



Edible Transformations

Curriculum Unit 09.03.11
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Introduction and Unit Goals

Science and Engineering in the kitchen is a fun and exciting way for students to learn about science concepts or ideas. The students are able to have hands on experiences learning about foods and how they change in some way when they are combined and mixed together. I have started incorporating food as a part of my procedural unit of writing. Procedural writing through food allows the students to write the steps to explain how they have created their treats, along with creating something they can enjoy and eat. The students become more engaged in these activities and their writing has improved. Together with the students, I make more complicated recipes, such as chocolate chip cookies, so they understand the importance of properly following steps, so they can make a delicious treat to enjoy. As cooks it is important to follow the sequence of a recipe to ensure that the foods are being cooked properly and are edible.

The following unit is designed for students from kindergarten to second grade. The focus will be on the physical changes that occur when a variety of ingredients are mixed. The students will learn to describe the changes using the solid and liquid phases of food. They will compare the changes of several liquid ingredients mixed with two solid ingredients. The students will also use a mystery experiment to help them understand the concept of freezing, melting and evaporation. To tie everything together, we will explore the role of temperature and how food changes from a solid to a liquid and from a liquid to a solid. The final tie in will be to observe how a seed changes as it grows into a vegetable.

The students will keep a journal to describe the transformations that occur between the ingredients they mix together. The students will use their five senses to describe what is happening. In their journal they will sequence the various experiments and activities they work on. The students will focus their description on what they observe happening as the ingredients combine and change in some way.

Rationale:

Science is an exciting subject for students to learn. It allows students to explore, investigate, think critically and delve into a subject or experiment. They gain an understanding of the world around them, how things are created, how things work and why things look the way they do. Science allows the students to have a firsthand experience of what they are learning about, which increase their comprehension of the concept or idea being taught. The students also have a better recollection of the activities they do on their own, then those activities they watch the teacher demonstrate. Science can often be an outlet for the reluctant reader or poor math student because science can be trial and error, allowing for mistakes to be made.

Kindergarteners enjoy the kinesthetic activities that science provides them. They like to play with things to see how they feel, smell and sometimes taste, even when they should not. Science is an excellent way for students to explore using their five senses. The five senses allow a student to make their descriptions more vivid and understandable. Young students are very curious about the world around them and often want to know the why of so many things. Science allows the students to explore through hands on activities, thus engaging all students, even those with limited attention spans.

Five and six year olds are excited about eating, they always want to know when its time for lunch or snack. Food is a way to motive students into learning about science concepts. Incorporating food to a unit on changes allows the students to be able to use their hands and safely taste mixtures, even if they may not be very appealing. When students are active participants in creating a recipe, they become more excited and have a sense of pride and accomplishment. They are able to see what they have made and enjoy eating it as well. They are also able to recollect how the recipe was made and cannot wait to share their part in its creation.

The students will discover how ingredients transform depending on what they are mixed with. Flour and baking soda will react differently based on the liquid that is added to them. The experiments will show the students that not all solids and liquids react or change in the same way. They will discover how a liquid can become a solid and a gas. They will also discover how temperature can transform a food into something completely different from the way it originally started out as.

The students will also discover how a seed grows. They will watch as a seed transforms into something very different and edible. They will watch as a radish seed splits apart and opens and begins to grow. Explaining that not all foods begin the same way we see them before we eat them. Most foods have to change in some way in order for people to be able to digest and eat them.

Temperature:

As we cook, temperature plays an important role in transforming foods from one state to another. Cooking and refrigeration increase the number of foods that can be eaten. Cooking often changes the texture or make up of the foods we eat. When we cook or bake it requires either heating or cooling the food in order to make it edible. Heat is the energy that is transferred from a hot object to a cold one. Temperature measures the directions in which the heat will flow. The more heat applied to a pot or pan the faster the molecules will move

and collide into each other. This moving and colliding is an important aspect of changing the molecules and foods ¹. As a food is continually heated its temperature increases. However, this is not the case when foods are changing its state, either from a solid to a liquid or a liquid to a gas. It may take longer to thoroughly heat or cool the food before it can transform into another state.

Phases of Foods:

I want the students to understand that everything, even foods exist in three phases or states, solid, liquid or gas. As chefs in the kitchen we usually work with foods in a solid or liquid state. We often mix liquid and solid ingredients, or multiple solid ingredients, or multiple liquid ingredients together to create some type of edible food dish. The heating or cooling of ingredients helps to further the transformations that occur when ingredients are mixed. As the temperature of a food is raised or lowered the effects are often permanent or irreversible, such as baking a cake, all the ingredients are unable to be converted back to their original states. However, there are very few recipes that are reversible, such as making an ice pop, you can leave the ice pop out on a counter and it will transform into juice again.

In each of the phases, the molecules are constantly moving. The bonds of a gas are weaker than a solid or liquid, but a solid's bonds are the strongest amongst the three phases. During the heating or cooling process it is the bonds that are manipulated that change the phase of the food. The bonds between the molecules help us to distinguish between each of the phases.

