Kitchen Chemistry: Fun Food Activities and Experiments

By Christina Blassingame-Cleveland

Chemistry is the study of the way materials are put together and how they act under various conditions. There are many chemistry concepts that explain daily events we observe in life. Chemistry uses all of one's senses-what one sees, tastes, touches, smells, hears, and feels. Many or most of the experiments in this unit can be performed in a classroom setting using items found in an ordinary household kitchen. I hope this unit encourages a child's natural curiosity and introduces them to the fun of chemistry. Young children are genuinely inquisitive; these experiments and activities are designed to interest and excite them. This unit is divided into three sections. The first one is experiments with water. The second one is experiments with food. The third one is experiments using acids and bases. The last section lists various cooking activities using foods. Enjoy!

RATIONALE

"Curiosity killed the cat, satisfaction brought him back." Though this saying contains no truth, it illustrates a good point. The aim of this unit is to peak the interest of 3-5 year olds in science, chemistry, cooking, and the world around them. The experiments and activities are short, make use of easily available materials, and are designed to stimulate the minds of pre-kindergarten age students in a multi-age classroom. From my teaching experience, I know that young children enjoy discovery activities and learn best by engaging in hands-on activities.

At the present time, there is no designated science curriculum at the pre-kindergarten level. It's up to each teacher to pick and choose what ideas and lessons he or she wants to teach. However, the newly implemented Letter People curriculum does contain some lesson plan ideas around science-usually to correlate with a theme and a letter, to be covered in either a one or two week time span. Plus, all Head Start teachers are required to do a weekly health and nutrition lesson as well, so many of these experiments could be incorporated into a health or nutrition activity.

In addition, the experiments in this curriculum unit are designed to be done by a teacher, with the children as an eager, inquisitive audience. They can be done in small groups of three, four, or five children. While doing the experiments with water, students will discover what types of foods contain starch, find out what a starch is, and learn how to test various foods for starch. Starch is a large molecule found in living cells. It looks like a long twisted chain with many branches sticking out. This long twisted chain is thought to capture the iodine inside the spiral pattern. It combines with iodine to form a distinctive blue-black color (VanCleave 221). This is an excellent way to segue a lesson into a lesson on nutrition or the five basic food groups.

Now for a little background information. This will be helpful to know before beginning the classroom activities with water. The linking of two or more atoms produces a molecule. Water molecules have a strong attraction for each other, which draw them closer together. The surface

of water acts as if a thin skin were stretched across it (VanCleave 38). This allows objects to float on top.

Students will also learn how soap works, what molecules are (see above paragraph), and how they move and observe diffusion. Diffusion is the movement of molecules from one place to another, resulting in an even distribution of the molecule particles. Students will also observe capillary action, the movement of water up through tiny tubes. Students will also make their own soapy bubble solution, and blow soap bubbles. The soap and water molecules link together to form a zigzag pattern (VanCleave 60). This irregular pattern allows the thin layer of liquid to stretch outward when blown into. A related lesson on personal hygiene would also work great here, too. Soap molecules are long. One end will dissolve in water and the other will dissolve in oil. One end of the molecule works on the particles of grease and the other end stays in the molecules of water (Wood 49). I chose these activities because I thought they would be fun and would be of interest to a three, four, or five year old.

While observing the experiments with food, students will learn why an apple turns brown. This is due to enzymes, chemicals found in living cells that change the speed of the chemical reaction in the cell. Students will also observe liquids, solids and what happens when they are separated, and observe a liquid change to a solid. When a substance freezes, it changes from a liquid to a solid by reducing the heat content of the liquid. Students will then find out why and how a powder dissolves into a liquid, and see how a solid dissolves when placed into a liquid. Dissolving means that the solute, which is the material that breaks into smaller parts and moves throughout a solvent, moves evenly throughout the solvent (the material that a solute dissolves in) (VanCleave 221,152).

I also included four experiments with acids and bases, because I thought they would help children observe the many changes that happen to food or food related products like baking soda, salt, etc. An acid is a material that tastes sour, neutralizes bases, and turns purple cabbage juice red. A base is a material that tastes bitter, neutralizes acid and turns purple cabbage juice green. The process of neutralization is one in which an acidic or basic solution is brought to a neutral state, one which is neither acidic nor basic. As a result of these experiments, children will observe how to make an acid indicator, find out which foods or kitchen substances contain acids, such as vinegar and pickle juice neutralize acids. An acid indicator is a solution that will indicate the presence of an acid or a base. Keep in mind these experiment are best done when teacher-directed, with student assistance as needed.

