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Introduction to Chemistry

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Introduction

INTRODUCTION TO CHEMISTRY is a multisensory thematic unit which will introduce basic concepts in Chemistry to students with moderate mental retardation between the ages of nine and thirteen. While this unit is intended for students with special needs, regular education teachers at the primary level may find this information appropriate for their classes. INTRODUCTION TO CHEMISTRY will integrate many curriculum areas around the common theme of basic chemistry. This unit will provide background information necessary to the planning of varied lessons. In addition, this unit will provide the teacher with teaching methodology, sample lesson plans, and an annotated bibliography.

INTRODUCTION TO CHEMISTRY is intended to meet the specific needs of my students. I teach students with moderate mental retardation at the primary level. In addition, other significant needs such as expressive/receptive language disorders, significant visual impairment, and gross/fine motor difficulties present themselves. Some of my students experience receptive language problems which inhibit their ability to process oral information. Other students experience expressive language problems which impede their ability to demonstrate understanding with responses to questioning. Therefore, I must present information in a variety of ways using as many modalities as possible. I use a multi-sensory, hands-on approach to teaching which allows for experimentation by students within the unit. Therefore, I rely heavily on the theory of multiple intelligences as a means of presenting information and creating alternative methods of assessing students' knowledge. I utilize technology as a means for assessing knowledge. A computer program entitled Board maker is used to create pictorial representations of what is said or read. When planning a lesson, one can select the vocabulary that will be used and find "universal pictures" to illustrate the word and its meaning. Therefore, the student can participate in the lesson by "reading" the directions, making choices, and expressing a thought . When one can pinpoint certain vocabulary and provided a means for presenting the vocabulary, a students' understanding is enhanced. Therefore in this unit, I will include a section on the necessity of a common vocabulary with consistent, basic vocabulary as a method for creating a common understanding. It has been my experience that science is a wonderful content area to develop topics for thematic units. Students enjoy playing the scientist on the journey to discovery. They are able to fully participate in their learning through questioning and experimentation. The students will be able to repeat experiments in a science center and perhaps design their own experiments to enhance their ability to interact with the material being taught. In addition, science is based on first principles which are often simple and

concrete in nature. Therefore, I am able to break down topics into basic components for teaching which one can then build upon as a carpenter builds a house upon a foundation.

Goals and Objectives

My overall goal for this unit is for my students to develop an appreciation for and understanding of basic chemistry as presented on a kindergarten level. My students will be able to define scientist and tell what some of his/her tools might be (ie. magnifying glass, microscope, measuring cups and spoons, etc.) My students will tell how they can use their senses safely to gather information. My students will discuss how three forms of matter: solid, liquid, and gas, are the same and how they are different. In addition, my students will tell the difference between a mixture and a solution. Also , my students will be able to conduct a simple experiment and make observations. We will explore ways to record information in a meaningful manner (ie. journal, graphs, diagrams, etc.)

Teaching Methodology

When presenting this unit, I will be using a variety of teaching methodologies to ensure student understanding. The most significant method is the thematic unit approach. This method provides for the presentation of information in a repetitive, yet fun, way across a selection of curriculum areas. When a student gets the same information in a variety of ways, s/he has a greater chance of developing ownership of that information and using it in the future. It has been my experience that a thematic unit approach is a very popular and successful teaching method on the primary grade level.

Because I teach at the primary level, I incorporate much children's literature into the unit. Literature creates a rich, meaningful way to present and enhance science instruction. In addition, I will use specific reading strategies when presenting the literature to the class. For example, I have experienced success using the KWL. This approach addresses the educational theory that meaning is derived from future knowledge building upon prior knowledge. Using the KWL, the teacher begins by asking the question "What do we KNOW?" Then, the teacher records the responses of the students as they tell what they already know about a particular topic being studied. At this moment, the teacher is tapping prior knowledge and developing a teaching framework for future lessons and assessments. Next, the teacher asks the question "What do we WANT to know?" Again, the teacher records the responses of the students as they tell what they would like to learn. At this moment, the teacher is setting the purpose for instruction. The students have questions that need to be answered and therefore, give them a reason for participating fully in the class. In addition, the teacher can address the student questions in future lessons. In this way, the students have had some input and control over what they are learning.