Solids:

The majority of the foods the students come in contact with appear as a solid, such as hamburgers and grains of cereal. The students need to understand how solids behave in order to describe the changes they see happening. Solids are distinguishable because all solids have a definite shape, which is not easily changeable. A solid can easily be picked up, pushed on, turned around and still its shape will stay the same.

The molecules in a solid are packed tightly together and cannot move around easily, thus preventing them from moving far apart. The molecules within a solid have a stronger attraction to one another than those in a liquid or a gas. The molecules in a solid are very compact or dense. Density is a term used for how tightly packed the molecules within a solid are. Solids tend to be the densest of all three phases of matter. This is the reason why solids have a consistent shape.

A solid will expand as it is heated, because the atoms within it will vibrate vigorously.

This vibration allows the bonds to stretch and spread apart. The molecules will have more mobility and freedom to move about instead of staying together. As a solid is heated at a high enough temperature it will melt and will enter the liquid state. The solid has reached its melting point and is now starting to transform into a liquid.

Liquids:

Most liquids the students recognize are beverages they drink, such as fruit juices. Liquids have no shape of their own, so they are able to effortlessly change their shape. The molecules are densely packed together allowing them to freely move about and flow. Liquids have fluidity, the ability to flow. The liquid will take the shape of the container it is being poured into. The molecules within some liquids can be attracted to the sides of the container they are being placed into. The attraction is referred to as adhesion, which allows a liquid to stick to solids, in this case the sides of its container. When a liquid is cooled it transforms into a solid and when it is heated it becomes a gas.

As liquids reach their freezing point they begin to enter the solid phase. When most liquids freeze they contract and will take up less space. However, the exception is water, which will take up more space. As the temperature of a liquid is lowered it will make the molecules slow down and move together. Over time the liquid freezes and becomes a solid.

Fast moving molecules at the surface of a liquid, will break the bonds keeping it in the liquid and the liquid evaporates. The amount of a liquid's surface that comes into contact with air affects the liquid's ability to evaporate into a gas. The molecules on a liquid's surface are attracted to both the air molecules above them and the liquid molecules below them. Surface tension is created as the molecules of the liquid pull together. A smooth covering forms as the top of the water tightens up due to the tension created. The strong bonds between molecules in a liquid give the liquid cohesion. Cohesion allows molecules to stick together and form bonds. Cohesion is the reason behind observing liquids in the form of droplets or round shapes. Molecules clump together forming little round drops.

As liquids are continuously heated, its molecules move around quickly, which makes the bonds between them break. The molecules move around faster as the liquid becomes warmer. As molecules move around they collide with one another, breaking the bonds holding them together. Liquids have the ability to spread out so more of the molecules can escape into the air. The molecules will rise, escape and become a gas. As a liquid is heated it will release vapor and will eventually evaporate and enter the gas phase.

Gases:

Although foods rarely appear as a gas, I want the student to have a general understanding of how a liquid enters the gas phase. Water or liquid disappears into a gas and the vapor is released into the air. This disappearance is an important aspect of what sets liquids apart from the other phases, thus making a liquid a liquid. This also helps to explain what happens when a liquid sits over time, as it will disappear into the atmosphere.

Gases have no definite shape or size. Gases spread out and have no particular pattern. They spread out to fill the volume they are in. Gases are present in the air even if we cannot see them. The aroma from a food lets us know that gases are present in the air. A gas can be reversed back into a liquid, the gas will cool down and become a liquid. Condensation is the tiny water droplets that are left when air comes in contact with a warmer surface.

Mixtures:

People are constantly mixing foods together when they cook, for example a salad and a sundae are both a mixture. I want the students to understand the term mixture, combining two or more ingredients to create or make something new and different. As the students will be combining two substances together, the term mixture is more developmentally appropriate for kindergarteners than the term solution because the students will be adding ingredients together and mixing them. In a mixture each of the substances creating that mixture will keep its original chemical properties. Mixtures can be reversed and changed back into the solids, liquids or gases that it formed from, however this process takes work and is not easily done. A solution can be formed when a solid dissolves into a liquid. Solutions are also created when two liquids are mixed together.

Gels:

Gels are a type of mixture involving water and solids. The most common form of a gel the students are familiar with is pudding. A gel is a mixture of water and other solid molecules. The molecules will bond together to form a sponge-like matrix, which traps the water into a multitude of separate pockets.

As the granules in gelatin are heated, water penetrates the granules and separates the chains holding them together. This causes the granules to swell and soften in a process better known as gelation². As the granules cool down, the chains will slowly reform and become tighter.

Freezing:

Freezing occurs when a liquid becomes a solid. Water must be cooled below 32 degree Fahrenheit or 0 degrees Celsius in order for it to change from a liquid to a solid. A great deal of cooling must occur in order to change water into ice, even if the water is already at a temperature of 32 degree Fahrenheit or 0 degrees Celsius. The water expands as it freezes and become a solid; ice. Ice is made of crystals that join together. As you watch an ice cube freeze, you will notice that it is a slow process. It takes time for the entire cube to freeze. First, a thin layer of ice forms on the top and then the ice cubes begin to freeze throughout.