During the experiment "Making Copper Shine," students will produce hydrochloric acid by mixing vinegar and salt, which turns into a strong acid that quickly removes the dull coating on the copper penny. In the experiment "How to Make Carbon Dioxide", children will learn that carbon dioxide gas can be made with baking soda and vinegar. As the gas escapes, the mixture will begin to bubble. I think that the children will enjoy this experiment. An oxide is an compound that is made up of oxygen combined with any other element.

Most people don't think of cooking as chemistry, but when batters turn into pancakes, cookies, or cakes, it definitely is chemistry. Here are four fun food activities that students will love. In each activity, they will make ice cream, butter, popcorn, Jell-O, and pancakes. As they watch the ice

cream freeze, they will see how properties of matter change. When they shake up the heavy cream, they will observe suspension. Suspension is a mixture of two materials; one does not dissolve in the other, but temporarily stays suspended in the liquid until gravity pulls it down. The children will make peanut butter, and the use it to create peanut butter play dough or peanut butter ice cream. As they see popcorn pop, they will learn how heat in the popcorn kernel turns to steam and then bursts the starch shell. And making pancakes is a great way to see bubbles trapped in dough. The children can enjoy their food as a snack or as part of their lunch.

UNIT OBJECTIVES

The student will be able to:

1. Identify the cause and effect of an experiment.

2. Discuss the results of various experiments.

3. Observe and tell what happens during an experiment.

4. Identify the colors red, orange, yellow, green, blue, purple, brown, and black.

5. Assist with simple cooking activities.

6. Use a measuring cup.

7. Develop a new vocabulary.

8. Use everyday household items in new ways.

9. Discuss the taste, smell, and color of various materials.

AGE/GRADE LEVEL OF INTENDED AUDIENCE

As mentioned earlier, this unit is geared towards pre-kindergarten children ages three to five years old. It can also be adapted for young special needs students or for children ages six through eight. In my opinion, learning should and can be fun. Many of the activities in this unit can be adapted for grades one, two, or three. The children can perform the experiments in small groups of three or four children. They could record the results in a science journal, or make use of bar graphs or charts to show the experiment results.

UNIT STRATEGIES

There are several strategies contained in this unit. The first is student observation. There are several questions that you can ask students during the experiments. First, what materials are we using? Do you know the name of them? What are they used for? Have you ever seen them before? What do you think we will do with them? What do you think will happen? Why? Students should be allowed to touch, taste, and smell the materials, when safely able to do so. Have them describe the appearance of the materials before and after the experiment. Let students predict the results of the experiment. Were they right? Why or why not? Discuss the above questions before, during, and after the experiments. Encourage students to think of other uses for the materials, especially those found in the kitchen-like salt, vinegar, etc.

The second strategy is teacher-led demonstrations. Due to the dangerous chemicals used in some of the experiments, it is best that the teacher handle the iodine, etc. I would perform each of the experiments in a small group of three or four students. Before each experiment, we would discuss the materials used. After each experiment, we would talk about what happened and why.

In addition, for older students, a "Science Journal" would be an excellent way to chart the results of the experiments. They could write their predictions, materials needed, and the experiment results. They could also write about their predictions. Were they right? Why or why not? They could draw a chart or table of the results as well. Most of the experiments in this unit can be done by older students in pairs or a small group of three to four students.

The peanut butter play dough, ice cream, and peanut butter smoothie activities could be done during Black History Month. The children could learn about George Washington Carver, who discovered several ways to use the peanut. Many of the food activities could be done as a unit. The ice cream making activity would be ideal on a spring day. The speedy soup recipe is a great way to stay warm on a chilly winter day. When the students freeze orange juice, they could explore texture and temperature. Also, the students could use colored ice cubes, made with water and food coloring, to paint pictures.

What I like most about the many ideas in this curriculum unit is that you can pick and choose which activities to do, depending upon time constraints, subject matter, age, ability level, and student interest. The most important thing I've found is that teachers want choices. Hopefully, this unit will give teachers not only several choices, but will also provide them many opportunities to foster student learning and have fun at the same time.

CLASSROOM ACTIVITIES WITH WATER

1. Testing for Starch

Purpose: To observe foods that contain starch.

Materials: Iodine, water, small jars, paper towels or newspaper, foods to test such as potato, apple, flour, salt, etc., plastic knife, medicine dropper.

Procedure: Put the paper towel or newspaper down on a table. Give each child a plastic knife so they can cut the apple and potato. Help children pour a little bit of water in their jar. Then help children add an equal amount of iodine to their jar. Now use the medicine dropper and put a drop of iodine solution on each piece of apple and potato. Then do the same to the flour and the salt. What happened? Why?

Results: If the iodine turns dark brown or bluish purple, then the food contains starch.

Only the foods that come from plants contain starch. Make sure children don't eat the iodine or the foods with iodine on it.

2. How Soap Works

Purpose: To observe how soap works to clean grease stains out of clothes.