Periodically, throughout the unit, the teacher will return to these charts that she made and ask some questions. "Has 'What we Know?" changed? Did we have some knowledge that was not entirely correct? Do we have new knowledge and ideas to add to the chart? Does any of this affect 'What we want to know?" Then, the teacher will ask "What have we LEARNED?" and record the student responses. In this way, the teacher and the class will be able to observe what has been accomplished thus far and what needs to be revisited. This is a tangible way for students to observe, record, and comment on their own educational progress. It

again, gives some control and responsibility for learning back to the students.

Journal writing is another format for interacting with scientific information. Each student will keep a daily journal or log of their observations, thoughts, and ideas throughout this unit. The teacher will pose questions of the day for the students to respond to in their journal. For those students who have difficulty writing, a drawn picture would be a legitimate response to a question. In addition, students could dictate their thoughts and ideas to an adult or peer who would then record these responses in the journal. When the teacher examines the journals, she or he can assess the students' knowledge of the scientific concepts being presented and use of scientific vocabulary. This assessment would result in modification of lessons to reteach concepts that are not yet understood.

Another great teaching strategy is the use of graphs and other pictorial representations as a means for organizing information in a meaningful way. For example, when discussing mixtures and solutions, the class could graph which things were dissolved in water to make a solution and which things would not dissolve in water . Then the students could look at the graph to see if any common characteristics could be seen with the items that could dissolve in water. Graphing provides the visual learner with an opportunity to interact with the lesson in his or her own style of learning.

Vocabulary

A common vocabulary is very important when teaching a thematic unit to students with special needs. Words need to mean the same thing to everyone so that a common understanding is achieved and that we are all speaking the same language. I choose the vocabulary that I feel is necessary to achieving my goals and objectives. Then I teach the vocabulary and definitions and provide opportunities for the students to use the vocabulary in a meaningful manner. In this unit, I will teach the vocabulary in a concrete manner as we conduct experiments and interact with the chosen literature. In addition, I will assess the students' understanding of vocabulary by examining their journals. I have chosen the following vocabulary: scientist, eyes/see, ears/hear, nose/smell, hands/touch/feel, senses, solid, liquid, gas, mixture, solution, dissolve, evaporate, and condensation.

Vocabulary is an important tool in education and science has very specific definitions so as to create a universal language for scientific study. While I acknowledge this importance, many scientific definitions are not appropriate for students at the kindergarten level. Therefore, I have devised definitions that are appropriate for my students. The following is a listing of the definitions I have chosen to use. Scientist: A person who uses the senses, tools, and the mind to answer questions.

Senses: People use their senses to gather information about an object. There are five senses--see, smell, touch, hear, and taste. Scientists do not now use taste to gather information because it is dangerous. Some scientists were poisoned by dangerous elements when they used taste as a means to gather information.

Eyes/See: A person sees things with his/her eyes.

Ears/Hear: A person hears sounds with his/her ears.

Nose/Smell: A person smells odors with his/her nose.

Hands/Touch/Feel: A person touches or feels objects with his/her hands.

Matter: Matter occurs in three states or forms--solid, liquid, and gas.

Solid: Matter that is solid has a definite form or shape that can be touched.

Liquid: Matter that is liquid is wet and can be poured into a container.

Gas: Matter that is gas is in the air and usually cannot be seen alone.

Mixture: A mixture is when two or more things are combined together but the things do not change and can be easily separated. Molecules do not mix.

Solution: A solution is when something is dissolved in liquid and cannot be easily separated. Molecules mix together.

Compound: A compound is when an element experiences a chemical reaction and changes its characteristics or properties.

Chemical Reaction: A chemical reaction occurs when chemicals react with one another on an atomic level.

Dissolve: To dissolve is the action of forming a solution.

