Learning Lab: Data Analysis and Graphing Skills
Student Response Pages

Objective: Students will learn how to set up data tables and graphs in a science based situation

ATL Skill: Critical Thinking – Interpret data

TEKS: 8.3A in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student

Directions: Rotate to each station as instructed. Your goal is to complete each station by completing the action required and responding on your lab page.

Part I: Making Data Tables

Making a Table -

Any time data is collected in an experiment, it is most often presented in a table. The data table must have a title, rows, columns, and headings. The title should be placed at the top and tells the observer what information is contained in the table. At the top of each column should be a “head” that tells you what information is in the column.

Pick up the reference page at this station. Keep it to use all year in science class.

Table 1 Title: ________________________________________________________________

Independent Variable: ____________________________________

Dependent Variable: ____________________________________

Make table in this space:

Does the color of soda affect the number of friends that drink it?(Explain)______________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
Table 2 Title: _______________________________________________________________

Independent Variable: _____________________________________

Dependent Variable: _________________________________________

Make table in this space:

Does the number of assignments completed affect a student’s science grade? Explain:

____________________________________________________________________________________

____________________________________________________________________________________

Part II: Analysis of Data Tables

Reading a data table: Examine the data found in the table and answer questions #1-4.

Table: Growth of eight plants in a three week period (see lab station for table)

1. In this plant growth experiment, what were the two variables tested?

2. What conclusions can you draw in regards to the amount of light a plant was exposed to and how tall the plant grew?

3. What conclusions can you draw in regards to the amount of water given to a plant and how tall the plant grew?

4. Describe which plant or plants did he best and develop a hypothesis on plant growth based on the date you examined.
Part III: Examining Graphs

**Venn diagram** on International Astronomical Union –

1. Many people were upset when Pluto was demoted to dwarf planet status because they had grown up with Pluto being the ninth planet. According to the Venn diagram, if Pluto was to be re-instated as a planet, which other objects would also have to be included as planets too?

____________________________________________________________________________________

____________________________________________________________________________________

2. Some people think that all objects that have achieved hydrostatic equilibrium should be considered planets. Use the Venn diagram to decide if you think this is a good idea. __________________________

____________________________________________________________________________________

____________________________________________________________________________________

**Bar Graph** on Plant Growth in Various pH Soils -

A team of botanists conducted an experiment investigating the effect of pH on plant growth. The height of the plant was measured three weeks after planting.

1. Based on the data they collected, what is the optimal pH for growing basil? Explain your answer.

____________________________________________________________________________________

____________________________________________________________________________________

2. Based on the data they collected, which plant fares better than the others in low pH environments? Explain your answer. __________________________

____________________________________________________________________________________

____________________________________________________________________________________

3. At which pH is there the greatest difference between the heights of parsley and basil? What is the height difference at that pH?

____________________________________________________________________________________

____________________________________________________________________________________

**Line Graph** on the Effect of Temperature on S’more Melting Time -

Perry built a homemade solar oven and conducted an experiment to investigate the effect of the outside temperature on the time required to melt a s’more in the solar oven. He hypothesized that the warmer it was outside, the more quickly the s’more would melt.

1. Was Perry’s hypothesis correct? Explain your answer. __________________________

____________________________________________________________________________________

____________________________________________________________________________________

2. If Perry tested his hypothesis on a day when the temperature was 77°F, based on this trend, how long should he expect it to take for the s’more to melt?

____________________________________________________________________________________

____________________________________________________________________________________

3. If Perry tested his hypothesis on a day when the temperature was 100°F, based on this trend, how long should he expect it to take for the s’more to melt?

____________________________________________________________________________________
Various Graphs on Amount of Precipitation

Each of these three graphs were created using the same data: the amount of precipitation in mm for each month of the year. Which of the three graphs is best suited for the data. Support your opinion.

_______________________________________________________________________________________
_______________________________________________________________________________________
_______________________________________________________________________________________

Part IV: Critiquing Graphs

Graph 1:

1. Examine the graph and suggest an appropriate title and axes labels (with units if appropriate).
   Title: ____________________________________________________________
   X axis: ___________________________________________________________
   Y axis: ___________________________________________________________

2. Explain what you think this graph could be about.
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

Graph 2:

1. This graph doesn’t come with much information. Examine the graph and list what labels are missing.
   ______________________________________________________________________
   ______________________________________________________________________

2. There is a huge disparity with one of the bars. What questions can you come up with about the difference in this particular bar versus the others?
   Questions you have:
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
Part V: Tabling, Graphing and Analyzing Data

Parts A and B need to be in order, C and D do not need to be completed in a particular order.