Materials: Plastic jar with lid, small piece of rag, powdered laundry detergent, cooking grease or shortening, water.

Procedure: Fill the jar about half full of water. Add some laundry detergent and let children take turns shaking the jar until the solution is soapy and bubbly. Drop a small glob of grease on the rag and put it in the soapy solution. Put the lid on the jar and shake it for a few minutes. Take out the rag and observe. Most of the grease should be gone.

Results: Soap molecules are long. One end will dissolve in oil and the other will dissolve in water. One end of the molecule acts on the particles of grease and the other end stays in the molecules of water. As more and more ends of the soap molecules try to work into the grease, they come between the grease and the cloth. They keep working to force the grease out of the rag and break it up into tiny balls. Each of these tiny balls is covered with a water-liking film. This film keeps the tiny balls of grease from combining and they remain in the water when the rag is removed (Wood 52).

3. Unseen Movement

Purpose: To observe the effect of molecular motion.

Materials: Dark food coloring, and a tall one half-pint jar of water.

Procedure: Put the jar somewhere that it will not be disturbed for 24 hours. Put two drops of food coloring into the water. Observe immediately and then again in 24 hours.

Results: The drops of coloring sink to the bottom of the jar. This forms colored streaks in the water as they fall. After 24 hours the water is all one color. The atoms and molecules in matter are in constant motion. The water molecules are moving; you just can't see this with your eye.

The small particles of food coloring are being moved around by the spreading molecules. With enough time, the colored particles will be evenly spread throughout the jar of vibrating water. *Diffusion* is the movement of the color throughout the water.

4. Rising Water

Purpose: To change the color of celery leaves.

Materials: One stalk of fresh celery with leaves, green food coloring, one clear plastic drinking glass, a plastic knife.

Procedure: Fill the glass about 1/4 full with water. Add food coloring to the water. Cut across the bottom end of the celery with a plastic knife. Stand the cut end of the celery in the colored water. After 24 hours observe the color of the leaves.

Results: The pale green leaves are now a dark green. All plants have tiny tubes in their stalks. The colored water moves up through these tubes to the leaves. Air pressure in the room makes the water push upward. The pressure inside is less than outside the tubes, so the colored water is pushed up to the leaves. The movement of water up through tiny tubes is called *capillary action*.

5. Soap Bubbles

Purpose: To make a soap bubble solution and to blow soap bubbles.

Materials: Liquid dish soap, 9-inch piece of 20-gauge wire or pipe cleaners, (any thin bendable wire will work,) and a cup. Depending on class size, you will need one cup per student.

Procedure: Fill the cup one-half full with the dish soap. Add enough water to fill the cup.

Stir. Make a 1-1/2 inch-diameter loop in one end of the wire. Dip the loop into the soap solution. Hold the loop, with the thin layer of soap stretched across it, about four inches from your mouth. Gently blow through the film of soap. Note: you may purchase plastic bubble blowers for this experiment.

Results: You should get lots of soap bubbles. If the soap film breaks, try to blow more gently. Add one tablespoon of soap to the solution if the bubbles keep breaking. The soap and water molecules link together to form a zigzag pattern. This irregular pattern allows the thin layer of liquid to stretch outward when blown into (VanCleave 60).

CLASSROOM ACTIVITIES WITH FOOD

1. Browning Apple

Purpose: To see the effect of oxygen on the darkening of fruit.

Materials: Apples, vitamin C tablets, plastic knives, rolling pins, plastic bags.

Procedure: Let student cut apple into slices. Put the vitamin c tablets into the plastic bags. Use a rolling pin and crush the vitamin C tablets. Sprinkle some of the powder over half of the apples. Let the apples sit uncovered for one hour. What happened? Why?

Results: The section of the apple without the vitamin C turns brown, but the section of the fruit with the vitamin C on it is still the same color. Fruits like apples, pears, and bananas turn colors when left out in the air. This is caused by chemicals called *enzymes*.

The enzymes are let out of the discolored cells and react with oxygen to digest the cells of the fruit. Color and taste changes happen. Vitamin C stops the fruit from darkening by reacting with the enzyme before it can start digesting the cell tissue.

2. Curds and Whey

Purpose: To separate milk into its solid and liquid parts.

Materials: Milk, Vinegar, small baby food jars, tablespoons.

Procedure: Fill the jars with milk. Add 2 tablespoons of vinegar and stir. Allow the jar to sit for two to three minutes. What happens? Why?

Results: A *colloid* is a mixture of liquids and very small particles that are spread throughout the liquid. Milk is a colloid. The solid particles in milk are evenly spread throughout a liquid.

