POURING WATER BETWEEN TWO GLASSES

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INTRODUCTION:

What is an observation? What is a conclusion? How does one investigate those observations? This activity explores how science works by collecting observations and then investigating them to verify conclusions, by experiments.

MATERIALS NEEDED:

water.
two 6-8 ounce glasses (glass or plastic)
optional materials may be used for a classroom activity (see procedure)

SAFETY PRECAUTIONS:

Wear safety goggles or glasses

There are no hazards associated with materials in this experiment.

DISPOSAL:

All materials in this experiment can be disposed of in the trash or down the drain.

EXPERIMENTAL PROCEDURE:

Fill a glass about 3/4 with water. Begin pouring water from one glass to another in a steady stream.

Question your audience for observations: "What do you observe?"

Differentiate between observations and conclusions/explanations. For example, the observation is "bubbles" not "air bubbles". (Note: air bubbles is a conclusion since we don't know if the bubbles are filled with "air".) Write the observations on the chalk board or large pad on an easel.

At this point, the experimenter may want to form the audience into small groups and provide each group with two glasses and water so that they may experiment with the system and determine additional observations.

After compiling observations, the experimenter will question the audience. As an example, questions and responses will take form similar to the following:

The experimenter will help the participants determine what the bubbles are by asking appropriate questions and performing appropriate experiments.

Some appropriate responses for "bubbles" are:

Question: From past experience, when have you observed bubbles in a liquid?

Response: Boiling.

Question: Is this boiling?

Response: No it is not hot.

Question: Can I boil water at room temperature?

Response: No

Demonstration: Boil water in a closed system by reducing the pressure.

Question: Is it hot?

Experiment: Have someone touch the container of water.

Response: It is not hot.

Statement: The water does not have to be hot to boil.

Response: The cups are open to the air. The system containing the boiling water was a closed system.

Conclusion: The water is not boiling.

Other responses include:

Bubbles sometimes appear in a liquid on standing.
Bubbles form in soda (carbonated beverages).

To demonstrate bubbles in a carbonated beverage, shake the beverage container then open it. Another alternative is to put some carbonated beverage in a baby bottle, cap it with a nipple without a hole (available from EvenFlo customer service at 1-800-356-BABY.) and shake. Repeat with pure water.

Let some tap water stand. Observe the bubbles that form after a while. Where did they come from?

Eventually, all possibilities will be exhausted leaving only the explanation that the bubbles are air bubbles. The experimenter may want to add examples from nature on how gases get mixed with water in streams, rivers, or oceans.

Another observation is "The water falls down."

Question: Why?
Response: Gravity

Question: Can we pour up?
Response: No (some speculation may be offered).
Experiment: Pour a gas from one inverted glass filled with air up to a second inverted glass filled with water, under water in a large battery jar or aquarium. (Yes, we can pour a gas up under water. The question was “Can we pour up?”)

Another observation is "The water makes a sound as it pours."

Question: Describe the sound (repeat the pouring)
Response: It changes.
Question: What causes this?
Response: Vibrations (varied responses).
Experiment: Talk with hand over throat.
Back into a corner while talking.
Demonstrate the mechanism of a music box, first holding it in the air and, second, place it against an object.

Eventually, the participants will associate sound with vibrations in objects and moving through the air.

Another observation is "The stream of water twists as it falls."

Examine the stream of water. What does it look like when poured out of the glass? How does it change as it falls? What happens when it falls a greater distance such as from someone standing on a desk to a bucket on the floor? (These are all surface tension effects.)

Continue with the questioning, experiments, demonstrations, and examples. There are many experiments you can devise to explain observations that you can develop with time. Follow the observations as suggested by your audience. Take the class in the wrong direction and end up at a point showing the path you followed was wrong, your class will learn from mistaken hypotheses. Always differentiate between observations and hypothesis/explanation. This process can continue for as long as there is available time.

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