

Scientific Method Practice

In the scenarios below, identify the following components of an experiment.

1. Independent variable
2. Dependent variable
3. Control
4. Repeated trials
5. Constants

Use the scenario below to write a title and a hypothesis using the following formats:

6. Title: The Effect of the (changes in the independent variable) on the (dependent variable)
7. Hypothesis: If the (independent variable – describe how it will be changed), then the (dependent variable – describe the effect).

Scenario 1 Floor Wax

A shopping mall wanted to determine whether the more expensive “Tough Stuff” floor wax was better than the cheaper “Steel Seal” floor wax at protecting its floor tiles against scratches. One liter of each brand of floor wax was applied to each of 5 test sections of the main hall of the mall. The test sections were all the same size and were covered with the same kind of tiles. Five (5) other test sections received no wax. After 3 weeks, the number of scratches in each of the test sections was counted.

Scenario 2 Brands of Car Wax

Jack wanted to test which brand of car wax was most effective. He tested four brands of wax. He cleaned the hood of his car and removed the old wax. He measured four equal sections on the hood of the car. Each of the waxes was used to cover a section. An equal amount of wax, the same type of rag, and equal buffing were used. Five drops of water were placed on each square, and the diameter of each drop was measured (cm) (quantitative). Jack could have used a qualitative dependent variable by developing a rating scale for amount of shine, from dull to very shiny.

Scenario 3 Compost and Bean Plants

After learning about recycling, members of John’s biology class investigated the effect of various recycled products on plant growth. John’s lab group compared the effect of different-aged grass compost on bean plants. Because composition is necessary for release of nutrients, the group hypothesized that older grass compost would produce taller bean plants. Three flats of bean plants (25 plants/flat) were grown for 5 days. The plants were then fertilized as follows: (a) Flat A: 450 g of 3-month-old compost, (b) Flat B: 450 g of 6 month-old compost, and (c) Flat C: 0 g compost. The plants received the same amount of sunlight and water each day. At the end of 30 days the group recorded the height of the plants (cm).

Can you find what is wrong with these Scientific Method Experiments?

Scenario 4 Metals and Rusting Iron

In chemistry class, Allen determined the effectiveness of various metals in releasing hydrogen gas from hydrochloric acid. Several weeks later, Allen read that a utilities company was burying lead next to iron pipes to prevent rusting. Allen hypothesized that less rusting would occur with the more active metals. He placed the following into 4 separate beakers of water: (a) 1 iron nail, (b) 1 iron nail wrapped with an aluminum strip, (c) 1 iron nail wrapped with a magnesium strip, and (d) 1 iron nail wrapped with a lead strip. He used the same amount of water, equal amounts (mass) of the metals, and the same type of iron nails. At the end of 5 days, he rated the amount of rusting as small, moderate, or large. He also recorded the color of the water.

Scenario 5 Perfumes and Bees' Behavior

JoAnna read that certain perfume esters would agitate bees. Because perfume formulas are secret, she decided to determine whether the unknown Ester X was present in four different perfumes by observing the bee's behavior. She placed a saucer containing 10 mL of the first perfume 3 m from the hive. She recorded the time required for the bees to emerge and made observations on their behavior. After a 30-minute recovery period, she tested the second, third, and fourth perfumes. All experiments were conducted on the same day when the weather conditions were similar; that is, air temperature and wind.

Scenario 6 Fossils and Cliff Depth

Susan observed that different kinds and amounts of fossils were present in a cliff behind her house. She wondered if changes in fossil content occurred from the top to the bottom of the bank. She marked the bank at five positions: 5, 10, 15, 20, 25 m from the surface. She removed 1 bucket of soil from each of the positions and determined the kind and number of fossils in each sample.

Scenario 7 *Aloe vera* and Planaria

Jackie read that *Aloe vera* promoted healing on burned tissue. She decided to investigate the effect of various amounts of *Aloe vera* on the regeneration of planaria. She bisected the planaria to obtain 10 parts (5 heads and 5 tails) for each experimental group. She applied concentrations of 0%, 10%, 20%, and 30% *Aloe vera* to the groups. Fifteen mL of *Aloe vera* solutions were applied. All planaria were maintained in a growth chamber with identical food, temperature, and humidity. On day 15, Jackie observed the regeneration of the planaria parts and categorized development as full, partial, or none.