Vinegar causes the small dissolved particles to clump together, making a solid called *curd.* The liquid part is called *whey*. Remember the nursery rhyme "Little Miss Muffet?" This would be a great time to review it.

3. Frozen Orange Cubes

Purpose: To see if orange juice will freeze like water. (and to see a liquid change to a solid)

Materials: Orange juice, ice tray, refrigerator.

Procedure: Fill one-half of the ice tray with orange juice. Fill the rest of the ice tray with water. Put the tray in the freezer over night. Take out the frozen cubes. Carefully try to bite into a cube of orange juice and a cube of water. Because this can be a potential choking hazard for young children, I recommend purchasing mini ice cube trays. The ice cubes will be a lot smaller.

Results: The liquid orange juice and the water both change to solids. The frozen orange juice cube is not as firm as the cube of ice. It is easy to eat the cube of orange juice. Orange juice does not become as firm as the water because all of the materials in the juice are not frozen. Many liquids freeze at a higher temperature than water does. Most of the frozen material in the juice is water. The juice cube is a combination of frozen and unfrozen material which makes it easy to eat.

4. Streamers of Color

Purpose: To observe the dissolving of a powder into a liquid.

Materials: Clear plastic drinking glasses, dark colored powdered fruit drink, flat toothpicks.

Procedure: Fill the glass with water. Use the wide end of a flat toothpick to pick up a scoop of the powdered fruit drink. Shake the powder in the water. Observe. Keep adding the powder until the water becomes completely colored.

Results: Streamers of color move down through the water. The crystals dissolve in the water as they fall. When the crystals dissolve they break apart into smaller and smaller particles evenly throughout the liquid.

5. Speedy Soup

Purpose: To make a quick, tasty cup of soup.

Materials: Bouillon cubes, plastic cups, hot and cold water.

Procedure: Fill one cup with cold water. Add one bouillon cube. Let this cup sit. Fill the second cup with hot water. Add one bouillon cube to the water and stir. What happens? Why? For this activity, allow two cups and bouillon cubes per student, or divide students into small groups to perform the experiment.

Results: The solid cube dissolved faster when placed in hot water. Heat makes the molecules of water move faster, and the water molecules hit against the cube and made it break. Stirring make it break more. The cube takes a lot longer to dissolve in cold water, although stirring helps it dissolve quickly.

CLASSROOM EXPERIMENTS WITH ACIDS AND BASES

1. How to Make an Acid Indicator

Purpose: To make an acid indicator.

Materials: One uncooked cabbage, plastic knives, large spoon, tea kettle, electric skillet or stove, paper towel, funnel, bottle with lid, water pot holders, magic marker, small paper plates. (Also have on hand items for testing such as baking soda, salt, vinegar, various kinds of fruit, baking soda, etc.)

Procedure: Put some water on to boil in an electric skillet or in a teakettle on top of the stove. Give students the small paper plates and plastic knives. Give them a piece of cabbage to cut up. Add the cabbage to the electric skillet or stove. Once the water boils, add the cut up pieces of cabbage to the water. Stir the cabbage, and then let the pieces soak for about twenty minutes. Put

the paper towel over the neck of the bottle to form a funnel. Pour the water into the bottle using a funnel. Screw the lid on the bottle. Label the bottle "Indicator."

Results: You can use this indicator to test various items or foods, such as fruit, salt, vinegar, baking soda, etc. If the indicator turns pink, then the substance was an acid.

If the indicator turned blue or green, the substance was an *alkali*. It might take longer for the color to change for some tests. If it does, add more acid indicator.

2. How to Neutralize Acid

Materials: Lemon juice, baking soda, acid indicator from the above experiment, teaspoon, medicine dropper, 3 pint sized jars, paper, pen, and tape.

Procedure: Pour about an inch of lemon juice into one jar and label it "acid." Put two level teaspoons of baking soda and about half a teaspoon of water in another jar. Now pour a little lemon juice acid into the third jar for testing-just enough to cover the bottom of the jar. Add the indicator until it turns pink. (This shows it is an acid). Then use the medicine dropper and add a few drops of alkali (the baking soda). Keep adding it one drop at a time until it turns purple. When this happens, the mixture is no longer an acid. When an alkali is mixed with an acid, a salt is produced (VanCleave 62). Most salts are neutral. Too much acid in our stomachs can cause indigestion.

3. Making Copper Shine

Materials: Several dull copper pennies, paper towels, table salt, vinegar, medicine dropper.

Procedure: Fold the paper towel and put it on the table. Put the penny on the towel. Cover the penny with a thin layer of salt. Pour a few drops of vinegar on the salt.

Results: The penny turned bright and shiny, because when vinegar is added to salt, the acetic acid in the vinegar mixes with the salt, and produces hydrochloric acid). This strong acid quickly removes the dull coating on copper. In time, the copper will corrode from combining with molecules of water, oxygen, and carbon dioxide in the air (VanCleave 62).