A. Making a Table – Make a table of the information in the space below. You should have a title, and 3 columns showing time, and the 2 temperature differences.

   Title:

B. Making a Line Graph – Make a line graph of the information on the grid below. Make sure to add title, label the variables (x and y axis), add units, increments (tic marks), and connect the plotted points.

   Title of graph:
C. **Making a Bar Graph** – Make a bar graph of the information on the grid below. Add the same labelling information as requested for the first graph.

D. **Making a Circle Graph** – Make a circle graph of the information. Again, proper labels are expected.
Station Pages follow:
Part 1: Making Data Tables

Table 1:

For each example, identify the independent and dependent variables and create a data table to organize the information in. Draw the data table in the space provided on your response page. Remember to follow all the guidelines for making data tables.

Allison wanted to find out if the color of soda affected whether her friends would choose a particular one. She collected the following data:

Orange Soda – 5 friends
Yellow Soda – 7 friends
Green Soda – 2 friends
Clear Soda – 1 friend
Brown Soda – 15 friends

**Independent Variable:** ________________________________

**Dependent Variable:** ________________________________

Does the color of soda affect the number of friends that drink it? (Answer the question on your lab page)
Part 1: Making Data Tables

Table 2:
For each example, identify the independent and dependent variables and create a data table to organize the information in. Draw the data table in the space provided on your response page. Remember to follow all the guidelines for making data tables.

Isaac wanted to know if the number of homework assignment completed in a science class affected a student’s science grade. He collected the following data:

25 assignments completed = 95%
21 assignments completed = 89%
8 assignments completed = 50%
17 assignments completed = 75%
15 assignments completed = 65%

Independent Variable: _____________________________________
Dependent Variable: _______________________________________

Does the number of assignments completed affect a student’s science grade? Explain on your page.
**Part II: Analysis of Data Tables**

Reading a data table: Examine the data found in the table and answer questions #1-4 on your response page.

**Table: Growth of eight plants in a three week period**

<table>
<thead>
<tr>
<th></th>
<th>Amount of Light per day</th>
<th>Amount of Water per day</th>
<th>Height Week 1 in cm</th>
<th>Height Week 2 in cm</th>
<th>Height Week 3 in cm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant 1</strong></td>
<td>0 hours</td>
<td>¼ cup</td>
<td>0 cm</td>
<td>0 cm</td>
<td>0 cm</td>
</tr>
<tr>
<td><strong>Plant 2</strong></td>
<td>0 hours</td>
<td>1 cup</td>
<td>0 cm</td>
<td>0 cm</td>
<td>0 cm</td>
</tr>
<tr>
<td><strong>Plant 3</strong></td>
<td>4 hours</td>
<td>¼ cup</td>
<td>1 cm</td>
<td>3 cm</td>
<td>6 cm</td>
</tr>
<tr>
<td><strong>Plant 4</strong></td>
<td>4 hours</td>
<td>1 cup</td>
<td>0.5 cm</td>
<td>1 cm</td>
<td>1.5 cm</td>
</tr>
<tr>
<td><strong>Plant 5</strong></td>
<td>8 hours</td>
<td>¼ cup</td>
<td>1.5 cm</td>
<td>4 cm</td>
<td>8 cm</td>
</tr>
<tr>
<td><strong>Plant 6</strong></td>
<td>8 hours</td>
<td>1 cup</td>
<td>1 cm</td>
<td>3 cm</td>
<td>6 cm</td>
</tr>
<tr>
<td><strong>Plant 7</strong></td>
<td>16 hours</td>
<td>¼ cup</td>
<td>1 cm</td>
<td>2 cm</td>
<td>3 cm</td>
</tr>
<tr>
<td><strong>Plant 8</strong></td>
<td>16 hours</td>
<td>1 cup</td>
<td>1.5 cm</td>
<td>5 cm</td>
<td>10 cm</td>
</tr>
</tbody>
</table>

1. In this plant growth experiment, what were the two variables tested?

2. What conclusions can you draw in regards to the amount of light a plant was exposed to and how tall the plant grew?

3. What conclusions can you draw in regards to the amount of water given to a plant and how tall the plant grew?

4. Describe which plant or plants did he best and develop a hypothesis on plant growth based on the date you examined.
Part III: Examining Graphs

Pages are “Examining Graphs” – pdfs not in this document
Part IV: Critiquing Graphs

Graph 1:

This graph compares 3 children, Jose, Amala and Paul. It does not have a title or any labels.

