What a Reaction

Summary

These two activities will explain the "Law of Conservation of Matter" - matter can neither be created nor destroyed.

Materials

Part #1

- Balloons
- String for tying around balloons
- Seltzer tablets
- Water
- Vials, vial holders, lids for vials,
- Scales
- Safety goggles
- Metric weights
- *What a Reaction*

Part #2

- Plaster of Paris
- Water
- Mixing bowl
- Ziploc baggies
- Thermometers
- Popsicle stick
- Spoons
- Scales

Additional Resources

Books

- *Surprising Science*
, by Nancy De Waard, John De E. John ISBN 0673363120BT

Background for Teachers

Everything in and on Earth is made of matter. The amount of matter on Earth does not change. Matter is only changed from one form to another. Matter changes physically and chemically all the time; however, the total amount of matter always remains the same. This is known as the Law of Conservation of Matter. Matter can neither be created nor destroyed. It can only change from one substance to another.

When seltzer tablets and water are mixed together they create a chemical reaction. These two substances create carbon dioxide. In this activity students will understand that matter is neither created nor destroyed. It has changed from one substance to another.

This is the reason for using the scales to measure the matter. The weight should be the same before and after the experiment. The chemical change is known as the Law of Conservation of Matter. Matter can neither be created nor destroyed. It can only change from one substance to another. Measuring all substances before and after the reaction will help students confirm predictions and draw conclusions about the "Law of Conservation of Matter."

In the second part of this activity you will be using plaster of Paris, which originated in Montmartre Paris. Plaster of Paris is formed from gypsum. The gypsum is heated to 150 decrees Celsius and becomes a dry powder. When this powder is mixed with water it re-forms into a paste and eventually

hardens into a solid. The powder mixed with water is held together by hydrogen bonds in the water molecules. This is a week bond that is easily broken. That is why Plaster of Paris is quite soft.
When Plaster of Paris and water are mixed together they undergo a chemical change. The particles rearrange to make a completely new substance. When plaster of Paris and water are mixed together the mixture becomes warm releasing energy in the form of heat therefore undergoing a chemical change.
Warning: Plaster of Paris should never be dumped down a sink or toilet. It always hardens and will cause major problems with plumbing.

Intended Learning Outcomes

2. Manifest Scientific Attitudes and Interests.

Instructional Procedures

Invitation to Learn
Predict what you think will happen when vinegar and baking soda are mixed together in a bottle with a balloon attached to the top. Do you think that the mass of the objects will be the same or different after performing the experiment? Does this experiment support the "Law of Conservation of Matter?"
Instructional Procedures-Part One

- Predict what will happen when the seltzer tablet and water are mixed together. Record answers on large paper for class to see. Students should record their own predictions on their worksheet.
- Discuss what the mass will be before and after the experiment. Record these answers along with the first question.
- Have all of the materials assembled before hand to perform this experiment: scales, metric weights, seltzer tablets, water, balloons, vials, lids, and vial holders.
- Model how you want the experiment to be preformed. Show students how to do everything you want the students to do except pouring the water into the balloons. You want the students to experience this sensation as they perform the experiment.
- Break your seltzer tablet into four small pieces. Place these pieces in your balloon. Place the balloon on the balance scale along with your piece of string and record the weight.
- Place your vial and lid on the balance scale. Record their weight. Pour water into the vial and place lid on the vial. (three-fourths full of water). Place the vial onto the scales and record the weight.
- Subtract the weight of the vial and lid from the weight of the vial with water and lid to get the weight of the water.
- Model this next step for students without pouring the water in the balloon. This would give the prediction away.
- Demonstrate how to carefully remove the lid from the vial and pour the water into the balloon making sure that the balloon does not let any gas escape.
- Show student how to tie the balloon closed and watch what happens.
- Record observations.
- Add the weight of the water to the weight of the balloon, string, and seltzer tablet.
- The weight should be the same before and after the experiment.
  - Do the results match predictions or do predictions need to be modified.
  - Check to see if the mass is the same or different from the first measurement taken.
  - Explain measurement on *What a Reaction* worksheet.
  - Now experiment has been modeled for students so have students collect materials and perform the experiments in groups.
  - Write on worksheet what happened with experiment.
  - Explain what this experiment has to do with the "Law of Conservation of matter?"