4. How to Make Carbon Dioxide

Purpose: To make carbon dioxide.

Materials: Baking soda, vinegar, jar, teaspoon.

Procedure: Pour enough vinegar in the jar to cover the bottom about 1/4 of an inch. Add a few teaspoons of baking soda to the vinegar.

Results: The mixture will quickly begin to fizz and bubble. It is giving off carbon dioxide gas, and as the gas escapes, it makes the mixture bubble.

FUN FOOD CLASSROOM ACTIVITIES

1. Ice Cream Fun

Purpose: To make ice cream.

Materials: Rock salt, sugar, whole or low fat milk, crushed ice, vanilla extract, small cups, spoons, measuring cups, measuring spoons, pint-size zip baggies, gallon size zip baggies.

Procedure: Measure one cup of milk, two tablespoons of sugar, and one-half teaspoon of vanilla extract into a pint-size zip baggie. Squeeze out as much air as you can. Put the pint-size baggie inside the gallon-size baggie. Add four cups of crushed ice and six tablespoons of rock salt to the gallon size baggie. Squeeze all the air out and seal. Let the students shake the gallon-size bag vigorously for several minutes. They can problem solve about the best way to do this. You could also break the students up into teams or into twos. When the ice cream is the desired consistency, (thick and creamy), take the pint-size baggie out of the gallon size baggie and rinse it off and remove the salt. Squeeze the ice cream out of the baggie into the paper cups and enjoy!

Results: The children were able to see the consistency of the milk liquid change to a solid. This demonstrates that the properties of matter can change. Note: For a class of twenty students, you will need to make two bags of ice cream. This activity was taken from "The Teacher's Brew Science Activities Box."

2. Butter Me Up

Materials: One carton of heavy whipping cream, small baby food jars, masking tape, bread, crackers.

Procedure: Pour a little bit of whipping cream into each jar. Seal with masking tape. Have children take turns shaking the jars.

Results: In about ten minutes the cream should turn into butter, and there should still is a great deal of liquid left in the jar as well. Cream is a combination of butterfat and water molecules. The butterfat floats all through the water. This is an example of suspension-a solid suspended in liquid (Loeschnig 106). When you shake the liquid, the molecules of butterfat collide and stick together. Then the clumps get bigger, and you have butter, a solid substance. The water molecule part of the cream is the liquid left in the jar. The children can spread the "butter" on bread or crackers to enjoy.

3. Peanut Butter Fun

Materials: One package of unsalted roasted peanuts, a food chopper or blender, margarine or vegetable oil, salt, crackers, apple slices, celery sticks for tasting.

Procedure: Let children help shell the peanuts. Place the peanuts in a food chopper. Let the students take turns chopping the peanuts in a food chopper. Combine the chopped nuts with

enough soft margarine and add a little salt. Serve on crackers, apple slices, or celery sticks for tasting. Variation: Make the peanut butter in a blender, using 1 to 3 tablespoons vegetable oil for each cup peanuts.

Results: The chopped peanuts combine with the salt and oil or margarine to create a solid mixture. Yummy!

There are many other fun classroom activities you can do with peanut butter. One activity is to make peanut butter play dough. To do this, mix together equal parts of peanut butter and dry nonfat milk. (You may have to add more peanut butter or dry milk as needed to get the right consistency.) Wash cookie cutters and set them out on a clean tabletop. Then invite the children to touch, smell, taste and create with this different kind of play dough.

For an unusual and delicious peanut treat, try making peanut butter ice cream. Mix together 2 cups vanilla ice milk, 6 tablespoons peanut butter and1/2 cup whipped topping. Spoon into small cups and freeze for at least 2 hours. Makes 6 small servings.

Last but not least, here is a delicious recipe for a peanut smoothie. The ingredients that are needed:

2 cups milk, 4 ice cubes, 1/2-teaspoon cinnamon, 1/3-cup peanut butter, 1-tablespoon molasses. Put all of these ingredients in a blender. Blend until smooth. Serve chilled or omit ice and serve heated for a "wintertime" treat.

4. Popping Popcorn

Materials: 1/2 cup of popcorn, an old-fashioned popcorn popper, butter, salt, small paper cups.

Procedure: Put about half of the popcorn into the popper. Gather the children around to watch. Let them observe the sounds and smell of the corn kernels. Let them listen as the corn heats and begins to pop.

Place the popcorn into small cups and serve, with butter and salt if you like.

Results: The moist and pulpy heart of the corn kernel is surrounded by a hard starch shell. When the kernel is heated, the moisture in the kernel turns to steam, the heart gets bigger-and the shell bursts (Mandell 88).