Melting:

Melting occurs as a solid is heated to become a liquid. Ice begins to melt and become water at a temperature above 32 degree Fahrenheit or 0 degrees Celsius. A great deal of heat is needed to change ice into water, pressure also aides in changing ice to water. As you watch an ice cube melt in a glass of liquid, you will notice it is a slow process. The cube does not disappear immediately it takes time for the cube to melt. It becomes

smaller and smaller until finally it has completely melted.

Evaporation:

As water boils it is heated to a temperature of 212 degrees Fahrenheit or 100 degree Celsius. The water turns into a gas called steam, which is invisible. A great deal of heat is needed to change water into steam, even when it is already at its boiling point. Under pressure, such as a pressure cooker, steam can get much hotter before it starts to boil. After an ice cube melts, one is left with water. The water left will slowly begin to disappear into the atmosphere and become a gas.

Ice Cream:

By freezing cream, we make it possible to taste the birth of creaminess, the tantalizing transition from solidity to fluidity ³. Ice cream consists of fresh cream, milk and table sugar. Sugar helps to make the frozen cream softer, but also lowers its freezing point, the dissolved sugar gets in the way as the water molecules settle into ordered crystals ⁴. The sweetened cream is unable to freeze in the slush because the cream freezes well below the freezing point of water ⁵. Slush forms as a warm object is placed in the ice mixture. Salts are added to help dissolve the slush. The salts lower its freezing point and allow it to get cold enough to freeze the sugared cream ⁶. As the ice crystals begin to form from water molecules as the ice cream mix begins to freeze, giving the ice cream its ability to solidify. During freezing, air cells in the mix are disturbed and mixed up. The air cells weaken and break down the matrix made from the ice crystals and cream. The breaking down of the matrix allows the ice cream to become lighter and easier to scoop out.

Ice cream consists of several variations on how it is made. The most popular is the standard or Philadelphia-style ice cream. This kind of ice cream is made from cream and milk, sugar, and a few other minor ingredients ⁷. French or custard ice creams contains egg yolks along with cream, milk and sugar. Some of these mixes are not made with cream but use milk instead. This type of mixture must be cooked in order to kill any bacteria from the raw yolks.

Chocolate:

Chocolate is made from the astringent, bitter, and otherwise bland seeds of a tropical tree, yet its flavor is exceptionally rich, complex, and versatile ⁸. At room temperature, chocolate is solid, hard, and dry, but as it begins to melt it becomes smooth and creamy. Chocolates have different purposes, some are meant for eating and others are meant for baking, while some are meant for both eating and baking.

The Radish:

Plants have six major organs, roots, stems, leaves, flowers, fruits and seeds. Roots help to keep the plants firmly in the ground. The stem helps to provide nutrients between the roots and the leaves. The leaves produce high-energy sugar molecules through photosynthesis ⁹. Photosynthesis requires exposure to sunlight and a good supply of carbon dioxide ¹⁰. Radishes require full sunlight in order to grow. Flowers are where the reproductive organs are stored. Fruits contain the seeds and they also help to spread them to further growth. The seed is the part of the plant that promotes regeneration.

Radish seeds grow fairly quickly, usually within a few weeks. Radishes are a root vegetable. Radishes vary in size and color and length of growth rate. Some varieties of radishes begin to grow in three to seven days. Radishes require full sunlight to grow.

The Water Cycle:

Water is one of the most important substances on the earth. Without the presence of water people, animals, and vegetation could not survive. The parts of the water cycle that will be discussed are evaporation, condensation and precipitation. Evaporation is where the water in a body of water is heated and turns into vapor. The vapor enters the air. The water vapor cools off and changes back into a liquid. Clouds form as the cold helps to cause condensation. When the clouds become so dense, precipitation occurs. The precipitation that falls from the clouds is dependent on the temperature. Water can fall as rain, sleet, snow or hail.

The water cycle provides a great way for the students to discuss how solids, liquids and gases affect the weather and the role temperature plays. It is something that the students are able to relate to and have prior knowledge about.

Scope and Sequence:

Lesson 1: Mixing sugar and colored water.

Lesson 2: Defining and identifying changes in their in the world around them.

Lesson 3: Defining and providing examples of solids, liquids, gases, mixtures, and evaporation.

Lesson 4: Observing a sugar ice cube as it freezes, melts and evaporates. The evaporating process will take over a week.

Lesson 5: Creating two separate mixtures of milk and flour and milk and baking soda.

Lesson 6: Creating two separate mixtures of seltzer and flour and seltzer and baking soda.

Lesson 7: Creating two separate mixtures of vinegar and flour and vinegar and baking soda.

Lesson 8: Creating two separate mixtures of oil and flour and oil and baking soda.

Lesson 9: Make gelatin and gelatin jigglers. Compare the differences between the two types of

gelatin.

Lesson 10: Make ice cream to demonstrate how cold transforms a liquid into a solid.

Lesson 11: Make chocolate sauce to demonstrate how heat transforms a solid into a liquid.

