Nothing New -- A Physical Change

Summary

Through observation and experimentation, students will understand the difference between physical changes and chemical changes.

Materials

Large clear plastic or glass bowl
Short clear plastic or glass bowl
Masking Tape
Plastic wrap
Small rock
Water
Salt
Stirring spoon
Pitcher or two-liter bottle
Tablespoon

- *Physical or Chemical Change?*

Additional Resources
Books

- *Kitchen Chemistry*
, by John B. Bath, Ph D. and Sally C. Mayberry, Ed.D. ISBN 4-4222-1137-6
- *Simple Science Experiments With Everday Materials*
, by Muriel Mandell ISBN 0-8069-5764-6
- *Chemistry Matters*
, AIMS Education Foundation, ISBN 1-3203-03-6
- *Hands--On Physical Science Activities*
, by Marvin N. Tolman ISBN 0-13-230178-4
- *Science Experiments You Can Eat*
, by Vicki Cobb ISBN 0-06-446002-9

Background for Teachers

Often students have the misconception that making a solution such as salt water produces a chemical change. It is important to discuss reversibility of a physical change and that chemical changes produce a new substance, physical changes do not. At the conclusion of this experiment, it is important for students to observe the same amount of salt is left in the bowl that was used to make the solution-- no matter was destroyed. The amount of water also remains the same, but that some of the water underwent a phase change to a vapor.
It is also important to activate student prior knowledge of the Water Cycle. The Water Cycle has multiple examples of physical changes.

Intended Learning Outcomes

1. Use Science Processes and Thinking Skills
5. Understand the Nature of Science

Instructional Procedures

Invitation to Learn

Ask students to imagine that while on a field trip, the class is stranded on a deserted island in the ocean. There is plenty of undrinkable salt water, but no fresh water. Explain that we have the following materials with us to make fresh drinkable water from salt water: large and small, bowl, plastic wrap, rocks, their knowledge of the Water Cycle, and the energy from the sun.

Instructional Procedures

- Allow each group of three students to experiment with the materials and their knowledge of the Water Cycle to think of ways they could get fresh water from salt water. It is helpful to review the stages of the Water Cycle before students start the experiment, especially condensation and evaporation. Discuss whether the changes water goes through during the cycle are physical or chemical.
- Allow groups to share their methods. Before introducing the design for the solar still, be sure to validate student ideas and draw similarities between their designs with the design that will be used. When possible incorporate their ideas into the design. They will have the opportunity to design and test their own stills.
- Each group will make their own solar still by:
  - Making a salt water solution by mixing three to four tablespoons of table salt with one one to two liters (depending on the size of the bowl) of tap water. It is important for students to make the solution, rather than the teacher. Making a saltwater solution provides experience with a physical change. A two-liter bottle can be used instead of a pitcher to make the solution. The students stir or shake the salt and water to make a salt-water solution. This solution represents the salt water of the ocean. Ask students to hypothesize whether making salt water is a physical or chemical change.
  - Pour the saltwater into the large bowl.
  - Place the small empty glass in the center of the large bowl. The top of the glass should be shorter than the top of the bowl, but taller than the salt water line. It is best to use a glass that doesn't have a lip top.
  - Put plastic wrap over the top of the bowl. Use masking tape to make sure the seal is tight
  - Put the rock in the center of plastic wrap, over the empty glass. The rock should not exceed the width of the cup. This will weigh the plastic down and help with water collection.
- Take the solar stills outside to an area with plenty of exposure to the sun. Let it stand for a minimum of 24 hours. The longer you leave it out, the more fresh water you will collect.
- Discuss and record predictions in student science journals.
- Observe the stills two to three times a day. After a minimum of 24 hours, take off the plastic wrap and look at the water in the cup. Ask students if they think it is salty or fresh. Students can taste the water or simply observe to see if the salt and freshwater were separated.
- Discuss what happened (distillation) to get fresh water from salt water.
- Use *Physical or Chemical Change?* checklist to help determine if the changes observed were physical or chemical. Is mixing salt and water a physical or chemical change? An optional step is to repeat the process by taking the separated salt from the still and mixing it again with the fresh water. This allows students to see that physical changes can often be repeated, reversed and new substances are not formed. Ask, "is the amount of salt still the same? Has the water disappeared or simply undergone a phase change?"

Extensions

Curriculum Extensions/Adaptations/Integration

- A simple way to illustrate that making a salt water solution is a physical change is to leave a cup of salt water in the sun and wait for the water to completely evaporate. Is the amount of salt still the same? Has the water disappeared or undergone a phase change?
- Design a new type of solar still.

Could a solar still be used to determine the amount of water content in foods such as applesauce?

Over the years, scientists proposed and tried various methods for converting freshwater to saltwater. Research the geographical and social implications of being able to efficiently find a way to convert abundant amounts of ocean saltwater to freshwater. Develop your own theory or method.

Family Connections

Make a solar still at home. Experiment with other solutions such as food coloring and water and various types of juices.

Assessment Plan

Test other solutions to see if they can be separated using distillation or evaporation.

Teacher observation and student journals.

- *Physical or Chemical Change?*
checklist.

Bibliography

Shepard,L.A.(Nov2005). Linking formative assessment to scaffolding. *Educational leadership*, 63.3 p.3

To help scaffold student understanding of physical changes, this activity builds on students' prior knowledge of the Water Cycle to understand physical changes. This article, "Linking Formative Assessment to Scaffolding," discusses the importance of eliciting prior knowledge to help students build new understanding by making sense of new experiences in light of what they already know. "Teachers should not think of prior knowledge assessment as a discrete pretest to use from time to time. Rather it should be common in classroom practice. Knowledge activation routines help develop students' metacognitive abilities while providing relevant knowledge connections for specific units of study."

Marzano,R.,Pickering,D.,Pollock,J.,(2001) *Classroom Instruction That Works*, Alexandria, VA.ASCD

This text covers multiple research based instruction strategies that when implemented, improve student achievement. "The more learners use linguistic and non-linguistic representations of knowledge, the better they are able to think and recall knowledge." One research based method that enhances the development of non linguistic representations in the classroom is making physical models--concrete representation of the knowledge being learned. Nothing New--A Physical Change was designed to give students the opportunity to use and create a nonlinguistic representation of a physical change. Students will create and observing a working solar still. Another strategy presented in this book was Generalization/Principle Patterns. The *Physical or Chemical Change?* checklist will be used to help students make generalizations when determining the types of changes occurring in matter.

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