5. Pancakes, Pancakes

Materials: Electric skillet, 1/2 cup of flour, 1 teaspoon sugar, a tablespoon, plates, forks, napkins, syrup, butter, honey, margarine, pinch of salt, 1/3 teaspoon baking soda, 1 egg white, 1/3 cup buttermilk, spatula or pancake turner, non-stick cooking spray.

Procedure: Spray the electric skillet with the non-stick cooking spray. Warm it over medium heat. Stir the dry ingredients together. Beat the egg, and then add the buttermilk and oil. Add the

liquid to the dry ingredients gradually, stirring only until the batter is smooth. Don't keep stirring once it is smooth or the pancakes will be tough. Test the griddle by dropping water on it. When it sizzles, the griddle is ready. Drop two heaping tablespoons of the pancake mixture onto the hot skillet. Cook each pancake until the top is full of bubbles and the underside is brown. Then turn the pancake over and brown it quickly on the other side. This recipe makes 6 pancakes. Double or triple the ingredients to make more pancakes. Note: If you prefer to use regular milk, substitute 2/3 of a teaspoon baking powder for the baking soda.

Results: Baking soda is used to puff up bread and cake. The pancake batter contains more liquid than solids, and the batter itself is thin. The bubbles that appear on the pancakes as they cook help the pancakes brown. By using baking soda, it takes less time for the pancakes to cook (Mandell 106).

ANNOTATED BIBLIOGRAPHY/TEACHER RESOURCES

Books

Brainard, Audrey, and Wrubel, Denise H. Literature Based Science Activities: An Integrated Approach. New York: Scholastic,1993. This book lists various classroom activities and cites several age-appropriate books for students.

Gardner, Robert. Science Experiments to Do at Home-Kitchen Chemistry. New Jersey: Enslow Publishing, 1999. This book lists several great experiments that students can do using materials found at home.

Gardner, Robert. Science Projects About Kitchen Chemistry. New Jersey: Enslow Publishing, 1999. This book has great ideas for experiments using kitchen items.

Kohl, MaryAnn, and Potter,Jean. Science Arts-Discovering Science Through Art Experiences. Washington: Bright Ring Publishing, 1993. This book lists many art activities using scientific concepts.

Loeschnig, Louis V. Simple Chemistry Experiments with Everyday Materials. New York: Sterling Publishing Company, 1994. This book gives detailed chemistry experiments using common materials.

Mandell, Muriel. Simple Kitchen Experiments-Learning Science with Everyday Foods. New York: Sterling Publishing Company, 1993. This book tells about experiments with common foods.

Mandell, Muriel. Simple Science Materials with Everyday Materials. New York: Sterling Publishing Company, 1989. This book contains lots of hands-on experiments using easily found materials.

Markle, Sandra. Primary Science Sampler. California: The Learning Works, 1980. This book has samples of several different science activities as well as experiments.

Murphy, Pat, Klages, Ellen, and Shore, Linda. The Science Explorer Out and About-Fantastic Science Experiments Your Family Can Do Anywhere! New York: The Exploratorium, 1997. This book features great experiments for all ages.

Penrose, Gordon. Sensational Science Activities with Dr. Zed. New York: Simon & Schuster, 1990. This book features the zany Dr. Zed performing numerous experiments.

Van Cleave, Janice Pratt. Chemistry for Every Kid-101 Easy Experiments That Really Work. New York: John Wiley & Sons, Inc., 1989. This book tells several experiments that deal with liquids, solids, acids, bases, gases, and matter.

Whitney, Jay. The Best of Wonder Science-Over 400 Hands-On Science Activities. New York: Delmar Publishers, 1997. This book features fantastic ideas for many science activities.

Wood, Robert W. Science for Kids-39 Easy Chemistry Experiments. Pennsylvania: Blue Ridge Summit,1991.

This book gives great ideas for chemistry activities.

WEBSITES

www.chathamcollege.com

This website contains ideas for various experiments at the kitchen chemistry site.

www.earlychildhood.com

This website has lots of great activities for science, art, and cooking.

www.growingchild.com

This website is a wealth of information for pre-kindergarten age students on a variety of topics.

www.creativepre-k.com

This website is a wealth of information for pre-kindergarten age students on a variety of topics.

www.eric-carle.com

This website lists detailed summaries of all of Eric Carle's books- a Pre- K teacher's dream!

www.scholastic.com

This book contains books for purchase for teachers of all grades. A great way to build a personal or classroom collection of books on many subjects or student interest.

TRADE BOOKS FOR STUDENTS-LISTED BY SUBJECT

These books can be used during group time or circle time. They can also be used to supplement the classroom activities and experiments.

COLORS

Ets, Marie Hall. Gilberto and the Wind. Puffin Books, 1963. This story is about a little boy who plays with the wind.