Lesson 12: Grow and observe the changes of a radish seed as it transforms into an edible vegetable.

Food Experimentation Rationale:

The students will perform experiments to understand how solids and liquids transform as they are mixed together. They will observe the changes as a liquid freezes, melts and evaporates. Understand the importance of temperature in changing a liquid, solid or gas into another phase of matter. Finally, they will observe as a seed transforms into a vegetable. This section provides an understanding of why these particular experiments were chosen. For further details on performing these experiments see the Classroom Activities sections that follows the Food Experimentation Rationale section.

Lesson 1: Mystic Green

In this exploratory lesson the students will be mixing sugar and colored water. The students will learn about the change that occurs as a liquid and a solid are added together. This experiment will be leading to an experiment on evaporation. They should focus on what they did to mix the ingredients and what they noticed happening. Do not tell them the name of the ingredients till they have finished.

I chose to begin with sugar and water because this is a great way to introduce the concepts of freezing, melting and evaporation. In this one experiment, the students will observe as a liquid changes into a solid, and how that solid changes back into a liquid, and how that liquid then changes into a gas. Then the students will monitor the changes that occur over several days. They will notice how the mixture changes over time and how the water will evaporate and describe the changes to the sugar. This experiment is also a great way to explain parts of the water cycle to students. Explaining how our weather is dependent on the temperature outside, providing the students with another example to aid their understanding of what is happening.

Lesson 2 and 3: Changes & Definitions

In lesson 2, the students will learn and define changes. They will use examples from their lives to help them understand the idea of change. In lesson 3, the students will learn about solids, liquids, gases, mixtures and evaporation. They will find examples in magazines. These two lessons are designed to help build some background knowledge for the students to help them have a better understanding of what will occur in the experiments. By understanding the terms, changes, liquid, solid, and gas, the students will be able to explain the transformations they observe using more descriptive language.

Lesson 4: Freezing, Melting, and Evaporation

In this lesson, the students will learn about freezing, melting, and evaporation. The students will use the mixture of sugar and colored water. The students will observe the changes that occur as ice cubes made from sugar and green colored water is frozen, melted and evaporated. The students will record the changes that occur as the sugar and water transforms into a solid, a liquid and a gas. The freezing stage will occur overnight. The melting stage will occur within a day. However, it is the evaporation stage that will take up to a week's time. The students should monitor the sugar water mixture every other day to observe its changes.

Before I placed the mixture into the freezer, the sugar sat at the bottom of the container and the water above. The first time I tried this experiment, I let it sit out overnight covered and then I put the mixture into the freezer. When I took it out of the freezer the next morning there was no defined layer of sugar, it seemed as if it mixed. As I let them sit there uncovered there still was no defined layer and white crystal-like shapes began to form on the top. Over more time it became moldy and fuzzy. I tried the experiment a second time, this time mixing the sugar and water and then placing it directly into the freezer. The next morning when I took it out, I

noticed a layer of sugar at the bottom. The layer of sugar remained as it melted and began to evaporate. Left over several days, mold begins to form again. Due to this mold issue, I decided put the mixture into ice cube trays and found success.

Create a mixture of water, do not use blue dye, and sugar in ice cube trays and observe what happens as the water evaporates and what becomes of the sugar. I put two teaspoons of sugar and colored water in each cube of the ice cube tray. When it is taken out of the freezer there will be a separation between the sugar and water.

As they melt, they will become a mixture again, with a layer of sugar on the bottom. This will allow the students to see how a liquid freezes and changes into something different. Then we will observe as that solid changes back into liquid form. The evaporation process will take about a week for all the water to evaporate. After evaporation occurs the sugar granules will remain. The sugar will be a deeper color from what the water started out as. The sugar will form a hexagon matrix on the bottom of the plastic container, resembling stained glass. This will allow the students to observe how one mixture freezes, melts and evaporates.

Lesson 5 - 8: Mooing Cow, Fizzy Pop, Dressing on the Side, Slick Spot

In lesson 5, the students will create mixtures of milk and flour and milk and baking soda. The students will discuss how the ingredients have changes and compare the two mixtures. In lesson 6, the students will create mixtures of seltzer and flour and seltzer and baking soda. The students will discuss how the ingredients have changes and compare the two mixtures. In lesson 7, the students will create mixtures of vinegar and flour and vinegar and baking soda. The students will discuss how the ingredients have changes and compare the two mixtures. In lesson 8, the students will create mixtures of oil and flour and oil and baking soda. The students will discuss how the ingredients have changes and compare the two mixtures.

The students will observe the changes that occur as they create a mixture using a liquid and a solid and the reactions that take place. The students will work with baking soda and flour as their solid ingredients and seltzer, milk, vinegar and oil as their liquid ingredients. The names of the solids and liquids should not be revealed until the end. As the students work with each mixture encourage them to use the term solid and liquid. The solids will remain constant throughout these experiments, it will be the liquid that changes daily. The students will observe and record the similarities and differences between each of the mixtures. The students will describe the changes that occur between each of the two separate solid ingredients and liquids and then compare the changes between each of the solid ingredient mixtures. The students will record their observations focusing on using their five senses.

