Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Homeroom: \_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_ **1.3**

**Human Error in Experiments (SPI.INQ.5)**

|  |  |
| --- | --- |
| **Key Points** | **Notes** |
| **Conclusion** | * A **scientific conclusion** must be supported by \_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_! * A conclusion accepts or rejects your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Scientific conclusions do not always have to support your hypothesis. * Before making a conclusion, the scientist must make sure that they have avoided any sources of \_\_\_\_\_\_\_\_\_\_\_\_ in their experiment (human error and experimental error) |
| **Human Error** | * A human error is an error made by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * The most likely error in an experiment is human error. Unfortunately, we are not perfect ☹ * If there is any human error, a conclusion is not valid. * Errors humans frequently make:   1. Biases   2. Not following the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an experiment (for example, missing or adding a step)   3. Making an error in measurement or calculation   4. Assuming a cause and effect relationship without data   5. Not having a controlled experiment |
| **Biases** | **Biases** are \_\_\_\_\_\_\_\_\_\_\_\_\_\_or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that will lead to a certain conclusion  •Can be intentional or unintentional  •Some sources of biases:  -Trying to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ someone else  -Relying on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ information  -Past experiences are\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ you |
| **Following Procedures** | * You must follow the procedures of an experiment \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. * If you make an error in the procedure, you must completely re-do the experiment! |
| **Errors in Calculations** |  |
| **Cause and Effect** | •In order to assume a cause and effect relationship has occurred, there has to actually be \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a cause and effect!  •You need to back, back, back that up with evidence. You must have experimental data that proves there is a cause an effect relationship between your independent and dependent variable, before assuming there is one. |
| **Controlled Experiment** | * A controlled experiment has:   1. ONE \_\_\_\_\_\_\_\_\_\_\_\_\_\_ variable   2. \_\_\_\_\_\_ dependent variable   3. Control \_\_\_\_\_\_\_\_\_\_ and experimental group   4. All other variables are controlled (control variables) |

**“I Got This! (Independent Practice):**

1. Which of the following statements about conclusions is FALSE?

1. Conclusions are based on research and data
2. Conclusions are made from error-free experiments
3. A valid conclusion must support the hypothesis
4. A valid conclusion does not always support the hypothesis
5. Your science fair project produces unexpected results that do not support your hypothesis. When you review your experiment, you discover that you measured a chemical incorrectly. What should you do?
6. Report the results and do not worry about the mistake
7. Change the results to support your hypothesis
8. Repeat the experiment
9. Assume that your results would have supported your hypothesis if you had not made a mistake
10. You want the results of an experiment to come out a certain way. You focus on any bit of data you can use to prove that your hypothesis was correct. What have you introduced into the experiment?
11. Bias c. an effect
12. A conclusion d. a cause
13. Mrs. Webb concludes that the 7th graders are more on target to reach science mastery because they are taller. What is wrong with Mrs. Webb’s conclusion (besides the fact that 8th graders are awesome)?

5. Kaliyah calculated the volume of the rock to be 30 mL. What is the error in her calculation and how could it be fixed?