DePaola, Tomie. The Cloud Book. Holiday House, 1975. This book talks about the shape and color of clouds.

FOOD

Anderson, Peggy Perry. Out to Lunch. Houghton Mifflin, 1998. This book features foods eaten for lunch.

Barrett, Judi. Cloudy With a Chance of Meatballs. Simon & Schuster, 1978. This amusing tale takes place in a place where food falls from the sky.

Brown, Marcia. Stone Soup. Simon & Schuster, 1975. This book is about a trio of soldiers who make a tasty soup using a stone.

Demarest, Chris L. No Peas for Nellie. Macmillan, 1989. This story is about a picky eater named Nellie who hates peas.

DePaola, Tomie. Pancakes for Breakfast. Harcourt Brace Jovanovich, 1978. This story is about a boy who loves to eat pancakes for breakfast.

Ehlert, Lois. Eating the Alphabet-Fruits and Vegetables from A to Z. Harcourt Brace and Company, 1989. This book has great pictures about a different fruit or vegetable for each letter of the alphabet.

Falwell, Cathryn. Feast for 10. Houghton Mifflin, 1993. This story is about an African-American family and a large meal they prepare together.

Fleming, Denise. Lunch. Holt, 1992. This story features a mouse and all the food he likes to eat for lunch.

French, Vivian. Oliver's Vegetables. Orchard Books, 1995. The story features Oliver's favorite vegetables.

Gretz, Susanna. Rabbit Food. Candlewick Press, 1999. This book talks about the foods that rabbits eat.

Mcqueen, Lucinda. The Little Red Hen. Scholastic, year unknown. This story is about a hen who makes bread.

Morris, Ann. Bread, Bread, Bread. Morrow, 1989. This book tells about various types of bread.

Murphy, Stuart J. Just Enough Carrots. HarperCollins, 1997. This story features a dilemma about carrots.

Numeroff, Laura Joffe. If You Give a Moose a Muffin. HarperCollins Publishers, 1991. This story is about a boy and a moose.

Numeroff, Laura Joffe. If You Give a Mouse a Cookie. Harper Collins Publishers, 1985. This story is about a mouse who comes to visit.

Numeroff, Laura Joffe. If You Give a Pig a Pancake. Harper Collins Publishers, 1998. This pig likes to eat, draw, etc.

Seuss, Dr. Green Eggs and Ham. Random House, Inc., 1960. My favorite story features all the places where he won't eat green eggs and ham.

Soto, Gary, and Martinez, Ed. Too Many Tamales. Scholastic, Inc., 1993. This tale features tamales-a whole bunch!

Tofts, Hannah. I Eat Vegetables. Zero to Ten Ltd, 1998. A boy talks about his favorite vegetables.

Wells, Rosemary. Bunny Cakes. Scholastic, Inc., 1997. A boy makes a birthday cake for his grandmother.

Williams, Rozanne Lanczak. Who Took the Cookie From the Cookie Jar? Creative Teaching Press, 1995. This story features the popular game of the same name.

ICE CREAM

Fujikawa, Gyo. Let's Eat. Zokeisha Publications, c.1985. This book talks about eating ice cream, among other things.

Hill, Eric. Spot's Birthday Party. Putnam, c.1982. Spot eats ice cream at a birthday party.

Mitgutsch, Ali. From Milk to Ice Cream. Carolrhoda Books, c.1981. This book talks about the process of ice cream making.

Neimark, Jill. Ice Cream. Hastings House, c.1986. This book also talks about ice cream.

Reece, Colleen L. What Was It Before It Was Ice Cream? Children's Press, c.1985. This book talks about the process of making ice cream.

WATER AND RAIN

Bogacki, Tomek. Cat and Mouse in the Rain. Farrrar Straus Giroux, 1997. Two animals enjoy a fun day playing in the rain.

Burningham, John. Mr. Grumpy's Outing. Houghton Mifflin, 1991. This book tells about a day in the life of Mr. Grumpy.

Demi. The Empty Pot. Henry Holt and Company, 1990. This tale is about a boy who tries to grow a plant so he can be emperor.

Elgar, Rebecca. Jack it's a Rainy Day. Kingfisher, 1999. This book tells all about Jack in the rain.

George, Lindsay Barrett. William and Boomer. Greenwillow, 1987. Two friends enjoy a rainy day.

Halpern, Shari. My River. Macmillan, 1992. This book traces the developments of a river.

Hest, Amy. In the Rain with Baby Duck. Candlewick Press, 1995. Fun in the Rain with a Duck.

Hoban, Julia. Amy Loves the Rain. Harper, 1989. A girl tells why she loves the rain.