I chose to use baking soda because of its ability to cause a reaction with a variety of liquids. By using baking soda as the solid, it allows the students to be able to incorporate their sense of hearing into the experiments. Baking soda has the ability to neutralize acidity, it is used in baking as a leavening agent and it helps to reduce odors. Baking soda when mixed with an acid will release carbon dioxide air bubbles. The baking soda neutralizes the acid component and releases carbon dioxide air bubble. The carbon dioxide bubbles will cause the mixture to rise and the bubbles become trapped by the gluten. I chose to use flour because is a great thickening agents. Flour is finer in texture compared to the baking soda.

Lesson 9: Wiggling About Demo

In this lesson, the students will make gelatin and gelatin jigglers. They will compare the similarities and differences between the two types of gelatin.

Discuss with the students how temperature can also effect how liquids and solids change. The students will be involved in the process of making the experiments, but for safety reasons they will not get close the stove during the heating process. Now that the students have been describing the changes they have been observing, they will have the background to explain what is happening within each of the recipes.

The students will observe how in both recipes the granules of the gelatin need to be heated in order for the granules to dissolve. They will then see how the regular gelatin continues to change once cold water and refrigeration are added to the process. Once the gelatin has settled they will compare the two mixtures. The regular gelatin easily falls apart and is difficult to hold for an extended period of time. However, the jigglers are a bit firmer and will hold its shape. It is also able to hold up to the students touching it. The students will then record their observations in how they feel, look and taste.

Lesson 10 and 11: Creamy Bag Demo and Chocolate Fountain

In lesson 10, the students will make ice cream. They will observe as cream is frozen to transform into ice cream. In lesson 11, the students will melt solid pieces of chocolate to make a liquid chocolate sauce.

The students will observe two demonstration recipes of how temperature affects the outcome of a recipe. Making ice cream demonstrates how liquid ingredients transform into a solid as they are frozen. The students will make ice cream using a plastic bag or coffee can. I chose the plastic bag recipe because the students will be able to see how much energy it takes to mix the ice cream ingredients. The students will have to vigorously shake the mixture. Let the ice cream freeze over night. Either recipe for ice cream can be found at <http://crafts.kaboose.com/ice-cream-in-a-bag.html> or <http://crafts.kaboose.com/coffee-can-ice-cream.html>.

The next day the students will make chocolate sauce. Use either chocolate chips or chocolate wafers. The wafers can be found at a craft store. Use a double boiler to melt the chocolate. This recipe demonstrates how a solid chunk of chocolate is manipulated and changed into a smooth liquid as it melts. Chocolate is a poor conductor of heat, to speed the process of melting, use small pieces of chocolate. Chocolate chips or wafers are recommended. If using a chocolate bar chop the chocolate into small pieces. The students will use the chocolate sauce to put on top of their ice cream. The students will observe and record the changes that have occurred to the bag of cream and the chocolate morsels.

The students now have enough background knowledge about liquids and solids. The students can discuss what changes would occur if the ice cream were to be left out. The ice cream would begin to melt and reenter the liquid phase. The students can discuss what changes would happen in the chocolate was left undisturbed. The chocolate would overtime begin to harden and solidify.

Lesson 12: Seedlings

In this experiment, the students will learn how a seed changes into an edible vegetable.

Finally, to tie everything together the students will watch as a radish seed grows. The radish was chosen because it begins to grow quickly. The students will observe the seed as it begins to split open, sprout and transform into a radish. This is a way for the students to understand how food grows and changes. Most foods need to transform in order to be edible.

After the seed is placed in water and covered, the next day the seed will split and a small thin stem and a small leaf will begin to appear. As the stem begins to grow it will become red at one end and white at the other. After several more days, several small green leaves will appear and at the end of the stem you will notice white veins beginning to form.

Classroom Activities:

The majority of the classroom activities are set up for the students to work in a small group and discover what will happen. For most of the science experiments, the journal pages will be blank with just the experiment name on the top, unless otherwise specified. I suggest make journals a head of time otherwise have students keep paper in a folder.

1.) Lesson 1: Mystic Green: Exploration Lesson (sugar and colored water)

Objectives:

Students will explore with solids and liquids.

Students will describe using their senses what is occurring.

Students will record the sequence of what they did.

Materials:

Science journals (one per person), Pencils, Crayons, One bowl per group, Spoon, Sugar for each group, Water (add food coloring, not blue), two ice cube trays

Vocabulary:

Mixtures are the combination of two or more solids or liquids that are put together and stirred.

