	37
Tuesday	83
Wednesday	76
Thursday	56
Friday	39
Saturday	57
Sunday	42

A bit of practice…

- Write down what is correct about this data table:

Height of Plant With Fertilizer Over Time

Date	Height (cm)
8/1	5
8/2	6
8/3	8
8/4	9
8/5	13

More practice…

- What is wrong with this table?

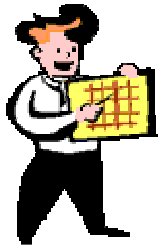
Date	Height
1-Aug	5
2-Aug	6
5-Aug	13
3-Aug	8
4-Aug	9

Question:

- Can you determine if data supports your experiment by just looking at the data table?

(OF COURSE IT'S A TRICK QUESTION!)

Answer:



- It is usually necessary to graph the data before coming to a conclusion.

Rules for Graphing

- The most important rule is to determine which type of graph is best suited for your data.
- Types of graphs: bar graph, line graph, scatter plot (or best fit line), and a pie graph

Bar Graph

- Use a bar graph when you are counting, tallying or grouping data.
- The title of a bar graph is different because one of the variables is a word.

Example: The number of hummingbirds attracted to different colors of feeders.

Example: All the students with grades between 90-100%

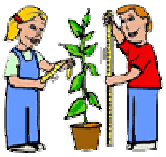
Line Graph

- Use a line graph when the variable you're changing has a range from low to high.

Example: Change temp. to see effect on number of eggs hatching.

Line Graph

Example: Plant growth over time.



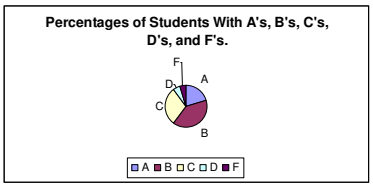
- Use a line graph when you are recording data over a period of time (days, minutes, seconds, months, etc.).

Scatter Plot / Line of Best Fit Graph

- Use this graph when:
  - More than one data point can be plotted on the y-axis for each data point on the x-axis.
  - A line of best fit, trend line or slope line is added.

Pie Graph

- Use a pie graph when all of the data adds up to 100%.



A bit of practice….

- Look at the following questions. Which need a bar graph? Which need a line graph for their data?

1. Does air pressure affect the height of a basketball bounce?
2. Is there a relationship between the color of light bulb and the number of insects attracted to it?
3. Is there a relationship between I.Q. and height?
4. How many A's, B's, C's, D's and F's will this class have on the first test?
5. Does the temperature affect the number of cricket chirps?

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How do I know which variables to graph on the x-axis?

- Independent variable
  - The variable you control or change
- Time always goes on the x-axis.

X-axis

How do I know which variable to graph on the Y-axis?

- The dependent variable.
- The # of ___.

Y-axis

Underline the variable that would be placed on the x-axis.

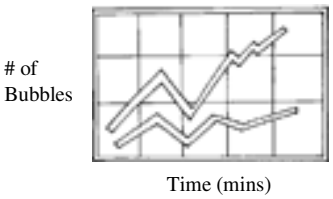
1. Does the amount of fertilizer affect the growth rate of corn?
2. Does air temperature affect the bounce of the basketball?
3. Is there a relationship between I.Q. and height?
4. Does temperature affect evaporation rate?
5. Does the color of the flower affect the number of bee visits?

Answers:

1. Does the amount of fertilizer affect the growth rate of corn?
2. Does air temperature affect the bounce of the basketball?
3. Is there a relationship between I.Q. and height?
4. Does temperature affect evaporation rate?
5. Does the color of the flower affect the number of bee visits?

Another graphing rule

- Label the axes of the graph with the variables used in your experiment.
- Be sure to include units of measurement when you are labeling.



Another graphing rule

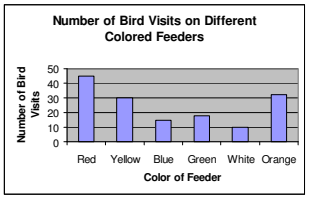
- Title the graph
  - Rules:
    - Both variables must be included in the title.
    - Every chart and graph must have a title.
  - Hint: These titles are not cute or creative – they tend to be long and boring.

Numbering the axes of a graph

- Look at your data; determine the low and high numbers.
- Determine the range and the number of spaces on your graph paper needed to cover the range.
- Each square on the axis must represent the same number of units.

Bar Graphs are Easy to Interpret

- The longer the bar, the more impact the independent variable has on the dependent variable.



A line graph can show how one variable affects the other by how the line slopes.

Direct – as one variable increases, so does the other.

Direct or positive relationship

No relationship

Indirect – as one variable increases, the other decreases.

Indirect or negative relationship

Are We There Yet???

- Almost!
- Next, we are going to look at analyzing all of this data and writing a proper conclusion.