Johnson, Angela. Rain Feet. Orchard books, 1994. This tale is about fun splashing in the rain.

Kalan, Robert. Rain. Greenwillow, 1978. This book features the sounds of rain.

Knutson, Kimberley. Muddigush. Macmillan, 1992. This story is about rain and mud.

London, Jonathan, and Karas, Brian. Puddles. Viking, 1997. This book discusses rain puddles.

Nikola-Lisa, W. Storm. Atheneum, 1993. This book details a thunderstorm.

Simmons, Jane. Come Along, Daisy!. Little, Brown, 1997. This book features animals in the rain.

VanLaan, Nancy. Little Fish, Lost. Simon & Schuster, 1995. This book is about a fish who lost his way.

Williams, Rozanne Lanczak. Rain. Creative Teaching Press, 1994. This book tells about rain sounds.

APPENDICES

LIST OF MATERIALS FOR CLASSROOM USE

Note: These items are listed in order of appearance of the experiments listed in the classroom activities section. Some items may be used more than once. Some items are used in more than one experiment. The amount of each will depend on class size and method used. (small group, large group, or pairs of students)

Paper	Small paper plates
Paper Towels	Tablespoons
Salt	Orange juice
Flour	Ice trays
Apples	Refrigerator
Plastic Knife	Dark colored powdered fruit drink
Medicine Dropper	Bouillon cubes (any flavor)
Iodine	Small plastic cups
Small Jars	Hot and cold water
Potatoes	Red cabbage
Small pieces of rag	Large spoon
Powdered laundry detergent	Tea kettle
Cooking grease or shortening	Electric skillet or stove
Dark food coloring	Funnel
One tall half pint jar	Bottle w/lid
Celery	Potholders
Green food coloring	Magic markers

Clear plastic drinking glasses	Small paper plates
Liquid dish soap	Salt
Nine inch pieces of 20 gauge wire	Baking soda
Pipe Cleaners or plastic bubble wands	Lemon juice
Vitamin C tablets	Teaspoon
Rolling pins	Pen
Plastic bags	Tape
Milk	Three pint-sized jars
Vinegar	Several dull copper pennies
Small baby food jars	Rock salt
Sugar	Unsalted roasted peanuts
Whole or low fat milk	Vegetable oil or margarine
Crushed ice	Food chopper or blender
Vanilla extract	Salt
Small cups	Crackers
Spoons	Bread
Pint-size zip baggies	Apple slices
Gallon size zip baggies	Celery sticks
Heavy whipping cream	Peanut butter
Small baby food jars	Dry nonfat milk
Masking tape	Various shapes/sizes cookie cutters
Vanilla ice milk	Peanut butter
Whipped topping	Small cups
Milk	Ice cubes

Cinnamon	Molasses
Popcorn kernels	Popcorn popper
Butter	Plates
Forks	Napkins
Syrup	Honey
Egg white	Buttermilk
Spatula or pancake turner	Nonstick cooking spray
Paper towels	Napkins

COMMUNICATION STANDARDS

PRE-KINDERGARTEN READING/LITERATURE STANDARDS (AGE 3-5)

1. Students will listen to, experience, and interpret a wide variety of high quality, age-appropriate literature.

2. Students will be exposed to and begin to comprehend and interpret a wide variety of age-appropriate materials.

3. Students will develop increasing proficient in beginning reading skills and strategies including phonemic awareness and vocabulary building.

PRE-KINDERGARTEN WRITING STANDARDS (AGE 3-5)

1. Children will begin to organize thoughts and information and participate in writing to communicate for different purposes with assistance as necessary.

2. Children explore gross and fine motor tasks to develop dexterity for pre-writing skills.

3. Children will begin to use with some assistance, appropriate conventions, or language in writing.

PRE-KINDERGARTEN SPEAKING/LISTENING/VIEWING STANDARDS

1. Children will use speaking and listening skills to communicate effectively.

SCIENCE AND TECHNOLOGY CORE CURRICULUM FRAMEWORKS

EXIT CONTENT STANDARDS

1. All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

2. All students demonstrate knowledge of basic concepts and principles of physical, chemical, biological and earth sciences.

3. All students use and master materials, tools and processes of major technologies which are applied in economic and civic life.

4. All students explain the relationships among science, technology, and society.

5. All students construct and evaluate scientific and technological systems using models to explain or predict results.

6. All students develop and apply skills of observation, data collection, analysis, pattern recognition, prediction and scientific reasoning in designing and conducting experiments and solving technological problems.

7. All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

8. All students evaluate the impact on current and future life of the development and use of varied energy forms, natural and synthetic materials, and production and processing of food and other agricultural products.

9. All students demonstrate basic computer literacy, including word-processing, software applications, and the ability to access the global infrastructure, using current technology.