Physical Science: Solids and Liquids

Activity Overview

Children mix common ingredients together and **observe** the interesting and exciting results. In the process of **experimenting**, they encounter dissolving, changes in texture and consistency, and color mixing. As they create their mixtures, they **explore cause and effect**, **test their predictions,** and **communicate their results**. They **use scientific tools** and engage multiple senses to help them make discoveries.

*science process skills are in bold

Underlying Science Concepts:

- A mixture is a substance in which two or more substances are combined.
- Combining different substances together can produce a new substance with different properties (i.e. color, texture, and consistency).
- Substances can be grouped according to their physical properties into solids, liquids, and gases.

Materials:

For "Engage":

- A set of at least 3 liquids in clear cups and at least 3 solid ingredients in clear cups (see suggestions below)
- Ice cube tray (or Styrofoam™ egg carton, paint tray with wells, or mini muffin tin)

For "Explore":

- At least 3 liquid ingredients for mixing (see suggestions in box)
- At least 3 solid ingredients for mixing (see suggestions in box)
- Clear cups or other containers that will not easily spill
- Small plastic spoons (such as those on the ends of coffee stirrers or ice cream sampling spoons)
- Eye droppers or pipettes (use plastic spoons if droppers are not available-one per cup of liquid)
- Stirring sticks, such as craft sticks or coffee stirrers
- Paper towels
- Magnifying lenses (optional)

Suggested Solids and Liquids:

Solids: flour, salt, cornstarch, baking soda, colored gelatin
Liquids: water, juice, milk, dish soap, oil
(Using different types of liquids makes for more interesting mixtures; however, red, blue, and yellow colored water can be used instead.)

Getting Ready:

- For each group of 4-6 children, prepare a set of solids and liquids in cups for the children to mix at the tables. Place the ingredients in clear cups that will not easily spill. Place plastic spoons in the solids, and eyedroppers in the liquids.
- On a tray, place a set of the cups of solids and liquids for yourself to use for the "Engage" section. Have an ice cube tray, stir stick, and magnifying lens (optional) nearby.
- For each child, place on the table: an empty ice cube tray (or other mixing tray), a stir stick, a paper towel to wipe off their stir stick, and a magnifying lens (optional).

Before doing this activity with the children, do a little experimenting yourself with the solids and liquids you have chosen. This experience will help prepare you for making this a successful activity in the classroom.

Engage

- Ask if anyone has ever mixed ingredients together. As they share, encourage them to describe what they used and what happened when they were mixed. If they don't have ideas, you might lead them with questions about mixing ingredients in the kitchen, at the beach, or in the bathtub.
- Tell them that when we mix different ingredients together, it is called a *mixture*.
- Let the children know that you brought some ingredients for them to use to make mixtures, and they will get to do experiments. Like scientists, they will make observations and notice what happens when they combine different ingredients together.
- Show them a tray with the cups of ingredients that they will be using. Explain that the ingredients are all things you might have in your kitchen, but we won't be eating or drinking them today. We'll be using them for science experiments.
- Identify each of the ingredients in the cups. If you have the original containers that the ingredients came in, show them to the children so they can make stronger real world connections.

Optional: Discuss Solids and Liquids

The goal is not for children to learn the definitions of liquids and solids, but this activity can be a good way to introduce these terms and concepts, depending on the readiness of the children.

- Tell them that some of the ingredients are called LIQUIDS. Ask if anyone has heard of "liquids" before or has an idea about which ingredients are liquids. Encourage them share their ideas.
- Depending on the children's prior knowledge, give them clues to help them figure out which ingredients are liquids. For example, you could say, "If I put my finger in a liquid, it will get wet." Then test the ingredients by placing your finger (or a child volunteer's finger) into each cup. Or you could say, "Liquids make a puddle when they spill," and then demonstrate which ingredients make a puddle and which do not (the solid ingredients can make a pile, but not a puddle).
- If children say that liquids are things that we drink, affirm that we do drink *some* liquids, but challenge them to think of liquids that are not for drinking.
- Once you have established which ingredients are liquids, tell the children that the other ingredients are called SOLIDS. Let them share their ideas about what solids are.
- Ask them how the solid ingredients are different from the liquid ingredients. Establish that the solid ingredients are dry, they do not make a puddle when spilled, and that you can pick up a tiny little piece of the solids, (but you can't pick up a piece of a liquid.)

- Tell the children they can experiment to find out what happens when they mix the different ingredients together. Show the additional materials they will be using and give the following tips:
    - To pick up the dry ingredients (solids), we will use small spoons. Emphasize that they only need to use a little bit at a time.
    - To pick up the liquids, we will use droppers (demonstrate how to use a dropper).
    - We will use stir sticks for stirring.

