SpongeBob - Bubble Time Experiment ***Teacher Notes***

(Student worksheet on page 4-5)

Description: This activity is used to help students identify variables in an experiment. Students should also be able to explain various strategies scientists use to limit problems (variables) that would affect the accuracy and reliability of collected data.

NOTE: I use this activity after the students have completed the other Bikini Bottom worksheets related to experiments.

Materials:

- *4 brands of bubble gum (at least one sugarless brand)*
- *Rulers for measuring bubble size (or use the measurement guide on page 3)*
- *Timers (or use classroom clock/computer)*
- *Copies of student worksheet (see pages 3-4)*

Objectives: As a result of this activity, students will be able to:

- *Identify variables that may affect the outcome of an experiment.*
- *Utilize strategies used by scientists to limit the influence of extraneous variables*
- *Develop an experiment that will address variables and controls.*
- *Identify possible errors that would affect the accuracy of the data collected.*
- *Recommend strategies to increase an experiment's reliability*
- *Analyze data on an individual and class basis to make recommendations*

Procedure:

1) Introduce the activity by reading the description on the student worksheet. Help students identify the independent variable (brand of bubble gum) and dependent variable (diameter of the bubble itself).

2) Lead the class in a discussion of other variables that should be addressed in order to make sure the results are accurate and reliable. Here are some examples:

- *Bubble Blowing Ability*
  - *How many people should you include in your experiment?*
    Small group vs. larger group - which will give better results? Typically, the larger the sample size, the more accurate and reliable your results will be. The more people you have, the more results you'll have to evaluate. You may find some students are better at blowing bubbles than others, but the averages should help to refine the results.
  - *How many times should you blow bubbles, i.e. # of trials?*
    Students should try to blow bubbles more than once (i.e. five or more trials) What will you do if someone has a "blow out" or you can't measure it? Students will need to decide how to handle this situation. They will also want to prevent a student from blowing 20 bubble and only counting the five biggest ones.
- *Bubblegum Brand*

- *How long should you chew the gum before you try to blow bubbles?*
  The amount of sugar in a gum could affect the length of time you need to chew the gum in order to get good bubbles. Everyone should chew the same amount of time for each brand of gum to control this variable.
- *Are the pieces the same size/mass?*
  Students may want to add a step to the experiment to measure the size/mass of a piece of each type of bubble gum to compare results. Some brands have larger pieces than others, which may require cutting some pieces in half to have a comparable size/mass.

- *Measurement Errors - How will you measure the diameter of the bubbles?*
  In order to get the most accurate results, everyone should measure the same way. How will everyone do this, i.e. have another person measure by holding the ruler at the edge of your mouth or in front of you to estimate the diameter of the bubble.

  UPDATE: We used a new measurement chart for our experiments this year. See the next page for the chart, which is similar to the method used on the Dude Perfect Bubblegum Challenge available on YouTube.

3) Allow time for students to write their own experiments. Lead a discussion to develop a class procedure that includes controls for each of the variables discussed in #2 above.

4) Allow time for students to test the various brands of gum you have selected.
NOTE: I usually do testing over a period of four class periods. Students test only one brand per day at the start of class.

5) Share the results of the experiment with the class.
NOTE: I set up a Google forms for students to submit their averages for each brand. I download the data as a spreadsheet and use the tools available to sort them into classes, brands, etc. Go to https://goo.gl/forms/F2Vr41JcFzO0w8PV2 for a sample you can copy and modify for your needs.

6) Discuss the questions on Part D to help students analyze the results and make a recommendation for the brand of gum Patrick should use in the competition. In the past, most of my classes end up with the same brand as the top one. However, the accuracy of the data (mostly due to measurement errors) and the reliability of the recommendation (mostly due to students who did not follow the same procedures) usually helps students understand the importance of following a specific set of steps/strategies in order to have good results that can be used to make an informed decision.

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Bubble Time

Name _____

Patrick loves bubble gum and would like to be able to blow bigger bubbles than anyone else in Bikini Bottom. To prepare for the Bikini Bottom Big Bubble Contest, he bought four different brands of bubble gum and needs your help to find the brand that creates the biggest bubbles.

Part A: Identifying Variables & Controls

1) What is the independent variable in this experiment? _____

2) What is the dependent variable in this experiment? _____

3) What other variables would be involved in this experiment? List at least three and explain how will you set up your experiment to control these variables.

_____ - _____

_____ - _____

_____ - _____

Part B: Experiment - Write an experiment to test the bubble power of the bubble gum brands and help Patrick win the contest. Remember to include all the necessary parts to ensure your results are accurate and reliable. You may use an additional page if needed.

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Part C: Results

1. Use the chart below to document the results of your experiment.

Brand	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average

2. Use the Google form provided by your teacher to submit your results.

Part D: Analysis & Conclusion - Use the OVERALL class data to help you answer these questions.

1. Which brand had the highest average for YOU? _____
2. Which brand had the highest average OVERALL? _____
3. Did your results match the overall results? Explain using the data.

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4. Which brand would you recommend Patrick use in the contest? Why?

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5. Is the data accurate and reliable? Explain why or why not.

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