Evaporate: To evaporate is the action of a liquid turning into a gas.

Condensation: To condense is the action of a gas turning into a liquid.

Melt: To melt is the action of a solid turning into a liquid because of heat.

My definitions are very simplistic and do not allow for the exception to the rules and other unusual examples. However, for my purposes, I believe that a simplistic approach supports my goal of teaching a general understanding of chemistry at a very low level. (Please note that these definitions are based on the Institute classes and Chemistry reference books listed in the annotated bibliography under teacher materials.)

Background Information

Chemistry is the study of matter as well as the changes that occur in matter. Everything in this world is made up of matter. Matter can be anything that is experienced by the five senses and takes up space or has a mass. Matter has specific physical characteristics or properties such as density, temperature, color, and smell. The temperature of matter would include specific boiling points, melting points, and/or freezing points. Matter also has chemical characteristics or properties. Some elements of matter can combine with each other and/or react with each other chemically and physically.

Matter exists in four states or phases: solids, liquids, gases, and plasmas. Elements and compounds can move from phase to phase when a physical force is present such as temperature. For example, when the temperature changes, the state of matter can change. This is best illustrated with water. Water can move from state to state and not change its substance. When one boils water in a pot on the stove, one can see the steam over the pot. The steam (or gas) condenses to become a drop of water (a liquid). If one places the drop of liquid in the freezer, it becomes ice (a solid). Despite the varied states, the water retained its properties and did not become anything but water.

When a chemical force is present, it changes the properties of the element, making the substance completely different. A chemical force does not change the state of the substance. It changes the chemical structure of the substance, making it something new.

The first state of matter that we will discuss is a solid. A solid can consist of elements (or compounds) or a mixture (combination) of different elements. For example, many rocks are mixtures of different elements. Solids have specific characteristics or traits. The main characteristic is that they hold their own shape. Therefore, if you place a solid in a container, its shape will not change. Even if the solid is ground up into tiny pieces, those tiny pieces will not change their shape. In addition, the atoms within the solid do not move around much. They are in fixed positions. The atoms and electrons move in place, but do not go anywhere.

We use freezing points to determine when a liquid becomes a solid. The pressure surrounding the liquid influences the freezing point. The higher the pressure; the higher the freezing point. When the temperature decreases, most solids become smaller. It is interesting to note that this is not true for water. When water freezes, it expands or becomes larger. When a solid consists of a pure element, it freezes in a specific structure called a crystal lattice. A crystal lattice describes an organization for atoms that gives them specific places within the solid.

The next state of matter that we will discuss is a liquid. The liquid is a state that falls between a solid and a gas. Its main physical characteristic is that when placed in any container, the liquid will take on the shape of the container. First, it will fill the bottom of the container, then the rest of the container because of gravity. Also, the liquid has a flat surface because of gravity.

Another characteristic of a liquid is that it is difficult to compress. When one compresses something, one is pushing the atoms closer together so that the matter will take up less space. Liquid atoms are already close together so it is difficult to push them closer together. It is also difficult to compress a solid; however, a gas can be compressed easily.

A gas or a solid can become a liquid using different means. A solid needs energy, such as heat, to become a liquid. Every solid has a melting point. A melting point is a temperature that, when reached, changes the state of a substance from a solid to a liquid. The opposite is true for a gas. When the temperature drops, the gas is losing energy. When the condensation point is reached, the gas forms drops of a liquid. For example, water vapor from a boiling pot cools to form drops of water.

The next state of matter that we will discuss is a gas. We are surrounded by gas. The air that we breathe made up of gases. Gases consist of atoms that are spread out and moving around with lots of energy. A gas’s main physical characteristic is that it will fill any shape or size of a container. Its atoms are spread equally throughout the container. A liquid, on the other hand, will only fill a container from the bottom to the top of the container.