Procedure:

1. Explain to the students that when we cook, the foods we use are called ingredients.
2. Explain to the student that they will be working in groups to create a new mixture.
3. Explain to the students that they will:
 - °x Draw a picture of each ingredient before you add them
 - °x Add the ingredients together (use as much or as little of each ingredient as they choose)
 - °x Use the spoon to stir them.
 - °x Record what happened when the two ingredients were combined (in journal under when ingredients are combined)
4. Pass out journals, give a 1/2 cup of sugar and 1/2 cup of colored water.
5. Have students write their name on the front cover of the journal.
6. Students will turn to page 1 of journal.
7. In their journals, each student points to space that says ingredient 1: have them draw a picture of what one of the ingredients. Repeat for ingredient 2.
8. Tell them to go ahead and combine the ingredients together, record how many teaspoons of sugar and water they add to their cups. Using the spoon to stir them.
9. In journals, have them complete the last sections, when ingredients are combined.
10. Students will share what they discovered.
11. Explain, they created a mixture using sugar and water. Explain the term mixture.
12. Possible discussion questions: How did the ingredients change? Did you need to use more of one ingredient then another?
13. Place 2 teaspoons of sugar and then green colored water into ice cube trays.

Make enough ice cubes so each group gets one cube. Place in freezer overnight. The ice cubes will be used for the freezing, melting and evaporation experiment, lesson 4.

2.) Lesson 2: Changes

Objectives:

Students will learn the definition of change.

Students will provide examples of changes in their lives.

Materials:

chart paper, marker, journals, pencils, crayons

Vocabulary:

Changes are when something becomes different in some way, it may have a different look, color, shape, texture or taste to it.

Procedure:

Begin to talk with the students about what a change is. Use examples from their lives and from some of the foods they may eat, such as chocolate milk, brownies, eggs, and pancakes. Discuss with them that as they describe something one should use their five senses to provide a better description. Create a chart listing the definition and have the students provide an example of each.

3.) Lesson 3: Defining solids, liquids, and gasses - examples

Objectives:

Students will understand the difference between a solid, liquid and gas.

Students will learn about solids, liquids and gases in their lives.

Students will provide an example of a solid, a liquid and a gas.

Students will classify foods as either a solid or a liquid.

Students will create a chart of solids and liquids.

Students will sort foods into a solid or liquid.

Materials:

Pictures from magazines, Play food from kitchen center, Student snacks, chart paper, marker, tape or glue, journals, pencils, crayons

Procedure:

Discuss with the students the definitions of a solid, liquid, gas and mixture. Create a chart listing the definition and have the students provide an example of each. Provide examples for gases, as these will be the hardest for students to come up with.

After showing United Streaming video, Properties of Matter, Part 1, see if the students can add to the chart.

Vocabulary:

Solids are any food that has a shape. A solid can be held in your hands without falling onto the floor. If you put a solid down it will stay in the spot you placed it. Liquids are any substance that flows. If you put it on a table the fluid would roll off onto the floor.

Gases are invisible and are all around us.

4.) Lesson 4: Freezing, Melting, Evaporation (sugar and colored water ice cubes)

This is an experiment you will observe over a week or more time. Students should record what changes they notice every day or every other day, depending on what changes are occurring.

Objectives:

Students will observe how a mixture has changed.

Students will understand the terms freezing, melting, evaporation.

Students will describe how the liquid and solid have changed.

Students will understand how freezing, melting, and evaporating happen in term of weather.

Materials:

Ice cubes from Mystic Green Experiment, journals, pencils, crayons, clear plastic containers (1 per group), 2 teaspoons of sugar, and green colored water.

Vocabulary:

Melting is when a solid becomes a liquid.

Freezing is when a liquid becomes a hard solid.

Evaporation is when a liquid disappears into the air and becomes a gas.

Procedure:

1. Explain to them that you made a mixture of sugar and colored water and placed it into the freezer the other day.
2. Place one ice cube into a clear plastic container for each group.
3. Students will discuss and record the changes they observe.

Possible questions:

What did the liquid become? Why do you think that?

4. Explain to the students the concept of freezing.

5. After students make their observations move the containers to a window.
 6. The next day, have the students get their containers. Students will discuss and record the changes they observe.
Possible questions:
What happened to the ice cube? Why do you think that?
 7. Now that ice has melted, mark each container at top of water level.
 8. Students will continue to monitor until water evaporates. This may take several days or a week depending on the temperature in the classroom.
 9. Explain the process of evaporation to the students, as they notice the water level is decreasing. Students will record their observations.
 10. After water has evaporated, have the students discuss what has happened.
 11. A variation is to heat the sugar mixture to observe the effects heat has on evaporation. A discussion can be had about why the heated sugar mixed evaporated faster then the other sugar mixture.
- Possible extensions: Exploring the water cycle and Weather and seasons.

5.) Lesson 5 - 8: Experiments with milk, seltzer, vinegar, oil

Objectives:

Students will create a mixture.

Students will discuss changes that occur.

Students will discuss similarities between two mixtures.

Students will discuss differences between two mixtures.

Students will record the changes that occurred.

Materials:

2 containers per group, 2 spoons per group, 1/4 cup flour, 1/4 cup baking soda, 2 - 1/4 cup liquid - day 1: milk, day 2: seltzer, day 3: vinegar, day 4: oil, Journals, Paper towels, 4 copies per student of Experimenting with Liquids and Solids Worksheet (following Appendix section) (Lemon juice can also be used instead of the vinegar)

Vocabulary:

Ingredients are the foods we use in a recipe.