- Your job is to mix the different ingredients together in the ice cube tray and to observe what happens. What kind of mixtures can you make?
- Optional - Use magnifying lens to see more closely.

Explore

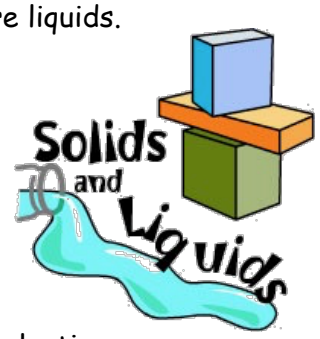
- Allow children to make their own choices about which ingredients to mix together in each of the wells in their tray. Let their curiosity lead the way!
- As children combine the different solids and liquids, remind them to:
  - Use small amounts.
  - Take their time! Add a little of this and a little of that. Stir them together. **Observe** what happened. **Predict** what will happen if they add another ingredient.
  - Notice how their mixture changes as they add different ingredients.
  - Share with others at the table. If you can't reach something, say, "Please pass the ____." (Remember to say "Thank you!")
  - Put the little spoons and droppers back into the cups they belong in.
  - It is not necessary to fill up all the wells in their tray.
- As children are working, ask questions such as:
  - What do you notice?
  - What do you think will happen when you add ___?
  - How did it change?
  - Which ingredients did you use?
  - How does it feel? (It's okay to let the children touch their mixtures.)
  - What does it remind you of?

Refrain from asking too many questions…children also need uninterrupted time to focus on their work.

Reflect

- Ask questions such as:
  - What kinds of mixtures did you make?
  - What other kinds of ingredients (solids and liquids) would you like to try mixing together?

Ideas for Further Explorations



- When eating foods at snack time or lunch, talk about which are solids and which are liquids. Some foods, like oranges, are a mix of both.
- Make mixtures with children such as playdough, oobleck, flubber, cloud dough, etc. Directions can be found online.
- Cooking is Chemistry! Include cooking as part of your science curriculum with opportunities for children to combine ingredients and observe how they change.
- Investigate ice to discover more about water in its solid and liquid states.
- Make Discovery Bottles with the children by putting various solids and liquids into plastic bottles and sealing the caps. There are a limitless number of combinations to experiment with and many suggestions can be found online.

Literature Connections

- ***Pancakes, Pancakes*** **by Eric Carle**
- ***Walter the Baker*** **by Eric Carle**
- ***Soup Day*** **by Melissa Iwai**
- ***Warthogs in the Kitchen*** **by Pamela Duncan Edwards**
- ***Five Little Monkeys Bake a Birthday Cake*** **by Eileen Christelow**

Key Vocabulary:

During the activities integrate the words below into your conversations. Children's vocabulary will build with practice.

- Mixture
- Ingredient
- Observe
- Predict
- Dissolve
- Thicker
- Thinner
- Liquid
- Solid

Teacher Tips

The goal of this activity is not for children to learn or memorize definitions of solids and liquids, but rather to explore different properties and characteristics of liquids and solids through hands-on experiences.
Mixing together solids and liquids is a fun and developmentally appropriate way for young children to begin learning distinctions between states of matter.
More importantly, mixing activities lead children to make connections between what they do (for example, adding more water to their mixture), and what is happening to the materials. This activity engages children in early chemistry experiences and builds their understanding of how substances can change and transform. The open-ended nature of this activity allows each child to control his or her own experiments, which is empowering. Keep the emphasis on the processes of experimenting, observing, comparing, describing, and communicating.

Background Information for Teachers

One way to change substances is by mixing them together. In chemistry, a distinction is made between chemical changes and physical changes. A **chemical change** takes place when two substances are mixed together, a chemical reaction takes place, and a new substance is produced. A chemical change involves a change at the atomic and molecular level. An example being that baking soda mixed with vinegar produces carbon dioxide gas. A **physical change** takes place when substances are mixed together and remain simply a mixture of those two substances, such as dissolving salt or sugar in water, mixing sand and water, or making flour and water paste.

The science related to chemical and physical changes is too abstract for young children. Rather, the focus should be on the changes (or transformations) that they observe as they make mixtures. They can see how adding more water changes flour into a soft dough or thin paste. They can notice that some substances mix together easily, and others do not mix at all (such as oil and water). They can observe that salt will dissolve in water, while sand will settle on the bottom. From their first hand experiences, children may learn about dissolving, absorbing, floating, sinking, and about the properties of liquids and solids. As an intentional teacher, you can scaffold their learning and support their emerging scientific understandings.