To create a gas, one needs energy. Atoms in gases have more energy than atoms in solids or liquids. Most gases start out as liquids. When energy is added to a liquid, it boils and creates steam or vapor. This temperature is called the boiling point. The boiling point is the temperature when a liquid becomes a gas. When the temperature drops, the gas becomes a liquid because the speed and energy of molecules decreases. When this happens, attraction forces step into the picture. This force allows molecules to group together.

There are times when a liquid is allowed to sit for a period of time. It’s molecules become a gas. This is

called evaporation. Evaporation is when molecules from a liquid escape into the air as vapor. All liquids evaporate at room temperature. This occurs because not all of the molecules in a liquid has the same amount of energy. Those molecules with a lot of energy escape into the air as vapor.

The last state of matter that we will discuss is plasmas. Plasmas are similar to gases, however, the atoms are different. Plasmas' atoms consist of free electrons and ions of an element. Plasmas are difficult to find. They need a special environment to exist. Examples of plasmas include: a fluorescent light bulb, a neon sign, and stars. A plasma can be created from a gas by pushing a lot of energy into the gas. The extra energy breaks apart neutral atoms into positively and negatively charged atoms and free electrons. The electrons and ions create a gaseous, glowing ball.

Plasmas are unique forms of matter and are difficult to explain. The explanation requires an understanding of the parts of an atom and positive/negative charges. Therefore, because of the nature of my class, the unit I have designed for my students does not include specific instruction with plasmas. I have included this information for those teachers who may be teaching higher functioning students and wish to expand the unit to include plasmas.

The study of chemistry includes the study of mixtures. Mixtures occur throughout our environment such as: rocks, concrete, and salt water. A mixture is when each substance can be separated from the whole by physical means. A solution is also known as a mixture. The most common example of a solution is salt water. The salt can be separated from the water through evaporation by allowing the saltwater to sit out for a long period of time or by boiling the saltwater until all that remains is the salt. (Please note that this information is gathered from the internet site www.chem4kids.com. This site has information that is appropriate for children to understand.)

Thematic Unit

I will begin this unit with a brainstorming activity around the question,"What is a scientist?" The class will discuss how scientists search for answers to questions. Using chart paper, we will generate a list of possible questions for scientists. I will save this list for possible use in the future when we discuss the science fair. Then, we will begin to discuss how scientists answer questions. We will talk about the use of our senses to gather information. We can look at shape, size, color, texture, sounds, and smells. This information can give us clues to an answer if done safely. However, scientists do not use the sense of taste because of the danger of poisoning. In addition, we will discuss some of the tools a scientist might use in order to search for answers (ie. magnifying lenses, microscopes, measuring cups/spoons, etc.) Finally, I will introduce the concept that we can be scientists, too. In the next lesson, we will begin to learn how to make scientific observations.

Next, we will read I See Colors by Rozanne Lanczak Williams. This children's book uses photographs as a means to sort objects by color. Students will begin to sort and classify math manipulatives by color in the mathematics center. In science, we will discuss how matter has weight, form, and color. We will then discuss how we use our senses to observe and classify matter according to common characteristics. We will begin simple graphing activities as a means to visually classify matter. For example, we will graph our shirt colors. Each student will make a shirt cut-out in the color of their own shirt. Then students will create a picture graph by grouping those shirts that are the same color. This activity can be replicated using shoes. Students can graph those wearing sneakers with those wearing sandels, etc. Graphing is an interactive means for dealing with the organization of information. I like to begin with the use of pictorial representations of the item being graphed because my students need concrete, visual connections to the material being studied. They have difficulty relating abstract images to concrete items.

Then, we will read I Can't Sleep by Kimberlee Graves. This children's book is about a child who cannot sleep. She/he finds different objects under the blankets. We will continue our discussion of matter and making observations using our senses. We will focus on the sense of touch. When we touch an object, we can feel its texture, size, and shape. Using our senses, we can make predictions about the object. We will then play a game entitled The Mystery Bag. The students will use their sense of touch to gather information about a mystery object. They will use this information to make predictions about the identity of the mystery object. Then, the students will check to see if their predictions were correct. Another activity would be the creation of My Touch Book. Students will gather items that can be glued to construction paper to form a book about the different textures of materials. Students can gather items such as: sandpaper, tin foil, wool cloth, cotton balls, velvet, leaves, etc. Then the students will write a sentence about the item and how it feels. Again, this activity reinforces language as a means for relating observations to others(Graves, 1994). Another book entitled, What's In My Pocket? by Rozanne Lanczak Williams discusses the same concepts but at a higher reading level.

