

A Classic 4th Grade Science Fair Example

Key Ideas:

- **Display the Scientific Method on a 3-sided Board**
- **Create a Research Binder containing a Scientific Journal**
- **Take a scientific principle and test ONE single variable.**
- **Relate topic to a real life application. (Scientific Problem)**



Step #1 – Develop a Scientific Question based on a Scientific Problem: Does milk affect plant growth?

- **Understand Control Group – Plant & Water**
- **Experimental Group – ONE single factor of variation**

Step # 2 - Background Research - Complete a Literature Review – Download guidelines from Website

1. Asking Questions...What are the “variables” in your plant growth experiment? (Sun, water, soil, temperature, amount of growth space, type of plant, time)
2. What makes plants grow? (Photosynthesis)
3. What is photosynthesis?
4. What “chemicals” are in milk?
5. Which Sources of Research are you going to record in your Research Binder?: (Internet, Books, Magazines, Newspaper, Interview)

BLOCK CH NOTE: What is the number of Required Sources for your grade level?:

- **4th Graders = 4 Sources**
- **5th Graders = 5 Sources**
- **6th Graders = 10 Sources + one Interview**

Step # 3 – Hypothesis Statement & Explanation: “I believe that milk will increase plant growth.”

Hypothesis reasoning for this statement will need to be explained both in the binder and on the board.

Step # 4 - Materials: What will you need?

1. Number of test “Trials” Needed for your experiment?

4 th Graders	5 (One plant per Liquid)
5 th Graders	5 Trials (3-5 Plants per Liquid)
6 th Graders	10 Trials (6-10 Plants per Liquid)
High School	25-50 Trials are required to drown out genetic differences

2. 5 Bean Plants
3. 5 Liquids: Milk, Kool-Aide, Water, Orange Juice, Pepsi
4. 5 plastic cups to be used as Measuring Cup (This will avoid cross-contamination of liquids.)
5. Research Binder to record notes
6. **Camera to take photos**

Step # 5 - Procedure: Step by Step to isolate all “non-tested” Variables. Test only ONE Single Variable.

1. Limit: All liquids will be refrigerated to avoid bacteria growth.
2. Consistency: “Feed” each plant daily for 20 days.
3. Quantity: Each plant is watered with the same amount of liquid (¼ cup) daily
4. Time: Each plant is watered at the same time of day.
5. Location: Each plant is placed in the same location for sunlight.
6. Space: Each plant is placed in the same size container.
7. Soil: Each plant is planted in the same soil.
8. Observation: **Record** the number of new leaves for each plant **daily**.
9. Observation: **Record** the number of dead leaves for each plant **daily**.
10. Observation: **Record** the height of each plant **daily**.
11. Observation: **Take photos** of each plant **each 3 days**.

Step # 6 - Record Data: Record Data in Binder. This is your observation.

1. Chart: Chart will display the number of new leaves over time.
2. Table: Table will display the number of dead leaves over time.
3. Graph: Graph will display the height of each plant over time.
4. Photos: Photos will show plant growth over time.

Step # 7 - Interpret Data: Ask why and what happened...

- What happened to the plants?
- Why did this happen to the plants?
- What observations did you make? Number of new leaves? Dead leaves?
- Use scientific thought to explain why “things happened” as they did?
- Remember a Scientific Project is a human endeavor. Interpretation and Observation of data.

(Remember the “hearing the knock at the door” example?)

Step # 8 - Conclusion: Explain why the hypothesis was OR was not supported by the data. It is ok if the data does not support your hypothesis. In fact, sometimes it may be better if your data does not support your hypothesis because this leads to further research. The key to the conclusion is an explanation BASED on your FINDINGS AND RESEARCH. A complete explanation of how the conclusion relates to the hypothesis earns “higher points.”

Example Conclusion: The information gathered in this experiment suggests that the hypothesis is not supported by the data. The data indicated that Kool-Aide made the plants grow best. I think that milk hindered the plants’ photosynthesis. Therefore, I would not use milk to feed plants. However, the plant fed with Kool-Aide also turned red, so other questions remain.

Step # 9 - Further Research: Can you connect this to a real-life application?

I would like to discover why Kool-Aide made plants change color. It might be possible that the sugar content in Kool-Aide assisted in the photosynthesis process of making the plants grow better. **I would have to test this new hypothesis: Kool-Aide changes plant color.** If I could complete this experiment again, I would test a variety of flavors of Kool-Aide. Maybe the combination in the Kool-Aide flavoring has something to do with how sugar, water, and minerals are transported in a vascular plant. If I can figure out how to make plants turn a certain color, than I can use this idea to make plants change color for Holidays, like a florist does for Special Occasions.

Step # 10 – Compete the Construction of a 3 sided Science Fair Board.

“A true science fair project should create more questions than it answers.”