Recipe is something you follow to make a particular food dish.

Mixtures are the combination to two or more solids or liquids that you put together.

Procedure:

1. Explain to the students that they will be creating mixtures.
2. Each group will get a 1/2 cup of flour and a 1/2 cup of baking soda.
3. In journal, describe what each of the ingredients looks like. Draw a picture.
4. Do not mix the solids together. (Mention several times)
5. Each group will get two 1/4 cups of milk. (Liquid depends on which day)
In one of the containers, you will add some of the solid. They can add as much or as little as they wish.
6. Have students count and record the number of teaspoons they add.
7. Then, add some of the liquid into your container.
8. Observe what happens. Record what happened in your journal.
9. Repeat creating the second mixture.
10. Clean up. Bring students back to carpet and ask them to discuss what they noticed.
11. Possible questions: What did you notice happening when you added the liquid?
How did the flour or baking soda change?
with another. The students can then report their finding to the class. Also, depending on time, the students can work on one or two of the experiments each day.
12. Variations: half the class can work with one liquid while the other class works

Liquid reactions to Flour: 1/2 cup of flour to 5 tablespoons of each liquid

| Milk | Seltzer | Vinegar | Oil |
|--------------------------|---|---------------------------------|--|
| Dough like. Very sticky. | Bubbles and sizzles. Paste like. Sticks together. | Dough like. Sticky but crumbly. | Carmel like color. Resembles raw cookie dough. |

Liquid reactions to Baking Soda: 1/4 cup of baking soda to 3 tablespoons of each liquid

| Milk | Seltzer | Vinegar | Oil |
|---|-------------|---|---------------------------------------|
| Toothpaste like. Resembles melted Italian ice | Quick fizz. | Fizzes and bubbles. Lumpy and not completely mixed. | Soup like with clumps of baking soda. |

As the mixtures sit, the mixture hardens and a liquid layer begins to form on all mixtures except the oil.

6.) Lesson 9: Wiggling About Demo (gelatin)

Objectives:

Students will understand how temperature changes a liquid to a solid.

Students will compare the appearance and texture of two kinds of gelatin.

Materials:

Gelatin, Gelatin Jigglers, 2 spoons, 2 bowls with tops, 2 baking pans, butter knife, spatula, journals, pencils, crayons

7.) Lesson 10: Temperature and a liquid - Creamy Bag (Making Ice Cream)

Objectives:

Students will transform a liquid into a solid.

Students will describe the changes occurring.

Students will use their five senses to explain the changes.

Students will write in their journals, describing what occurs.

Materials:

measuring cups and spoons, large bowl, rolling pin, freezer bags, 6 cups crushed ice, 1 cup rock salt, 1/2 cup of half and half, 1/2 cup heavy cream, 2 tablespoons sugar, 1/4 teaspoon vanilla extract, paper towels

Vocabulary:

Heat is how hot a food gets.

Temperature is how hot or cold something feels when you touch it.

Use either recipe: <http://crafts.kaboose.com/coffee-can-ice-cream.html> or

<http://crafts.kaboose.com/ice-cream-in-a-bag.html>

8.) Lesson 11: Temperature and a solid - Chocolate Fountain (Melting Chocolate)

Objectives:

Students will observe how a solid becomes a liquid.

Students will describe the changes occurring.

Students will use their five senses to explain the changes.

Students will write in their journals, describing what occurs.

Materials:

Chocolate (morsels, candy bars or chocolate wafers found in a craft store for molds), double boiler, water, spoon, paper towels, journals, pencils, crayons

Do Not let any water get into the chocolate or it will not melt. It becomes very hard and difficult to work with.

8.) Lesson 12: Seedlings: Growing a Radish

Objectives:

Students will understand the changes that occur as a seed grows.

Students will describe and record the changes that occur when a seed grows into a plant.

Materials:

Radish seeds, paper towels, water, flat caps or plastic plates, tape, rubber bands, plastic wrap

Teacher Resources:

Coffee Can Ice Cream (Kaboose)<http://crafts.kaboose.com/coffee-can-ice-cream.html> The website provides a kid friendly recipe for making ice cream from a coffee can.

D'Amico, Joan, & Eich Drummond, Karen. "The Science Chef: Travels Around the World." New York: John Wiley & Sons, Inc., 1996. A book about the science of cooking using fun food experiments from around the world.

Gaff, Jackie. "Looking at Solids, Liquids, and Gases How Does Matter Change?" Berkeley Heights: Enslow Publishing, Inc. 2008. Describes what a state of matter is and how each can change states.

Homemade Ice Cream in a Bag (Kaboose)<http://crafts.kaboose.com/ice-cream-in-a-bag.html> The website provides a kid friendly

recipe for making ice cream using a plastic bag.

Lansky, Vicki. "Baking Soda Over 500 Fabulous, Fun, and Frugal Uses You've Probably Never Thought Of." Minnetonka: Book Peddlers, 1995. A book describing how baking soda reacts with a variety of ingredients. It also provides you with a variety of uses for baking soda.