During the Institute lecture, I learned about a fun activity that utilizes the sense of smell to observe materials. The teacher collects a variety of scented items such as: mint, rose petals, potpourri, spices, etc. Each item is placed in its own clean jar and labeled. Students take turns smelling the items and describing how the items smelled. The students will then graph their favorite and least favorite scents. The class discusses the results of the graph and the experience of using their noses to gather information. The teacher should discuss safety with this activity. Items should not be placed in or near the nose. The items should remain inside the jar.

Next, we will read a children's book entitled What Happened? by Rozanne Lanczak Williams which illustrates the three forms of matter: solid, liquid, and gas. We will discuss key action vocabulary as it relates to the changing forms of matter (ie. melt, freeze, evaporate, condense, and dissolve). In cooperative groups, the students will make collages of examples of the three states of matter. Students will gather pictures from magazines that illustrate the concepts of solid, liquid, and gas and sort them into the appropriate category forming collages.

The concept of a gas can be difficult to grasp for low functioning students because it is often invisible and one cannot touch it. Gibson's book entitled Making Things Change offers an experiment to demonstrate the existence of oxygen in our air. Oxygen is important because people need it to breathe and fire needs it to burn. This activity is done by the teacher only. A candle is lit and placed on a saucer. Place three sets of four quarters around the candle. Then, fill the saucer with colored water. The teacher lights the candle and places a jar over the candle, standing on the sets of quarters. The level of the colored water will rise as the candle burns out. The lit candle uses up the oxygen in the jar. The water rises to replace the oxygen that is used up by the fire. The students will see that without oxygen, fire will not burn. In addition, the students will observe that a gas such as oxygen takes up space. When removed from the environment, another element will take its place. For example, water filled the oxygen's place (Gibson 1995).

As we study matter and its properties, we will discuss the similarities and differences of solids, liquids and gases using our senses. We will examine an apple, grape juice, and helium from a helium balloon. We will chart our observations using our senses and an observation paper. We will discuss the similarities and differences that are found.

Our next reading book is entitled It's Melting by Rozanne Lanczak Williams. This story illustrates the concept that the addition and or removal of heat can cause a change in matter. We will experience how temperature affects matter by observing its impact on water. We will see water in its liquid state. When the

water is placed in the freezer, it changes its form into ice, a solid. When the water is boiled on the stove, its changes its form into a vapor.

The concept of temperature affecting matter can be extended into our cooking class. We can make hot chocolate, adding marshmallows and mini chocolate chips. We will be able to observe them melt and then discuss why they melted. Another children's book entitled Where Did It Go? by Kimberlee Graves discusses the same concepts at a higher reading level.

The concept of temperature affecting matter can also be illustrated using an experiment found in Gibson's book entitled Making Things Change. In this experiment, the students carefully mark two large plastic soda bottles at the half-way point with colored tape. They fill both soda bottles carefully to the point marked by the tape. Both bottles should have the same amount of water. Place one soda bottle in a warm room and the other soda bottle in the freezer. Leave them alone for a twenty-four hour period. The students should take out the soda bottle in the freezer and compare the water with that of the soda bottle in the warm room. The ice should be higher than the point marked by the tape. This is because water expands when it is frozen. In the winter, water pipes may burst should the water freeze and expand in the pipes. Students may have experienced this problem over the years in their own homes (Gibson, 1995).

To summarize what we now know about matter and its properties, we will read a book entitled What Is The World Made Of? All About Solids, Liquids, and Gases by Kathleen Weidner Zoehfeld. This book is more sophisticated as discusses a variety of concepts. However, as we have discussed the concepts slowly over time, this book will provide an excellent review of the topics.

