

## *Unit 1: The Scientific Method*

### **Unit Overview:**

This unit will focus on the development of the scientific method and its application in problem solving. The student will have the opportunity to develop a working knowledge of this method by applying its theory through 4 laboratory investigations.

### **Unit Objective(s):**

- Identify the form and function of a scientific graph.
- Identify and properly apply the steps of the scientific method.
- Identify the parts of the metric system.
- Identify and apply the appropriate metric values.

### **Skills attained:**

- The students will be able to identify the position and function of the five main graph parts.
- Be able to differentiate between the controlled and experimental variables.
- Apply the various metric measurements to appropriate objects being measured.
- Convert metric values from one to another.
- Develop a controlled experiment from a correctly stated hypothesis.

### **Unit Topics:**

- How to develop a Graph.
- The Metric System its parts and use.
- The Scientific Method the steps and their application.

**Unit Vocabulary:** (metric system, meter, liter, gram, kilo, hecto, deca, centi deci, milli, independent variable, dependent variable, hypothesis, controlled experiment, experimental variable, theory, problem, placebo, and controlled variable, x axis, y axis)

## Procedure:

Before handing out the worksheets to the students it is recommended that you go over each one to make sure the information in each activity was covered in the class lecture or any reading assignment that you might have given. As the class leader, it is up to you to make modifications to the assignments as you see fit. Questions may be left out if you feel they are inappropriate for one reason or another. The worksheets and labs were designed to cover the full scope of each of the units. Just as in different biology textbooks, emphasis may be given to certain areas more so than others. The activities in this book tend to float down the middle of the road. If you feel a need to add to the activities, Xerox a copy and then add your material to it before running off the class copies. It is also recommended to make a dry run through each of the labs. This will give you an idea of how smoothly it will go in class. Problems that students might encounter will become visible and you can direct them away from them in your pre lab discussion. It will also give you an idea of how much class time will be needed to complete it. Never hand out a lab without first going over the basics of it in detail. This will save you a lot of time as the lab progresses in class. The labs may run from a little less than a regular 55 minute period to half of a 90 minute block period. You may want to add extension material to the labs as additional practice.

Please feel free to e-mail me with ideas or problems that you may encounter.  
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1. Have the students complete the lab: "How to develop a graph".

The students will examine the data tables and construct a graph using the five (5) parts of a complete graph. These graphs will be line graphs.

2. Have the students complete Lab 2 Scientific Method and More.

In this lab the student will demonstrate their knowledge of scientific method by examining a laboratory situation, developing working hypotheses, and determining if the experiment is controlled. They will also graph the data

3. Have the Students complete Lab #3 Metric Measurement.

Here you may have students work in groups. You may also use different materials to measure. It all depends on your skills. Allow the students to choose their materials if that fits your plan.

4. Complete Lab #4 "It's My Pinto Bean?"

Each student will receive a pinto bean and a leaf from a local tree. Using the bean first, have the students examine it closely. This should take 3-4 minutes. They are allowed to draw it but not mark on it. You will need to have pre marked cups available so as to allow them to put their bean in. You will place the bean in the cup and make a reference guide for your self-showing the bean and cup for each student. They are not to know which cup their bean is in. Mix up the cups and allow them to find their bean. Follow the same procedure with the leaf.

**Materials list:***(Graphing paper, pinto beans, small plastic cups, leaves from local trees, pencils, meter sticks, triple beam balances, graduated cylinders, test tubes, coins, notebooks, and other materials that you may choose to measure.*

**Content Background:**

The Metric System is a universal measurement system based on the number 10. The main categories of measurement are: meter, liter, and gram. The meter is a distance value, the liter refers to the volume, and the gram is a mass value. Using the value (meter, liter, or gram) as the center, they can be subdivided into smaller units by using one of the six prefixes placed before them (see the table below). If one wants to change a higher value into a smaller one, move the decimal point to the right. If one wants to change a smaller value to a larger one move the decimal point to the left.

This chart may be duplicated and given to the students for future reference.

Kilo	Hecto	Deca	Meter	Deci	Centi	Milli
One thousand times	One Hundred times	Ten times	Liter Gram	One tenth	One hundredth	One thousandth
1000 X	100 X	10 X	1	0.1	0.01	0.001

Remember when changing a value to a lower one move the decimal point to the right.

Example: 10 Kilograms to grams. Kilograms are larger than grams. Kilo is also three positions away from gram on the decimal scale. 10 kilograms = 10,000 grams.

When changing a lower value to a higher on do the opposite; move the decimal to the left.

Example: 12 grams to Kilograms. Gram is the smaller value and 3 decimal positions away from kilo. 12 grams = .012 kilograms.

## **Lecture Support:**

Lecture is a very important part of imparting your knowledge to your students. The lessons contain a framework of material essential to the units being covered. If you show the information on an overhead or through a power point demonstration without added material the students will be missing material. It is important that you read the content background presented in these lessons to become thoroughly familiar with the subject matter. Along with your text book it is an invaluable tool. As you lecture ask questions that will make the students think. Make sure they are all taking notes in one form or another. The method I use is to boot up the power point presentation on the computer and copy the text box on the left. I then transfer this material to a word document. On the document I will blank out word(s), sentence(s) or whole paragraphs then Xerox it as notes to be filled in during the lecture. Make sure you require each student keep a notebook.

### 1. Present the lesson on Graphing.

Go over the power point /notes lesson on graphing before hand. Make sure you understand the function and location of the major graph parts. When discussing the development of the scales for each axis and the title for the graph, it would be helpful if you have several alternate examples for each. Make sure you emphasize that these are variable as long as they meet the criteria you set in the lesson. Have the students work on these graphs at their desk. You may want to ask a student(s) to put their work on the board.

### 2. Present the lesson on the Scientific Method.

In this lesson you will be attempting to teach the students the process of scientific research. The scientific method is a difficult concept to teach. Make sure the students understand the differences between the experimental variable (the thing being tested) and the controlled variables (the things being kept the same). The lesson emphasizes this. You need to emphasize the “if – then” statement when making a hypothesis. You will need to make sure your students continue to use it throughout the course.

**Assessment:** *Unit 1 Test, all worksheets and labs may be used as an assessment.*

**Homework:** You may assign questions at the end of the chapter, vocabulary word definitions, or selected readings from the text book as appropriate homework assignments.