McGee, Harold. "On Food and Cooking." New York: Scribner, 2004. A book that explains the science of foods and how they are cooked. It explains the chemical reactions that occur when foods are combined and cooked.

Miller, Jeanne. "Food Science." Minneapolis: Lerner Publications Company, 2009. A book explaining how scientists and chefs create delicious and sometimes unusual dishes.

Morano Kjelle, Marylou. "The Prosperities of Liquids." New York: The Rosen Publishing Group, Inc., 2007. A book explaining the distinctive properties of a liquid.

Morano Kjelle, Marylou. "The Prosperities of Solids." New York: The Rosen Publishing Group, Inc., 2007. A book explaining the distinctive properties of a solid.

Oxlade, Chris. "Mixing and Separating." New York: Crabtree Publishing Company, 2008. A book explaining mixtures and solutions. It also explains how to filter the materials in a solution.

Radish (Wikipedia) <http://en.wikipedia.org/wiki/Radish> The website describes the types and varieties of radishes. It also provides ideas of how radishes are use in cooking and medicine.

Ramsay, Helena. "Hot and Cold." Danbury: Children's Press, 1998. A book describing the role of temperature on the states of matter.

Riley, Peter. "Solids & Liquids." North Mankato, MN: Smart Apple Media, 2008. A book explaining the differences between solids and liquids.

Spilbury, Richard and Louise. "What are Solids, Liquids, and Gases?" Berkeley Heights: Enslow Publishing, Inc., 2008. A book explaining what a solid, liquid, and gas are. It also provides some experiments for the students to try involving all three stages of matter.

Student Resources:

Hartzog, John Daniel. "Everyday Science Experiments with Food." New York: The Rosen Publishing Group, Inc., 2000. A book containing food experiments kids can work on at home.

Hartzog, John Daniel. "Everyday Science Experiments in the Kitchen." New York: The Rosen Publishing Group, Inc., 2000. A book containing experiments kids can work on using items from the kitchen.

Levine, Shar and Johnstone, Leslie. "Kitchen Science." New York: Sterling Publishing Co., Inc. 2003. A book of experiments kids can do at home by themselves, using items from around the kitchen. Providing parents and teachers some helpful tips to help the kids.

Nankivell-Aston, Sally and Jackson, Dorothy. "Science Experiments with Water." Danbury: Franklin Watts, 1999. A book of experiments incorporating the three phases of water.

Properties of Matter, Part 1 (Discovery Education, 2009) <http://streaming.discoveryeducation.com/index.cfm> Properties of Matter, Part 1 is a website showing videos about using foods to understand the five senses and how to identify the properties of matter.

Water (United States Environmental Protection Agency) <http://www.epa.gov/kids/water.htm> The website offers an interactive view of the water cycle. The students can use this to learn about the water cycle.

Williams, Zella. "Experiments with Solids, Liquids, and Gases." New York: The Rosen Publishing Group, Inc., 2007. A book of hands on experiments involving the three stages of matter.

Appendix: District Standards

In science students are required to be able to make scientific observations using their five senses and distinguish between an object's observable properties and its name or its uses. Students need to be able to identify the properties of matter. Students will observe foods describing the similarities and differences between the foods. Students will observe the changes that occur in a food as they change into a different state or phase of matter. Students will be observing liquids and solids and using their five senses to describe the observations they will make.

In writing the students are required to learn to write what they "see", include words that describe what they smell and taste, and organize their writing in sequential order so it makes sense to the reader. In procedural writing students write the steps on how to perform a task. Students must sequence the order of events starting from the beginning and writing all the steps until the last one. Students will use pictures and words or sentences to describe the process of what changes have occurred, starting from the beginning to the end.

Experimenting with Liquids and Solids Worksheet

What do you think the liquid ingredient is?

What do you think the solid ingredient 1 is?

What do you think the solid ingredient 2 is?

| Describe Ingredient 1: | Describe how Ingredient 1 has changed when liquid is added | Describe Ingredient 2: | Describe how Ingredient 2 has changed when liquid is added | Describe how Ingredient 1 and 2 are the same after liquid is added. | Describe how Ingredient 1 and 2 are different after liquid is added. |
|------------------------|--|------------------------|--|---|--|
| | | | | | |

I used _____ teaspoons of liquid ingredient.

I used _____ teaspoons of solid ingredient 1.

I used _____ teaspoons of solid ingredient 2.

Endnotes

- 1 McGee, Harold On Food and Cooking pg. 817
- 2 McGee, Harold On Food and Cooking pg. 458
- 3 McGee, Harold On Food and Cooking pg. 39
- 4 McGee, Harold On Food and Cooking pg. 39
- 5 McGee, Harold On Food and Cooking pg. 39
- 6 McGee, Harold On Food and Cooking pg. 39
- 7 McGee, Harold On Food and Cooking pg. 41
- 8 McGee, Harold On Food and Cooking pg. 694
- 9 McGee, Harold On Food and Cooking pg. 263
- 10 McGee, Harold On Food and Cooking pg. 263

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