Another book entitled The Magic School Bus Get's Baked in a Cake illustrates the differences between mixtures, solutions, and compounds. As we study these concepts, we will learn that a mixture occurs when two or more elements are mixed together but each retain its own properties (For example, sand and water). A compound occurs when two elements are mixed together resulting in a chemical reaction which then forms a new thing with its own properties (For example, vinegar and baking soda). A solution occurs when something is dissolved in a liquid (For example, salt and water). We will then create our own mixtures, solutions, and compounds. Then we will experiment with ways to separate the elements using different filters (coffee filter, cheese cloth). In addition, we will attempt to use evaporation as a means to separate elements. Then, we will discuss which group (mixture, compound, solution) was easier to separate into the original elements.

Another experiment found in Gibson's book entitled Making Things Change, illustrates the separation of mixtures. We will experiment with filtering tap water. Filtering is a form of straining to remove impurities or elements that do not belong in the water. Students will make muddy water in a jar using mud, clay or soil. A fun activity enjoyed by many children. Then the students will create a cone shaped filter from a coffee filter. Next, the students will place the cone shaped filter into the neck of a clean jar and carefully pour the muddy water through the filter. The water in the clear jar will appear much clearer than before. PLEASE NOTE that the water is still not safe to drink as it contains germs that were not filtered out with the cone shaped filter. This activity works because the filter's pores are too small to allow the dirt particles through into the clean jar. Only the water and particles smaller than the cones' pores, such as germs, can filter through to the clean jar (Gibson, 1995).

The mathematical component of my thematic unit will incorporate the use of measurement in chemistry. I will teach the use of basic measuring cups for use in measuring liquids or some solids. I will also introduce the use of weight and temperature when comparing forms of matter. The students will put this information to use with authentic experiments which require measurement. I will begin with a general exploration of

measurement tools. Students will have the opportunity to interact with the tools by measuring a variety of liquids and solids such as water, juice, sand, macaroni, salt, and flour. The students will make observations such as: Water in a quart-sized measuring cup will overflow a one cup measuring cup or sand in a half-cup measuring cup will not fill a pint-sized measuring cup. The students will develop concepts of volume and measurement. They will become experienced with measurement vocabulary and the proper names for measurement tools. These experiences will better prepare the students for various science experiments and kitchen activities.

The language component will be expanded through the discussion of the scientific method and design of a science fair project. We will brainstorm possible questions and solutions we might have in the area of chemistry. In addition, we will design an experiment and write about it. We will describe our purpose, hypothesis, and methodology, gather information and report out results. In this manner, students will use language in a purposeful, functional and authentic way. I find that a real life approach is more meaningful to my students than contrived lessons that lack reality.

Additional Fun Experiments

Chemistry includes opportunities for experiments that are fun and exciting to observe. A particular favorite of mine is watching white flowers change color. I like to use either Queen Anne's Lace or carnations for this experiment. The students use clear vases or jars filled with colored water. They use drops of simple food dye in water to make the colored water. I create cooperative groups of students that each have their own color with which to work. Then the students place the white flowers in the colored water. Each group maintains a journal about the flower. They make daily observations and write about what they have observed in complete sentences. They can draw and color pictures of their flowers. Students will observe the flower changing color. The flower absorbs the colored water changing from a white flower to a flower of color. As water evaporates from the flower into the air, it absorbs the fresh water from the vase to replace the evaporated water. This activity can also be repeated with celery stalks (Gibson, 1995).

Another great experiment for kids is the invisible ink activity. Students squeeze lemons to make lemon juice. Then the students write messages or draw pictures with the lemon juice on white paper. The paper is allowed to dry completely. An adult places the paper in the oven or over a toaster for a few minutes. (ADULTS PLEASE BE CAREFUL) The picture or message will appear on the paper. As the paper is exposed to hear, the water in the lemon juice is evaporated into the air. The remaining compounds react with the oxygen in the air and turns brown on the paper. The brown color makes the picture or message easily seen (Gibson, 1995).

