Topic: Scientific Method - Senses Lab

Summary: Students learn the scientific method by measuring their reflexes from dropping a ruler.

Goals & Objectives: Students will be able to use the 6 steps of the scientific method. Students will be able to create an if/then hypothesis. Students will be able to determine the independent and dependent variables. Students will be able to create a bar graph of their results. Students will be able to work with their lab partner.

Standards: CA Investigation and Experimentation: *c.* Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. *j.* Recognize the issues of statistical variability and the need for controlled tests.

Time Length: 40 minutes

Materials:
- Ruler – for every two students
- Graph paper and handout – for each student
- Handouts

Procedures:
1. Students fill out their problem statement described in the handout directions. Next each student comes up with an If/Then hypothesis. You might need to explain how to make an if/then statement. To help the students, you can say, "If I use the sense touch to grab the ruler, then touch will be the fastest sense in their experiment".

2. Organize students in groups of two. One student will be dropping the ruler and the other student will catch it. The student who is catching the ruler will repeat the experiment five times for each of the three senses (touch, sight, sound). Once that student catches the ruler 15 times and records data, then the partner switch duties.

3. Ruler. The student, who is dropping the ruler, holds the top part of the ruler vertical at the 30 cm end. The two fingers holding the ruler are closest to the edge of the ruler. The student, who is catching the ruler, puts the top of their index finger at the 0 cm mark and their thumb on the other side of the ruler. This lets the student to grab or pinch the ruler. The catching student has their fingers close to the ruler but not touching it. Once the other student drops the ruler, the catcher tries to catch the ruler with their same fingers. The highest point where the catching student's index finger is recorded on handout. Repeat three times.

4. Sight.   The student who catches puts their finger on the 0 cm mark. The dropping student drops the ruler with out any other clues. The catcher tries to grab the ruler once it is dropped. Record the result. Repeat three more times.

5. Touch.   The student who catches puts their finger on the 0 cm mark and closes his/her eyes. The student who drops the ruler taps the catcher on the arm and drops the ruler at the same time. Once the catcher's arm is touched, they try to grab the ruler. Record the result. Repeat three more times.

6. Sound.   The student who catches puts their finger on the 0 cm mark and closes his/her eyes. The student who drops the ruler says "now" and drops the ruler at the same time. Once the catcher hears "now", they try to grab the ruler. Record the result. Repeat four more times.

7. Students create a bar graph with the average of the senses as the IV (independent variable) and the numbers 0 to 30 cm as the DV (dependent variable).

Accommodations: Students with physical limitations can do one trial instead of five. Students who are not able to participate can make predictions while watching another group perform their lab.   Students with an IEP can take the handout home if they need extra time. If a student with an IEP cannot calculate average, they can graph one of their data points for each indicator.

Evaluation:
The problem statement, hypothesis, and materials are worth 5 points. The data table is worth 10 points. The analysis questions are worth 2 points each for a total of 14 points. The conclusion is worth 6 points. The graph is worth a total of 15 points with each part worth 5 points: title and labels, correct IV and DV values, completed graph. This assignment is worth a total of 50 points.

Scientific Method - Senses Lab

Problem Statement: Describe what you will be testing.

_____

_____

Hypothesis:
If _____,

Then _____.

Materials:

_____

Procedures:

    In groups of two, one student will drop the ruler and one will catch the ruler. Both students can use the results of the student who catches the ruler.

    The student, who is dropping the ruler, holds the top of ruler vertical at the 30 cm end. The student, who is catching the ruler, puts the top of their index finger at the 0 cm mark and their thumb on the other side of the ruler. This lets the student to grab or pinch the ruler. The catching student has their fingers close to the ruler but not touching it. Once the other student drops the ruler, the catcher tries to catch the ruler with their same fingers. The highest point on the ruler where the catching student's index finger is on is recorded on handout. Repeat three times.

    Sight.   The student who catches puts their finger on the 0 cm mark. The dropping student drops the ruler with out any other clues. The catcher tries to grab the ruler once it is dropped. Record your results. Repeat three more times.

    Touch.   The student who catches puts their finger on the 0 cm mark and closes his/her eyes. The student who drops the ruler taps the catcher on the arm and drops the ruler at the same time. Once the catcher's arm is touched, they try to grab the ruler. Record your results. Repeat three more times.

    Sound.   The student who catches puts their finger on the 0 cm mark and closes his/her eyes. The student who drops the ruler says "now" and drops the ruler at the same time. Once the catcher hears "now", they try to grab the ruler. Record your results. Repeat three more times.

Experiment:

Trial	Sight	Touch	Sound
1			
2			
3			
4			
5			
Average			

1) Independent variable: _____Dependent variable: _____

Graphing:
Students create a bar graph with the averages on the x-axis and the numbers 0 to 30 cm on the y-axis. Make sure to title and label the x and y axis's.

Analysis:
2) Which sense was fastest? _____ Which sense was slowest? _____

3) Did the ruler drop to the floor during any of your trails? _____

4) What experimental term is it called when a ruler is dropped to the floor? _____

5) Were the results of the sight trials the same as the average? _____

6) Why did you perform five trials for each sense instead of one? _____

_____

7) Please circle: If the results of the five trials were close in value, this is called <u>precise</u> or <u>accurate</u>.

Conclusion:

8) _____