Science Lab Investigation: Faucet Aerator with Engineering Component

Objective

Students will investigate how a faucet aerator works and explore its impact on water conservation. They will also engage in an engineering design challenge to create their own version of a faucet aerator.

Materials

- Faucet with removable aerator
- Different types of aerators (if available)
- Measuring cups
- Stopwatch
- Water source
- Paper towels
- Engineering design materials (plastic bottles, mesh, rubber bands, etc.)
- Notebooks and pencils for recording observations

Introduction

A faucet aerator is a small device attached to the end of a faucet. It mixes air with water, which reduces water flow while maintaining water pressure. This helps to conserve water and reduce utility bills. In this investigation, students will learn how aerators work and why they are beneficial. They will then apply engineering principles to design their own aerator.

Hypothesis

Students will hypothesize how an aerator affects water flow and conservation. For example: "I believe that using a faucet aerator will reduce the amount of water used without significantly changing the water pressure."

Procedure

Part 1: Investigating the Faucet Aerator

1. **Observation**: Remove the aerator from the faucet and observe its components. Discuss what each part might do.

2. **Experiment**:
    a. Measure the water flow without the aerator:
        - Place a measuring cup under the faucet.
        - Turn on the faucet for 10 seconds and measure the amount of water collected.
    b. Measure the water flow with the aerator:
        - Reattach the aerator.
        - Repeat the measurement process for 10 seconds.
    c. Compare the amount of water collected with and without the aerator. Record the results.

Part 2: Engineering Design Challenge

3. **Define the Problem**: Explain that students will design and build their own faucet aerators using available materials.
4. **Criteria and Constraints**:
    - The aerator should reduce water flow while maintaining adequate water pressure.
    - It should fit securely on the faucet.
    - Use provided materials within the given time frame.
5. **Brainstorm and Design**: Have students sketch their designs and list materials needed.
6. **Build and Test**:
    - Construct the aerators based on their designs.
    - Test the aerators using the same procedure as in Part 1.
    - Record the water flow and compare it with the initial measurements.
7. **Evaluate and Redesign**: Discuss the results. If the design did not meet the criteria, brainstorm improvements and test again.

Data Collection

Condition	Water Flow (ml)
Without Aerator	
With Kit Aerator	
With Student Made Aerator	

Analysis Questions

8. How did the water flow compare between the faucet with and without an aerator?
9. Did your aerator design successfully reduce water flow? Why or why not?
10. What challenges did you face in designing your aerator?
11. How might your design be improved?

Conclusion

Summarize the findings and discuss the importance of water conservation. Emphasize the engineering process and how iterative testing and redesigning help solve real-world problems.

Extensions

- Research different types of aerators and their specific uses in various settings.
- Explore the impact of water conservation on the environment and community resources.
- Create a campaign to promote the use of aerators in students' homes.

Safety Considerations

Ensure that students handle water and materials safely to avoid spills and accidents. Supervision is necessary when working with running water and small components.