In addition, all students love the volcano experiment. Students create bubbles of gas to simulate the eruption of a volcano. First, place a small jar on a large platter. Then surround the jar with clay to form a volcano. Next, fill half the jar with baking soda and add several drops of red food coloring. Finally, add a tablespoon of vinegar at a time to the baking soda and food coloring in the jar. The students will watch as the volcano erupts with lots of bubbles down its sides. The vinegar is an acid and the baking soda is an alkali. When mixed, they produce bubbles of gas that are light and fizzy; simulating lava flow from a volcano (Gibson, 1995).

Assessment

Assessment is an important tool in the area of teaching. We use assessment to chart the progress of a student. I use a variety of alternative assessment strategies as my students are not able to be meaningfully assessed with regular paper and pencil tests. I use a science journal that has students respond to specific

questions related to the lessons. I then assess the journal for accurate use of vocabulary and understanding of concepts. The journal becomes a part of the student's portfolio. The portfolio provides a chart of where the student began and how the student progressed throughout the unit. The portfolio would also include observation charts, graphs, diagrams, and lab reports of experiments conducted by the students. In addition, I hold periodic student conferences to discuss progress and issues that need to be resolved. The notes from those conferences as well as the student responses are included in the portfolio.

Conclusion

INTRODUCTION TO CHEMISTRY is a literature based thematic unit that introduces basic concepts of chemistry to students with special needs. These students function at the kindergarten level. The unit is concrete and hands on in nature. It incorporates a variety of activities and experiments for the students to participate during class. I always recommend conducting an experiment yourself before having the students try it out. This way, you are familiar with the material and concepts and can answer questions, assist students, and provide for a safe fun experience. The literature used in this unit supports the New Haven School's literacy initiative. The books use a controlled vocabulary that allows for reading predictions, sight word development, and shared/guided reading activities in addition to the science lessons that were discussed. Therefore, the classroom library should incorporate children's literature related to chemistry. An annotated bibliography of children's books that can be used as teaching tools as well as student resources is included at the end of the unit. This unit also includes sample lesson plans that can be used successfully with students with special needs.

Lesson Plan #1

Subject Area: Science

Objective: To observes that a mixture is two or more items mixed together, yet retaining its own properties.

Materials: varied precut fruits

bowls

Procedure:

1. The students will observe the varied precut fruits.

2. The students will write down their observations (ie. color, texture, size, shape, smell).

3. Then the students will mix the fruits together in one large bowl.

4. The students will make new observations.

5. The students will write down their observations(ie. color, texture, size, shape, smell, and changes in the fruits).

6. The students will then separate the fruits into several smaller bowls of like fruits.

7. The students will make new observations.

8. The students will write down their observations (color, texture, shape, size, smell).

9. The students will answer the question, “Has the precut fruit changed?”

NOTE: This activity can also be done with precut vegetables for a vegetable salad.

Justification:

Students will observe in a concrete manner that a mixture is the combination of elements that can be separated and retain their own characteristics. In this lesson, the students will see that the fruit was combined and then separated without changing its form or characteristics. (For example, the apple segments were still apple segments and the orange segments were still orange segments not matter if they were together or separate.)

Lesson #2 (Science)

Subject Area: Science

Objective: Mixtures and solutions can be separated through the use of filters or evaporation.

Materials: Sand, water, salt, clear glass saucers and glasses, coffee filter

Procedure:

1. The students will mix sand with water (A mixture).

2. The students will write down their observations.(The sand will change color and settle near the bottom.)

3. The students will mix salt with water (A solution).

4. The students will write down their observations. (The salt will dissolve in the water.)

5. The students will use the coffee filter to strain the sand from the water.

6. The students will write down their observations. (The sand will remain in the coffee filter, separate from the water.)

7. The students will use the coffee filter to strain the salt from the water.

8. The students will write down their observations.(The salt remains dissolved in the water.)

9. The students will place the jar of saltwater out to evaporate. (This may take several days depending on the amount of water in the jar. Or, the students can boil the saltwater until the water has evaporated; leaving the salt behind.)