Instructional Procedures-Part Two

Get materials ready.
Hand out the graphic organizer to each student.
Hold up a baggie with the white powder in it and a cup with water.
This part is the invitation to learn. Have each student predict on their graphic organizer what they think will happen when the powder and water are mixed together.
Hand out the materials to perform the activity. This activity may be done in groups or individually. If done in groups each student should be responsible for their own graphic organizer.
Because of the "Law of Conservation of Matter" all materials need to be weighed before and after the experiment.
Read through the worksheet with the students before they perform the activity. Check for understanding and clarify any misunderstanding and answer any questions.
Guide the students through the activity step by step.
Record the weight of all the individual ingredients. Add all individual weights for a total.
Record a temperature reading of the powder before mixing.
Mix the ingredients in a bowl for about three minutes. Record a temperature reading of the mixture. Pour the mixture into a baggie. Press to remove all of the air and seal the baggie.
Mold into desired shape by pressing on the bag. (You will need to wait about 20 minutes before the change starts to occur and the shape can be molded.)
After twenty minutes you should start to feel the temperature changing. Tape the thermometer to the baggie. Record a temperature reading every two minutes for 14 minutes.
Record the temperature and their observations about what is taking place every two minutes.
When the temperature stops rising or starts going down remove the thermometer from the baggie, weigh all materials and compare beginning weight with ending weight.

Extensions

Curriculum Extensions/Adaptations/Integration

Use an aquarium to mix baking soda and vinegar to produce carbon dioxide. Students will not be able to see the gas; however, carbon dioxide is produced.
Blow bubbles into the aquarium and watch what happens. The bubbles will float on top of the gas proving that the gas is really there. Students are fascinated by this experiment.
Make another mixture of Plaster of Paris and water in a clear bowl. With the mixture in the bottom pour a cup of water on the top of this mixture. This will show the students that the change did not occur because water evaporated, rather the change occurred because it was a chemical change.
Pour one cup of Plaster of Paris, one and a half cups of vermiculite and one cup of water into bowl. Stir this mixture until it is ready to be sculpted. When this mixture no longer sticks to the sides of the bowl it is ready to be sculpted. This would be a great activity to have students do to demonstrate their knowledge of landforms.

Family Connections

Tie a string to the middle of a ruler and attach a blown up balloon to one side and a balloon without being blown up on the other side. Lift the ruler by the attached string. Explain what happened. The ruler should drop down on the side of the blown-up balloon. Teaching that air is matter and has weight.
Students and family members could perform this same experiment with aquarium, baking soda, and vinegar at home.
This same Plaster of Paris recipe could be used at home to create a fictional character. When finished it could be painted and used to write a story about the character.
There are many molds that can be purchased at craft stores. Students could use a mold and the

Plaster of Paris recipe to create something that they are interested in.
When students do one of the connections at home they should explain what is happening with the Plaster of Paris. This will help cement their learning of the "Law of Conservation of Matter."

Assessment Plan

Check student's worksheet for clear understanding of the "Law of Conservation of Matter" along with correct terminology.
Have students explain to one another what has taken place and listen for correct terminology and explanations. Record findings.
When doing the curriculum extension tell students that they will need to explain what happened when baking soda and vinegar are mixed together. Students will explain what gas is made and why the bubbles seemed to be suspended in mid-air. They will need to tie this to the "Law of Conservation of Mater."
After students have preformed the experiment they should be able to write a reflection paper. They should include in their paper something about heat as an indicator that a "Chemical Reaction" has taken place. The student should conclude something about when the temperature stopped rising and the substance started getting hard the chemical reaction had stopped or was over and that a new substance was formed.

Bibliography

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Hands-on learning is critical to students' understanding of science concepts. Research shows that hands-on projects actually help children learn better. Hands-on learning helps students more readily understand concepts and boosts their self-confidence.
Performance Assessment is the collection and evaluation of evidence of student learning, focusing on indicators of meaningful and valuable student progress. This type of assessment asks students to perform, create, produce, or do something. Performance assessment moves the students into higher-level thinking and problem-solving skills. It uses tasks that represent meaningful instructional activities involving real world applications and using human judgment to do the scoring.

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