Examine the graph and suggest an appropriate title and axes labels (with units if appropriate).

Explain what you think this graph could be about.
Part IV: Critiquing Graphs

Graph 2:

This graph doesn’t come with much information.

Examine the graph and list what labels are missing.

There is a huge disparity with one of the bars. What questions can you come up with about the difference in this particular bar versus the others?
Part V: Tabling, Graphing and Analyzing Data

Step 1:

A. Making a Table

Any time data is collected in an experiment, it is most often presented in a table. The data table must have a title, rows, columns, and headings. The title should be placed at the top and tells the observer what information is contained in the table. At the top of each column should be a “head” that tells you what information is in the column.

Read the paragraph below. Use the information to complete a table.

An experiment was conducted to measure the amount of oxygen consumed during cellular respiration by germinating seeds at two different temperatures. Measurements were taken every two minutes for 10 minutes. The first set of seeds was kept in a cold environment in which the temperature was maintained at 10°C. The measurements (showing cumulative oxygen consumption) obtained at 2-minute intervals were: 1 mL, 1.8 mL, 2.7 mL, 3.6 mL, and 4.5 mL. The second set of seeds was kept in a warm environment in which the temperature was maintained at 24°C. The measurements (showing cumulative oxygen consumption) obtained at 2-minute intervals were: 2 mL, 3.1 mL, 4.3 mL, 5.6 mL, and 6.5 mL.
Part V: Tabling, Graphing and Analyzing Data

Step 2:

B. Making a Line Graph

Line graphs show data plotted as points that are connected by a line. Line graphs are often used to show change over time and can be used to compare two or more sets of data.

Before a line graph can be constructed, you must identify the two variables that will serve as x and y coordinates on the graph. These are called the “independent variable” and the “dependent variable”.

The independent variable is the one being manipulated or changed during the experiment. It is always placed on the x-axis or horizontal axis. The dependent variable is the observed result of the independent variable being changed. The dependent variable is always placed on the y-axis or vertical axis. An easy way to remember this is to ask yourself the questions, “What did I know before I did the experiment?” (independent variable) and “What did I learn by doing the experiment?” (dependent variable).

Using a piece of graph paper, or the student worksheet if one was provided by your teacher, graph the information that you placed in your newly constructed data table in Part A. Remember: Since you were comparing seeds at two different temperatures, there should be two different lines plotted on your graph.

Be sure to: (1) Label each axis appropriately, (2) Scale each axis appropriately, (3) Title your graph, (4) Label each of the two lines on your graph.
Part V: Tabling, Graphing and Analyzing Data

C. Making a Bar Graph

Bar graphs are useful for showing comparisons of data collected by counting. A bar graph has two axes, a horizontal axis and a vertical axis. Generally the horizontal axis is labeled and the vertical axis is divided. The data are not related so the bars do not touch.

Using a piece of graph paper, or the student worksheet if one was provided by your teacher, make a bar graph of the following information:

Students were surveyed to determine what part of the school day was their favorite. Students could choose only one of the following categories as their favorite part of the school day:

<table>
<thead>
<tr>
<th>Part of the School Day</th>
<th># of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Class</td>
<td>15</td>
</tr>
<tr>
<td>Science Class</td>
<td>25</td>
</tr>
<tr>
<td>English Class</td>
<td>8</td>
</tr>
<tr>
<td>History Class</td>
<td>10</td>
</tr>
<tr>
<td>Gym</td>
<td>46</td>
</tr>
<tr>
<td>Lunchtime</td>
<td>73</td>
</tr>
</tbody>
</table>
D. Making a Circle Graph

A circle graph is used to show how a certain quantity is broken down into parts. The circle represents the whole, and the “slices of the pie” represent the portions of the whole. In a circle graph, be sure to label the sections so that the data is shown.

Using your notebook paper, or the student worksheet if one was provided by your teacher, make a circle graph of the following information:

People were surveyed to determine what color automobile they would prefer. The results were:

- Grey – 50%
- Red – 25%
- White – 10%
- Blue – 10%
- Beige – 5%