10. The students will write down their observations. (The salt is left behind.)

Justification:

The students will clearly observe how scientists use filters and evaporation to separate the elements in mixtures and solutions. They will also observe how the elements do not change. Each element retains its own characteristics and properties. This lesson expands Lesson Plan #1 by using a realistic lab experiment for the mixture and utilizing solutions, filters, and evaporation. The students can take what they learned about mixtures with the lesson with the fruit and apply this knowledge to Lesson #2. Then, the knowledge is expanded through the introduction of solutions and the use of filters and evaporation as a means to separate elements from each other.

Lesson Plan #3

Subject Area: Science

Objective: To make observations of a chemical reaction

Materials: Baking Soda, water, vinegar, 2 balloons, 2 empty soda bottles, funnel.

Procedure:

1. Make Predictions: What will happen when baking soda and water are mixed? What will happen when baking soda and vinegar are mixed? Write down your predictions.

2. Measure and pour one cup of water in a empty soda bottle.

3. Measure and pour one cup of vinegar in a empty soda bottle.

4. Measure and pour one tablespoon of baking soda in each of the balloons using the funnel.

5. Place the balloon on the neck of the water bottle. Allow the baking soda to pour into the water bottle. What happens? Record your responses.

6. Place the balloon on the neck of the vinegar bottle. Allow the baking soda to pour into the vinegar bottle. What happens? Record your responses.

7. Discuss the role of chemical reaction in this experiment.

Justification:

The students will use their previous experiences with vinegar and baking soda as discussed in the unit on which to base their predictions. The students will observe that some elements chemically react to each other when they are combined together. A chemical reaction changes the properties or characteristics of the elements; creating a new substance with its own characteristics or properties.

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Usborne Pocket Scientist. CHEMISTRY EXPERIMENTS. 1988.

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Selected Classroom Readings

Student Materials

Beech, Linda. THE MAGIC SCHOOL BUS GETS BAKED IN A CAKE. Scholastic, 1995

*Discusses mixtures, solutions, compounds, and chemical reactions at a children's level.

Branley, Franklyn M. AIR IS ALL AROUND YOU. HarperCollins Publ. 1986.

*Discusses the mystery of air.

Gibson, Gary. SCIENCE FOR FUN. MAKING THINGS CHANGE. Copper Beech Books. 1995.

*A book about experiments dealing with making things change.

Graves, Kimberlee. I CAN'T SLEEP. Creative Teaching Press, 1994.

*A children's reading book that deals with observations of matter.

Graves, Kimberlee. WHERE DID IT GO?. Creative Teaching Press, 1997.

*A children's reading book that deals with the properties of matter and the properties of a solution.

Krulik, Nancy. THE MAGIC SCHOOL BUS IN A PICKLE. Scholastic, 1997..

*A children's book about microbes.

Williams, Rozanne Lanczak. I SEE COLORS. Creative Teaching Press, 1994.

*A children's reading book dealing with the properties of and classification of matter.

Williams, Rozanne Lanczak. IT'S MELTING. Creative Teaching Press, 1994.

*A children's reading book dealing with how properties of matter can change.

Williams, Rozanne Lanczak. WHAT HAPPENED? Creative Teaching Press, 1994.

*A children's reading book dealing with the affect of heat on states of matter.

Williams, Rozanne Lanczak. WHAT'S IN MY POCKET? Creative Teaching Press, 1994.

*A children's reading book about observing matter using the senses.

Zoehfeld, Kathleen. WHAT IS THE WORLD MADE OF? ALL ABOUT SOLIDS, LIQUIDS, AND GASES. HarperCollins Publ. 1998.

*A children's book about the varied forms of matter that exist in our world.

Internet Sites

www.chem4kids.com

*Chemistry inormation written for students to comprehend.

www.teachersfirst.com/cnt-chem.htm

*Chemistry resources and links for teachers.